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The IMF, the EU and the Sovereign Borrower: the Case of Hungary 2008-2010

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SUMMARY

There have been intensive debates in Hungarian public life on the ways of regaining economic sovereignty and enlarge the room of manoeuvre of the national government vis-à-vis international financial institutions. The paper addresses the concepts of sovereignty and of fiscal room of manoeuvre of a (new) EU member state, and the nature of sovereign debtors' dependence on foreign finance in the post-2008 financial context. The author concludes that contrary to wide spread beliefs, nation states do have options regarding relations to supranational and international bodies, yet the preconditions of successful manoeuvring are hard to attain.
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Motto:

"Interdependence has developed to such a degree that all EU member states – the strong and the weak, the virtuous and the sinners – have lost their full economic, and even political sovereignty by now.
Fmr Finance Minister Tommasso Padoa-Schioppa

„Hungary will not "break its back" to reduce its budget deficit to 2.8% of GDP in 2011 just to please a few financial experts in distant offices."
National Economy Minister György Matolcsy

INTRODUCTION

In autumn of 2008, amid the turmoil in international financial markets, the Hungarian government at that time decided to turn to international institutions for financial support; first to the European Union (EU), and to the International Monetary Fund (IMF or Fund) afterwards. The requests were accepted, and the ensued massive loan of 20 billion EUR saved the country from a potential sovereign insolvency.

If a country is forced to borrow from an international financial institution (IFI), it is an embarrassment for any country as the Fund is a lender of last resort. Before this event happened, few would have questioned whether capital market players would accept an EU member as a bankable risk. Ex post, particularly after the Greek events in early 2010, sovereign default in Europe does not sound unthinkable. Let us take the following fact: in the autumn of 2010 the yields of ten-year bonds issued, say, by Ireland and Portugal were as high as 6 per cent, while Italy's yield being below 4 per cent, Germany's less than 3 per cent a year – all that prove in the past few months the investors have become able to differentiate among European county risks.

Still, back in 2008 the events did come as a surprise: Hungary had been looked at as a rather successful transition country with an emerging economy for a long time.

In order to understand the case, we will look first at the events themselves, then at the whys and hows, and finally we will summarize the lessons learned from this and other similar sovereign borrower's case.

THE TRAIN OF EVENTS LEADING TO A GOVERNMENT PANIC

The events evolved rather fast. The currency (forint) sharply depreciated in September and October of 2008; capital market players lost their appetite for Hungarian sovereign debts: for weeks, the agency of the Hungarian treasury (AKK) proved unable to sell government bonds at reasonable prices, and later there was no demand for them at all.[1]

[1] *See my analysis of the Hungarian case – Bod (2009)*

Cross border banking credit lines got suspended, evoking the spectre of sudden stop in capital inflows. The Hungarian authorities got frightened, asked for help, one can venture to claim, in a panic.[2]

Within weeks, the EU/IMF tandem put together a sizable loan package. The Council of the EU, by its decision of 4 November 2008 (14953/2/08), offered Hungary a medium-term financial assistance of up to EUR 6.5 billion. This loan was administered under a balance of payments facility created for member states - based on Article 119 of the Treaty - back in 2002 (Regulation No 332/2002).[3] As the text of the Treaty goes: although there is no general bail-out clause in the legal documents, yet when a member state is having difficulties with its balance of payments, and the difficulties are liable to jeopardise the functioning of the common market, the Commission investigates the position of the given state, and the Council, acting by a qualified majority, will grant assistance. The Council lays down the conditions and details of such assistance, possibly in a „coordinated way with other financial institutions" to which the client in case may recourse – an implicit reference to the IMF. In addition to international institutions, other Member States, as the text explicitly says, may wish to join in granting assistance.

In the case of Hungary, there was no third country assistance involved. Instead, when Hungarian office holders approached the Commission (and probably a few key European capitals), the EU immediately contacted the IMF and requested it to join in the exercise of providing policy-related financing for Hungary.

With Greece some time later (Summer 2010) having a similar joint EU/IMF programme, the question 'Why should an EU member state be financed by the Fund?' does not now seem to be a real issue. Still, the Hungarian case raises interesting policy issues concerning the role of the IMF, and also the role of the EU, when an EU member state is experiencing financial difficulties.

The simple, but far from the only reason of why the European institutions insisted on IMF participation in the loan was the lack of funds at the disposal of the EU. From the start, its financial resources of that nature were limited: at the time of the creation of the 2002 regulation the total sum was 12 bn EUR. Even doubling or trebling the size of this "exceptionally loan facility" would not be enough to solve the problems of a single medium sized European economy in need of contingency finance. This was the way the EU loan was provided in the Hungarian case (or later to Greece) in conjunction with loans from the International Monetary Fund. The Fund provided SDR 10.5 billion (around EUR 12.5 billion) under a Stand-by arrangement (SBA) approved on 6th of November that year, and the World Bank (WB) also earmarked a loan of EUR 1 billion.[4]

EU: NOT GOOD AT TROUBLE SHOOTING

The other, and probably as important, issue at stake was loan conditionality. The conditions of the economic policy to be respected by the Hungarian authorities were laid down in the Memorandum of Understanding signed on 19 November 2008 between the Commission on the one hand, and the Hungarian government and the National Bank of Hungary, on the other (MNB, Memorandum, 2008). But the Commission's team worked, in fact, closely with that of the IMF, and the loan conditions were actually put together, approved and monitored uni sono by the two lending institutions. In this particular case, as later with the Greek one, EU decision makers were probably motivated to team up in the deal with the IMF knowing that the Fund was better prepared to set quantitative loan conditions and to oversee indebted governments than other bodies. In addition, a Bretton Woods institution's corporate governance is different from the EU's: decision taking is much faster in Washington DC than in Brussels.

The sensitive issue of sovereignty also comes into the picture. Granting financial support is conditional and depends on the borrower's willingness to take particular economic policy measures as determined by the provider(s) of the funds; since the borrower is a member state of the EU (and member of the IMF/World Bank set) the parties to the deals face an awkward situation. It is hard for the EU Council (consisting of premiers or finance ministers of member states) to force politically unpopular loan conditions on a peer, particularly when other nations are also experiencing similar economic difficulties. Within the EU, economic policy harmonization agreements, pacts and initiatives among the member states do exist, but the coercive mechanisms have proved to be soft or vague.[5] This is less so with the IMF; throughout the decades, sovereign borrowers have learnt to accept IMF tutelage in return for loans at short notice from the IMF and its sister institutions.

[2] *This is how the present author sees the behaviour of the government of the day, see: Bod, P. A. (2010) : Hungary Turns to the International Monetary Fund in 2008 – Anatomy of a Crisis. Wekerle Sándor Üzleti Főiskola. Gazdasági Élet és Társadalom. No. 1. forthcoming).*

[3] *The documents referred to are the Consolidated version of the Treaty on European Union and of the Treaty establishing the European Community (2002/C325/01), and the Council Regulation (EC) No 332/2002 of 18 February 2002 establishing a facility providing medium-term financial assistance for Member States' balances of payments.*

[4] *See: Memorandum of Understaning between the European Community and the Republic of Hungary. November 2008. http://www.mnb.hu/A_jegybank/eu/hitelmegallapodas*

[5] *This is the case with the Stability and Growth Pact.*

True, to avoid formal loss of sovereignty, it is the borrower government that „offers" economic policy conditions to the lender, detailed in a letter requesting the loan to the IMF/World Bank. In this particular case, the request letter sets outs the Hungarian government's planned budgetary, tax policy and regulatory actions as agreed upon during the joint IMF/EU staff visit prior to finalizing the letter. „The 2009 budget will be amended to reflect the deterioration in the economic outlook and to further reduce the government's borrowing requirement.

The revised budget envisages a general government deficit of 2½ percent of GDP, which implies a structural fiscal adjustment of about 2½ percent of GDP. Revenues, which are difficult to project precisely in the present environment, are expected to decline somewhat as a percentage of GDP, reflecting the slower growth of the tax base and the effect of the spending measures outlined below. The tax cuts previously envisaged for 2009 will be cancelled and we will not make any changes in the tax code that could lead to lower net revenues."[6]

But the wording of such request letter should not deceive us: the government applying for an IMF loan would only include its "own" planned items in the letter after the measures have been thoroughly reviewed by the Fund's mission to the borrowing country. This is why the approval of such a request at the IMF Board meeting is mostly a formality; the planned measures being tabled by the government are the very ones that the IMF expects from the applicant.

The broad policy promises as they appeared in the Hungarian request letter were later detailed in follow-up negotiations. The particular loan conditions of the IMF/EU loan fell into the Fund's practice of determining quantitative performance criteria and targets, as well as structural measures. In this case performance criteria included target figures on central government primary balance, inflation, international reserves, external debt, and stock of central government's debt. Structural benchmarks included the passage by Hungarian parliament of a law on the Hungarian Financial Supervisory Authority, a scheme to recapitalized Hungarian banks, and introduction of new forms of taxes, such as tax on real estates.

It became clear soon that not all policy promises could be delivered even if the government had really tried hard. The economic reality turned out to be rather different, with implications for the public sector budget as well. 2009 will go down in Hungarian economic history books as a year of deep contraction of output, when budget revenues were strongly affected by the economic downturn. Eventual deficit and debt data varied from those written into the loan documents back in 2008. Still, the drawing down of the loan went ahead, as the Fund/EU team acknowledged the efforts of the government (a reshuffled Socialist government since April 2009, a sort of care-taker administration with a limited mandate until the general election in April 2010).

It is telling how much the data changed between the first and the second IMF loan review in major policy variables: the output contraction turned out to be much deeper by mid-2009 than anticipated at the granting of the loan and at the time of the first review. The original budget deficit figures had to be revised. Since deficit (primary balance) is one of the qualitative indicators, the Hungarian government asked for a waiver – the request was supported by the IMF/EU field team, and granted by the lenders.

Table 1. Hungarian macro economic data under successive IMF reviews

	2009	
	1st Rev.	2nd Rev.
Real economy (change in percent)		
Real GDP	-3,3	-6,7
Total domestic demand 1/	-4,5	-8,0
Private consuption	-3,8	-6,5
Gross fixed investment	-5,0	-10,3
Foreign balance 1/	1,1	1,3
Exports	-3,2	-15,1
Imports	-4,3	-16,7
CPI (end year)	4,3	6,4
CPI (average)	3,8	4,5
Unemployment rate (average, in percent)	8,9	10,5
Gross domestic investment (percent of GDP) 2/	19,4	22,5
Gross national saving (percent of GDP, from BOP)	15,4	18,4
General government (percent of GDP), ESA-95 basis 3/		
Overall balance	-2,9	-3,9
Primary balance	1,5	1,0
Debt	75,9	77,4

Source: IMF, second review

It is important to underline here the very fact that the lenders did not insist on the original loan conditions acknowledging that the macroeconomic conditions had changed significantly meanwhile. Having said that it is also true that even after a certain loosening of fiscal policy (1 per cent of GDP surplus instead of 1.5 per cent of surplus in primary budget) the fiscal environment still remained very strict for an economy shrinking by more than 6 per cent in that year.

The contrast to other European economies is striking: in some EU member states governments ran a double digit budget deficit in order to soften the blow of the international financial crisis to the given economy. In 2009 the largest government deficits in percentage of GDP were recorded by Ireland (-14.3%), Greece (-13.6%) the United Kingdom (-11.5%), Spain (-11.2%), Portugal (-9.4%), Latvia (-9.0%), Lithuania (-8.9%), Romania (-8.3%), France (-7.5%) and Poland (-7.1%) – as published by the Eurostat (Eurostat, 2010).

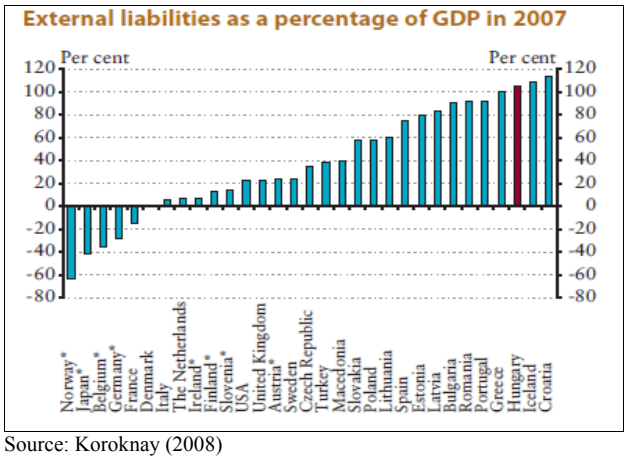
[6] *MNB (2008): Letter of intent. http://english.mnb.hu/engine.aspx?page=mnben_stand-by_arrangement*

These figures testify the tectonic changes in European fiscal positions and debt finance during the crisis, creating soon new realities for all parties concerned. The traditionally strict IMF stance on fiscality was gradually eased: the Fund joined the supporters of the concept of fiscal stimulus in crisis-stricken European economies. The change in attitude was so marked that commentators felt the IMF was „going soft" and not effective enough.[7] The EU Commission also had to accept that the benchmarks of the Stability and Growth Pact were disregarded by many member states. In this climate, the Hungarian loan conditions proved to be strict but not excessively during year 2009.

RETURN TO MARKETS: WHEN AND AT WHAT PRICE

The aim of the IMF/EU contingency financing facility was to counterbalance the detrimental effects of the „near sudden stop" in inflows to Hungary, and give time for the country to return to financial markets. Let us therefore look at the behaviour of the capital market. In 2008 it became obvious that Hungary's first and foremost problem for analysts and financiers was high external indebtedness. Combined (public and private) external debt well exceeded 100 per cent of GDP by 2008; not extreme in good times, but certainly high enough in the times of nervousness in international flows.

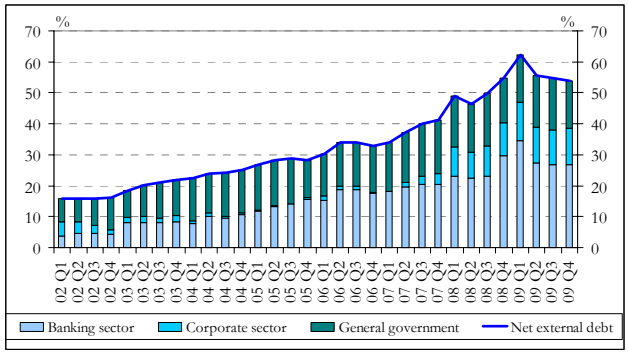
Table 2. External exposures of countries



Source: Koroknay (2008)

Secondly, the stock of external debt had been growing fast during the years before the shocks of 2008. These facts made suddenly Hungary a suspect case in summer of 2008 when tiny Iceland defaulted on a huge pile of foreign debt.

Table 3. Net external debt as a percentage of GDP



Source: MNB, Stability Report, 2010 April

The corporate sector's thirst for foreign funds was a quite general phenomenon in emerging economies throughout the years before 2008, with Hungary being no exception. But the country was exceptional in combining household indebtedness (via banks), corporate debts and massive public sector debts. This is why it is not much surprising that the financial turbulences of 2008 hit Hungary among the very first.

Banks, importantly, had mostly lent to households and businesses in foreign currencies until the events of 2008. The main driver of forex lending had been the large interest rate differential between the domestic currency (forint) and funding currencies such as the euro and the Swiss Franc. In Hungary, the increase in forex lending after 2003 reacted in part to the abolition of subsidies on forint-denominated mortgage loans. By the end of 2008, Hungary had had the highest share of loans in foreign exchange among the new Member States. Borrowing in foreign exchange is perfectly sensible when domestic interest rates are consistently high, and exchange risk is moderate – which was the case in Hungary and some other countries. The whole case changes if the currency deeply devaluates against funding currencies; this is what happened to the country after summer 2008.

Hungary ran high public sector deficits for a long time but domestic and foreign fund holders were ready to take Hungarian risks - until 2008. The country's sovereign risk rating improved to A-level in early 2000s when the country arrived at the doorstep of EU membership. Later, however, bloated debt and deficit figures simply unqualified the country for entry into the euro-zone, and deteriorating debts figures triggered sovereign risks and the country was downgraded to BBB, and then to BBB- by the major rating agencies in summer of 2008.

[7] *The Canadian central bank governor put it outspokenly: „Its fovernance is diffuse and ineffective. The IMF is effectively without the power of sanction." See: Carney (2010).*

After the news about the bankruptcy of Lehman Brothers in September 2008, financial market conditions immediately turned critical. Given its large fiscal deficits and high foreign exposure, Hungary became a target of speculations after the crisis of the Icelandic economy. On the 8th of October, the forex swap interbank market collapsed; the secondary market for government bonds froze, HUF depreciated steeply; trade was suspended in the Budapest stock exchange because of steep price fall. Government bond auctions had to be cancelled for lack of bidders.

Clearly, markets became edgy about Hungary. The perception of the country risk was reflected in the so-called CDS spread: the 5-year CDS spread of Hungary reached its peak levels around 600 bps in October 2008. By comparison, the Polish CDS spread was less than 300 bps in October 2008, the Czech CDS spread was less than 250 bps. The risk of default of Hungary was therefore perceived to be substantially higher than the default of Poland or of the Czech Republic.

While domestic (HUF-denominated) bond issues were restarted after a couple of months of suspension, the Hungarian government also tried to tap the international capital markets once the first shocks were over. The Ministry of Finance initiated an international bond issue in 2009 which was in fact significant overquoted. The authorities doubled the issuance volume from EUR 500 million to EUR 1 billion, and declared the issue a big success. However, the funding cost was very high: price of the bond exceeded the Bund (German government bond) of corresponding maturity by 432 basis points, resulting in an effective euro interest rate around 6.8 per cent.[8]

Year 2010 started more promisingly for emerging economies. Hungary issued its first US dollar-denominated bond after a five year interval in January 2010, against strong demand: orders totalled USD 7 bn, of which Hungary's AKK accepted USD 2 bn.[9] The 10 year instrument's yield was set 265 basis points over US Treasuries; visibly higher than the spread of 198 bps on Turkey's 10-year USD bonds. Turkey was ranked non-investment grade by major rating agencies, while Hungary stood at BBB-, the lowest investment-grade category, at Standard & Poor's; at Baa1, two notches higher,at Moody's, and BBB rank with Fitch, two ranks above non-investment (or 'junk') grade.[10]

HUNGARIAN POLITICS AND PASSIONS

The above pricing data indicates that an otherwise not cheap IMF/EU loan to Hungary was still less expensive than bonds issued to a sceptical capital market. Still, the incoming centre-right Hungarian Government under premiership of Viktor Orbán decided, after some confusing and confused communication, to suspend negotiations with the IMF/EU team in July 2010.

As the diplomatic statement of the IMF team put it:" "Over the past two weeks, the IMF mission has conducted intensive discussions with the authorities covering these issues. While there is much common ground, a range of issues remain open. The mission will therefore return to Washington, D.C. The IMF will continue to actively engage with the authorities with a view to bridging remaining differences."[11] As for differences there were many of them: first, the government wanted to negotiate a higher, 3.8 percent of GDP deficit for 2011 (rather than below 3 %) in exchange for structural reforms, while the team representing the lenders insisted on the original schedule. Second, the lenders did not like the planned financial sector levy ("bank tax")' either, designed to raise 200 billion forints (nearly one percent of GDP) in 2010 and unspecified years after: this would help reduce budget deficit but at the cost of hurting economic growth through reduced financial intermediation. The IMF/EU team noted that plans on structural reforms in transport and health care, in reorganizing state owned enterprises were not clear enough – while the new government felt it was too early to present detailed plans. The lenders' team was reported to worry about independence of the central bank after a proposed public sector pay ceiling which would much reduce the central bank governor's pay (a move also objected by the European Central Bank).

At the end of the talks, others used less diplomatic language such as "failure of negotiations".[12] The exchange rate weakened immediately, as investors worried about the future of the Hungarian finance.

[8] *Government Debt Management Agency (AKK), Auction and subscription results. See: http://www.akk.hu/aukcio*

[9] *Published by Portfolio.hu on January 27, 2010*

[10] *Polish issue of 5 year USD-denominated bonds were sold at 215 bps above similar US goverment bonds in July 2010, reflecting investors trust in the Polish economy (in contrast with Hungary's) in mid 2010.*

[11] *Statement by the IMF Mission to Hungary. Press Release No. 10/295. July 17, 2010. Concerning the differences between the parties, see Reuters: Factbox: Unresolved issues between Hungary and lenders Jul 23 2010.*

[12] *"Hungarian assets came under heavy selling pressure on Monday after the International Monetary Fund and European Union postponed the conclusion of a budgetary review in Budapest, insisting that the government must rethink its proposals. Although Hungary is not in urgent need of IMF financing, the failure of the negotiations was a blow to investors who remain uneasy about the country's debt levels and reliance on external financing."Financial Times, Forint falls after IMF halts Hungary talks. July 19, 2010*

A couple of notes should be made here concerning the background of the tensions ("remaining differences"). During the IMF's visit, the Hungarian government officials tried to persuade the Fund to accept a deficit target of as much as 3.8 percent of GDP for 2011 instead of 2.8 percent (as the minister for economy and finance G. Matolcsy said in July 2 interview). Hungary needs extra spending headroom to finance changes, such as merging state agencies at the county level, to yield longer-term savings, or reorganizing loss making state owned firms, the minister said, adding that the government also sought a two-year "precautionary" loan agreement beginning in 2011.[13]

Eventually, the loan review remained open; and without its successful closing, the government could not tap the remaining tranches of the ongoing loan. But the unused funds were not in fact needed at all, in light of record high international reserves at the Hungarian central bank. More importantly, the parties did not enter negotiations about the precautionary loan facility that government personalities had already discussed about in public. Failure of negotiations or temporary suspension of talks? Would the breakdown of that given round of talks amount to an 'economic freedom fight' against distant global powers? The latter version may sound strange, yet some Hungarian officials, and particularly the media close to the governing party, swiftly turned the collapse of the talks into something positive: deliberate action to strengthen national sovereignty. As the mentioned minister phrased it in a television programme: "the cabinet remains intent on maintaining the country's financial independence and regaining economic self-determination."[14]

A number of foreign commentators joined the debate – or used the Hungarian case to illuminate their views and beliefs.[15] Probably neither the fierce defense, nor the emotional dismissal of the points raised by government circles and supporters helps much to see clearly what policy course would really serve the nation's long term, strategic objectives.

The behaviour of rating agencies is easier to gauge. Analysts look at macro figures as well as at the political scene, and based on what they believe to be a 'good' economy' versus a 'bad' one, they rank countries. Recently some agencies became nervous about the Hungarian economy: its real position and its macro-management team.[16]

But the IMF was not the only, let alone the main, obstacle to the new Hungarian government's planned fiscal policy course, but the EU as well. The Hungarian general elections in April 2010 were obviously very important for the countr, but the change of government remained a domestic story. In the spring of 2010 the Greek sovereign debt crisis certainly led to shockwaves in Europe. As a consequence of this crisis, most European governments were soon forced to take measures to calm excitements in the financial markets. Not only Greece, but also Spain, Portugal and Ireland, declared drastic actions to smooth nervy bond markets. To avoid a similar fate, in May Italy pledged to cut its budget deficit by €24 billion by 2012, and even the most creditworthy nations joined in: in June the German government announced a package of measures that would save it around €80 billion by 2014. Its chancellor, Angela Merkel, said Germany should set an example of budgetary discipline to other euro-zone countries. The French government also declared it would act to trim its deficit by abolishing tax exemptions and freezing most spending programs from 2011 on.[17]

The mood thus changed in the summer of 2010 in the European Union, partly because of a parallel change in winds in the financial markets. There remained no room of maneuver for a new government, however logical and justified it would be to apply a dose of anti-cyclical spending to kickstart the stagnating economy. Neither fellow politicians, nor financial market players felt sympathy for the incoming Hungarian administration in its endeavors.

CONCLUSION

No economy, not even the biggest in terms of global market share, remains unaffected by imbalances and tensions in product and capital markets. Open, trade dependent small economies such as Hungary are especially exposed to external economic and financial forces. Being a member state of the European Union adds further to the factors that national governments must take into account in elaborating their policies. All these, yet, do not mean that 'globalization' and 'integration' would lessen the importance of nation state policy making. Governments still have levers to use and initiatives to launch; they can even – as this was the case here – question the policy line of influential international players like the IMF. The introduction of the Hungarian "bank tax" is an example for the sovereign decision of a government, against the advice of powerful institutions.

[13] *Bloomberg: Hungary Assets May Fall as IMF, EU End Talks Without Backing Deficit Plan. Jul 18, 2010*

[14] *Portfolio.hu: EcoMin says Hungary will not "break its back" to cut deficit in 2011 6th August, 2010*

[15] *See supportors of the Hungarian new government's position: e.g. Krugman, Paul: The New York Times, Give Me Your Tired, Your Poor, Your Hungary. August 4, 2010; Mark Weisbrot: To Viktor go the spoils: how Hungary blazes a trail in Europe. Guardian.9 August 2010, while as for critical opinions, see: Orban out on a limb. Hungary's new prime minister takes on the world. The Economist. Aug 5th 2010; Reuters Analysis: Hungary risks markets' goodwill with IMF/EU failure. By Krisztina Than, Jul 23, 2010*

[16] *Standard&Poor's: Credit Trends: Global Potential Fallen Angels. Publication date: 10-Sep-2010*

[17] *Economist, The Budget cuts in the euro area. Jun 10th 2010*

Governments can – most of the time – choose the degree of dependence on one class of fund holders over another class: IFI finance over private capital market. Yet, with high debt exposure, the government cannot neglect the fact that rating agencies, market analyst, fund holders watch indicators such as debt to GDP, deficit to GDP, relative size of international reserves very carefully. The market players demand the contour of an economic policy, and they appreciate simple, promising "stories" and easy to read figures. In a roundabout way, the markets enforce on their clients a policy line which is rather similar to the one recommended by IFIs.

Market finance of sovereign debt seems to be a totally business issue, while official financing has an element of formal policy harmonization under formal contracts. On the surface, the latter seems to involve borrower's concessions in terms of economic policy sovereignty: governments sign memoranda, expose themselves to regular reviews. In contrast, markets are inhabited by too many players with their fast changing inner relations, thus market finance does not appear to infringe sovereignty – yet, it does reduce the room of manoeuvre of an indebted government in need of funding.

This simple truth is sometime hard to understand in the world of politicians accustomed to legal, constitutional and institutional relations. But a major lesson of the financial crises of 2007-2010 was exactly the realization that capital markets are run by players with limited background knowledge and poor capacity to discount long term factors. Market players themselves may turn to governments and supranational institutions for help in case of shocks. Therefore, national governments can steer an open economy successfully only by playing both games well: the market game and the more formal game of international institutions.

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Successful Knowledge Management an Knowledge Sharing in Hungarian Enterprises

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SUMMARY

Some organizations failed to consider the relationship between knowledge management and organizational culture, and the cultural factors that impacted effective knowledge management initiatives. These organizations face challenges when implementing knowledge management initiatives. They should find ways to integrate knowledge management into their strategic vision, build a knowledge sharing culture that supports knowledge management and motivate employees to support these initiatives. The International Mapping of Knowledge Sharing Excellence Research has shown that there are differences in the maturity of knowledge sharing of managers within different culture types comparing the period before and during the crisis. It can be seen that it would be useful for Hungarian organizations to move towards an Adhocracy culture type, that concentrates on external positioning with high degree of flexibility and individuality and which results in a high maturity of knowledge sharing.
Journal of Economic Literature (JEL) code: O32, D83

INTRODUCTION

As Nonaka (1991:96) puts it "in an economy where the only certainty is uncertainty, the one sure source of sustainable competitive advantage is knowledge". This new economy, that is driven by globalization, rapidly changing information and communication technology, is characterized by Tapscott (1997:8) as follows: "It is widely accepted that the developed world is changing from an industrial economy based on steel, automobiles, and roads to a new economy built on silicon, computers, and networks…The new (digital) economy is a knowledge economy".

In order to maintain market position, to develop new products or technologies in this new economy, organizations need to exploit, develop, collect and share organizational knowledge effectively and efficiently (Gaál et al. 2008). The knowledge management and knowledge sharing have an important feature: it stays in the organizations long after the employees leave it. Thus the leaders of an organization should be aware of this and recognize that the old paradigm "knowledge is power" cannot exist in these days any more. Accordingly, the leaders ought to find ways to motivate, encourage colleagues to achieve the new paradigm of the XXI. century which is "sharing knowledge is power" (Csepregi 2008). Knowledge management and knowledge sharing will become realistic in an organization if employees who work there understand that sharing can support them in retaining their jobs, doing their jobs more effectively and helping their personal development (Gaál et al. 2008).

It is crucial to be aware of the concept of knowledge, before dealing with the different knowledge management and knowledge sharing approaches.

Knowledge is considered by Sveiby (1997:37) as "the capacity to act". Brooking's (1999:5) view of knowledge is that it is „organized information together with understanding of what it means". According to Davenport and Prusak (1998:5) knowledge is "broader, deeper, and richer than data or information". They offer the following "working definition" of knowledge: "Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms." Besides these definitions knowledge is interpreted in several ways in different publications.

Our research defines knowledge as the whole of information, experience, routines, practices etc. that can be connected with people, can be found in the mind of a person or group or in electronic or paper documents and can be broadened during sharing that occurs between the knowledge sender(s) and the knowledge receiver(s).
Bartol's and Srivastava's (2002) approach contains information as an element of knowledge sharing and defines it as the action in which relevant information is diffused by employees to others across the organization. Contrary to this approach according to Kharabsheh (2007:530) the fact that knowledge sharing contains elements of reciprocity differentiate it from information sharing which is "about the management making information available to all members of the organization and it could be unidirectional and unrequested". Möller and Svahn (2004:220) believe that knowledge sharing is "sharing not only codified information, such as production and product specifications, delivery and logistics information, but also management beliefs, images, experiences, and contextualized practices such as business-process development". The relationship between sharing of organizational knowledge and intellectual capital can be examined with four behavior forms: employing intellectual capital and sharing its own knowledge with other participants; utilizing the obtained knowledge for getting competitive advantages without knowledge feedback; not using organizational knowledge, but sharing knowledge with others; not letting the intellectual capital in and out (Deák et al. 2009). As Christensen (2007:37) puts it "the goal of knowledge sharing can either be to create new knowledge by differently combining existing knowledge or to become better at exploiting existing knowledge".
According to our research knowledge sharing is a two-way process (giving and receiving knowledge) between the knowledge giver(s) and the knowledge receiver(s) who as participants of knowledge sharing share the knowledge found in their minds or the knowledge found in electronic or paper documents and which can occur at the same time when the participants are present or at different times when they make their knowledge explicit.

KNOWLEDGE MANAGEMENT SURVEYS AT THE UNIVERSITY OF PANNONIA, HUNGARY

The "Knowledge Management in Hungary 2005-2006" research

KPMG Hungary has a long tradition and much experience in knowledge management survey projects: Knowledge Management Research 2000 (KPMG, 2000) and Knowledge Management Research 2002. In 2004 University of Pannonia, Department of Management joined forces with KPMG-BME Academy in order to investigate the current state of knowledge management in the Hungarian profit and non-profit sectors. Therefore a detailed survey - "Knowledge Management in Hungary 2005-2006" - was conducted. (Gaál-Szabó-Óvári, 2007)
Collaterally with "Knowledge Management in Hungary 2005-2006" survey, a "National Culture Research" was completed with the collaboration of Trompenaars-Hampden Turner Management Consulting, Netherland and University of Pannonia, Hungary. The "National Culture Research" determined what type of organizational culture belongs to the participants' workplace. (Kovács, 2006).

Methods

The survey examined the organizations' successfulness of knowledge management programs. The results show growing awareness of knowledge management, its value to business and the benefits resulting from a systematic and holistic approach to the effective use of intangibles among organisations operating in Hungary. In the application of knowledge lies huge potential, which is still mostly unexploited.
130 small-, middle- and large organizations - operating in Hungary took part in the empirical survey. The respondents were top and middle directors, managers and owners. Only 37 percent of the respondents declare that they have a knowledge management strategy, while 77 percent are indicating knowledge as a strategic asset. It can be seen that there is huge gap between the reality and the desire. 22 percent of the participants have knowledge management program and 30 percent are currently setting up or considering one.
The most significant problems are the lack of understanding knowledge management benefits and the lack of time to share knowledge.
Knowledge management is seen as a key accelerator for realising synergies among units, improving quality and achieving higher added value for customers. Majority of the respondents show a growing interest in knowledge management initiatives. The most popular initiatives are: knowledge repository, information center and center of excellence. (KPMG-BME Academy, 2006)

Results and discussion

The study examines the correlation between types of organizational culture (defined by Trompenaars and Hampden Turner) and the successfulness of knowledge management program with using qualitative methodology.
The study consists of 14 fourteen case studies. All interviews were with senior managers, managing directors and owners and conducted personally. Anonymity was granted to participants to keep their identity unknown.
To arrive at a right understanding of this passage, here comes the review of organizational culture types. Trompenaars and Hampden-Turner define four types of corporate culture - the family, the Eiffel tower, the guided missile and the incubator.

The four diversity cultures model assumes major dimensions of person vs. task and centralised (which is also assumed to be hierarchical) vs. decentralised (which is assumed to be more egalitarian). (Trompenaars and Hampden Turner, 1998)

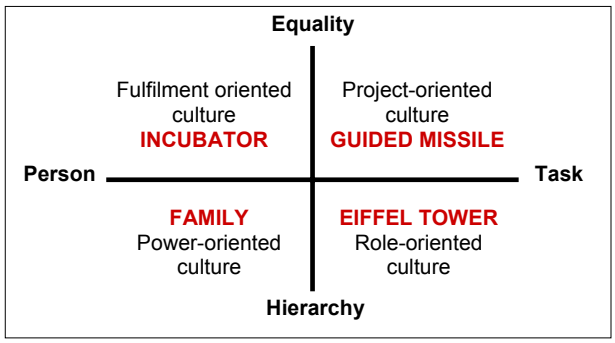

Figure 1. Types of organizational culture by Trompenaars and Hampden Turner

The family culture is personal, with face-to-face relationship, but also hierarchical, in the sense that the boss ("father") has experience and authority of the subordinates ("children"). The result is power-oriented corporate culture in which the leader knows better what should be done. Who is doing something is more important that what is being done.

The Eiffel Tower culture's structure is symmetrical, narrow at the top and broad at the base, rigid and robust. Each higher level has a clear function of holding together the levels beneath it. The subordinates obey the boss because it is his/her role to instruct them. The status is ascribed to the role.

The guided missile culture is oriented to tasks, typically undertaken by teams or project groups. It differs role culture in that the jobs members do are not advance. The ultimate criteria of human value in guided missile culture are how you perform and to what extent contribute to the jointly desired outcome.

The incubator culture is based on the existential idea that organizations are secondary to the fulfilment of individuals. The incubator is both personal and egalitarian. It has almost no structure or structure provides only for personal convenience: heat, light, coffee, etc. (Trompenaars and Hampden Turner, 1998)

The supposal was that some organizational cultures might be more receptive to knowledge management programs than other types.

The result of the research indicates that organizational culture types really influence the successfulness of knowledge management programs. Organizations with project-oriented - guided missile culture have successful knowledge management programs - while the organizations with the culture of person-oriented - family and role-oriented Eiffel tower have unsuccessful or have no knowledge management programs.

There were not any organizations in the study with dominant fulfilment-oriented - incubator culture so there is no information about its impact on knowledge management programs.

Guided missile culture has almost the same characteristics than a knowledge sharing culture has (Bair, 2004).

An organization that does not have a corporate culture which support knowledge sharing, it have to create a knowledge sharing culture. Knowledge sharing culture is about making knowledge sharing the norm. The tasks are to encourage people to work together effectively, to collaborate, to share and to make organizational knowledge more productive.

THE "INTERNATIONAL MAPPING OF KNOWLEDGE SHARING EXCELLENCE" RESEARCH

Analyses dealing with the evolution, the handling of the effect of the economic crisis include primarily handling with the economical, financial (Holland et al 2009a), structural perspective of the crisis. There are hardly any articles, surveys investigating the human side (Holland et al. 2009b, Jameson 2009, Boda et al. 2009). Is the crisis sensible to values, to the way of thinking, to the practice, so is in the culture of organizations? Does the culture of an organization change during the crisis, and does it affect the sharing of knowledge?

The fact that there has not been any scientific research carried out in Central-Eastern Europe, which measured managers working under top manager concerning their knowledge sharing increases the importance of this research. The International Mapping of Knowledge Sharing Excellence research at University of Pannonia, Department of Management addresses this research gap and thus the purpose of our research is to measure the role of managers working under top managers, who work at medium- and large sized enterprises in Central-Eastern Europe, in the maturity of knowledge sharing and to reveal the factors which affect the maturity of knowledge sharing of these managers.

Methods

Since this research focuses on managers working under top managers we investigated managers work in the field of HR, manufacturing, production, maintenance, logistics, finance, accountancy, controlling, commerce, supply, sale, marketing, project management and R&D.

A model was created for the research which proposes that on the one hand there is the organization itself with different kinds of features and on the other hand the manager as an individual, who owns different kinds of knowledge sharing competences influencing the maturity of knowledge sharing. These influencing factors were revealed through interviews with managers from companies and consultants. Accordingly, the organizational aspect of our model contains influencing factors like organizational culture, structure

oriented features, knowledge management programs, and leadership. In the individual aspect competences, helping the sharing of knowledge are grouped into methodological, social, personal, professional competences and other characteristics, competences.

A questionnaire was composed based on this model, which was tested by sending it to Hungarian managers.

The survey with the final questionnaire, which contained structured questions about the above mentioned 9 influencing factors and about the maturity of knowledge sharing and general information, has been conducted in Hungary since 2006 among managers working under top managers at medium and large sized enterprises. Since 2008 this survey among the same managers has also been conducted in other Central-Eastern European countries such as Serbia and Bulgaria. The database of the Hungarian survey has reached such high amount which made it possible to compare the database (collected before and during the crisis) of the Hungarian survey and investigate the effect of the economic crisis on the handling of knowledge and corporate culture of examined Hungarian enterprises.

The complete Hungarian survey consisted of 329 Hungarian respondents. In order to separate 2 periods (before and during the crisis) in connection with our research we took into account that the symptoms of the crisis had already appeared before October 2008 but intensively in October, so we drew a subjective line at the end of October with which it was possible to separate the 2 investigated periods. (Obviously this line is not so sharp, the questionnaires near this line were not taken into consideration during the research.) Thus it can be determined that 147 of the participants filled in the questionnaire before the beginning of the economic crisis and 181 since then. The left hand side diagram shows the distribution of the participant of the research before the crisis, and the right hand side diagram the distribution of those who took part since the beginning of the crisis.

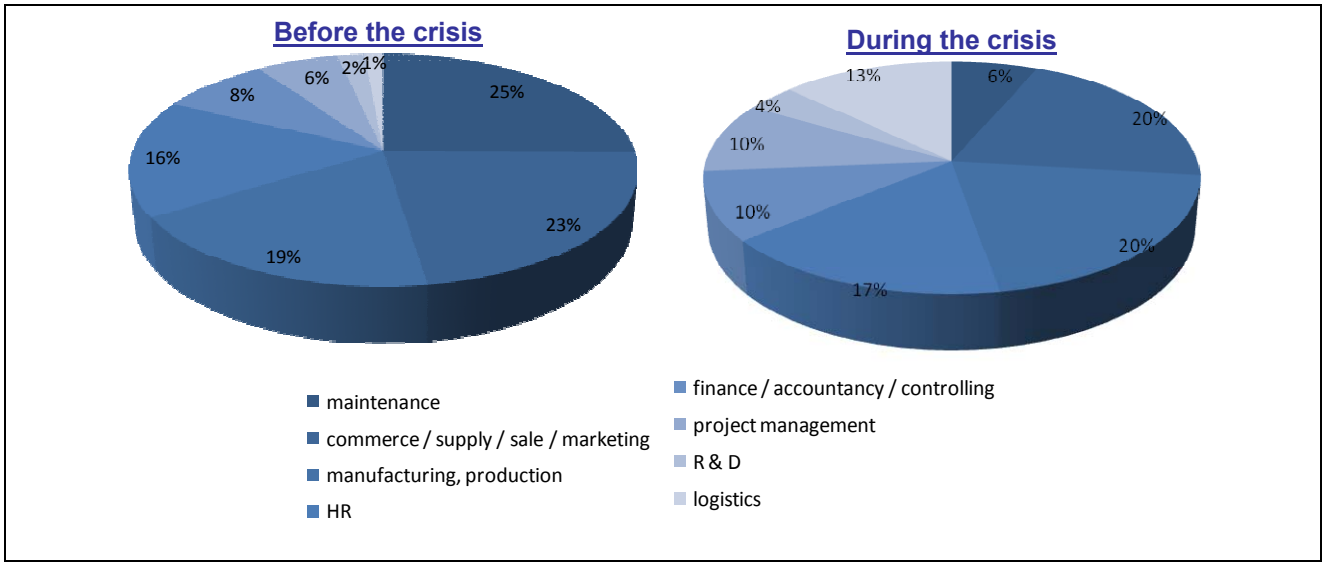

Figure 2. The distribution of the participants of the research before and during the crisis

In the remaining part of our paper the results of corporate culture and its effect on the maturity of knowledge sharing will be presented. Maturity of knowledge sharing examines the manager's availability to his subordinates and other managers and the usefulness of the knowledge given by him to his subordinates and other managers during the period of the availability and vice versa.

Although there are several methodologies (Handy 1993, Trompenaars 1998, Heidrich 2001) to examine the culture of organizations, we used the Competing Values Framework of Cameron and Quinn (1999) to examine the culture of the investigated managers. This Framework proposes dimensions such as "flexibility, discretion – stability, control" and "internal focus, integration – external focus, differentiation"; allow for four culture types to be distinguished. These culture types are Clan, Adhocracy, Market and Hierarchy.

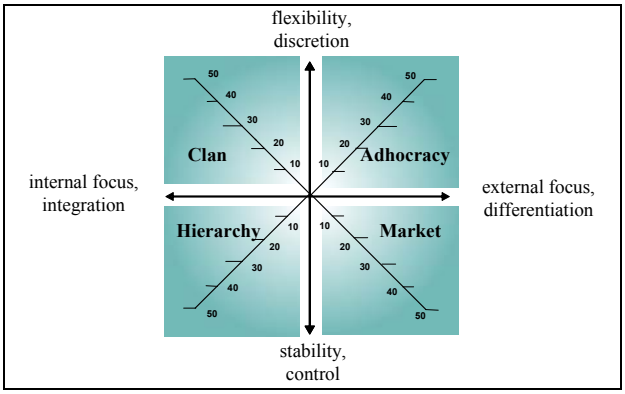

Figure 3. The Competing Values Framework - Corporate Culture types (Cameron Quinn 1999)

An organization that has Clan culture is characterized by internal maintenance with flexibility whilst by having an Adhocracy culture the organization concentrates on external positioning with a high degree of flexibility and individuality. While Hierarchy culture focuses on internal maintenance with a need for stability and control, an organization that owns Market culture pays attention to external positioning with a need for stability and control (Cameron and Quinn 1999). Table 1 contains additional feature of these four culture types.

Table 1. Features of Corporate Culture types

CLAN		ADHOCRACY
– friendly	***Workplace***	– dynamic, entrepreneurial, creative
– mentors, parent figures	***Leaders***	– visionary, innovator
– loyalty, tradition	***Glue***	– commitment to experimentation and innovation
– benefit of individual development, high cohesion, morale	***Long-term concern***	– rapid growth, acquirement of new resources

HIERARCHY		MARKET
– formalized, structured	***Workplace***	– result-oriented
– good coordinators, organizers	***Leaders***	– hard-driving producers, competitors
– formal rules and policies	***Glue***	– emphasis on winning
– stability, predictability, efficiency	***Long-term concern***	– competitive actions, achievement of stretch goals, targets

Source: Cameron-Quinn, 1999

The Organizational Culture Assessment Instrument, which is based on Competing Values Framework, consists of 6 items, each of which has four alternatives. 100 points are divided among these alternatives depending on the extent to which each alternative is similar to the organization of the investigated managers. The average score for each alternative is calculated by adding together the responses of each alternative and dividing it by 6. This Framework also enables the mapping of the preferred culture types of organizations besides the present ones (Cameron and Quinn 1999).

Results and discussion

The following diagram show the present and the preferred culture types of the examined Hungarian managers before and during the crisis.

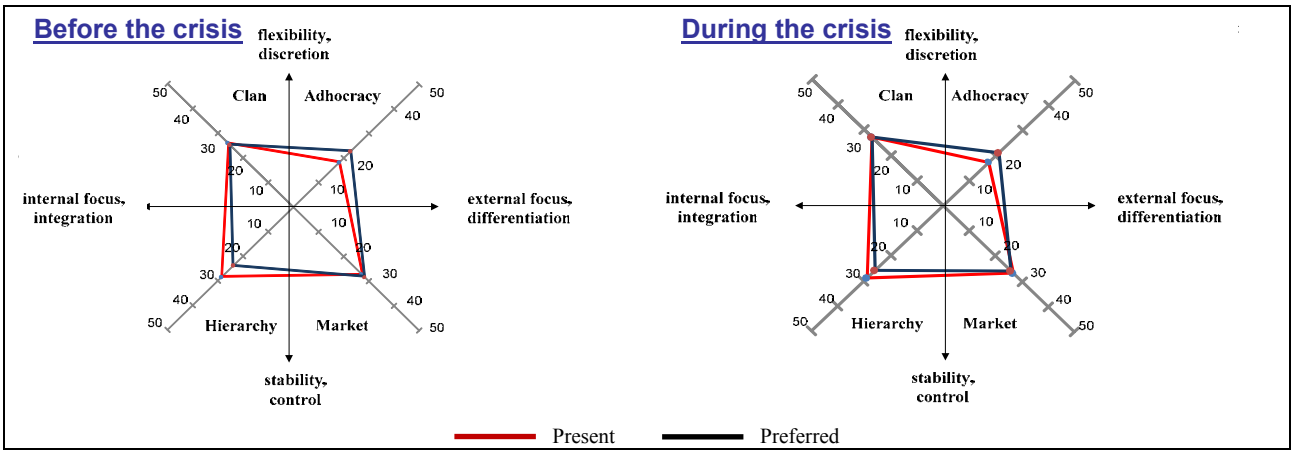

Figure 4. Present and preferred culture types of the examined managers before and during the crisis

The present culture types show that before the crisis Market and Hierarchy culture types dominated which indicates the importance of stability and control in the investigated organizations.

The examined managers would prefer a culture where Market culture type would remain dominant but the dominance of Hierarchy culture type would decrease significantly while the presence of Adhocracy culture type would increase and the condition of Clan culture type would not change. Thus external focus and differentiation would also prevail beside stability and control in the preferred culture of the examined

organizations. This shift shows that the investigated managers would like to move towards focusing on external subjects, tasks and flexibility, which indicates that they would like to work rather in a culture where adaptability, flexibility, creativity, meeting new challenges and preparing for the future are typical.

If we compare the present culture types of the investigated managers before and during the crisis the following statements can be made. Since the beginning of the crisis the dominance of Adhocracy and Clan culture types decreased a bit and the assistance of Hierarchy culture type increased slightly while Market culture type remained dominant. It can be determined that the investigated organizations did not move towards the preferred culture types (Adhocracy) that they defined desirable before the crisis.

During the crisis - likewise before the crisis - the participants would prefer a culture type where the dominance of Hierarchy culture would decrease and the presence of Adhocracy culture would increase.

During our research we also wanted to know to what extend knowledge sharing is mature within the present dominant culture types. Maturity of knowledge sharing is examined by availability and usefulness of knowledge.

Availability is measured from two directions: the availability of the investigated manager to his subordinates and other managers when he is asked for help (availability 1) and the availability of others (subordinates and other managers) to the investigated manager when he asks for help (availability 0).

Usefulness investigates how useful the knowledge given by someone to his/her colleagues is. Usefulness is also measured from two directions: the usefulness of the knowledge given by an investigated manager to his subordinates and other managers (usefulness 1) and the usefulness of the knowledge given by others (subordinates and other managers) to the investigated (usefulness 0).

The following diagrams present the mean of maturity of knowledge sharing of the examined Hungarian managers at the groups of the present dominant culture types before and during the crisis.

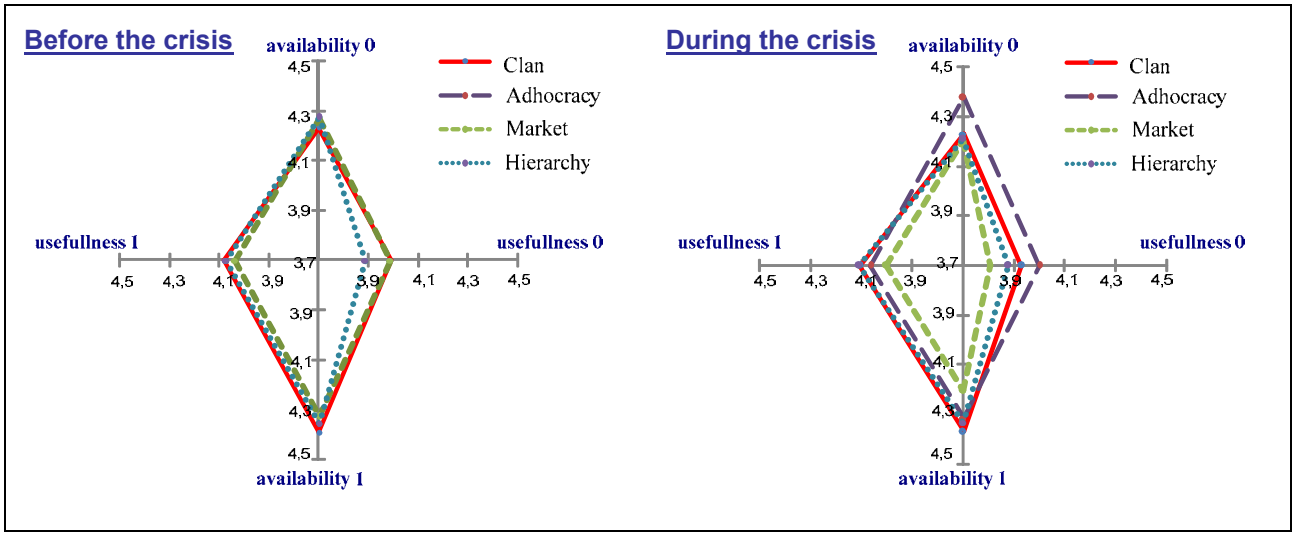

Figure 5. Maturity of knowledge sharing at different culture types before and during the crisis

The maturity of knowledge sharing could not be analyzed at Adhocracy culture before the crisis, because it did not emerge as a dominant culture type among either of the groups of investigated managers. Among the remaining three culture types while there were hardly any differences in the maturity of knowledge sharing at Clan and Market culture types, knowledge sharing became the least mature at Hierarchy culture type.

Since the beginning of the crisis Adhocracy culture type appeared also as a dominant culture at several investigated organizations besides the other three culture types and knowledge sharing became the most mature at this new dominant culture type, while the least matures are Clan and Market culture types.

It can be also be observed that during the crisis Market culture type exhibits worse knowledge sharing maturity than Hierarchy culture type had before the crisis. This draws attention to the following: during the crisis it is not enough for organizations to concentrate on external positioning and internal stability and control, they need to prepare for the future, be flexible, creative and adaptable, able to handle unexpected situations which are necessary and inevitable not only during knowledge sharing but also during the days of recession.

The fact that Adhocracy culture enables a higher maturity of knowledge sharing than other culture types and the fact that managers would like to move towards an Adhocracy culture type (Figure 3) indicates that Adhocracy culture is preferable. The direction of change towards it is desirable

not only because the ability of handling unexpected situations, being flexible and focusing on external tasks are necessary and inevitable during knowledge sharing but because recession requires it as well. Seeing this, the following question may occur. Why did not the investigated organizations make steps towards the direction of Adhocracy culture type if they are aware of the fact that the change in this direction would be desired for knowledge sharing and their operation as well?
Being aware of the above mentioned it would be advisable for medium and large sized organizations operating in Hungary to handle the crisis by planning the change in the culture of the organization parallel with financial and structural changes.

CONCLUSION

The concept of knowledge management continues to evolve. It is recognized as an important competitive factor for businesses worldwide.
The first organizational efforts to manage knowledge focused on information technology solutions. These technology-driven solutions, although important to knowledge management, often failed to achieve their objectives because they did not consider cultural factors critical to effective knowledge management.
Organizations failed to consider the relationship between knowledge management and organizational culture, and the cultural factors that impacted effective knowledge management initiatives.
These organizations face challenges when implementing knowledge management initiatives. They should find ways to integrate knowledge management into their strategic vision, build a knowledge sharing culture that supports knowledge management and motivate employees to support these initiatives.
The International Mapping of Knowledge Sharing Excellence Research has shown that there are differences in the maturity of knowledge sharing of managers within different culture types comparing the period before and during the crisis.
It can be seen that it would be useful for Hungarian organizations to move towards an Adhocracy culture type, that concentrates on external positioning with high degree of flexibility and individuality and which results in a high maturity of knowledge sharing. Still it could be seen that the feature of Hierarchy culture type have increase slightly in the present culture type of the investigated managers although considering the maturity of knowledge sharing the decline of the characteristics of this culture type would be desirable.
To reach adequate decision, information and facts that underlie the base of decision making (for instance to share knowledge within the organization) must be defined (Kosztyán et al. 2007).
Will the Hungarian organisation be able to find the appropriate path to get out from the crisis?

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Regional Systems – How to Make Them Work?

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SUMMARY

Regions can be defined in many ways; they can be viewed generally as a system with a large variety of alternative strategic alternatives of inputs and outputs, influenced by the interests of numerous actors. This gives a good reason for the use of system tools for structuring the relationships, identifying key factors or put in order a strategic plan for development of a region. Soft systems methodology is one of the strategic system tools, not explicitly utilised in regional strategic planning, offering quite a number of impulses, especially if combining it with the innovation concept.
Journal of Economic Literature (JEL) code: O18

INTRODUCTION

If we use the adjective "regional", first it is necessary to explain in what sense the term "region" can be used. The region is in this paper is derived from the context that relates to the concept of regional (innovation) strategy. Region is defined as a subnational territorial unit within a country, with an area larger than basic residential and administrative unit - municipality. From a systemic point of view, region is a complex dynamic system of open space with a large number of elements of varying quality and dense ties, it is richly structured and has a wide range of properties. The specific position is in this context, naming an economic region, which is a subsystem of the national economy, defined as a bounded territory, basically linked in social, urban and economic ties and from a geographic view, it is possible to characterize its level of economic performance or development, respectively.

REGION AS A SYSTEM, REGIONAL DEVELOPMENT AS AN OUTCOME

From the perspective of regional policy, region is a geographically defined area for the creation and implementation of regional economic, social, structural or innovation policy - is designed to meet the needs invoked by the internal active approach or in response to impulses from outside. A typical feature of the economic region is setting goals and purposeful activity with a strategy to achieve them. In terms of power implementation, crucial for a region is the degree of centralization and decentralization - to what extent is the regional authority responsible, capable and afforded for the developmental trajectory of the region.
In the light of the previous reflections, region as a type of regional economic organisation can be defined as an open system – definitely showing systemic features such as connection with the surroundings, internal differentiation, procedural nature of the organization, etc. The ability to adapt to the changed conditions in terms of its function, structure, learning, improvement enables to consider region as an organic system. Region exhibits characteristics of economic system with the internal and external linkages among the elements. Depending on the chosen level of distinctiveness it can be divided into different parts, based on the system as a whole, including its objectives. This means, region as an object of study can be investigated e.g. using system methodology via monitoring the changes in its state and structure. The regional behaviour is influenced by the internal elements on one hand, and external environment on the other hand. The status of the region as an open dynamic and organic system with its external and internal links can be illustrated by the following figure:

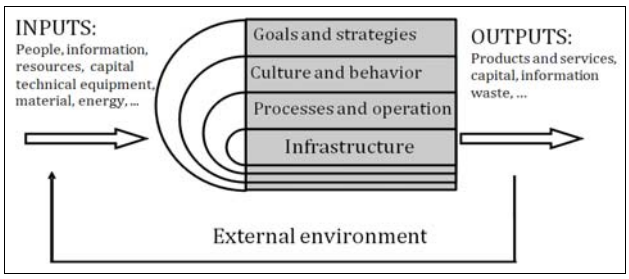


Figure 1. Region as an open system

It is not surprising that in connection to the potential trends of regions, we inevitably come across terms such as actors, stakeholders, assessing power and influence, processes, organisation, objectives, strategy, inputs and outputs, desirable changes via strategic planning, development, behaviour and system as well; which are terms as a rule used in soft systems methodology. Hence, region can be approached as a complex spatial dynamic open system, and consequently systemic methodology can be applied to study regions as systems. General System Theory, originally developed by Ludwig von Bertalanffy (Checkland, Scholes, 2000) and other scholars, can provide a useful analytical framework to describe and understand a range of factors involved in regional development. The whole complex can be understood and described by means of System Theory by defining sub-systems, system boundaries, external influence, entropy, feedback or system balance can be used to make clear complex and perplexing assortment of information involved in regional planning.

In general, Soft Systems Methodology (SSM) is certainly suitable for modelling systems involving human activities and in that way, SSM helps to understand the state of affairs and problems and to identify possible solutions. A part of SSM is the learning process and common understanding of the situation. Each solution can be examined in terms of the desired state and feasibility. From a systemic point of view, the goal is considered as a transformation, the change from one state to another. SSM in the past 30 years has been often applied to complex and dynamic social situations (Ackoff, 1974), where conflicts between the parties exist, or in other words, objectives of change are controversial. In a regional policy, region is considered as a spatially limited territory for the creation and implementation of regional economic, social, structural, or innovation regional policy. It is therefore supposed or committed to setting goals and to designing rational activities with a conscious strategy to achieve them.

In terms of objectives, it is traditional to link to the region to “regional development” - the general objective of regional development is achieving prosperity and welfare of regional population, which is derived from economic development and expressed by the area of competitiveness and the competitiveness of economic agents located therein. Regional development is in this sense located at the desirable output side of the system model.

The concept of development is also multifaceted; it is a melange of different meanings and shades. From the perspective of the public sector is typically aimed to increase revenue, to increase number of jobs and to reduce unemployment, to increase productivity, etc. Regional development is understood as the development of the region defined as a holistic process aimed at achieving progress in economic, social, cultural and environmental fields. The existing potential is used for improving living standards and quality of life of the inhabitants of the region. From a strategic development perspective, the developing of the following areas (Malizia and Feser, 1999):

- labour (the education and training, availability, price),
- infrastructure (availability, capacity, transportation, telecommunications, etc.)
- economic and community services and equipment (availability, capacity, universities and schools, business incubators, industrial and science parks, sports and tourist facilities, etc.)
- environment (natural, business, cultural, etc.)
- economic structure (the structure of the economic base, diversification, etc.)
- institutional capacity (management, knowledge, skills) to promote economic development and growth.

The term "development" has a vital economic tone, often associated with the words, social or sustainable. In philosophical terms, the development consists of of five essential elements, also called magic pentagon (Nohlen and Nuscheler, 1982):

- growth,
- labour,
- equality/justice,
- participation,
- independence/autonomy.

The future situation of the region as a system state is an outcome of the “action” - the spirit of SSM is a contrast between the situations as it is, and some models (regional development goals to be gained via strategic interventions) as it might be.

STRATEGIC PLANNING AND SOFT SYSTEM METHODOLOGY

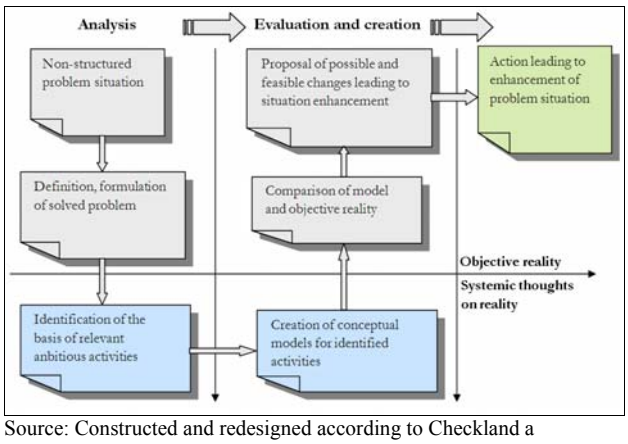
Regional strategic development plan is defined basically as an integrated conceptual development plan in the form of a document, aimed at future directions in development of the region. The strategic plan is developed for long-term coordination of public and private activities of economic, social, cultural and environmental character of the region.

Principles of strategic planning based on economics and corporate governance have gradually found application also in the management of complex territorial systems - municipalities, cities, regions (Davoudi, Strange, 2009; Adams, Alden, Harris, 2006). The resulting strategic document should arise as a final stage of the process of an open dialogue across the whole spectrum of subjects and groups in form of exactly identified and jointly shared values and goals. Strategic Development Plan for the region usually consists of three stages corresponding to three basic stages of system analysis (Table 1), that lists the common methods used in the development of the plan.

Table 1. Methods used in the creation of strategic development plans.

Stage	Regional strategy creation	Used methods
Analysis	Analysis of economic and social development of region, situation analysis	– Analysis of secondary data – Primary research – o Sources audit
Evaluation and creation	Tasks and primary needs in development of technical and social infrastructure, environment care, education, culture and other fields	– SWOT analysis – STEP analysis and foresight – Identification of problems – and prioritising – o Impact studies
Implementation	Proposal of administrative and financial coverage	– Goals and priorities setting – o Action plan creation

The evaluation stage uses standard methods as SWOT analysis and problem tree, and exceptionally methods of trend analysis - STEP (Social, Technological, Economic and Political), foresight or impact studies. Existing developed methodological background for the creation of strategic plans is only slowly getting into practice. Without a doubt, the regional unit as a system shows an ever-increasing complexity and uncertainty, with a great variety of possible strategic decisions. Stakeholders and actors (organisations and individuals) have sometimes an unpredictable behaviour, their decisions are interactive, they are mobile in the same way as many regional funds and resources. Low knowledge of problems in all their aspects (snarl of interrelated problems) requires a system tool for structuring of relations, identification of key factors, what leads to the tools of system analysis. The use of system analysis is usually based on the seven stages (Rosenhead, Mingers, 2001, Checkland and Scholes, 2000):



Source: Constructed and redesigned according to Checkland a Scholes, 2000.

Figure 2. Seven stages of SSM.

It is essential to move from an unstructured problem situation to the description of basic system components:

- Structure (for example geographical or administrative boundaries, competences etc.),
- Processes (activities, information and material flows),
- Climate – relationships between structure and processes, and all related problems,
- Culture and behaviour – interests, problems, conflicts, opinions,
- Environment – external subjects, factors influencing organization / territorial unit.

Hence, there is a question who does what and for whom, who is responsible to whom, what are the important terms and conditions and in what environments the planning takes place (Checkland and Scholes, 2000), namely to the use of the CATWOE terminology:

- **C**ustomers - who are the recipients of highest level of processes and how it affects them?
- **A**ctors – who are process participants, who will participate on the solution implementation and what will influence the success?
- **T**ransformation Process – which processes or systems are impacted by this activity?
- **W**orld View – what is the broader environment and broader impacts of this activity?
- **O**wner – who is the owner of the process or situation, that re the subject of the research and what role will they play in the solution?
- **E**nvironmental Constraints – what are the barriers and limitations, which will influence the solution and its success?

SSM can be appraised to traditional methods in developing a strategic plan for development of a region. We can articulate that the process of creation and implementation of strategic planning uses some elements of the SSM, but in practice its success encounters the usual simplification of systemic approach, inconsistency, lack of foresight and forecast, or a lacking theoretical base, on which strategic plans are built. The region, as an object of analysis and future strategic direction, should be viewed dynamically, we should monitor changes in its state, behaviour and structure, which is influenced on one hand by its internal components, and on the other hand by the external environment. Under the previous aspects of the SSM, the region can be characterized by its structure, processes, climate, interests of stakeholders and the external environment. It is also possible to simply apply the CATWOE terminology.

THE SSM METHODOLOGY USED IN THE PREŠOV SELF-GOVERNMENT REGION IN SLOVAKIA

On the basis of generally accepted division of regions and appropriate regional policy Prešov region can be included in the group of peripheral regions (Tödtling, Trippl, 2005), with all the typical characteristics. On behalf of this classification and also on behalf of the experience of successful regional policies in European regions in this category, an appropriate mix of regional policy for Prešov self-government region (PSR) can be defined. The realisation of SSM in PSR has been based on several theoretical concepts of regional innovation system, path dependence, learning regions, knowledge base and triple helix. A summary of the mentioned terms and concepts can be found in a more comprehensive concept of constructing regional advantage, as described for example in (Cooke, 2006). Spatial level of the region is ideal for the creation of innovations of products, processes and organisations, but also for promotion of innovation and creation of networks and clusters. Innovations, within the regional innovation system as a driving force, orients businesses and other institutions in the innovation system on ambitious goals, lead to the reconstruction of industrial structures and contribute to the emergence of new economic sectors.

From a procedural perspective, the regional innovation system is characterized by interactions and transitions between its various functions and actors, whose experience, knowledge and know-how support and reinforce each other. This way the role of both human and social capital is reinforced. The concepts of the global knowledge economy and the learning regions have difficulties with the task of management of changes and uncertainty. The rapidly changing environment requires flexibility, reaction speed and versatility. Therefore, for the regional development, except the regional innovation capacity of the in region localized institutions, the function of a learning innovation system based on a partnership with a high level of social capital (Lundvall, 1992) is very important. From the view of governance and management at the regional level the concept of multi-level governance was established, corresponding to the multidimensional nature of governance at the regional level for both vertical and horizontal axis, with a complex system of responsibilities, goals, interests, funding sources, etc. (Marks et al., 1996, Kohler-Koch, 2003).

The goal of SSM application was to design changes and to expand the regional innovation system by using the existing realistic innovation support for the business sector within the region, in accordance with the strategic objectives of the region. In terms of research methodology for SSM, methods like foresighting, forecasting, trend analysis, scenario building, empirical research (focus groups-group interviews, questionnaires and structured interviews), SWOT analysis, benchmarking, STEP analysis, feasibility study and an impact studies were used. The systems analysis procedure which was carried out in the form of seven stages of SSM can be characterized for the Prešov Region (PSR) as follows:

- Stage 1: The unstructured problem situation:
  The starting position resulted from the situation since the establishment of self-government regions in 2002 and the weak position of the PSR as the most underdeveloped region with high unemployment, low GDP, the lowest share of value-added industries in Slovakia, with extremely low spending on research and development and with vaguely set directions for future economic development. There is a low degree of cooperation between R&D and educational institutions and businesses, substantial lags in knowledge and technology transfers exist, coordination between regional institutions and regional leaders is at its beginning and the prioritization of research, development and innovation is very unclear. The forming supportive component of the regional innovation system consists of RRA agencies (Regional Development Agencies) and RPIC (Regional Advisory and Information Centres).
- Stage 2: Definition, formulation of the solved problem
  The Prešov region has reached the formulation of key problems of economic development in the form of two analytical strategic outcomes financed from external sources:
  RIS-PSR: Proposal from the medium and long-term Regional Innovation Strategy for the Prešov Self-government Region, which identified the key regional actors in the field of innovation and regional development, laid the foundations for regional partnership of public and private sector and managed to set the first goals in the field of promotion of innovation support and shaping of the regional innovation system. The general objective of RIS is based on the theory of regional innovation systems – to establish or strengthen regional innovation systems for enhancement of regional competitiveness.
  POKER: Its aim was to strengthen the partnership framework for regional development cooperation of actors in the Slovakia-East region (Prešov and Košice self-government region, NUTS3 level) and to jointly define a development strategy of the Slovakia-East region, within which the

Slovakia-East profile, forecasts, scenarios and development strategy for the NUTS2 was established.

Both activities allowed the identification of key players of the regional innovation system and marked the beginning of building a consensus between them. PSR can be characterized as a peripheral region with the characteristics listed in the table below:

Table 2: Background of regional innovation system in PSR

Dimension	Characteristics
Businesses and Regional clusters	Dominated by small and medium enterprises, cluster initiatives are missing.
Innovation activities	Low level of R&D&I in the region Emphasis on small innovations of products and process innovation.
Universities and research organizations	Relatively newly formed with an unfit profile (social sciences), however, there is technically oriented education in the neighbour Košice region.
Education and training	Focus on lower qualification, the situation is gradually improving, large outflow of skilled labour
Knowledge transfer	Lack of specialized intermediary services
Networks	Poorly developed networks

- ➢ Stage 3: Identification of the nature of relevant and ambitious activities
  In the regional innovation strategy, the nature of activities needed to promote innovation is shaped:
  - Target area 1: Development of a knowledge economy (R&D support in the region, promoting cooperation between R&D institutions and industry and businesses, development of innovation infrastructure ...)
  - Target area 2: Creation of qualified work positions
  - Target area 3: Human resources development
  - Target area 4: Implementation of innovation and technology transfer in the traditional manufacturing and services sectors (the implementation of innovation and technology transfer in selected sectors of industry, tourism and agricultural sector).
- ➢ Stage 4: Proposal of possible and feasible changes leading to situation improvement
  Regional Innovation Strategy of PSR is expected to create two institutions and two institutes oriented to enhance the regional innovation system:
  - The Regional Innovation Centre responsible for the system of design, management and implementation of innovation in regions, created as an association of public and private entities.
  - Regional Centre of technology and know-how transfer - as an intermediary between research activities and application of research and development results in industrial praxis.
  - Innovation forum - by organizing theme-oriented meetings creates space for communication of companies, national and regional institutions and other institutions active in the field of innovation and knowledge economy
  - Regional Development Fund - proposal for establishment of a pilot Fund, based on the example of the Slovakia-East region.
- ➢ Stage 5: Comparison of model and objective reality
  The further development showed that although the proposed activities would support the development of innovation in the region, but with the exception of the Innovation forum there is no option to implement these activities as intended due to financial reasons. In contrast, PSR was successful in obtaining funding for the creation of so-called Innovative Partner Centre (IPC), using a model of the Norwegian Molde Knowledge Park, with application to the conditions of Prešov region through public-private partnerships. The biggest added value should therefore be to identify potential projects for the IPC and the way they are funded in each of the areas:
  a) Tourism, culture and external relations,
  b) Entrepreneurship and development support in Prešov region,
  c) Human resources development in the field of education, research and sport.

  To verify the transferability of know-how from the Norwegian model into the terms of PSR and to analyze its specialization and feasibility, a very detailed analysis was performed by using qualitative and quantitative forecasting methods, structured interviews with regional actors in the field of innovation, several controlled discussions (Innovative Forums) and a mobilization meeting. In terms of the SSM methodology, the structure, processes, climate, culture, behaviour and the environment in which the IPC is situated were specified, using detailed analysis of the CATWOE terminology.
  A comparison of competitiveness of PSR with neighbouring regions, and other close and similar regions, showed that PSR is lagging behind in production, GDP and gross value added. A barrier to competitiveness is also a relatively high unemployment rate, not because of its height, but rather because of the structure of unemployed individuals and their educational level. The PSR competitiveness position compared to other regions of Slovakia, Hungary and Poland was exceptional in the number of beds in accommodation establishments in tourism as one of the indicators of potential in tourism.
- ➢ Stage 6: Establishment of conceptual models for identified activities

Research, analyses and trends show:

a) Tourism: conceptually, it is necessary to solve the current situation where the great existing natural tourism potential is not used, the yearly accommodation facilities usage ratio is very low (fewer than 20%), customer structure and structure of offered products and services are not profiled enough and the region lacks an unified information system. The biggest current issue of tourism development in terms of the Prešov region is the uncoordinated tourism development. Perspective areas in the field of tourism in terms of the Prešov region are - conference and scientific tourism, silver economy, health tourism, hunting tourism, experiential tourism and other out of them originating opportunities for tourism.
   There are great possibilities for public-private projects in tourism. Marketing of the region is underdeveloped and neglected, segmentation of the target groups is missing, promotion is nearly non-existent, and there is no unified information system or networks creation
b) Entrepreneurship and development support: in long-term the lowest number of organizations and staff is in research and development, low level of cooperation of the regional innovation policy actors, low level of cohesion in R&D and innovation and their utilization. Low is also the level of innovative activities of enterprises in the region and the awareness of the importance of such activities. The rate of investment in innovation of products and services is low as well. The business environment is characterized by high administrative demandingness of entrepreneurship and a high tax and social-contribution system, which has a negative impact on the price of labour. The public sector is not sufficiently effective. Perspective, in terms of PSR, is the industries of: electrical engineering, machinery production aimed at automating and robotics, tourism, health care and social services.
c) Human resources: the outflow of graduates of secondary schools and universities in the Prešov region can be considered as massive. Nowadays a significant shortage of skilled labour in several sectors can be noticed (mechatronics, specialist constructers, programmers, metallurgy workers, technology workers, staff focused on testing according to European and world standards, machine and metal processors, millers and turners), as a result to the lack of cooperation and inter-connection of the educational process with labour market needs and requirements of SMEs. Regional management of human resources development is underdeveloped. Human resource development should be the primary objective of PSR, to achieve a total raise of the entire region and improve the quality of life for the majority of its inhabitants. This need will be closely linked to the requirement on universities to be far more linked to the regional businesses and public organizations, and to serve as centres for research, consultancy and staff training.
   Previous stages allowed creating a draft concept of the future position of the IPC, which should not seek to intervene in support of all projects and especially given the already existing infrastructure (e.g. the NADSME network). On the other hand, by specializing in innovation and intermediation, public-private partnerships, the IPC will create its own irreplaceable position, thanks to which it could build a peer network and confirm its irreplaceable position within the market in a relatively short period of time. In this context, cooperation with the existing network of support institutions and co-financing entities is essential.

➢ Stage 7: Action leading to improvement of problem situation

The system analysis has guided the considerations towards the establishment of IPC as a place to generate ideas, innovation, networking, intermediary services and finance. Typical features of the IPC should be openness, to ability to participate, professionalism, communicativeness, networking potential, incubator of ideological goals and projects. The product of IPC will be projects and their implementation, while for the initial period the following projects are proposed:

a) Tourism, culture and external relations:
   1. Project aimed at the systematic approach to tourism, coordination of activities in PSR,
   2. Project aimed at marketing of the region – specifically on the area of tourism – the target groups, the viable types of tourism
   3. Projects focused geographically (Spiš, Vysoké Tatry, etc.) or typologically (congress tourism, silver economy, etc.)
b) Entrepreneurship and development support:
   1. Project aimed to support innovative industries with a scientific research base in the region (automation, pharmaceuticals, electronics, and chemistry) with the focus to create cluster initiatives in the region, to involve companies in global value-creating chains and to promote research and development.
   2. Innovation voucher project in the region for innovation implementation in a smaller scale in small and medium-sized enterprises.

3. Project of cooperation in the foundation of innovative firms in partnership with the RPIC (incubator) and University of Prešov (UCITT – University Centre for Innovation, Technology Transfers and Intellectual Property Protection).

c) Human resources development in the fields of education, research and sport:
   1. Project for training of human resources in the field of innovation, innovation management in enterprises and regional innovation policy,
   2. Educational project in the field of entrepreneurship in collaboration with the University of Prešov and high schools in the region.
   3. Project of education and training in tourism (target groups coming into contact with visitors).

It is assumed, that in the first stages of its existence, the IPC will be financed from external sources, mainly operational programs, as the sources from private sector are limited. However, for the projects to be successful, the private sector has not only to be involved in them, but also has to provide a level of co-financing of the projects.

CONCLUSIONS

Regional unit is considered as a system, typical by complexity, uncertainty, a large range of possible strategic decisions, often conflicting interests of involved stakeholders and actors. System approach to the region also raises the need for system tools designed for structuring of relations, identification of key factors, which leads to the tools of system analysis. In terms of the SSM methodology, the region can be characterized by its structure, processes, climate, interests of involved groups and external environment. SSM can be used both to establish a strategic development plan of the region, as well as to address specific problems, such as the creation or expansion of a regional innovation system. System approach, involving seven stages of SSM, relaying on a sufficient theoretical base and range of demanding methods, has led to the proposal of the nature and activities of Innovation Partnership Centre of Prešov self-government region.

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Development of Dynamic and Comparative Functions of Estimation of Innovative Potential

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SUMMARY

Questions of the rate fixing of different indexes of work of industrial enterprises are considered in the article. Special attention is paid to indexes which form the separate constituents of the innovative potential of machine manufacturing enterprises. The author offers two different approaches to the setting of norms for indexes of work in enterprises, the use of which will have a considerable economic effect in practice.

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The innovative activity of creative subsections of industrial enterprises is an extraordinarily important subject of the market for innovations in our country. Leaning on scientific and technical resources, information, and skilled personnel, they assist the effective development of enterprise. The result of such co-operation must be new products and technologies, increases in the competitiveness of Ukrainian wares, and the creation of new workplaces. As will be shown below, under the term innovative potential of enterprise we understand the maximal possibility of enterprise in the use of all innovative possibilities which can be estimated in a type of system index characterising the level of efficiency of scientific innovation to the complex achievement of innovative aims. The innovative potential of enterprise is reproduced by the possibility of structural subdivisions into perspective development due to internal possibilities. The increase of innovative potential of enterprise is foreseen by providing:

- developments of new types of products that meet the newest demands of users;
- products with a competitive edge in the market that are produced by this enterprise;
- creation of the proper use of progressive technologies and equipment for the production of goods;
- necessary market performance in the target market of enterprise;
- sufficient level of profitability of production and commercial activity of subsections of enterprise;
- effective development of skilled potential and basis of scientific research;
- improvement of the administrative structures of the enterprise;
- development of corporate culture.

The method of estimation offered for assessing the level of innovative potential in an industrial enterprise includes dependences between the different stages.

The laying out of innovative potential is based on separate constituents. For implementation of this procedure it is recommended to use the principle of functional decoupling, which allows in a sufficient measure the structured presentation of innovative potential in the type of a hierarchical structure of separate elements, which enables us to conduct a more detailed analysis in the future.

The structurally innovative potential of industrial enterprise can be examined from different points of view depending on the tasks put before the researcher, by submitting the potential as a sum of different sort of subsystems, elements, and other component parts of the complex multilevel system. In our research we took a sectoral cut of this system which traditionally exists in our theory and practice. At the sectoral level the structure of innovative potential can contain different families into which the elements are classified, as a rule, by resource principle.

The conventional approach to the decision of the chosen task [4, 1, 2] assumes in the structure of innovative potential of industrial enterprises the ability to select

skilled, production-technological, financial and economic, information-based, material and technical, and organizationally administrative potentials. In our view, such an approach needs certain adjustments and clarifications. First, the presentation of innovative potential as the sum of the above-mentioned potentials is somewhat debatable. As was well-proven by us in the first sections of this paper, independent presentation has innovative potential and in a great deal differs from the approach by the value concepts of material and technical potential, skills, and other scientific and technical potentials. In our view, for the determination of the level of innovative potential of an enterprise, and especially during its realisation, a complete value is not needed for scientific and technical, skilled, material and technical or other potentials, since only a part of them is used for this purpose. For example, the skilled (labour, intellectual) potential of firm or enterprise includes all present labour resources and prospects of their development. At the same time, for the realization of innovative plans only labour resources needed for the making (by the use) of concrete innovation are required. In this connection, we suggest that a composition of innovative potential include not potentials of the proper directions, but constituents, for this allows separate directions, which in our view more exactly reproduce requirements for innovative potential, more focused in order to determine its level. In general cases, the relationship between the proper potentials (as prompted by the majority of researchers) and proper constituents (as prompted by the author) takes the following form:

$$I_{ni} \geq I_{ci},$$

where I_{ni} is the innovative potential of the proper ("i") direction (scientific and technical, resource, skilled and other potentials), and I_{ci} is the proper ("i") constituent of innovative potential.

The resulting inequality shows that innovative potential of i-ro direction, as a rule, is less than that of the proper constituent innovative potential. In this connection, the use of recommendations given in [4, 1, 2] more frequently brings everything over to the overpriced values of innovative potential, that then results in the overvaluation of innovative possibilities of an enterprise or firm. This can lead to errors in the innovative planning and result in negative consequences not only for the production-enterprise activities of separate enterprises or firms but also for the economy of the entire country.

The general approach is to estimate the level of innovative potential of an industrial or scientific enterprise, as developed by us and presented in the scientific literature [3, 5, 6]. This enables us to determine the level of innovative potential at this point in time, leaning on today's indexes of innovative development in enterprises. Such an approach is most widespread in scientific research, but it does not allow us to determine the dynamics of innovative changes within an enterprise, and in addition, it does not allow to make an objective comparative estimation of achievements of separate enterprises as compared to other enterprises, if there is the necessity for such. In this connection it becomes necessary for improving methods for the purposeful searching for possibilities of their use in dynamic comparative calculations of the level of innovative potential.

The most common failing of a great number of differently scaled indexes for the description of innovative potential is the absence of the unique approach to setting norms of the indexes analysed, as authors of similar research justly specify [4]. For comparison of indexes of innovative potential it is suggested to use one of the possible rationing functions [4], which, in our view, is a measure more suitable for setting norms of indexes of innovative potential:

$$P_{ні} = A^{-\frac{P_{em}}{P_i}} \quad (1)$$

where $P_{ні}$ is the index of innovative potential, the estimation of which is conducted, after setting of norms; A is the index of rationing function, which reproduces the set tasks put before research (permanent number); P_i is the proper «i» index of innovative potential at the moment of estimation; P_{em} is the standard value of «i» index of innovative potential, which is accepted for a comparative or dynamic estimation.

For gaining an end by estimation of the level of innovative potential of industrial enterprise, in our view, for the most acceptable quality the index of rationing function A is followed to accept the number 2, so that $A = 2$. Taking into account this suggestion, Equation (1) will assume the following form:

$$P_{ні} = 2^{-\frac{P_{em}}{P_i}} \quad (2)$$

Equation (2) has importance for the aims of this research property: its value is always certain to be in the interval from «0» to «1». If the value of $P_{ні}$ obtained in Equation (1) will be evened to 0.5 ($P_i = 0.5$), then it testifies to the middle level of index (at a comparative estimation) or an absence of change in an enterprise in the area of this index (at the dynamic estimation of $P_{em} = P_i$). An analysis shows that dependence is between P_i and relation of P_{em}/P_i , that $P_i = F(P_{em}/P_i)$ has a nonlinear character which makes it more difficult to dissociate outsiders from leaders or give grounds for the determination of certain fines for a reduction in innovative activity. For example, if the proper index of Ri will be increased by three times, then the value of Rni will be increased from 0.5 to 0.794 (an increase of 60%), and at diminishing of the same index by three times, the value of Rni will fall from 0.5 to 0.125 (a reduction of four times).

The use of Equation (2) allows us to drive to the unidimensional plane all indexes of innovative potential (on each of its constituents) with the purpose of carrying out certain actions for bringing them over to the complex summarising index. Without such an approach summarising indexes which are offered by different

researchers for the estimation of level of innovative potential do not have the adequate content. Moreover, often there are cases where it is simply improper to report separate indexes to the unique base.

The subsequent operation for the estimation of innovative potential of enterprise depends on the set purpose. In our view, all actions of researchers can lead to two possible scenarios of research:

- estimation of changes which happen in innovative potential of enterprise for a certain period of time (from now on we will name this the action of researchers or analysts' research of the dynamic function of the innovative potential of enterprise);
- the location of this enterprise in the hierarchy of innovative achievements of similar (or not quite similar) enterprises (we will name this the action of researchers or analysts by research into the comparative function of the innovative potential of enterprise).

Taking into account what is expounded above will set two possible scenarios for calculation of the level of innovative potential of an enterprise.

SCENARIO № 1

The aim of this scenario is to determine the degree of innovative development as a dynamic constituent of innovative potential of a particular industrial or scientific enterprise. For practical realization of this scenario statistical information is needed about all constituents of innovative potential for two periods which are compared against each other. More frequently thes are is the current and the previous year, but if it is necessary to watch the dynamics of change of innovative potential for a more protracted interval of time, it is recommended also to conduct a comparison of the base year with all following years, including with the current year. For calculation of values of each of the characteristic coefficients it is recommended to conduct a help dependence (2), the values of the proper constituents of which are interpreted as follows:

$P_i = P_{it}$ - value of «*i*» index of innovative potential in a current «t» year;

$P_{em} = P_{i(t-1)}$ - value of «*i*» index of innovative potential in «t-1» year which is chosen for comparison with the current year.

Taking into account these parcels, dependence (2) will be expressed as:

$$P_{ні} = 2^{-\frac{P_{i(t-1)}}{P_{it}}} \quad (3)$$

Many of the factors which form the level of innovative potential have a dimension of monetary items. In time such indexes can change value even with the stable (unchanging) terms of work of the enterprise. The researchers of innovative potential [4] justly point out the necessity of accounting for inflationary processes when researching the dynamics of separate indexes of this category. In this connection, in our view, dependence (3) will be more precise and its results more reliable when it is amended to include inflation. The indicated parcels are shown in dependence (4):

$$P_{ні} = 2^{-\frac{P_{i(t-1)}}{P_{it}}(1+\gamma_t)} \quad (4)$$

where $\gamma_t = \frac{И_t - И_{t-1}}{И_{t-1}}$ is the average annual inflation rate; $И_t$ is the price level in a current «t» year; and $И_{t-1}$ is the price level in the previous «t-1» year which is chosen for comparison with the current year.

SCENARIO № 2

The focus of this scenario for the location of actual enterprise is on the criterion of innovative development among the group of family enterprises, united in sectorial, territorial, pattern of ownership or some other factor, for the determination of comparative constituents of innovative potential. For the practical realization of this scenario statistical information is needed about the constituents of innovative potential of all enterprises examined for the period of time investigated (statistical model of comparison). For this purpose all calculation coefficients for every enterprise are determined in comparison of basic parameters of enterprise, which are then examined with the proper parameters on all group of enterprises. A base for comparison can be formed in one of two possible directions:

a) from all values, the proper parameter act as a base for comparison when setting norms for the proper parameters by a general model (1), which then takes the following form:

$$P_{ні} = 2^{-\frac{P_i^{кр}}{P_i}} \quad (5)$$

where $P_i^{кр}$ is the best value of «i» parameter among all enterprises which are examined;

b) all calculation coefficients for each enterprise are determined in comparing basic parameters of this enterprise to the proper parameters, which are determined as on the median of the group of enterprises which is examined. A rationing function for practical realization of this variant of calculations is as follows:

$$P_{ні} = 2^{-\frac{P_i^{ср}}{P_i}} \quad (6)$$

where $P_i^{ср} = \frac{1}{n}\sum_{j=1}^{n} P_{ij}$ is the middle value of the i-ro parameter among all enterprises *n* which are examined; P_{ij} is a value of i-ro parameter for a enterprise «*j*» in this period of time.

The use of the variant of calculation of «a» or «b» depends on the purpose of the research being conducted. For example, if a comparison of the innovative potential of a certain group of enterprises is made regularly from year to year, then a calculation on the variant of «b» will be more appropriate. In this case annual calculations will more objectively reproduce not only the current rating of enterprises on the index of innovative potential but also reproduce the dynamics of change of this rating and progressive (regressive) changes for a particular enterprise. If the comparative function of innovative potential is used validly for one occasion for a random group of enterprises, which with large probability will not be repeated in the near future, then it would be more appropriate to use the variant of calculation of «a». It should be noted that calculations on the variant of «a» are simpler, as they eliminate the calculation of median values of the proper indexes. In order to discuss the exactness of calculations with the use of variants «a» and «b», then, in our view, calculations on the variant of «a» will be much more precise, so as to reproduce the appearance of ideal innovative development in a virtual (with the set of the best indexes) enterprise. The estimated innovative potential of actual enterprises will have indexes that are not the best, while a virtual enterprise and, accordingly, the relative rating of enterprises which are examined, will be in a range from «0» to «1». The change of the best indexes (on every their name) annually can be observed at different enterprises, which will not allow us to conduct the permanent monitoring dynamics of innovative potential on a separate enterprise. If there is a necessity to conduct monitoring and comparative and dynamic constituents of innovative potential, then the calculations introduced here can be used to decide on the use of proposed variant of «b».

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New Model of Current Account Balances

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SUMMARY

Managing current account balances – defining the value of the necessary closing level – is perhaps the most exciting daily routine activity of corporate financial managers. The relevant discussion of this subject in Corporate Finance by Brealey and Myers, one of the most popular manuals of today's higher education in finances, refers to research conducted over 60 years ago. This manual applies the Baumol model to current account balance management, starting from the costs of simple inventory management. An enhancement of the above is the Miller-Orr model, which restricts the volatility of the cash balances between an upper and the lower limit, and defines the value at one-third as the return point.

Our globalised world is characterized by electronic banking, which has fundamentally changed the entire system of finances. Research done on figures of the 2000s led to results that were different than before. According to new findings, in modern accelerated cash management the level of current account balances is not determined by the assumed "inventory management costs" (through the development of electronic methods, they have decreased drastically, anyhow), rather the habits of cash transaction management.

Journal of Economic Literature (JEL) code: G21, G35, G00, G10, G15

INTRODUCTION

Two decades after finishing the university I met my former teacher, the famous theoretical physics professor István Lovas, at a conference. He started his presentation the following way: "I can see here some of my former students. First, I would like to apologize, because not long ago we realized that what I taught to them during their studies is no longer valid."

What was behind it? This is the nature of theoretical physics. This science usually develops like this: we collect experiences, then code them, build up a model, from which we draw logical consequences, decode them, and at the end we compare them to reality. And sometimes we realize our model was totally wrong. It happens because we build up the model based on some experiences of the past, and we are trying to provide explanations for many new experiences on the basis of this model.

As my beloved professor realized, the 1980s model of theoretical physics was wrong, as became obvious at the end of the century. As we know, this has happened many times, not only in physics but also in many other fields of science.

In economics, companies apply forward-looking cash-flow planning, thus ensuring an appropriate cash flow position. The disposable cash and cash equivalents generated in business operations are valuable for the companies, as these assets can be used to increase liquidity and accomplish more efficient cash management. In daily business operations the financial management of each company has to make decisions on the efficient management of disposable cash; whether the cash should be available on the current account in exchange for a low sight interest, or rather as a term deposit generating higher interests, taking into account that a deposit withdrawn before maturity will incur interest losses. An overdraft may be an appropriate solution for the balancing of the cash flow, which provides a constantly available source of financing for the company, in exchange for paying the relevant costs. How should we specify the optimal current account balance, one which generates the smallest loss and at the same time, the highest gain for business operations?

THE CLASSIC MODELS

It is a fundamental principle in economics that the company should have enough disposable cash for the marginal rate of return on liquidity to be equal to the value of lost interest income [Brealey and Myers 1998]. William Baumol was the first to point out sixty years ago that the simple inventory management model can be applied efficiently to corporate financial management as well [Baumol 1952]. The initial problem of the inventory management model is that the provision of the stock level

necessary for fulfilling customer needs incurs costs. High inventory level compared to demands means high inventory management costs, and on the other hand, ordering in small batches will increase the fixed costs of ordering. In inventory management businesses have to consider two types of expenditures: the financing costs embodied in the inventory and the ordering costs incurred by procurement. The more the company orders of the given product - thereby reducing the costs incurred related to the order - the higher the extent by which the size of capital employed in inventories increases. Therefore we should increase the number of orders, as long as the decrease of ordering costs is higher than the increase of financing costs, i.e. the liquidity loss caused by employed capital. The equilibrium point will be there where the two effects will precisely cancel each other out:

$$Q = \sqrt{\frac{2 \bullet \text{sales} \bullet \text{ordering costs}}{\text{financing costs}}}$$

Based on the research of Baumol, the results obtained from the simple inventory management model can be applied efficiently in the field of corporate cash management as well. In this case, the place of the inventory is taken by the cash and cash equivalents, which will keep decreasing through the payments, and the orders are substituted by the securities held by the company, the sale of which incurs loss of interest (financing cost), as well as administrative costs (ordering costs). In this case the formula of the simple inventory management model will be as follows:

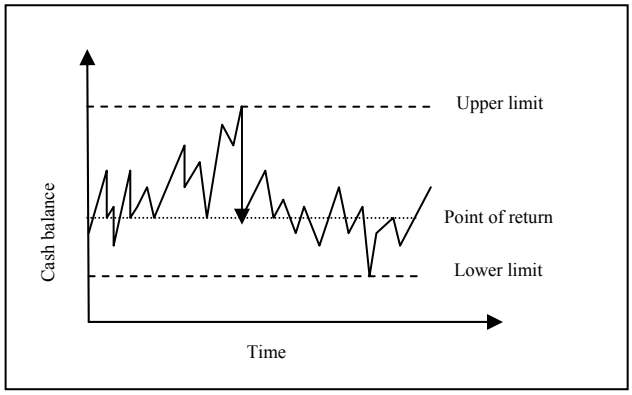
Sum of the securities of the company offered for sale =

$$= \sqrt{\frac{2 \bullet \text{annual payments} \bullet \text{administrative costs}}{\text{interest rate}}}$$

The value of the interest rate is in the denominator, thus it is easy to note the following relationship: higher interest rates reduce the amount of securities intended to be sold, since the higher the interest rate, the bigger loss the company has to accept as a result of the sale.

The model can be applied with very good results, as long as the company is utilizing its cash inventory evenly. At that time the payment turnover of the companies was already significant in terms of amounts, but in terms of transaction volume it was relatively low [Fogaras, 1997]. However, even this kind of cash management showed continuous volatility, thus it was difficult to plan for. So in such cases the Baumol model - derived from the simple inventory management model - can no longer be applied.

Miller and Orr attempted to find out how a company should manage its operations if it cannot forecast precisely the volatility of its daily cash flow [Miller and Orr 1966]. When planning cash flows, one of the biggest problems is the management of accounts receivable and accounts payable: money may be credited at any time from the payment of an invoice issued earlier, but the accounts payable should also be settled on an ongoing basis. Thus it requires careful planning to ensure that at any one time the appropriate level of cash should be available, while its level should be as low as possible, since excess cash will not generate income for the company. In their research Miller and Orr monitored the fluctuation of the cash inventory of companies and came to the following conclusion: cash shows constant fluctuation up to an upper limit. At this point the company is looking for a short-term type of investment for the placement of its disposable cash, thus the cash inventory returns to an optimal level, from which it will once again show constant fluctuation. Along with this reasoning, the balance will reach a lower limit at times, at which the company will release cash from term accounts (through the sale of securities or withdrawal of deposits before maturity) in order to bring its balance to the optimal level once again. Their results are shown in Figure 1.



Source: Based on Brealey and Myers (1998), p. 302

Figure 1: Fluctuation of cash balances (Miller and Orr)

Therefore, based on Miller and Orr's research, the cash inventory of the company may be constantly changing until it reaches one of the limits (upper or lower). At that point the financial manager will modify the balance by releasing cash or making term deposits. On the other hand, the question arises: for how long can a manager let the cash inventory keep changing?

When researching this issue, two important points were observed. One of the fundamental conclusions is that if the fluctuation of the balance is high at a daily level, or if the release of cash incurs high transaction costs, then it is recommended to maintain a wide leeway between the limits. In this case the company is able to save money by reducing its transactional costs.

The other important result of the model is the position of the point of return. In fact, after reaching one of the limits, the balance does not return to the middle of the distance between the two limits, but rather to a point closer to the lower limit. According to the research of Miller and Orr, companies usually reset their balances at a level corresponding to the lower third of the deviation. Based on the above the fluctuation reaches the lower limit more often than the upper one, i.e., the current account distribution is not symmetrical. But this does not minimize the number of transactions mentioned above, since we should return to that mid-point. However, at the mid-point the level of the cash inventory is higher than optimal, and therefore the company will generate interest loss.

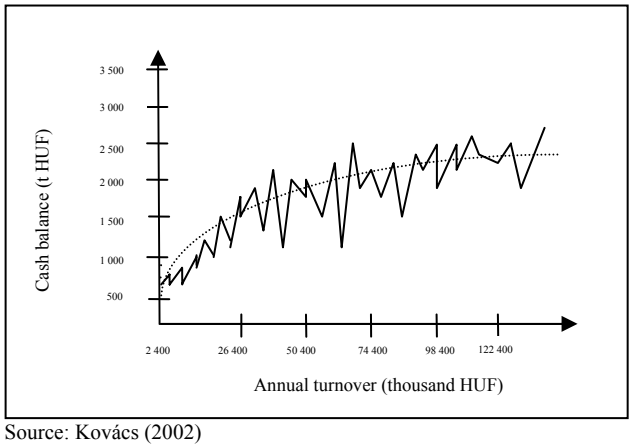
THE RELATIONSHIP BETWEEN CURRENT ACCOUNT BALANCE AND ACCOUNT TURNOVER

Based on the 60-year-old model of Miller and Orr, the optimal current account balance is one-third of the way between the lower and the upper limits, closer to the lower one. Surveys carried out at the end of the 1990s did not confirm the findings of Miller and Orr. In modern cash management companies pay attention to making their current account balance match their expected transactional needs as closely as possible, while maximizing interest. Ten years ago an analysis was conducted to find out how current account balances are distributed, and connected to that, what relationship can be demonstrated between the account balance and interests offered by banks [Kovács 1999]. The article outlines the effect of credit and deposit interests on current account balances. In addition, it also demonstrates that if the cash management of the company is free (i.e., not affected by lack of liquidity), the distribution of the current account balance is symmetrical, and the Gauss curve routinely used in statistics can be fitted on it. Furthermore, the article demonstrates that the optimal current account balance depends on the measure/system of credit and deposit interests offered to companies. On the other hand, it fails to give an answer to the question of what the optimal level of the current account balance is, or to the limits of fluctuation of the balance, as demonstrated by Miller and Orr.

Most companies usually place their disposable cash into short-term bank deposits, or less frequently into unit-linked funds. When they need the fixed deposits in order to secure liquidity, they release the funds; otherwise they will prolong them for a new term. This process can ensure efficient cash flow management. On the other hand, we did not consider the related costs incurred by the company. In case of term deposits, the banks do not charge fixed costs for premature withdrawal, and the loss of interest can also be minimized for deposits with different maturity. However, the management of the current account balance, the series of decisions made about the use of the cash inventory do incur costs, which can be placed in the category of administrative costs. Just consider that fund management fees fall due in the case of investment fund managers as well, but in the same way, in the case of bank deposits we can also expect a similar type of cost, which the banks include in their services (although they do not apply separate charges).

An analysis performed in 2001, based on the data of a commercial bank in Hungary, yielded interesting new results [Kovács 2002]. In this analysis, in addition to the balance, the number of transactions and the turnover volume of the corporate current account were also taken into consideration. Furthermore, the differences shown by customers with an overdraft compared to regular customers (those with no overdraft) were also checked. The results of the analysis shed new light on the assumptions held up to that point. Using the formula of the simple inventory management model applied in the research of Baumol, the value of the interest rate was considered as a choice between alternative options, i.e., the difference between keeping the funds on the current account and the interest yield of investment. In this case, based on the sample containing a high number of elements, it is possible to define the sum that the individual company incurs in a particular bank transaction as cost. In the research significant differences were demonstrated in terms of size, which could mostly be traced back to transaction volumes and characteristics of business operations. Thus small and medium-sized companies had to be distinguished, and the amount of administrative costs could be determined on this basis. The resultant amount can be determined based on the sample mentioned above, as about 2400 HUF for small companies and about 4500 HUF for medium-sized companies, and relying on these data it is easy to determine the optimal current account balance.

Figure 2 demonstrates that based on the resultant values, the average current account balance as a function of corporate account turnover can be described by a logarithmic curve. Parallel with the increase in the size of the company, the number of daily transactions also increases, as well as the daily average cash balance kept on the current account, which ensures liquidity. The logarithmic curve fitting the data increases by less and less with the rise of the number of transactions, i.e. even though the company conducts still more transactions, above a certain level the amount of liquid funds kept on the current account hardly changes. In fact, the total volume of transactions hardly increases beyond a certain daily frequency level, since daily credit and debit items of the same amount balance one another to an increasing extent. That way, it becomes less and less beneficial to increase the value of disposable cash balance, because of the benefits of liquidity and administrative costs.



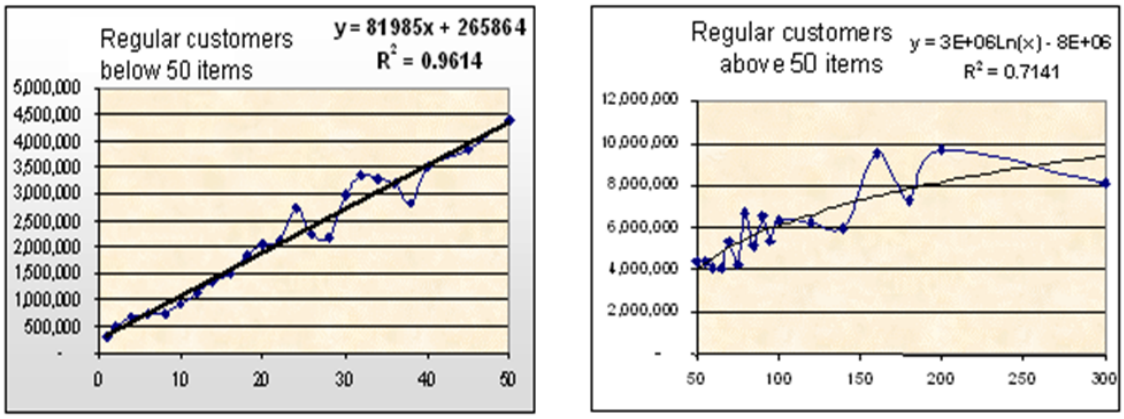
Source: Kovács (2002)

Figure 2: Assessment of the optimal cash balance

Data Explorer carried out the initial analyses, supplemented with additional data. Their aim was to demonstrate the formerly identified differences deriving from the size of the organization – i.e., financial management of smaller companies can be described by different features – at the level of the current account balance as well. At first they assessed the value of the average current account balance of companies performing an average monthly "x" (as a variable) number of transactions on the level of their entire customer portfolio. The results of the assessment confirmed the logarithmic curve presented earlier. The additional assessments produced a very high coefficient of determination (0.71). Carrying on the analysis, they assessed what kind of function can be used to approximate the data at a lower number of transactions (up to 100 transactions per month). In this case the best way to describe the values is a linear straight line, the coefficient of determination of which became even higher (0.96) than in the case of the logarithmic curve.

During the study another situation is also assessed, when rather than analysing the entire customer portfolio, the curves mentioned above are described based on the "account package holding" customers, who are more sensitive to interests and commissions. In this case the statements made concerning the total customer portfolio were also confirmed; i.e., in the case of cost-sensitive customers as well, the average current account balance can be fitted best by a linear, and then a logarithmic curve in respect of daily transactions. In this customer portfolio the curves were positioned somewhat lower.

In the case of regular customers, the results of the assessment are summarized by the graphs in Figure 3.



Source: Data Explorer analysis (2002)

Figure 3: Development of the average current account balance for regular customers

TOWARDS THE NEW MODEL

The high coefficient of determination of the curves resulting from the fitting of the regression lines gives reason to conclude that the curves fit the data quite well. Based on that, the following conclusions may be drawn. On one hand, it has been confirmed that the size of the company causes differences concerning the current balance as well. The smaller a company is, the lower balance it will keep on its current account, since this is sufficient to ensure an appropriate level of liquidity for the company. Above a certain number of transactions - which occurred at 100 transactions concerning the entire customer portfolio - the curve turns logarithmic, i.e. it becomes increasingly unnecessary to keep increasing the value of the balance. But why does this change occur?

In the case of small companies the number of daily transactions is minimal, and therefore it is simple to plan account balance movements. If the level of activity is two or three times higher, when the number of daily transactions is still low, the current account balance has to be higher proportionately, in a linear way. For larger companies we can already see significant account movements. Consequently, transactions of opposite direction (credit and debit transactions) cancel each other out on a daily level to an increasing extent, thus a certain equalizing effect occurs regarding the fluctuation of current account balances. The higher the number of daily transactions, the stronger is the equalizing effect we get, thus the fluctuation related to the volume of the disposable cash will relatively decrease, which is why we have the change from the linear curve, and this is precisely why the change is for a logarithmic curve.

Another important statement derives from this. The 60-year-old Baumol and Orr model presented at the beginning of this study tried to derive the size of the optimal current account balance primarily from the costs. The data of the 2000s – which was generated in the era of electronic banking – no longer support the old American model. In fact, from the symmetrical distribution of the current account balances inventory, the change from linear to logarithmic curve, and the daily transaction activity relationship that explains it, we can draw the conclusion that the current account balance is primarily

determined by transactional activity, i.e. daily cash flow changes, rather than administrative costs.

The analyses of current account balances are seen in a new light in that context, and the formerly created models should be reconsidered, discarded, and new models should be created. According to the new model, it is the opening deposit level of the relevant day, the transactional data of the relevant day and the statistically expected transactional volumes of the near future that determine the value of the closing deposit on the relevant day, i.e. the opening balance of the following day (D+1).

The statistical distribution of the value and frequency of credited and debited amounts is known, of which a few random credit and/or debit items are settled each day for smaller companies. However, bigger companies conduct so many transactions on a daily basis that at this level it becomes profitable to consider the offsetting (neutralizing) effect of credited and debited amounts. As a result of what we have said above, from the statistical frequency distribution of transactional amounts we obtain a new distribution for the current account balances. The resolution of the new model is the mathematical relationship of the statistical distribution of transactional amounts and average current account balances, which provides a significant deviation in case of a small number of transactions (i.e., no equalizing effect) and a high number of transactions (the equalizing effect is taken into account). Concerning average current account balances, a small number of transactions will result in a linear relation, while a high number of transactions results in a logarithmic relationship depending on traffic.

CONCLUSION

It should be noted for practicing economists that the cash management models created 60 years ago for the purpose of managing a small number of high-value transactions, with slow information flow and costly banking, operated on paper, are no longer valid. The new model, based on modern business practices, gives an answer to the question of what should be the planned size of corporate current account balances in the age of an accelerated and 100% electronic cash management driven economy.

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Separating the Measurement and Evaluation of Intellectual Capital Elements with Evaluator Functions

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SUMMARY

The purpose of this study is to contribute to the use of evaluator and utility functions in order to increase the reliability of scorecard based intellectual capital measurement methods and to express and aggregate the utility of IC elements to the organization. The conducted field experiment integrates the results of interviews with 23 brand name customers through examining the customer satisfaction measuring practice of service provider companies. The main finding is that the adequately calibrated evaluator functions assign perceived customer satisfaction to its scorecard based measured values and mitigate the distortions of scorecard based measurements. The evaluator function interpreted as a kind of utility function reflects the utility of IC values derived from a scorecard based measurement method. Our research discusses the repertoire of aggregating the utility of IC elements as well.
Journal of Economic Literature (JEL) code: I32, E01, C01, C52

BACKGROUND

Measuring and valuing IC

Making IC elements visible within the assets of a corporation and measuring their contribution to corporate success arise as a natural demand. The existing methods (market capitalization, return on asset, direct intellectual capital and scorecard methods) offer different advantages and serve diverse purposes (Andriessen 2004; Marr et al., 2003; Sveiby, 1997; Sveiby, 2001-2005). Scorecard methods of intellectual capital measurement aim at apprehending unique and strategically relevant IC elements and embodying competitive advantages by emphasizing organization specific measures (Marr et al., 2004; Sveiby, 1997).
Andriessen (2004: 238) makes a clear distinction between IC measuring and valuing practices. If the criterion of value is defined in monetary terms, the method to determine value is a financial valuation method (see market capitalization methods, return on asset methods and direct intellectual capital methods). We can use a non-monetary criterion and translate it into observable phenomena, in which case the method is a value measurement method (see some of the scorecard methods, e.g., Balanced Scorecard). If the criterion cannot be translated into observable phenomena but instead depends on the evaluator's personal judgment, then the method is a value assessment method (none of the existing IC methods can be classified here). If the framework does not include a criterion for value but does involve a metrical scale that relates to an observable phenomenon, then the method is a measurement method (see some of the scorecard methods, e.g., Skandia Navigator, Intangible Asset Monitor, Intellectual Capital Index). As a conclusion Andriessen (2004) adds that a measurement method is not a method for valuation.
Our research is based on the scorecard methods of IC measurement focusing on assigning non-financial measures to intangible assets and dealing with the management issues of individual IC elements strategically.

The value lying in an organization's external relationships has both tangible and intangible aspects and both need to be developed and managed (Baxter and Matear, 2004). Customer capital as part of IC is about the knowledge embedded in relationships external to the organization and its development mainly relies on the support deriving from human and structural capital (see e.g., Homburg and Stock, 2004; Leliaert et al., 2003). As one of the most important indicators of customer capital, customer satisfaction is always a potential source of innovation, repeat sales, positive word-of-mouth and customer loyalty (Fornell et al., 1996; Johnsen et al., 2005). The study analyzes the nature of typical customer satisfaction measurement methods used by Service Provider (SP) companies, particularly by Electronics Manufacturing Services (EMS) providers.

Scorecard based measurement of customer satisfaction

The last decades have spawned numerous researches on customer satisfaction. Various studies show a wide range of applicable practices to understand the customers' voice and measure their satisfaction and loyalty (see e.g., Eshghi et al., 2007; Gustafsson, 2008; Gustafsson and Johnson, 2004; Iacobucci et al., 1995; Johnson and Fornell, 1991).

The common way of Customer Satisfaction (CS) measurement, which typical SP companies follow, is based on scorecard methods. The customers give regular feedbacks by using pre-agreed scorecards. The ultimate goal is to quantify the performance of the SP in areas such as quality, supply chain management, delivery accuracy, flexibility, customer communication etc. Finally, an aggregated artificial number characterizes the level of each customer's satisfaction. The company interprets this aggregated figure (i.e. its performance) in its own preference system. For example, an EMS company uses a scorecard that measures CS on a scale that goes from 0 to 100 and every time a customer company expresses its satisfaction the answer is a number between 0 and 100. This number and the company's preference system give the interpretation of CS similarly to the example given by Table 1.

Table 1. An example for CS evaluation

Score	Level of Customer Satisfaction
< 20	Very poor
$20 \leq$ and < 40	Poor
$40 \leq$ and < 60	Meets expectations
$60 \leq$ and < 80	Above expectations
$80 \leq$	Excellent

Certainly, the content of scorecards and the scoring criteria may vary from customer to customer but is fixed at one particular customer. Let us focus only on one customer and its scorecard to understand the above shown measurement and evaluation. At first sight it appears that if the scorecard is well defined and the customer has the right interpretation of scoring criteria, the measurement is accurate and consistent, the evaluation reflects the real level of customer satisfaction. Unfortunately, this is not necessarily so as there is a number of factors that may influence both the measurement and evaluation and cause uncertainties.

Uncertainties around the measurement

Our study investigates how scorecard based assessment methods can capture the enumerated contributors of customer satisfaction and how reliably these methods are able to reflect the customers' perceived satisfaction to SP companies.

Measurement and valuation roles

The typical role setup of a scorecard based customer satisfaction measurement and evaluation at SP companies looks so that the customer provides the scores (does the measurement) and the service provider company evaluates them. With other words, the company receives numbers and believes that comparing these numbers to the evaluation criteria reflects how much the customer is satisfied. It means that the customer instead of giving feedback about its perceived satisfaction level quantifies the level of performance provided by the SP company.

Scaling

Is it really true that a customer is double satisfied when it gives 80 points (as customer satisfaction score) compared to giving only 40 points? Thinking about this question may make us worried about the consistency of this method, although SP companies widely use similar methods. The cause of this problem is the withheld assumption that a customer expresses its satisfaction on a linear scale (proportional scale), that is the score given by the customer is proportional to its perceived satisfaction. If it is not so, using linear evaluation regarding the level of customer satisfaction may be questionable.

Subjectivity

The customer organizations represent themselves by individuals, who may have influences on the feedbacks given by their organizations, even if they try to be objective with their best intentions. Unfortunately, their subjectivity is somehow always in the scores they give. If we consider the scorecards as measurement systems, the repeatability and reproducibility of these systems can be disputable (Burdick and Borror, 2005).

Evaluator functions

Our ultimate goal is to propose a solution by using evaluator functions that can mitigate the highlighted problems of CS measurement and evaluation. Evaluator functions are mathematical functions that translate the

scorecard based CS measurement scores to an evaluation scale. Let variable m be the measured CS scores in the $[m_S, m_E]$ interval, where m_S and m_E is the start- and endpoint of the measurement scale. Using these notations an E evaluator function assigns the $E(m)$ CS value to every m measured CS value and meets the following basic criteria.

The $E(m)$ function is monotonously increasing, that is higher measured values correspond to higher perceived satisfaction level, even if the relationship between them is not linear.

The range carrier of $E(m)$ is the (0, 1) or [0,1] interval.

$E(m)$ represents the perceived satisfaction that the customer would assign to the measured m satisfaction.

These criteria determine just a loose frame for an evaluator function, but taking other experiential properties of customers' behavior and satisfaction perceptions into account, particular evaluator functions can be derived.

The Eω(m) evaluator function

In this study, we use the

$$E_{\omega,m_S,m_E,m_0,E_{m_0},E_L,E_H}(m) = $$

$$= E_L + (E_H - E_L)\frac{\left(\frac{m-m_S}{m_E-m_S}\right)^{\omega}}{\left(\frac{m-m_S}{m_E-m_S}\right)^{\omega} + \frac{E_H-E_{m_0}}{E_{m_0}-E_L}\left[\frac{m_0-m_S}{m_E-m_0}\left(1-\frac{m-m_S}{m_E-m_S}\right)\right]^{\omega}}$$

function as evaluator function. This function is a linearly transformed version of Dombi's κ function introduced in the fuzzy theory as a membership function (Dombi, 1990), and a good approximation of a linearly transformed logistic function. For the details of choosing the ω parameter and the approximation see Jónás (2010). From this point onwards the simplified $E_{\omega}(m)$ notation will be used instead of the $E_{\omega,m_S,m_E,m_0,E_{m_0},E_L,E_H}(m)$ long form.

METHODOLOGY

Practical use of the Eω(m) function

One of the problems with the commonly used CS evaluation is that the measurement (done by the customer) and the evaluation (done by the service provider) are separate process steps. This separation in itself would not cause any problem, if the evaluation could adequately reflect the customer's perception. In practice, there is a disconnection between customers' and service providers' evaluations. Now we have a mathematical tool that the customer can use to evaluate its satisfaction using the CS scorecard, but first the customer needs to set the parameters of the evaluator function so that it reflects the customer's satisfaction perception of the measured CS scores. The study presents a method here how to use the $E_{\omega}(m)$ evaluator function for customer satisfaction evaluation. The $E_{\omega}(m)$ function is a tool that corrects and improves the reliability of the scorecard based measurement. We call this method reliability-based customer satisfaction evaluation (RCSE) method.

Step 1.

The customer is asked to measure its satisfaction based on a common scorecard system used for all customers.

Step 2.

The customer needs to set the window parameters for the $E_{\omega}(m)$ function, which determine the domain of variability (the $[m_S, m_E]$ interval) and the lowest (E_L) and highest (E_H) satisfaction values of the $[0,1]$ evaluation scale.

Step 3.

Three further parameters: m_0, E_{m_0} and ω have to be specified to unambiguously determine the evaluator function. For this purpose the customer specifies two satisfaction levels on the evaluation scale in the (E_L, E_H) interval and assign them to two arbitrary chosen (but different both from m_S and m_E) points of the original CS measurement scale. Either of these two pairs can be directly used as the (m_0, E_{m_0}) pair, so one point of $E_{\omega}(m)$ is explicitly given. In practice, the selection of m_0 as the midpoint of the measurement scale is suggested since half of the maximum reachable score is a good characteristic point of the scale.

Step 4.

Let (m_a, E_{m_a}) note the other arbitrary chosen (measurement value, evaluation value) pair. As (m_a, E_{m_a}) is a point of the $E_{\omega}(m)$ curve, the $E_{m_a} = E_{\omega}(m_a)$ equation needs to be met. From this equation parameter ω can be calculated as

$$\omega = \frac{\ln\left(\frac{E_H - E_{m_a}}{E_{m_a} - E_L}\frac{E_{m_0} - E_L}{E_H - E_{m_0}}\right)}{\ln\left(\frac{m_E - m_a}{m_a - m_S}\frac{m_0 - m_S}{m_E - m_0}\right)}$$

Which point of the measurement scale is worth to be chosen as m_a? Each customer has a kind of a threshold value for the measured CS score. Certainly, these threshold figures vary from customer to customer. Basically that is why the standardized scorecard based measurement has limited capability to express the

customer satisfaction appropriately. The customer specific evaluator functions allow the customers to assign their values of perceived satisfaction to the scores measured by a standardized scorecard method. Hence, setting m_a as the customer specific threshold value for the measured CS score for each customer is recommended.

AGGREGATED EVALUATION

Scorecard based measurement lays the foundation for evaluating the reliability-based customer satisfaction evaluation method. This is already an aggregate approach as its input variable is an aggregate score. Actually, a service provider company has multiple customers whose expectations may vary in a wide range. Even if the same service at the same performance level is provided, different customers may perceive very different satisfaction levels. The typical approach to handle this situation is the use of customer specifically structured, customized and weighted scorecards to measure the CS level. It means that different scorecards measure the performance of the same operation as different customers have different preferences. The SP company rightly wants to understand each customer and have an overall picture both about its performance and the customers' satisfaction level. How to aggregate and quantify the customer satisfaction levels in such cases?

The greatest advantage of using evaluator functions is that their range carrier is the same [0,1] interval regardless what their domains of variability are. Different scorecards with the same measurement scale can be used for different customers, but the evaluated CS is always expressed on the [0, 1] scale (or in one of its subsets). The evaluation scale is unified and the use of $E_\omega(m)$ functions can be interpreted as a common basis transformation. It allows us to aggregate the evaluated CS of multiple customers. The starting point is that each customer follows the same way of thinking and satisfaction perception as function of the CS score. Each of them can evaluate the CS by a suitably calibrated $E_\omega(m)$ function. Providing this, we can assume that the aggregated satisfaction has the same nature. The only remaining question is the calibration of the aggregated $E_\omega(m)$ function.

Let us assume that a SP company has n customers and there is a CS scorecard defined for each of them. Then by applying the $E_\omega(m)$ function every customer calibrates it according to the reliability-based customer satisfaction evaluation method. As discussed earlier, the $E_\omega(m)$ function has seven adjustable parameters: ω, m_S, m_E, m_0, E_{m_0}, E_L and E_H. In case of multiple clients there is an $E_\omega^{(i)}(m)$ evaluator function with $\omega^{(i)}$, $m_S^{(i)}$, $m_E^{(i)}$, $m_0^{(i)}$, $E_{m_0}^{(i)}$, $E_L^{(i)}$ and $E_H^{(i)}$ parameters for each customer, and

$$\omega^{(i)} = \frac{\ln\left(\frac{E_H^{(i)} - E_{m_a}^{(i)}}{E_{m_a}^{(i)} - E_L^{(i)}} \frac{E_{m_0}^{(i)} - E_L^{(i)}}{E_H^{(i)} - E_{m_0}^{(i)}}\right)}{\ln\left(\frac{m_E^{(i)} - m_a^{(i)}}{m_a^{(i)} - m_S^{(i)}} \frac{m_0^{(i)} - m_S^{(i)}}{m_E^{(i)} - m_0^{(i)}}\right)}$$

where the $\left(m_0^{(i)}, E_{m_0}^{(i)}\right)$ and $\left(m_a^{(i)}, E_{m_a}^{(i)}\right)$ pairs are the inputs of the ith customer to calibrate its evaluator function $(i = 1,2,..., n)$.

When the company is about to figure out the aggregate CS evaluator function, inputs of different customers can be considered with different importance and the company may consider the customer responses with different weights. Let w_i be the weight assigned to the i^{th} customer, that is the contribution of this customer to the aggregate CS level, where

$$\sum_{i=1}^{n} w_i = 1.$$

Without compromising the generality, assuming that the same measurement scale is used for all customers, the aggregate $m_S^{(A)}$ start- and $m_E^{(A)}$ endpoints of the measurement scales are the same for each evaluator function, that is $m_S^{(i)} = m_S^{(A)}$, and $m_E^{(i)} = m_E^{(A)}$ $(i = 1,2,..., n)$.

The $\omega^{(A)}$, $m_0^{(A)}$, $E_{m_0}^{(A)}$, $E_L^{(A)}$ and $E_H^{(A)}$ parameters of the aggregated evaluator function can be calculated as the weighted averages of the corresponding parameters:

$$\omega^{(A)} = \sum_{i=1}^{n} w_i \omega^{(i)},\ m_0^{(A)} = \sum_{i=1}^{n} w_i m_0^{(i)},$$

$$E_{m_0}^{(A)} = \sum_{i=1}^{n} w_i E_{m_0}^{(i)},$$

$$E_L^{(A)} = \sum_{i=1}^{n} w_i E_L^{(i)},\ E_H^{(A)} = \sum_{i=1}^{n} w_i E_H^{(i)}.$$

We call this construction parameter weighted aggregate customer satisfaction evaluation (PWACSE) method.

UTILITY POINT OF VIEW: ASSESSING THE VALUE OF IC ELEMENTS

The evaluated customer satisfaction represents the level of performance that our customers perceive. From the SP company's point of view customer satisfaction is a measure of performance, from the customer's perspective the level of satisfaction is the measure of the utility of services provided by the company. Therefore, the CS evaluator function can be interpreted as utility function as well. Since customer satisfaction can be considered as a specific element of intellectual capital, our aggregation results in the aggregated utility function of the chosen IC element.

The aggregated utility function as function of a measured m score gives a good overall indication of the utility (value) that a service provider gives to its customers. The aggregate utility function is invertible, therefore, a particular utility level can be translated to the m metric. Keeping in mind that the scorecard measurement has a known structure, the management can identify the actions required to achieve the necessary level of metric m. Doing so, the customers' inputs can be used for setting intellectual capital improvement goals.

Using the RICEE and PWAICEE methods

The approach of the RCSE method can be applied to any IC element and this generalized method is called reliability-based intellectual capital element evaluation (RICEE) method. Similarly, the logic of PWACSE method under the name of parameter weighted aggregate intellectual capital element evaluation (PWAICEE) can be used as a possible way to aggregate multiple utility (evaluator) functions for the same IC element, if the same scorecard metric is used as independent variable for the various utility (evaluator) functions. By this means, in case of multiple IC elements as many aggregated utility functions can be derived as many IC elements are chosen. For this the individual utility (evaluator) functions are to be calibrated one by one following the same way introduced earlier.

Evaluator functions and the aggregate evaluator function are tools that can correct biased scorecard based measurements on an IC element in order to express its utility to the organization more reliably. Having an actual (aggregated) measured score the (aggregated) evaluator function determines its value on the evaluation scale. This latter is a number from the [0,1] interval representing the actual utility of the examined IC element to the organization. Following this approach, one utility figure can be assigned to each IC element and all these figures are from the [0,1] interval. It means that by giving importance weights to IC elements it allows us to aggregate the current utility figures into one utility value. Figure 1 illustrates the generic use of the RCSE and PWACSE methods for n IC elements.

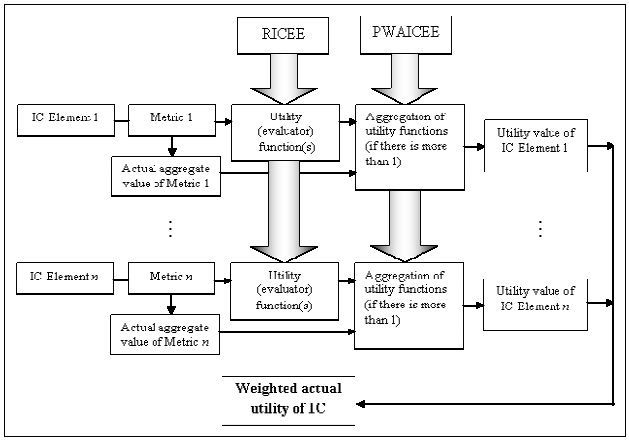

Figure 1. The scheme of aggregated utility of IC by using the RICEE and PWAICEE methods

A practical application of the RCSE and PWACSE methods

A site of a service provider company uses a scorecard with the following categories to collect information about the satisfaction of its 23 customers: quality of products and services, delivery accuracy, strategic value-added, operational performance, cost competitiveness, customer communication, materials management, reporting of operational metrics, program/project management, quotation process, supply chain performance, e-Business/ IT, documentation management, business start-up process, new product introduction/prototype, technology development.

Each customer has given a weight to each assessment category (the sum of weights is 100%). The weights represent the importance of the different measurement categories to the customers. Table 2 shows this weighting system.

Table 2. Customers' weighting of assessment categories

Customized scorecards / Weights																
Assessment category																
Customer	Quality of Products and Services	Delivery Accuracy	Strategic Value Added	Operational Performance	Cost Competitiveness	Customer Communication	Materials Management	Reporting of Operational Metrics	Program / Project Management	Quotation Process	Supply Chain Performance	e-Business / Information Technology	Documentation Management	Business Start-up Process	New Product Introduction / Prototype	Technology Development	Sum of weights
1	12	12	12	11	10	6	8	5	4	3	3	4	3	3	2	2	100
2	20	20	4	10	5	6	5	5	4	3	3	4	3	5	2	1	100
3	10	25	10	10	15	5	5	3	4		3	4	2	3	1		100
4	10	5	5	10	25	6	5	5	10	1	3	2	2	10		1	100
5	30	15	15	15	15	5	1	1	1	1	1						100
6	5	20	10	10	5	3	25	5	3		4	4	3	3			100
7	5	5	5	5	5	5	25	5	4		25	4	4	3			100
8	10	15	10	10	5	10	5	5	5	5	5		5	5	5		100
9	12	15	13	15	10	3		2	5			15	5	5			100
10	5	5	5	5	30	10	5	5	5		5	5	5	5		5	100
11	45	10	5	10	5	5			5			10		5			100
12	30	10	20	10	10	5					10					5	100
13	10	45		10	10		5	5	10		5						100
14	22	13	5	10	10	3	6	7	10		3		3	5		3	100
15	10	5	5	5	20	5	5	5	5	5	5	5	5	5	5	5	100
16	5	10	5	10	40	5		10								15	100
17	5	35	5	10	10	5	5	5	5		5		5			5	100
18	25	15	15	10	5	5			5			15		5			100
19	10	12	12	8	8	8	8	4	4	4	5	3	5	5	2	2	100
20	15	15	15	10	5	5	5					10	10	10			100
21	50	3	3	3	8	3	3	3	3	3	3	3	3	3	3	3	100
22	10	45	7	7	5	6	6	2	3	2	3	3	1				100
23	35		20	20	10			5				10					100

The company uses a scale from 0 to 100 to measure the customers' satisfaction. The measurement works so that each customer gives its scores category by category and the weighted average as aggregate score (weighted aggregate score) of the given scores is calculated for each customer (Table 3).

Table 3. Customers' Scores

Scores																	
Assessment category																	
Assessment category	Quality of Products and Services	Delivery Accuracy	Strategic Value Added	Operational Performance	Cost Competitiveness	Customer Communication	Materials Management	Reporting of Operational Metrics	Program / Project Management	Quotation Process	Supply Chain Performance	e-Business / Information Technology	Documentation Management	Business Start-up Process	New Product Introduction / Prototype	Technology Development	Weighted aggregate score
1	68	70	92	72	50	90	85	92	90	95	80	92	95	88	95	82	78.88
2	82	95	93	92	70	76	92	82	84	85	85	87	68	92	63	82	85.74
3	95	90	92	90	88	80	91	85	85		95	95	90	90	85		89.90
4	85	95	90	95	85	92	95	92	90	90	95	85	80	90		95	89.37
5	80	85	75	75	60	80	82	80	85	75	80						76.27
6	92	95	88	95	80	95	95	93	93		91	95	92	88			92.78
7	85	80	88	83	75	85	82	83	85		75	77	68	92			80.16
8	76	92	88	72	92	77	75	75	73	82	73		88	85	87		81.60
9	92	91	90	88	94	91		97	91			91	91	93			91.06
10	83	82	74	82	81	82	88	91	82		80	81	87	89		91	83.00
11	77	69	65	72	69	71			72			75		69			73.55
12	82	67	91	90	92	85					84					85	84.60
13	91	90		88	97		92	93	91		89						90.90
14	78	77	62	51	82	90	91	87	86		92		91	90		88	79.05
15	88	92	94	94	81	91	88	89	87	82	82	92	91	92	93	95	88.10
16	95	78	92	97	83	99		76								76	84.00
17	92	77	91	72	73	75	69	71	74		68		73			75	75.85
18	78	87	88	91	97	92			89			89		91			86.65
19	94	63	78	79	79	65	64	62	78	88	83	76	76	72	77	72	75.21
20	65	62	68	61	72	71	78					63	62	67			65.60
21	89	97	95	98	92	93	95	91	89	94	93	92	91	92	92	93	91.01
22	72	68	69	69	71	70	70	82	75	75	72	81	78				70.17
23	93		85	83	82			91				87					87.60

The method introduced so far represents the company's traditional method of customer satisfaction measurement. On top of customers' score inputs the following three additional questions were asked from the clients.

What would be your perceived satisfaction level on the (0,1) scale, if you scored our company at 50 on the measurement scale? Please, use 2 digit numbers.

What would be your perceived satisfaction level on the (0,1) scale, if you scored our company at 90 on the measurement scale? Please, use 2 digit numbers.

What is your current perceived satisfaction level on the (0,1) scale?

By answering Question (1) and (2) the customer calibrates its utility function, while question (3) as a control question compares the calculated utility of actual aggregate CS score to the customer's perceived satisfaction that it assigns to the aggregate score.

The same measurement scale was used for each customer, that is $m_S^{(i)} = 0$ and $m_E^{(i)} = 100$. In order to simplify the procedure, $E_L^{(i)} = 0$ and $E_H^{(i)} = 1$ were chosen for each customer. According to question (1) and (2) all customers have used $m_0^{(i)} = 50$, $m_a^{(i)} = 90$ scores for the calibration of their utility functions $(i = 1,...,23)$. The customers' inputs and the calculations done by the SP company using the RCSE and PWACSE methods are summarized in Table 4.

Table 4. Customers' inputs and calculations based on RCSE and PWACSE methods

Cust.	WAS	$E_L^{(i)}$	$E_H^{(i)}$	$m_S^{(i)}$	$m_E^{(i)}$	$m_0^{(i)}$	$E_{m_0}^{(i)}$	$m_a^{(i)}$	$E_{m_a}^{(i)}$	ω	CW (%)	CCPS	CUAS	LTWAS
1	78.88	0	1	0	100	50	0.05	90.00	0.90	2.34	4.35	0.50	0.5347	0.7888
2	85.74	0	1	0	100	50	0.1	90.00	0.85	1.79	4.35	0.75	0.7336	0.8574
3	89.90	0	1	0	100	50	0.05	90.00	0.95	2.68	4.35	0.95	0.9486	0.8990
4	89.37	0	1	0	100	50	0.2	90.00	0.80	1.26	4.35	0.80	0.7859	0.8937
5	76.27	0	1	0	100	50	0.1	90.00	0.98	2.77	4.35	0.75	0.7385	0.7627
6	92.78	0	1	0	100	50	0.15	90.00	0.90	1.79	4.35	1.00	0.9445	0.9278
7	80.16	0	1	0	100	50	0.1	90.00	0.85	1.79	4.35	0.60	0.5748	0.8016
8	81.60	0	1	0	100	50	0.2	90.00	0.80	1.26	4.35	0.65	0.6209	0.8160
9	91.06	0	1	0	100	50	0.1	90.00	0.95	2.34	4.35	0.95	0.9621	0.9106
10	83.00	0	1	0	100	50	0.1	90.00	0.95	2.34	4.35	0.80	0.8195	0.8300
11	73.55	0	1	0	100	50	0.4	90.00	0.90	1.18	4.35	0.70	0.6913	0.7355
12	84.60	0	1	0	100	50	0.3	90.00	0.85	1.18	4.35	0.75	0.7603	0.8460
13	90.90	0	1	0	100	50	0.35	90.00	0.95	1.62	4.35	0.95	0.9574	0.9090
14	79.05	0	1	0	100	50	0.25	90.00	0.90	1.50	4.35	0.70	0.7096	0.7905
15	88.10	0	1	0	100	50	0.4	90.00	0.87	1.05	4.35	0.85	0.8450	0.8810
16	84.00	0	1	0	100	50	0.3	90.00	0.95	1.73	4.35	0.90	0.8823	0.8400
17	75.85	0	1	0	100	50	0.2	90.00	0.95	1.97	4.35	0.70	0.7046	0.7585
18	86.65	0	1	0	100	50	0.4	90.00	0.95	1.52	4.35	0.95	0.9203	0.8665
19	75.21	0	1	0	100	50	0.35	90.00	0.85	1.07	4.35	0.70	0.6387	0.7521
20	65.60	0	1	0	100	50	0.3	90.00	0.95	1.73	4.35	0.50	0.5663	0.6560
21	91.01	0	1	0	100	50	0.2	90.00	0.95	1.97	4.35	0.95	0.9599	0.9101
22	70.17	0	1	0	100	50	0.1	90.00	0.85	1.79	4.35	0.30	0.3393	0.7017
23	87.60	0	1	0	100	50	0.25	90.00	0.90	1.50	4.35	0.85	0.8622	0.8760
Agg.	82.65	0	1	0	100	50	0.22	90.00	0.90	1.75	4.35	0.76	0.7609	0.8265

Figure 2 shows the assemblage of curves of the calibrated utility functions and the aggregate utility function generated using the PWACSE method.

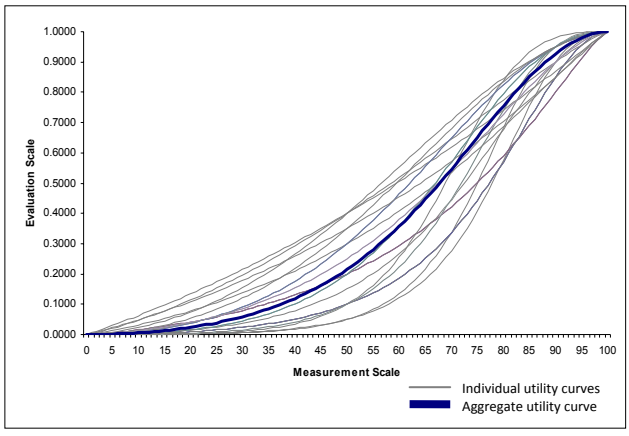

Figure 2. Assemblage of curves of the calibrated utility functions and the aggregate utility function

Statistical analyses

In order to characterize the goodness of the introduced methods, we calculated the difference between the customer's current perceived satisfaction (CCPS) and the calculated utility of aggregate score (CUAS) for each customer. If the measured scores are converted to the evaluation scale (the [0,1] interval) using a simple linear transformation, we get the linearly transformed weighted average score (LTWAS) for each customer. The CCPS-CUAS and CCPS-LTWAS differences are used to analyze statistically the data collected and calculated in our case study in order to see how well the RCSE method works. Table 5 shows the CCPS-CUAS and CCPS-LTWAS differences.

Table 5. The CCPS-CUAS and CCPS-LTWAS differences

Customer	CCPS-CUAS	CCPS-LTWAS
1	-0.0347	-0.2888
2	0.0164	-0.1074
3	0.0014	0.0510
4	0.0141	-0.0937
5	0.0115	-0.0127
6	0.0555	0.0722
7	0.0252	-0.2016
8	0.0291	-0.1660
9	-0.0121	0.0394
10	-0.0195	-0.0300
11	0.0087	-0.0355
12	-0.0103	-0.0960
13	-0.0074	0.0410
14	-0.0096	-0.0905
15	0.0050	-0.0310
16	0.0177	0.0600
17	-0.0046	-0.0585
18	0.0297	0.0835
19	0.0613	-0.0521
20	-0.0663	-0.1560
21	-0.0099	0.0399
22	-0.0393	-0.4017
23	-0.0122	-0.0260
Aggr.	0.0022	-0.0635

The descriptive statistics (see Table 6) and the Boxplot charts (see Figure 3) for the CCPS-CUAS and CCPS-LTWAS differences show that the estimated mean of CCPS-CUAS is closer to zero than the estimated mean of CCPS-LTWAS and the standard deviation for CCPS-CUAS is much less than for CCPS-LTWAS.

Table 6. Descriptive statistics for CCPS-CUAS and CCPS-LTWAS

Variable	Mean	StDev	Median	Range
CCPS-CUAS	0.00216	0.02885	0.00143	0.12756
CCPS-LTWAS	-0.0635	0.1198	-0.0355	0.4852

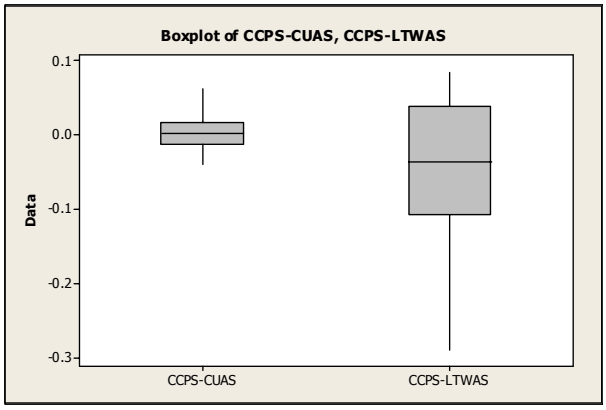

Figure 3. Boxplot charts for CCPS-CUAS, CCPS-LTWAS

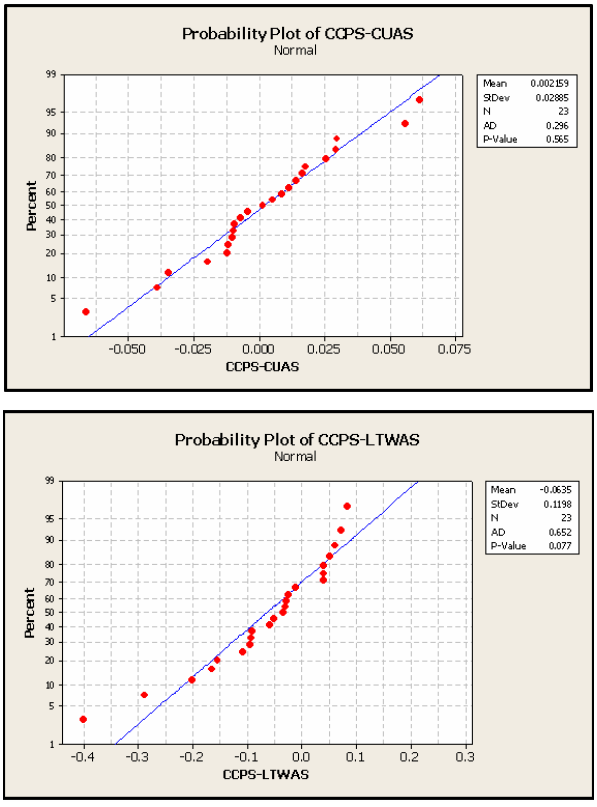

Figure 4. Probability plots of CCPS-CUAS and CCPS-LTWAS

The p-values of Anderson Darling normality tests applied to CCPS-CUAS and CCPS-LTWAS were greater than the significance level 0.05. This means the hypothesis that both CCPS-CUAS and CCPS-LTWAS are normally distributed random variables can be accepted, however, the probability plot charts suggest that probability distribution of CCPS-CUAS fits to a normal distribution better than the probability distribution of CCPS-LTWAS (see Figure 4).

Our hypothesis that the variance of CCPS-CUAS is significantly less than the variance of CCPS-LTWAS was proven by using F-test and Levene's test at significance level of 0.05. F-test was applicable as both of the variables passed the normality test at significance level of 0.05. Levene's test was used to reinforce the result from the F-test as although CCPS-LTWAS passed the normality test, but showed a relatively weak fit to a normal distribution. Figure 5 shows the results of F- and Levene's test.

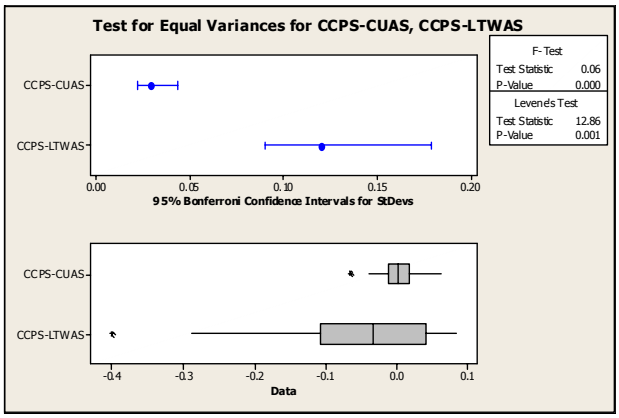

Figure 5. F-test and Levene's tests for equal variance for CCPS-CUAS and CCPS-LTWAS

Both tests resulted in p-values less than the chosen significance level, and so the null-hypothesis of equal variances of CCPS-CUAS and CCPS-LTWAS was rejected, thus there is a significant difference between them, namely, the variance of CCPS-CUAS is significantly less than the variance of CCPS-LTWAS. This statistical conclusion proves that the logistic-type evaluation based RCSE method is able to reflect the perceived customer satisfaction more reliably than the simple linear transformation of measured scores.

CCPS-LTWAS passed the normality test, but showed a relatively weak fit to a normal distribution, and so the Mann-Whitney test was used to compare the medians of the two variables instead of comparing their means. The test at significance level of 0.05 resulted in p-value of 0.0369. So the null-hypothesis that the two medians are equal was rejected (see Table 9). Based on this results and the descriptive statistics, it can be concluded that the median of CCPS-CUAS (0.00143) is closer to zero than the median of CCPS-LTWAS (-0.0355) and the same is valid for the mean figures.

Moreover, if we look at the differences between the aggregate CCPS and CUAS values and between the aggregate CCPS and LTWAS values, it can be stated that

the aggregate CUAS figure (0.7609) generated by using the PWACSE method is much closer to the aggregate CCPS (0.76) figure than the aggregate LTWAS (0.8265) figure.
The application of the RCSE and PWACSE methods require some extra work both from the customers (e.g., the three additional questions they need to answer) and from the service provider company. On the other hand, if both parties understand what the methods are about and how they can lead to a more reliable evaluation, they will recognize that the methods are worthwhile to use.

DISCUSSION

Key findings, managerial implications and further research directions

By showing that a distinction can be made between financial valuation methods, value measurement methods, value assessment methods and measurement methods, Andriessen (2004) warns that more research is needed into the nature of the problems, strength and weaknesses that valuation and measurement addresses.
The focus of this article is on the organizational ability to separate the measurement and valuation of intellectual capital elements. As a kind of organizational resource the perceived values of IC are of great importance, which are then compared to the measured values. The heart of the matter is how and to what extent IC can contribute to the execution of strategically relevant goals which means the evaluation of IC elements and the assessment of their utility in the company's own preference system. Expressing the value of an IC element through scorecard based measurement may result in distorted information and so it is not able to reflect the real utility of the examined IC element to the organization correctly. The adequately calibrated $E_{\omega}(m)$ evaluator functions are suitable tools to assign perceived customer satisfaction to its scorecard based measured values, and thus the application of these functions mitigates the distortion effects of scorecard based measurement methods. Besides customer satisfaction the reliability-based intellectual capital element evaluation method can be generally applied to any IC element.
An $E_{\omega}(m)$ evaluator function can be interpreted as a utility function reflecting the utility of measured intellectual capital values derived from a scorecard based measurement method. The parameter weighted aggregate intellectual capital element evaluation method can be used for aggregating multiple utility (evaluator) functions for the same IC element, if the same scorecard metric is used as independent variable for the various utility (evaluator) functions. Using the utility functions, the current utility of each identified intellectual capital element can be expressed on the common [0,1] scale and having importance weights given to the elements their current utility values can be aggregated into one utility value.
By choosing key success indices from human, structural and customer capital aligned to strategic goals, the presented approaches can be used for setting measurement against evaluation, enhancing the reliability of measurement, and expressing and aggregating the utility of IC elements to the organization.
Utility functions can convert the figures derived from financial valuation and scorecard based measurement, the methods presented here allow the joint use of these two approaches in the same performance management system.
One implication of this research relates to the application of RICEE and PWAICEE methods for other intellectual capital elements such as employee satisfaction, technology transfer, labor recruitment, training programs and to signal the value of intellectual capital to stakeholders (see e.g., Andriessen, 2004; Mouritsen et al., 2003, Narayanan et al., 2000; Ndofor and Levitas, 2004; Roos et al., 1997). The findings of this study also contribute to an improvement of awareness of how the measurement and evaluation of intellectual capital elements as an input can be built into organizational decision making processes. In addition, future lines of research could be geared to establish how the targeted value of intellectual capital elements could be deducted from organizational strategic goals.

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The Level of Investment Layout in European Union Farms

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SUMMARY

The paper presents analysis of investment layouts in UE-27 farms having the three biggest economic sizes (16-<40 ESU, 40-<100 ESU, ≥100 ESU) for years of 2004 – 2007. The analysis of the farms of economic size 16 and larger ESU shows that the bigger economic size a farm has, the larger net and gross investment layouts are. The highest ratio of reproduction of fixed assets was noted mainly in the case of farms in new EU member states. In EU-15 countries the earned margin for self-financing of development is not allocated to investments and development, whereas in EU-12 countries the earned margin for development played significant role in investment activities of farmers.
Key words: investment layouts, economic size, farming, European Union
Journal of Economic Literature (JEL) code: G31

INTRODUCTION

Investment activity is a basic type of activity of farms and has a direct effect on their existence and development. The necessity to modernize the production means introducing modern technology into production processe, which plays an essential role in the life of farms in different countries. There is a great need for continuous development of farming due to the increased demand for the protection of natural environment, wellbeing of animals, expectations of customers for the quality of food and growing international competition (Adamowicz, 2008). Specific characteristics of farming production as well as high dependence on natural and climatic factors and spatial character of plant production require great need of fixed assets (Sadowski and Poczta, 2007).

Equipment of farms in terms of fixed assets determinates the possibility of effective use of other elements of production capacity, increase of productivity and competitiveness (Czubak, Sadowski and Wigier, 2010).

The level of investments realized in farms reflects the influence of external factors, mainly connected with the economic situation and internal factors, especially the size of production potential (land, human resource, capital) and the economic power (value of production and income) (Kusz, 2009b). Therefore the great differentiation of production potential of farms in European Union may be also accompanied by diverse level of investment layout.

PURPOSE AND METHODS OF RESEARCH

The aim of his work is to present and evaluate the level of investment layout in European Union farms of three largest economic size classes (16-<40 ESU, 40-<100 ESU, ≥100 ESU) in the years of 2004 – 2007.

Empiric data originates from Farm Accountancy Data Network for years 2004-2007 (FADN 2010). Due to data availability the information about Malta is related to the years of 2005-2007, for Romania and Bulgaria the data shows 2007. The analysis covers farms from all EU-27 countries represented in the network and is related to the three classes of the largest economic size (16-<40 ESU, 40-<100 ESU, ≥100 ESU). The decision to select only the three farms belonging to classes of the largest economic size for analysis comes from the fact that they determine the level of competitiveness of farming in each country and they show the highest potential of growth. In order to lessen the influence of random fluctuation the analysis was conducted on the basis of average values related to the concerning period.

FADN is a collecting data regarding farms which plays a significant role in creating added value in farming. This is the reason why the presented data is related to representative farms of this group.

RESULTS OF RESEARCH

The level of investment layout in farms of EU-27 is strongly diversified (table 1). Analysis of farms belonging to the three largest economic size classes shows that in majority of EU member states the larger the economic size is, the higher level of investment layout is: gross and net per single farm. Such a positive correlation between economic sizes and levels of investment activities was also experienced by Sobczynski (2009) and Mikolajczyk (2009) in their research. The only exception were farms in Cyprus, where the net and gross investment value decreased with the increase of economic size.

The highest level of gross investment was characteristic for farms (table 1): in first economic size 16-<40 ESU in Luxemburg (33 480,30 €) and Estonia (30 574 €); in economic class size 40-<100 ESU in Estonia (72 889,50 €), Lithuania (70 854,80 €) and Latvia (69 696,30 €); in economic class size ≥100 ESU Latvia (367 605,30 €) Estonia (235 980 €) and Denmark (223 687,50 €). The lowest value of gross investment layout was noted in farms in Ireland (-507,70 €)and Cyprus (926,50 €) in economic class size 16-<40 ESU; whereas in economic class size 40-<100 ESU and ≥100 ESU Cyprus (accordingly -1 154 €; -2 987,50 €) Greece (accordingly 2 871,20 €; 7 865,50 €) and Spain (accordingly 6 078,50 €; 8 723 €).

Table 1. The level of investment layout [€/farm] in farms in EU-27 (average for years 2004-2007)

Country	Gross investment [€/farm]			Net investment [€/farm]		
	16-<40 ESU	40-<100 ESU	≥100 ESU	16-<40 ESU	40-<100 ESU	≥100 ESU
Austria	17584,7	29234,7	38893,5	2652,7	6962,2	10279,0
Belgium	8018,7	18174,2	55559,7	-773,0	2834,2	20299,2
Bulgaria	10992,0	46609,0	87433,0	6043,0	37079,0	35961,0
Cyprus	926,5	-1154,0	-2987,5	-5761,8	-16363,5	-25245,5
Czech Republic	9851,3	25133,3	129232,5	532,8	5304,5	16877,0
Denmark	13113,5	27829,5	223687,5	2393,0	5236,0	153747,8
Estonia	30574,0	72889,5	235980,0	20143,5	48062,3	151988,8
Finland	15181,8	45774,0	110022,0	299,0	14643,8	40035,8
France	9474,2	21623,7	45648,0	-1598,2	-1165,5	-413,7
Germany	9572,2	23061,2	65850,2	-1629,0	2035,2	13705,0
Greece	1169,7	2871,2	7865,5	-3273,5	-4930,5	-5576,5
Hungary	11970,0	26657,5	128879,5	2227,8	2934,3	21699,2
Ireland	-507,7	12501,5	28879,5	-9351,7	-4201,2	-9397,0
Italy	3962,7	11034,7	33769,0	-2760,0	-2025,2	-885,5
Latvia	24833,5	69696,3	367605,3	15431,5	42322,3	254836,5
Lithuania	27595,5	70854,8	194921,0	20645,5	53314,0	133799,0
Luxembourg	33480,3	58421,3	121265,5	7507,5	16978,3	50379,0
Malta	4193,6	26667,3	88555,0	954,0	19100,7	73060,7
Netherlands	4155,0	19515,3	125756,5	-7967,5	-1228,3	58633,0
Poland	10808,0	30728,5	67774,8	4473,8	17879,3	21009,0
Portugal	4995,0	27316,5	24580,0	-739,5	13212,8	875,3
Romania	5917,0	43230,0	158830,0	-3986,0	20589,0	69908,0
Slovakia	17921,0	38652,0	133950,0	2618,0	-7536,0	-191457,0
Slovenia	18929,2	55815,0	-	5351,7	30363,7	-
Spain	2424,0	6078,5	8723,0	-834,7	-453,2	-2944,5
Szwecja	17801,0	39432,3	122370,0	559,8	9139,8	38906,8
United Kingdom	11619,0	22518,7	76993,0	828,2	4550,7	26735,2
EU-15	10136,3	24359,2	72657,5	-979,1	4105,9	26291,9
EU-12	14542,6	42148,3	144561,2	5722,8	21087,5	51130,6

Source: own calculations based on (Farm…2010)

Gross investments show the total investment layout needed to reproduce assets and to increase them. According to the methodology of FADN a gross investment means the value of purchased and produced fixed assets decreased by the value of sold and handed over fixed assets free of charge in the accounting year plus the of value of the basal herd. On the other hand, the net investments mean gross investment minus the value of depreciation. The net value of realized investments determines the real increase of assets (potential of production) (Woś, 2004). Not only the reproduction of the existing assets, but also the investments in their development which make the modernization of the farm possible are the necessary conditions for development of farming and are crucial for promoting their competitiveness on the global market (Wasilewska, 2009). If the value of net investments is negative, it is a sign that the assets are decapitalized. A situation like this was experienced in farms of all analysed economic sizes in Cyprus, France, Greece, Ireland and Spain. Positive value of net investments was characteristic for farms of all

economic classes in Bulgaria, Czech, Denmark, Estonia, Finland, Hungary, Latvia, Luxemburg, Malta, Poland, Slovenia, Sweden and Great Britain (table 1).

On the other hand the level of net investment layout per one person in the vase of full employment (table 2) was the highest in Latvian farms of economic class 16-<40 ESU (8 941,10 €) as well as of 40-<100 ESU, whereas in the group above 100 ESU Danish farms took the best position (investment level: 49 059,80€). The highest value of investment layout per 1ha of farming land was stated in Malta farms in three analysed economic size classes. The lowest level of net investments calculated per one person in the case of full employment as well as per 1 ha of farming land was characteristic for farms in Cyprus, Greece and Ireland.

Important information regarding development possibilities of farms is the ratio of reproduction of fixed assets, calculated as the relation between gross investment expenses and value of fixed assets (Sobczyński, 2009). The highest ratio of reproduction of fixed assets was stated mainly in new member-countries: Latvia, Lithuania, Estonia, Bulgaria, Czech Republic, Poland, Slovenia and Hungary (table 3). This may result from the improvement of their economic situation after they entered the European Union , gained better access to the financial means for investments, and had easier access to new technologies (Kusz, 2009a).

The ability of a farm to finance the investment depends on its opportunity to acquire financial means. The amount of the external capital depends on the value of the worked out income and willingness of farmers to cut down on current consumption (Kusz, 2009b). Taking into ocnsideration of the amount of the worked out income of the farm, it is possible to define the growth capacity of the farm and the amount to be allocated, the so called surplus needed to self-finance the development. The gross income of the farm is the base to define the amount needed for self-financing. This value should finance the minimum stipulated costs of own work and the credit installments. The farmer can use the left over surplus as his own contribution to the investment activity (Goraj and Mańko 2009). The costs of his own work was calculated as follows: the cost of hired labour was divided by number of units of paid work. The estimated surplus related to the value of depreciation and in this way the ratio of self-financing of reproduction was received. If the value of the ratio is above 1, it shows the capacity for extended reproduction. If the reproduction ratio equaling 1- straight reproduction is true, the ratio from 0 to 1- reproduction is restricted. Negative ratio means that not only the reproduction of fixed assets does not take place, but in order to maintain activity it is necessary, for example, to sell the assets (Sobczyński 2009). Analysing the ratio of self-financing of reproduction it is noticeable that in most countries of EU-27 this ratio was above 1. This indicates the capacity for extended reproduction. The highest value of this ratio was noted in Spain, Malta, Greece, Poland, Latvia, Estonia and Bulgaria (table 3). The lowest ration was obtained in Denmark and Sweden. In farms of economic size ≥100 ESU negative ratio was not registered. Only in Denmark, Slovakia and Sweden the ration was negative in 0-1 span. This shows that farms with higher economic power have higher capacity of self-financing of reproduction.

Table 2. The level of net investment, calculated per one person in full-time employment €/AWU (annual work unit – full time person equivalent) and per 1 ha of agricultural land [€/ha] AL in farms UE-27 (average for years 2004-2007)

Country	Net investment per one person in full-time employment [€/AWU]			Net investment 1 per ha AL [€/ha AL]		
	16-<40 ESU	40-<100 ESU	≥100 ESU	16-<40 ESU	40-<100 ESU	≥100 ESU
Austria	1688,5	3468,3	3209,0	78,4	145,7	178,5
Belgium	-665,8	1819,8	7530,2	-31,8	73,6	338,4
Bulgaria	1285,7	4772,1	1166,1	71,8	148,4	36,1
Cyprus	-2888,1	-4725,0	-6883,8	-458,9	-690,9	-355,4
Czech Republic	257,8	1325,7	437,5	6,9	29,3	16,0
Denmark	2917,6	4163,2	49059,8	70,1	77,4	961,5
Estonia	6532,8	6645,5	5878,7	124,0	130,6	153,4
Finland	219,4	6995,5	10271,8	6,1	207,5	451,4
France	-1243,6	-662,1	-124,8	-34,8	-14,9	-3,1
Germany	-1151,0	1136,5	3024,0	-51,3	33,6	67,5
Greece	-1837,9	-1900,6	-1289,8	-231,7	-168,6	-343,7
Hungary	1102,1	853,0	809,3	28,9	16,9	25,1
Ireland	-7273,0	-2627,4	-2999,8	-167,3	-64,0	-77,1
Italy	-1915,2	-899,2	-184,6	-154,0	-57,6	-16,1
Latvia	5088,9	6234,0	6762,5	110,9	129,7	282,6
Lithuania	8941,1	12873,2	5173,4	154,5	188,2	155,5
Luxembourg	6225,8	9807,8	20293,5	144,1	226,2	368,6
Malta	470,4	6230,5	12685,7	242,1	3503,3	14267,5
Netherlands	-6206,5	-668,8	15237,7	-538,8	-45,8	1293,5
Poland	1972,5	5211,6	1687,5	129,4	242,9	47,0

Country	Net investment per one person in full-time employment [€/AWU]			Net investment 1 per ha AL [€/ha AL]		
	16-<40 ESU	40-<100 ESU	≥100 ESU	16-<40 ESU	40-<100 ESU	≥100 ESU
Portugal	-361,5	4298,2	208,0	-14,1	108,4	6,7
Romania	-664,3	1767,3	1788,4	-34,5	52,6	61,2
Slovakia	615,8	-889,2	-3713,7	14,8	-21,2	-122,4
Slovenia	1849,7	9573,2		231,8	655,2	-
Spain	-588,1	-265,2	-1078,8	-23,0	-7,5	-21,5
Szwecja	437,6	5280,4	11004,4	7,6	77,6	156,1
United Kingdom	618,9	2449,1	6111,8	6,8	29,8	108,7
EU-15	-609,0	2159,7	8018,2	-62,2	41,4	231,3
EU-12	2047,0	4156,0	2344,7	51,8	365,4	1324,2

Source: own calculations based on (Farm…2010)

In order to define the factors influencing the level of realized investments in European Union farms of economic size 16 ESU, the method of lineal regression was used. Analysis of lineal regression was conducted using the step-proceeding method.

Basing on the merits and accessibility of the data a list of variables was created which can explain directly or indirectly the level of investment layout in farms which conduct the accounting for purposes of European FADN. Due to the difference between farms in countries EU-15 and EU-12 (Sobczyński, 2009) the analysis was conducted separately for each group of countries. As dependent variable were chosen: due to high dynamics of labour cost (Runowski, 2009; Ziętara, 2008) and the necessity of substitution of live work with capital Y1 – value of net investment layout per person in full-time employment [€/AWU] and also due to the fact that it is the capital that decides about the production possibility and competitiveness of farms (Kowalczyk, 2007) Y2 – ratio of reproduction of fixed assets [%].

Table 3. Ratio of reproduction of fixed assets and ratio of ability to self-finance reproduction of farms UE-27 (average for years 2004-2007)

Country	Ratio of reproduction of fixed assets [%]			Ratio of ability to self-finance reproduction		
	16-<40 ESU	40-<100 ESU	≥100 ESU	16-<40 ESU	40-<100 ESU	≥100 ESU
Austria	5,65	7,00	7,69	1,44	2,10	2,99
Belgium	4,50	5,83	8,80	0,86	1,57	2,35
Bulgaria	15,05	32,95	21,34	3,70	4,40	2,96
Cyprus	0,53	-0,34	-0,40	1,03	1,61	2,23
Czech Republic	5,78	7,86	5,33	1,82	2,24	1,68
Denmark	2,25	2,65	8,44	-0,92	-2,88	0,70
Estonia	20,02	20,83	19,33	3,07	3,02	2,75
Finland	7,28	12,18	14,93	0,91	1,24	1,17
France	7,39	11,05	13,68	0,61	1,12	1,62
Germany	2,18	3,74	6,71	0,36	1,45	1,73
Greece	0,96	1,53	2,99	4,28	4,64	7,74
Hungary	8,59	9,41	12,41	2,33	2,30	1,75
Ireland	-0,05	0,85	1,08	1,42	2,42	2,38
Italy	1,33	1,91	1,84	1,50	3,07	6,10
Latvia	29,52	34,55	33,06	3,51	2,89	2,36
Lithuania	22,47	26,32	22,40	6,39	5,86	3,92
Luxembourg	6,51	7,56	9,71	1,07	1,40	1,72
Malta	1,60	4,16	6,84	3,24	6,01	9,43
Netherlands	0,84	2,10	5,70	-0,45	0,54	1,34
Poland	8,47	11,87	8,75	3,13	3,71	3,41
Portugal	5,31	12,16	6,39	1,91	2,55	3,29
Romania	4,90	11,61	15,73	1,22	3,41	3,63
Slovakia	13,08	9,01	4,06	1,25	0,89	0,67
Slovenia	5,51	9,41	-	1,54	2,39	-
Spain	1,41	1,96	1,32	5,31	7,28	9,46
Szwecja	4,84	6,85	10,51	-0,08	0,49	0,84
United Kingdom	1,95	2,76	4,50	-0,14	1,06	1,91
EU-15	3,5	5,3	7,0	1,2	1,9	3,0
EU-12	11,3	14,8	13,5	2,7	3,2	3,2

Source: own calculations based on (Farm…2010)

As independent variable selected were variables describing production potential of farms: x1 – economic size [ESU], x2 – technical equipment of work [value of fixed assets €/AWU]; variable describing development ability of the farm: x3 – ratio of ability to self-finance the reproduction and variable characterising the production intensity: x4 – cost of fertilizers per 1ha AL [€/ha AL], x5 – cost of plant protection agents per 1 ha AL [€/ha AL], x6 – stock of animals [LU/ha].

Level of net investment layout per one person in the case of full employment in EU-15 countries was explained with 3 independent variables (table 4). With the increase of economic size of the farm and the growth of the amount of technical equipment used in work, the level of net investment per one person in full employment also increased. On the other hand, the increase of the ratio of ability to self-finance the reproduction has a negative impact on the value of the described dependent variable. The negative correlation between the level of net investment per one person in full employment and the ratio of ability to self-finance the reproduction may indicate that despite the existing surplus no money was allocated to finance the development of the farm. The matching of the selected model to the empiric data is 28%.

For the explanation of the level of net investment layout per one person in full employment in countries of EU-12 three independent variables were used (table 5). Increase of the ratio of ability to self-finance the reproduction contributed to the increase of the net investment layout per one person in full employment. This may indicate the fact that in the countries of EU-12 increase of ability to self-finance measured by the ratio of self-financing of reproduction was accompanied by the real increase of the investment layout per one person in full employment. The growing number of technical equipment used in work also contributed to the increase of the described dependent variable. On the other hand, the described dependent variable was influenced by the increase of the level of intensity of farming production measured with cost of plant protection agents per 1 ha of farming land. The matching of the selected model to the empiric data is 53,34%.

Table 4. Resumption of variable dependent regression: Y1 – value of net investment layout per person in full-time employment [€/AWU] for UE-15

Independent variables	BETA	Standard error BETA	B	Standard error B	t(168)	level p
Free word			-2211,49	1487,490	-1,48673	0,138917
x_1	0,507557	0,074950	61,16	9,031	6,77190	0,000000
x_2	0,151394	0,070679	0,01	0,003	2,14201	0,033599
x_3	-0,143296	0,071013	-573,55	284,235	-2,01787	0,045159
Model: $Y_1 = -2211,49 + 61,16x_1 + 0,01x_2 - 573,55x_3$						

R= 0,52918852; R^2= 0,28004049; F(4,172)=16,726; p<,00000; S_e = 8325,6
Source: own calculations based on (Farm…2010)

Table 5. Resumption of variable dependent regression: Y1 – value of net investment layout per person in full-time employment [€/AWU] for UE-12

Independent variables	BETA	Standard error BETA	B	Standard error B	t(168)	level p
Free word			-2459,16	695,2963	-3,53685	0,000588
x_3	0,800845	0,071686	2148,81	192,3464	11,17159	0,000000
x_5	-0,432718	0,087579	-26,70	5,4033	-4,94089	0,000003
x_2	0,158411	0,081854	0,01	0,0076	1,93530	0,055453
Model: $Y_1 = -2459,16 + 2148,81x_3 – 26,7x_5 + 0,01x_2$						

R= 0,73035391; R2= 0,53341684; F(3,113)=43,062; p<,00000; Se = 3430,1
Source: own calculations based on (Farm…2010)

Among variables which are statistically significantly related to the ratio of reproduction of fixed assets for the EU-15 countries there were 4 dependent variables (table 6). Only the growth of the economic size caused the increase of the ratio of reproduction of fixed assets. Negative influence on the ratio of reproduction of fixed assets had following variables: technical equipment used in work, ratio of ability to self-finance the reproduction, level of costs of plant protection agents per 1 ha UR. The matching of the selected model to the empiric data is 35,48%.

Table 6. Resumption of variable dependent regression: Y2 – ratio of reproduction of fixed assets [%] for EU-15

Independent variables	BETA	Standard error BETA	B	Standard error B	t(168)	level p
Free word			0,076584	0,005832	13,13223	0,000000
x_2	-0,503382	0,066906	-0,000001	0,000000	-7,52369	0,000000
x_1	0,514124	0,070950	0,000257	0,000035	7,24629	0,000000
x_3	-0,398955	0,067223	-0,006613	0,001114	-5,93478	0,000000
x_5	-0,198878	0,069249	-0,000137	0,000048	-2,87191	0,004593
Model: $Y_2 = 0{,}076584 – 0{,}000001x_2 + 0{,}000257x_1 – 0{,}006613x_3$ - $-0{,}000137x_5$						

R= 0,5956873; R2= 0,3548433; F(4,172)=23,650; p<0,00000; Se =0,03264
Source: own calculations based on (Farm…2010)

Table 7. Resumption of variable dependent regression: Y2 – ratio of reproduction of fixed assets [%] for EU-12

Independent variables	BETA	Standard error BETA	B	Standard error B	t(168)	level p
Free word			0,136123	0,014214	9,57689	0,000000
x_2	-0,441278	0,081113	-0,000001	0,000000	-5,44027	0,000000
x_3	0,569387	0,071037	0,031517	0,003932	8,01531	0,000000
x_5	-0,385829	0,086787	-0,000491	0,000110	-4,44571	0,000021
Model: $Y_2 = 0{,}136123 – 0{,}000001x_2 + 0{,}0315117x_3 – 0{,}000491x_5$						

R= 0,73608439; R2= 0,54182022; F(3,113)=44,543; p<0,0000; Se = 0,07012
Source: own calculations based on (Farm…2010)

In the farms in EU-12 countries the increase of ratio of ability to self-finance reproduction contributed to the increase of the ratio of reproduction of fixed assets. Whereas a negative correlation was noticed between the ratio of reproduction of fixed assets and technical equipment of work as well as the value of cost of plant protection agents per 1 ha UR (table 7). The matching of the selected model to the empiric data is 54,18%.

In this place it is worth mentioning that like in the case of the analysis of regression for the dependent variable Y1 – the value of the net investment layout per one person in full-time employment differs from the influence of the ratio of self-financing of reproduction on the ratio of reproduction of fixed assets – Y2. In EU-12 countries this ratio is positive, whereas in countries EU-15 this correlation is negative. Similar correlation was observed in the research conducted by Sobczyński (2009) regarding possibility of development of farms EU-25. The quoted author noticed that in the EU-15 countries there was no correlation between the ratio of ability to self-finance the reproduction and the ratio of realized reproduction and reproduction and increase of fixed assets, whereas in EU-10 such correlation existed. It means that there is difference in investment behaviour of farmers in EU-15 and in EU-12 countries. This may indicate the fact that farmers from EU-12 new-member states tend to allocate the worked out gross profit from their farms in greater extend to self-financing of investment activity than farmers from EU-15 countries.

SUMMARY

The analysis of farms of economic size 16 and over ESU showed that while the economic size increased, the gross and net level of investment layout also increased. Whereas the highest ratio of reproduction of fixed assets was noticed mainly in farms of new-member countries, which may indicate that access to the European Union accelerated the investment activity of farmers.

Differences between investment behaviour of farmers of EU-15 countries and of EU-12 new-member states were noticed. In EU-15 countries negative correlation was stated between the ratio of ability to self-finance the reproduction and the level of net investment layout and the ratio of reproduction of fixed assets, whereas in EU-12 countries this correlation was positive. This may indicate that in EU-15 countries the worked out surplus for self-financing of development is not related to investment and development, whereas in EU-12 the level of worked out surplus for self-financing of development determined the investment activity of farmers. Another factor which could activate investment activity of EU-12 farmers was the possibility to make use of EU structural funds for modernization and development of farming.

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The Consequences of the Diversity of Innovation Development in Industry

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SUMMARY

It is well known that when high economic growth rates are not supported by the diversity of the economy and the faster development of human capital, then the economic growth efficiency will be understated [1].
Unfortunately, lately and nowadays only one direction of innovation activity prevails in Ukraine. This is the adoption of new technological means with the purpose to increase the range of goods. But the creation of new technologies within the enterprise is considered to be of secondary importance. This results in negative consequences, namely in a decrease in long-range innovation development, loss of quality and level of novelty, also a redistribution of proportions of the present scientific and technological potential in industry and an insufficient level of innovation in economic entities. This is significant when buying scientific and technical achievements, as Ukrainian commodity producers prefer licenses to use the objects of industrial property that are native elaborations on known technologies, which is explained by their lower price.
Thus, evidently the process of the diversification of industrial innovation development can be positive in direction but may vary according to the results of the influence of economy, nature and population.
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Often there are contradictions between the necessity for innovation development and its negative consequences for the economic system. Diversification is often the reason for changing the type of economic unbalance and as a result there is a breach in the present industrial system traditions and structure of contacts.

As researchers remark, considerable corrections to the processes of the diversity of innovation activity are brought by the globalization of the world economy. There is a certain "overlay" of processes and contradictions of diversity and globalization because of the increasing international competition [2]. Thus, nowadays it is necessary to search for new ways of development for Ukrainian industry that do not conflict with the economic and innovation processes taking place in the world economy.

The main problem of the Ukrainian industry is the persistence of its technological structure and weak diversity, which provide little opportunity to estimate the social-economic consequences of further development of the processes of innovation development diversity. The direction of further development in the innovation activities of industry should become progressive diversity based on the widening of branches and production with a large degree of added value to the price of goods which are produced, and with a large portion of innovative goods. Such realization of the progressive diversity strategy supposes the creation of prerequisites for more dynamic growth of production and the export of advanced technology products, services, etc. This will have a positive consequence for the whole industrial system of the national economy, as it will give competitive positions to Ukraine in the international markets of high technology, balance the current orientation on raw materials export, and help to increase the number of further elaborations and introduction of innovations in the industry, as well as lead to an increase in the number of patents and inventions.

The diversity of innovation activity is one of the ways to reduce the innovation risk. It lies in the distribution of development contractor efforts and capital investments for realization of different innovation projects that are not connected with each other. If it turns out that one of the projects is unprofitable, others can still be successful and will make a profit. However, as practice shows, diversification can not only reduce but also increase the risks of the innovation activity in the case when an entrepreneur invests in a project that is directed to a sphere of activity where his knowledge and management skills are limited [3].

It is important that the diversity of innovation development in industry provides for the concentration of capital on the leading directions of the innovation activity. As a result of

such orientation towards long-range innovation in industry it is possible to expect a new progressive structure of the industry with predominance of new technological modes. The main means to achieve the object of diversity is versatile and multilevel development of the kinds of industrial activity and production, innovation reorganization of new spheres and scopes of activity, the modernization of the management structure and use of new technologies. A positive result is most likely to be obtained from diversification in the related kinds of activity that are able to use resources together with experience and technologies, which in aggregate provide a synergetic effect.

In our opinion, the process of the diversification of innovation development can have positive dynamics if:

- The priorities of the innovation activity of the industry are well-defined.
- Measures for organising the introduction of new technologies are taken that suppose the training of qualified personnel and provide support to the engineering of the introduced innovation processes.
- There is an organized system for marketing and management of innovations in the industry.
- There is an organized system for the monitoring of innovation process development in the industry.
- Access to informational resources about existing innovations and elaborations is provided.
- The specific forms of the innovation activity organization, which play the role of the pilot programs for the estimation of the introduced innovations efficiency, are made.
- There is appropriate registration and protection of intellectual property rights for further elaborations of existing ideas or products.

As Postaluk and Postaluk mention, during diversification in a social-economic system, multiple-valued system bifurcation consequences occur. In the process of the dynamic diversity the traditions, innovations and institutions simultaneously create and destroy the national economic system. On the one hand, under their influence, positive technical-technological, structural, managerial and other system improvements occur at all points, levels and in all spheres of business, authority and society. The positive component of these improvements consists in the consolidation of the national economic system, its traditional relations as the source of fundamental innovations, and the formation and development of the leading institutes of the postindustrial economy, under whose influence the innovations of different spheres of science are integrated into one productive strength [4].

On the other hand, the interaction of traditions and innovations destroys the fractal properties of the national economy. This is the reason for the change in the types of economic unbalance and as a result, a breach of the present system's traditions and of the structure of connections takes place. These disruptive actions of innovations are accompanied by major system changes in the structure of business institutes, authority and society, which causes difficulties for the functioning of the national economic system, and sometimes leads to its destruction. Because of this, the scientists mention that there is a necessity to develop the mechanisms of changes of the institutions, providing for stimulation and protection of the creative process properties, especially of innovations, for prevention and minimization of their disruptive system effects [4].

According to Buhvalov and Katkalo, diversity is not profitable for some companies because of the additional costs connected with the management of different kinds of business [5]. The same can be said for the innovation directions of the industrial activity, where also the risks of the realization of the innovative projects of diversity are added. The negative consequences of the diversity of the industry innovation development can be unsuccessful diversification of the industrial company (for example, the Xerox company) [5].

Additional positive consequences of the diversity of innovation development for the economy are that the risks of innovation activity are reduced greatly because of the capital distribution between different kinds of innovation spheres. This provides an opportunity to concentrate on activity that is new, cutting edge and immensely long-range. In this way, new kinds of activity and new technologies appear, but not spontaneously and chaotically.

One of the instruments for determining the long-range kinds of innovation diversity activity is Foresight – technological advance knowledge. It is known that demand for some kinds of industrial goods is cyclical. An example of this is the conjunctive instability in the raw materials market of the output. This is especially actively shown during the financial crisis because of the exchange fluctuations. The diversification of the innovation development of the industry will give an opportunity to compensate for competitive positions in some markets while losing them in other markets. Bounded diversity (that supposes the development of some innovative directions of the industrial activity, in other words, that uses the same or concurrent technologies, the markets of goods and services realization, etc.) have especially big potential for the positive consequences for the economy (or industry in particular).

Yurkova, who researched diversity in non-ferrous metallurgy, distinguishes two general directions of the diversity which are estimated as positive in the view of industry development. The first one is connected with the use during diversification of some advantages which a certain company achieved in the sphere that is traditional for it (in the same time the existent technologies, resources, productive capacities, distribution channels, marketing , and so on are used for the diversified activity). Such direction has got the name of synergetic diversity. The other direction is conglomerate diversity. which consists of a change in the operations of the company to new technologies and market needs [6]. The difference between

these two directions is, in our opinion, in the purpose of the diversity that the company makes for itself. For the purpose of development and improvement of the profiled industrial activity, synergetic diversity is used, but for getting more profit and for minimization of the entrepreneurial risks it is good to develop conglomerate diversity. Conglomerate diversity gives an opportunity to the company not only to manage new risks of the industrial goods sale due to new directions but also to activate the innovation process.

Thus, two motives for diversity are reflected in the scientific literature:

- protective (distribution of risks; decrease of the cyclic instability; change of the activity category, i.e., decrease in production; protection from competitors, etc.);
- offensive (aggressive growth; negotiation of the limits; new market penetration; achievement of synergetic effects; competitors' removal, etc.) [7].

For the economy the diversity of the innovation development of the industry gives the impulse for the development of new ways of production, activates innovation activity, raises the competitiveness, and minimizes the risks of the industrial activity, which in turn helps to create new workplaces and provides stability for the industry in crisis periods.

The positive aspect of the diversity of innovation development for social sphere is the diversity of scientific potential, which is reflected first of all in the prerequisite formation for further development and improvement in the quality of life for the population.

It is necessary to mention one more positive direction of industry diversity that supposes a change from the raw materials orientation of the native economy and from old technologies of the third technological mode to the development of a processing industry using new technologies, that in future will lead to the formation of knowledge as the basis of the economy, which, to our mind, is not too dematerialized.

Thus, there are positive changes in the social-economic system as the result of diversification: the number of new workplaces is increased, the competitiveness of the industry is raised (especially the export part), higher quality human capital is achieved, effective management is formed, and so on.

It is significant that we have researched the diversity of the innovation development of the industry. The factors and motives of the diversity, in addition to those described above, are innovations: strengthening and widening innovative kinds of activity in the industry. These processes are uninterrupted: the development of traditions and innovations constantly changes the orientations of the investment flows during diversification. The scientists have proved the existence of the threshold value for the degree, depth and width of the innovation diversity for every economic system and its structures, outside which the efficiency of innovative diversity descends [9].

Ignoring and missing of specified risks can lead the negative social-economic consequences. Apart from the positive effects of the diversity process it is necessary to mention some risks and possible disadvantages, threats to the social-economic system that diversity brings. The impartial fact is that diversity foresees the presence of certain resources, first of all, financial resources. It is known that deficient investment activity cannot create the opportunity to modernize and to diversify the economy.

The important moment in the realization of diversity is to train well-qualified personnel that are oriented towards innovation introduction and have a high level of training for getting new information or technologies for the purpose of providing structural diversity and innovation development.

At present some financial, institutional and infrastructural barriers largely prevent the modernization and diversity of the native industry based on innovations.

The financial aspect of diversity realization is very important. Under the high fund depreciation of the industry of Ukraine, diversification requires considerable financial costs. The withdrawal of such financial resources, in researchers' opinions, will lead to a huge strain on the whole economy in area and time [7]. Even if the costs for innovation activity are added to from the state budget if topping up is needed, if there are crisis manifestation in the industry development, the diversity of the innovation sphere is a very complicated topic. But the diversity of the innovation development of industry is the one way to increase competitiveness and to provide the stable development of the economy.

The negative consequence of the diversity can be the high risk of losing the invested resources in the innovation projects under their limiting conditions. In spite of this, only diversity is the one form to realize the innovations and investments. We consider that the one opportunity to avoid the negative consequences is the active practice of the technological foresight policy – Foresight. Together with this it is necessary to assist the formation of the national innovation system, economic and institutional mechanisms that stimulate knowledge creation, distribution and usage.

The crisis situation in Ukraine creates the prerequisites for long-range diversity, which should be put in place now. The crisis ought to be used as the certain jumping-off place for important structural changes in the industry of Ukraine towards the development of innovative ways of activity based on the use of nanotechnology, cell technology, and other such advanced technologies.

In addition, use of branch-wise diversity in the industry, even within limits, gives the opportunity to reduce greatly the level of economic risk. So the strategy of diversity within a certain group of branches of industry is efficient only under the favorable forecast of the conjuncture of certain goods markets. The least risky is, to the researchers' opinions, the diversity of the groups of branches that are not connected with each other, and this gives the opportunity to develop alternative kinds of activity.

Though the process of diversification has the positive consequences of reducing the risks of the innovation activity in the industry and increasing its stability, sometimes the exceeding of the limited value of the diversity characteristics leads to negative consequences.

Research of the native and foreign practice to realize the strategy of the diversity gives us the opportunity to methodize the main negative consequences for the social-economic system:

- steep expectations when choosing the ways of the diversity which entail big material losses;
- complication of the organizational-managerial structure in companies;
- distribution of the financial run-the-business resources between different directions of innovation activity in the industry;
- barriers to restructuring of the native industry;
- inconsistency between industrial and innovation policy;
- the possibility of industrial disasters, worsening of the ecologic situation;
- disappearance of unique technologies under the guise of "diversity" because of their insufficient protection by patents and licenses;
- lack of well-qualified personnel;
- the time needed for diversity realisation.

The main drawbacks in the realization of the diversity are:

- lack of necessary knowledge, experience and skills (technological skills) for new activity realisation;
- lack of attention paid to behavioural aspects of diversity that cause problems of a social character (inefficient management);
- the results from the diversity can be just in the long-term;
- necessity of considerable financial resources;
- displacement of the tendency of the diversity strategy realization;
- difficulties in the search for appropriate direction for the diversity.

The negative consequences for the social-economic system listed here are not the full list. But we have concentrated our attention on the general negative moments in the development of the native industry under economic ambiguity.

Thus, the success of diversification in many cases depends on making a innovation-industrial policy, with the state support of the system for ground-breaking projects, especially within the state-private partnership. With the purpose of providing the positive consequences of the innovation development diversity it is necessary to create the institutional forms of innovation activity support (innovation clusters that are necessary to realize the priority directions of the innovation activity, they can take the original form of the diversity realization in the industry of the region). Approval of the national development strategy including diversification as a strategic task of industry will help to realize efficient diversity. Unfortunately, the current strategy for the innovation development of Ukraine has no positions about diversity in general and the diversity of the innovation development of the Ukrainian industry in particular.

Also a system approach to the creation of mechanisms for attracting youth to the sphere of science, and measures which propose a system of state grant support for young scientists are two ways to help develop innovation and industrial diversity. This will diminish the outflow of the clever people abroad and will provide for the uninterrupted development of the innovation economy.

Formation of a system for annual monitoring of diversity results will make it impossible to get negative consequences from the diversity of the innovation development in the industry, will help to provide flexibility to industrial companies, and will give the opportunity to trace the international trends in the development of science and technologies.

The specification of diversity priorities is possible on the basis of making a forecast of the technological development – Foresight. Formation of the priorities is necessary to connect with the real competitive advantages of the native industry and demands for providing national safety.

The concentration of the financial resources on directions of breakthroughs will help to make diversity in the long-range for the native industry spheres. Besides, it is important to use venture capital more actively for diversity realization, as it can minimize the risks under unsuccessful forms of the industrial diversity. The insurance of innovation risks has also great potential for the elimination of negative sides of the diversity.

The important condition for the efficient diversification of industry innovation development is entrepreneurial activity. So the main task for diversity realization is the clearance of obstacles to the entrepreneurial activity: simplification of the managerial permissions for starting up a new business; transparency of the procedures for state monitoring of the entrepreneurial activity; an efficient production infrastructure that supposes the system of planning of land use, transport, etc.

The entrepreneurial activity in small-scale businesses is an important factor in the diversification of the economy, because the small-scale enterprises work in general in the industries that are not based on raw materials but that use technologies of an innovative kind and are flexible in times of economic ambiguity.

So the simultaneous development of all kinds of industry needs the concentration of huge resources: financial and intellectual capital, which is a problem for the enterprises of the native industry. This is why the most expedient way to renew the industry based on innovation development diversity is the connected diversity of the production, that is, the development of the kinds of industry that are connected with each other and goods and services diversification within one enterprise.

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Monitoring of Efficiency of Innovative Activity of Industrial Enterprise

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SUMMARY

Questions of economic evaluation of the monitoring of innovative activity in industrial enterprise are considered. A system of indexes which estimate monitoring results from different perspectives is offered: economic, financial, administrative, market, social and ecological. We present a system for the monitoring of the infrastructure of innovative activity, internal and external innovative possibilities of industrial enterprise. The proposed system of economic evaluation of the results of innovative activity monitoring is proposed for machine manufacturing enterprises inUkraine.
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For the receipt of objective information about the innovative activity of an enterprise it is necessary to use a system of monitoring consisting of some aggregate of processes and indexes. In order to form and analyse such a system the following complications need to be taken into account:

- the methods for the calculation of indexes, which reproduce processes taking place in an enterprise, must develop some compatible method for foreseeing the use of the unique technology of receipt and treatment of weekend information;
- organization of collection and treatment of initial reliable information must be carried out promptly enough, otherwise data will lose its actuality and importance;
- the updating of information must be carried out at a certain frequency (mode of regularity), otherwise the monitoring system will lose divisibility.

Arising from these complications, it follows that for the development of innovative performance one formal estimation of index indicators may not be enough for necessary and expert estimation. Thus the simplest indexes are determined with the single concordance of opinions of experts. For more difficult indexes, influenced by market factors, macroindexes of the industry's nation and/or region, it is necessary to use a multistage survey with the calculation of weighed coefficients and to take into account the degree of the use of such indexes in administrative practice.

It is impossible to fully formalize an innovative sphere and describe it with the help of the system of indexes. In the opinion of Lokhanovoy [4], an attempt to comprehensively describe all aspects of innovative activity can result in the inadequate re-creation of reality tighten development of the monitoring system, so as to define the algorithm of determination of each index and its place in technology for acceptance of administrative decisions. This means that the amount of indexes for monitoring is limited by logical construction of the system, practical use of indexes, costs of their development and receipt of information, depending on the number and time involved.

The features of the informative providing of innovative activity determine the necessity to use a systematic approach for the development of the structure of monitoring indexes, which foresees the exposure of basic causes and addresses connections and contradictions during the realization of innovative activity within an enterprise, and which takes into account the potential consequences of innovative measures and complex decisions in tasks of innovative development by the complex presentation of aims, functions, resources and stages of the innovative process.

Monitoring the innovative activity of machine manufacturing enterprises, in our view, must include the presentation of each of the constituents that are rich in structural content, such as shown in Fig. 1.

Monitoring innovative activity using a rich-in-content structure for the case of a machine manufacturing enterprise (Fig. 1) does not assume the complete

noninteraction of separate blocks. Some can to a certain measure overlap (be duplicated). For example, research can be attributed to the resource constituent of innovative potential (resource of intellectual works), and the forming of this research can belong to one of the stages of innovative process; in different blocks the same evaluation indexes can be used in a similar way.

On the whole, the grouping of indexes presented in Fig. 1 provides clear choices for the monitoring of innovative activity and implementation of criteria, and in our view, re-creates the system of innovative activity within a machine manufacturing enterprise.

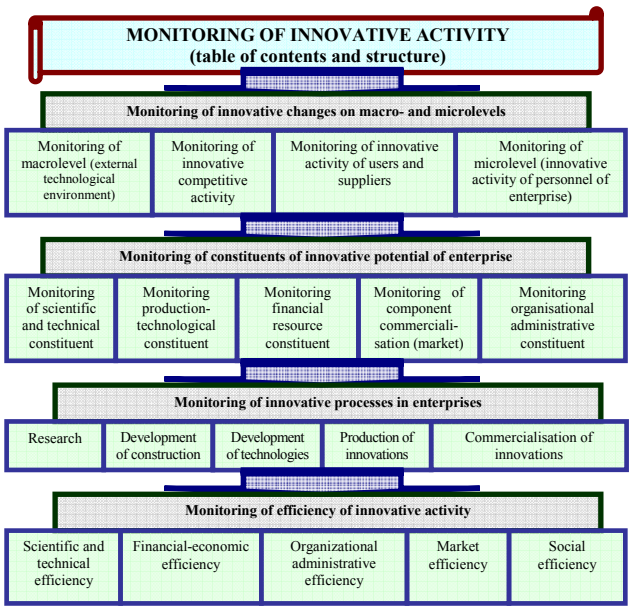

Figure 1. Rich-in-content structure for the monitoring of innovative activity in a machine-building enterprise

Monitoring the efficiency of innovative activity is characterized by the effectiveness of innovative activity of the enterprise as a whole. The indexes must reproduce the degree to which the goals of innovative activity are met, which, in our view, can be established as follows.

1. To the criteria of scientific and technical efficiency of innovative activity of industrial enterprise we recommend considering:
   a) probability of technical success of the most meaningful (as to costs, scale of use, actuality, efficiency) innovative developments of enterprise of B_{my}:
   $$B_{my} > max;$$
   b) patent cleanness (absence of violations of existent patent rights) of $ПЧ$ and patentability of $ПП$ (presence of high degree of novelty and possibility of patent defense of scientific development):
   $$ПЧ > 0;$$
   $$ПП > 1;$$
   c) level of novelty (unique development, at the level of the best adaptation, improvement to existing technology, etc.) of RN:
   $$RN > 1;$$
   d) cost and time of development of $ВЧ_{розр}$:
   $$ВЧ_{розр} > min;$$
   e) the presence of modern scientific and technical possibilities for the introduction of development of $M_{впр}$:
   $$M_{впр} > max;$$
   f) potential possibilities for development in the future ПМрозр:
   $$ПМрозр > max;$$
   g) possibilities of the use of scientific development in other spheres of production and commercial activity of enterprise (expansion of necessities).

In number the scientific technical results of innovative activity are characterized absolutely by calculation indexes. For the absolute indexes we recommend to take the following:

- the general amount of the patents obtained for scientific and technical developments and products of enterprises;
- the total costs or charges of the sale (for commercialization, transfer) of patents, licenses, commodity signs and other scientific and technical and intellectual achievements of industrial enterprise;
- specific relation of the certified products to the general volume of output of products of enterprise, calculated separately to national and international standards;
- the cost dynamics of immaterial assets of the enterprise;
- other factors such as the quality of academic degrees, any medals or certificates received by an enterprise, or other types of recognition based on results of scientific and technical activity.

The calculation-coefficient indexes of blocks of scientific and technical results of innovative activity in machine-building enterprises are shown below.

1.1. Coefficient of scientific maintenance of production of $K_{не}$:
$$K_{не} = B_н / B_Σ ,$$
where $B_н$ is the costs of enterprise for scientific and technical activity; $B_Σ$ represents the general costs of enterprise for production and commercial activity.

1.2. A coefficient of propensity to the innovative activity of enterprise is $K_{ін}$:
$$K_{ін} = B_н / O_p ,$$
where O_p is the annual volume of realization of these products of enterprise.

1.3. Coefficient of the use of own developments of $K_{вр}$:
$$K_{вр} = P_{вл} / P_Σ,$$
where $P_{вл}$ is the amount of own developments from within an enterprise; $P_Σ$ is the general amount of the enterprise's own scientific developments.

1.4. Coefficient of the use of purchased scientific developments of other enterprises $K_{пр}$:
$$K_{пр} = P_{прв} / P_{прΣ} ,$$

where $P_{прв}$ is the amount of purchased scientific developments within an enterprise; $P_{прΣ}$ is the general amount of purchased scientific developments of the enterprise.

1.5. Coefficient of update of the technological provisions of enterprise $K_{тп}$:

$$K_{тп} = ТП_{нв} / ТП_{Σ},$$

where $ТП_{нв}$ is the amount of new technological processes within an enterprise; $ТП_{Σ}$ is the general amount of technological processes which are used in an enterprise.

2. The financial-economic results of innovative activity of enterprise can be appraised with the use of the following criteria:
   - ➢ scientific maintenance of products produced within an enterprise, which is characterized by specific costs of research in the structure of unit cost or in a structure sale and which allows maximum use of the innovative possibilities of enterprise (the optimum size reproduces the level of the industrially developed countries of $M_н \rightarrow opt$);
   - ➢ costs for the acquisition of patents, licenses, know-how and other scientific products, for the necessities of innovative production ($B_{нп} \rightarrow opt$);
   - ➢ any change in the volume of requirements for innovative developments, products and services of enterprise, from the side of foreign users $ΔП_{in}$ in a "*t*" year as compared to (t-1) a year (in absolute $ΔП_{in} = П_{int} – П_{in(t-1)} \rightarrow max$ or relative $ΔП_{in} = (П_{int} – П_{in(t-1)})/ П_{in(t-1)} \rightarrow max$ measurements);
   - ➢ reduced cost per unit of products $ΔC_{од}$ due to innovations in a "*t*" year as compared to an earlier year (t-1), for factor such as expenditure on energy, cost of basic materials, and organizational costs (in absolute $ΔC_{од} = C_t – C_{t-1} \rightarrow max$ or relative $ΔC_{од} = (C_t – C_{t-1}) / C_{t-1} \rightarrow max$ measurements);
   - ➢ any increase in volume of net income of $ЧП$ due to innovations $ΔП_{чп}$ in a "*t*" year as compared to a year (t-1), by the types of innovations: food, technological, organizational, market (in absolute $ΔП_{чп} = ЧП_t – ЧП_{t-1} \rightarrow max$ or relative $ΔП_{чп} = (ЧП_t – ЧП_{t-1}) / ЧП_{t-1} \rightarrow max$ measurements).

Special attention is needed for the last criterion, so that its exact meaning can reveal additional efforts and costs in the utilization of separate accounts for specific types of products that could be carried out at multitop-level production. Taking into account features of the calculation of this index, it can be positive enough in terms of the general reduction in volume of income from production and commercial activities of industrial enterprise.

To the calculation-coefficient innovative performance of monitoring of this block of result indicators the following is required.

2.1. The coefficient of increment of immaterial assets of enterprise *HA* in a "*t*" year as compared to the year (*t-1*) of $K_{нм}$:

$$K_{нм} = (HA_t - HA_{t-1})/HA_{t-1}.$$

2.2. The coefficient of increase in annual volume in the sale of products of enterprise $ΔN$ in a "*t*" year as compared to a year (*t-1*):

$$ΔN = (N_t - N_{t-1})/ N_{t-1}.$$

2.3. Is there a coefficient of increase of the labour productivity on enterprises $ΔПП$ in a "*t*" year as compared to a year (*t-1*):

$$ΔПП = (ПП_t - ПП_{t-1})/ ПП_{t-1}.$$

2.4. Profitability of costs of enterprise for research $IRR_{НДДКР}$:

$$IRR_{НДДКР} = ΔП_{чп} / B_{НДДКР},$$

where $B_{НДДКР}$ is the general costs of enterprise for conducting research.

An analogical method can be the expected indexes of profitability of immaterial assets (relation $ΔП_{чп}$ to the cost of immaterial assets) and profitability of the realization of innovative products (relation $ΔП_{чп}$ to the production of innovative goods cost).

2.5. Part of the volume of realization $Д_{ін}$ from the sale of innovative products of $N_{ін}$ in a general volume sale of $N_Σ$:

$$Д_{ін} = N_{ін} / N_Σ.$$

2.6. A coefficient of autonomy of enterprise is in financing of innovative activity $K^{ІД}_{авт}$:

$$K^{ІД}_{авт} = B^{вл}_{ІД} \Big/ B_{ІД},$$

where $B^{вл}_{ІД}$ is the costs of the enterprise for the financing of its own innovative activity; $B_{ІД}$ is the general expenditure of enterprise on innovative activity.

2.7. Coefficient of debt circulation $K_{об}$ of creditor *КЗ* and debtor *ДЗ*:

$$K_{обКЗ} = N / КЗ;$$
$$K_{обДЗ} = N / ДЗ.$$

3. For organizational administrative factors in the results of innovative activity it is recommended to reproduce the following criteria:
   - ➢ the volume of net income of $ЧП_{інн}$ due to innovations, in the category of innovation (food $ЧП^{пр}_{інн}$, technological $ЧП^{техн}_{інн}$, organizational $ЧП^{орг}_{інн}$, market or marketing $ЧП^{марк}_{інн}$) - $ЧП_{інн} \rightarrow max$, $ЧП^{пр}_{інн} \rightarrow max$, technological $ЧП^{техн}_{інн} \rightarrow max$, organizational $ЧП^{орг}_{інн} \rightarrow max$, market or marketing $ЧП^{марк}_{інн} \rightarrow max$);
   - ➢ a share of clear profits is from the innovative activity of enterprise of $ЧП_{інн}$, which is the per employee management sphere in general

$\Delta ЧП_{\Sigma}^{упр}$ and those engaged in innovative activity $\Delta ЧП_{інн}^{упр}$:

$$\Delta ЧП_{\Sigma}^{упр} = ЧП_{інн} / Z_{упр} \rightarrow max;$$

$$\Delta ЧП_{інн}^{упр} = ЧП_{інн} / Z_{упр}^{інн} \rightarrow max,$$

where $Z_{упр}$, $Z_{упр}^{інн}$ are the amount of workers of management sphere in general and those engaged in innovative activity, respectively;

- the predicted future of managerial staff $\Delta Z_{упр}^{інн}$ is in its general quantity $Z_{уп}$, which is those engaged in innovative activity of enterprise $Z_{упр}^{інн}$:

$$\Delta Z_{упр}^{інн} = Z_{упр}^{інн} / Z_{уп} \rightarrow opt.$$

- the level of professional preparedness of managerial staff for realization of innovative activity:

$$ПП_{упр} = \frac{\Delta ПП_{упр}^{вища} + \Delta ПП_{упр}^{30\ 45} + \Delta ПП_{упр}^{\geq 5} + \Delta ПП_{упр}^{д+к} + \Delta ПП_{упр}^{інн} + \Delta ПП_{упр}^{техн}}{5} \rightarrow max,$$

where $\Delta ПП_{упр}^{вища}$ is the part of administrative workers of the enterprise with degrees in higher education; $\Delta ПП_{упр}^{30-45}$ is the part of administrative workers aged 30-45 years; $\Delta ПП_{упр}^{\geq 5}$ is the part of administrative workers with five or more years experience of administrative work; $\Delta ПП_{упр}^{д+к}$ is part of administrative workers that have scientific degrees of Doctor or Candidate of Sciences; and $\Delta ПП_{упр}^{інн}$ is the part of administrative workers with more than a year's experience in managing innovative activity.

For monitoring the calculation-coefficient innovative performance for this block of result indicators, the following applies

3.1. There is a part of managerial staff of УП in the general quantity of personnel of ПП of enterprise ΔУП:

$$\Delta УП = УП / ПП.$$

3.2. The coefficient of fluidity of managerial staff on the whole $K_{уп}^{пл}$ and those engaged in innovative activity $K_{уп\ інн}^{пл}$:

$$K_{уп}^{пл} = Z_{уп}^{зв} / Z_{уп};$$

$$K_{уп\ інн}^{пл} = Z_{уп}^{інн\ зв} / Z_{уп}^{інн},$$

where $Z_{уп}^{зв}$, $Z_{уп}^{інн\ зв}$ are the amount of exempt management workers during a year on the whole and engaged in innovative activity, respectively.

3.3. The part of vacant administrative positions, both total and for engagement in innovative activity.

3.4. The [art of management workers accepted in an enterprise with the use of the system of testing (this is recommended for analyses for the last five years).

3.5. The part of management workers, activity of which answers the system of growth operating in an enterprise.

3.6. The part of workplaces of management workers that are provided with the informative resources of the personal setting: Internet access, local informative network, networks for special branches, professional magazines and journals, reference books, normative and regulative materials, special literature of the professional setting, and so on.

3.7. The part of workplaces of management workers that are provided with hardware which promotes the efficiency of administrative labor: computers, fax, telephone, transport vehicles, photocopiers, shared office space and separate offices, and so on.

3.8. The part of costs for organizationally administrative provision of innovative activity.

4. The market results of innovative activity are recommended to reproduce the following criteria:

- appeal of products of enterprise $\Delta N_{конк}$, the competitiveness of which meets the best world standards:

$$\Delta N_{конк} \rightarrow max;$$

- index of growth of market of $I_{ринк}$ share:

$$I_{ринк} = \frac{N_p^t / N_{\Sigma}^t}{N_p^{t-1} / N_{\Sigma}^{t-1}} > max$$

where N_p^t, N_p^{t-1} are the volume of the realized products of enterprise in the target market in "*t*" and (t -1) periods of time; N_{Σ}^t, N_{Σ}^{t-1} are the general volume of the realized products in the target market in "*t*" and (t -1) periods of time;

- the level of satisfaction of necessities of target market in innovative products $I_{пот}^{інн}$:

$$I_{пот}^{інн} = N_p^{інн} / N_{\Sigma}^{інн} > max,$$

where $N_p^{інн}$ is the volume of products realized by an enterprise in the target market of innovative products; $N_{\Sigma}^{інн}$ is the value of credible service for innovative products (it is determined by an enterprise during market research).

For monitoring calculation-coefficient innovative performance in this block of result indicators the following is recommended:

4.1. The coefficient of update of products as a result of innovative activity Конов:

$$К_{онов} = N_{інн}^{оновл} / N_{тов},$$

where $N_{інн}^{оновл}$ is the volume of output of new products (as a result of innovative activity); $N_{тов}$ is the general commodity issue of products of enterprise.

4.2. The part of costs for marketing and advertising in the lump sum of innovative expenditure of $Ч_{мр}$:

$$Ч_{мр} = B_{мр} / B_{ІД},$$

where $B_{мр}$ is the costs of enterprise for marketing and advertising; $B_{ІД}$ is the general expenditure of enterprise on innovative activity.

4.3. The volume of financial receipts within an enterprise from the transfer of innovative technologies and commercialization of the created objects of intellectual property.

4.4. Appeal of innovative products shipped to users in markets abroad $I_{інн}^{зед}$:

$$I_{інн}^{зед} = N_p^{інн\ зед} / N_p^{інн},$$

where $N_p^{інн}$ is the general volume of the innovative products realized within an enterprise; $N_p^{інн\ зед}$ is the volume of innovative products shipped by an enterprise to user abroad.

4.5. Presence at the target market of the ramified network of sale of innovative products.

5. Social and ecological results of innovative activity, which must be in the sphere of attention of monitoring, can be reproduced by the following criteria:

➢ index of social efficiency (improvement of terms of labor of workers engaged in the sphere of production (creation) $I_{інн}^{вироб}$ and drawing (consumption) $I_{інн}^{сппо}$ on the results of innovative activity of enterprise) $I_{інн}^{соо}$:

$$I_{інн}^{соо} = I_{інн}^{вироб} + I_{інн}^{спож} = (П_{в.інн}^{покр} - П_{в.інн}^{погірш}) / ПП_{вироб} + (П_{сп.інн}^{покр} - П_{сп.інн}^{погірш}) / ПП_{спож} \to \max,$$

where $П_{в.інн}^{покр}$, $П_{в.інн}^{погірш}$ are the number of workers of enterprise whose labour conditions improved or worsened, respectively, in the sphere of production (creation) of results of innovative activity of enterprise; $ПП_{вироб}$, $ПП_{спож}$ are the mean value of work in the sphere of production and consumption of results of innovative activity of enterprise, respectively.

By the condition (by limitation) of the offered model of index of social efficiency of innovative activity of enterprise, there must be an observance of inequality:

$$I_{інн}^{соо} > 0.$$

Taking this limitation into account it is possible to establish an interval of change in the index of social efficiency $I_{інн}^{соо}$ in the interval of 0...2;

➢ the index of ecological efficiency, which reproduces the decline in level of ecological harm in the sphere of production (creation) $I_{еко}^{вироб}$ and drawing (consumption) $I_{еко}^{спож}$ on the results of innovative activity of enterprise $I_{інн}^{еко}$:

$$I_{інн}^{еко} = I_{еко}^{вироб} + I_{еко}^{спож} = (ПР_{вироб}^{\Sigma} \quad ПР_{вироб}^{шкідл}) / ПР_{вироб}^{\Sigma},$$

$$+ (ПР_{спож}^{\Sigma} \quad ПР_{спож}^{шкідл}) / ПР_{спож}^{\Sigma} \to \max$$

where $П_{вироб}^{шкідл}$, $П_{спож}^{шкідл}$ are the volume of hazardous wastes of production in a calculation per procut unit in the sphere of production (creation) and drawing (consumption) on the results of innovative activity of enterprise, respectively; $П_{вироб}^{\Sigma}$, $П_{спож}^{\Sigma}$ are the general costs in natural resources per product unit in the sphere of production (creation) and drawing (consumption) on the results of innovative activity of enterprise, respectively.

For monitoring the calculation-coefficient indexes of the efficiency of innovative activity of this block of results we recommend taking the following factors into account.

5.1. The coefficient of decline of frequency of injury to workers Кчт:

$$Кчт = (m(t-1) - mt) / ПП,$$

where mt , m(t-1) are the number of accidents leading to the loss of capacity on one day “t” and (t - 1) period of time, respectively.

5.2. The coefficient of decline of the proportion of workers in harmful and dangerous workplaces, Кшн:

$$Кшн = (Пш(t-1) - Пш\ t) / ПП,$$

where Пш t , Пш(t-1) are the number of workers in harmful and dangerous workplaces in “t” and (t -1) periods of time, respectively.

5.3. The coefficient of the maintained or additionally created workplaces $K_{рм}^{ІД}$ due to innovative activity of enterprise:

$$K_{рм}^{ІД} = \sum_{i=1}^{i=n} t_{i1} N_i / Ф_{1ПП},$$

where t_{i1} is the labor intensiveness of unit of innovative products «*i*»; N_i is the annual production of innovative products «*i*»; *n* is the nomenclature of innovative wares (rank); $Ф_{1ПП}$ is the annual working hours of one worker.

5.4. The part of workers which promoted the production qualification or level of education as a result of the enterprise carrying out innovative activity Чкв:

$$\text{Чкв} = \text{Пкв} / \text{ПП},$$

where $П_{кв}$ is the number of workers in the enterprise whose qualifications or levels of education were raised.

5.5. Coefficient of reducing production waste $K_{відх}^{інн}$:

$$K_{відх}^{інн} = \left(B_{t-1}^{інн} - B_t^{інн}\right) \Big/ B_{пр}^{інн},$$

where $B_{t\ 1}^{інн}$, $B_t^{інн}$ are the wastes of production of innovative goods in (t -1) and "t" periods of time; $B_{пр}^{інн}$ is the production volume of innovative goods.

5.6. Profitability of nature protection constituent of innovative activity $P_{пр.охор}^{інн}$:

$$P_{пр.охор}^{інн} = \frac{П_{відх} + \Delta E}{ОФ_{пр}^{відх} + ОЗ_{пр}},$$

where $П_{відх}$ is the income from realization or repeated utilization of wastes of production; ΔE is an annual economic effect (reduction of economic losses) in the national economy from the introduction of results of innovative activity of enterprise; $ОФ_{пр}^{відх}$ is the cost of capital production assets involved in enrivonmental protection activities, taking into account funds from collection, storage, purveyance and utilization of the wastes and by-products of innovative activity of enterprise; $ОЗ_{пр}$ is the average annual amount of money in circulation from protection of the natural environment.

5.7. Coefficient of eco-friendliness of innovative products of enterprise $K_{еко}^{інн}$:

$$K_{еко}^{інн} = 1 - \sum_{i=1}^{i=n} \frac{B_i^{шкідл}\ \gamma_i^{шкідл}}{ПР_{i1}^{інн}\ N_i^{інн}},$$

where $B_i^{шкідл}$ is the annual volume of unused waste of «*i*» kind located in an environment; $\gamma_i^{шкідл}$ is the likelihood of relative danger (harmfulness) of «*i*» kind; $ПР_{i1}^{інн}$ - actual cost of natural resources on unit of mined-out innovative products of «*i*» kind; $N_i^{інн}$ - annual production of innovative products of «*i*» kind.

5.8. The coefficient of patents providing for the eco-friendliness of innovative production $K_{пат}^{еко}$:

$$K_{пат}^{еко} = F_{відх}^{еко} \Big/ F_{\Sigma},$$

where $F_{відх}^{еко}$ is the amount of patents owned by an enterprise that provide for innovative utilization of by-products of production; F_{Σ} is the general amount of patents owned by an enterprise.

It follows also that the social and ecological consequences of innovative activity of an enterprise also depend a great deal on macrofactors such as:

- legal provision for innovative activity, so that it is not contradicted by current legislation;
- a positive (negative) influence on of innovative activity can arise from prospective legislation;
- a positive (negative) reaction in public opinion can influence the innovative activity of an enterprise.

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Empirically Based Asset Management Decision Support for Reliable and Cost Effective Asset Operation

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SUMMARY

This article describes a method that supports asset management decision making so that complex technical assets are operated reliably and cost effectively. It focuses on improving the foundations of planning applied to formulate condition-based maintenance strategies. To this end, it presents a novel empirically based method for determining wear allowances in technical assets. The parameter of wear allowance is referenced to quantify current condition and anticipated changes of condition as a function of asset utilization.

Journal of Economic Literature (JEL) code: M41, G12

INTRODUCTION

Asset management is an integrative task within a company. In collaboration with numerous external partners, it is responsible for effective and efficient interaction of resources and processes in every phase of a technical asset's life cycle (Schenk et al., 2003). This generates a broad and interdisciplinary range of tasks, which extends from the planning of a complex technical asset to its procurement, construction, commissioning, operation and maintenance through decommissioning and dismantling/disposal. The fundamental tasks and objectives of asset management include (Biedermann, 2002):

- ➢ High operational reliability:
  ensuring reliable and stable asset operation without negative effects on humans, the environment and the process
- ➢ High availability:
  assuring all of an industrial asset's functions necessary and desired to perform manufacturing and logistics tasks (Moubray, 1997)
- ➢ High efficiency:
  continuously monitoring the consumption of raw materials and energy and of cost effectiveness

High complexity and flexibility with short product cycles and constantly changing requirements during operation are especially characteristic of the life cycle of modern, adaptable assets (Schenk-Wirth, 2004). This inevitably leads to shorter planning cycles and diminishing planning certainty for maintenance processes, thus generating great need for practical methods and tools that assure asset operation is reliable and cost effective.

The solution to the commercial aspect of this problem is extensively supported by effective methods and tools for life cycle costing (LCC). Their use renders all expenditures transparent, which are necessary throughout the entire product and asset life cycle in a company, and relates them to commercial revenue. In addition to expenditures for investments, raw materials and operating supplies, primarily expenditures for routine and long-term maintenance actions are recorded and corresponding forecasts of economic life are calculated. Then, they are compared with the respective corporate objectives.

The performance of LCC analyses often reveals the fundamental problem with information on the current and expected condition of technical assets. This information is difficult to obtain in the real setting of asset operation with present solutions, e.g. by applying statistical or analytical methods, specifying physical and chemical properties of materials, performing fault tree analyses or determining load spectra.

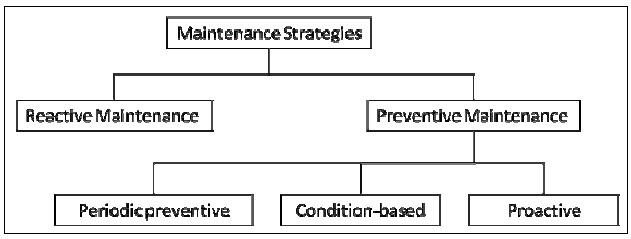
A practicable method of quantifying and evaluating the physical property of an asset's "technical condition" over the course of time was developed and tested at the Fraunhofer IFF together with partners from industry.

The method incorporates the irregular wear of an asset's components resulting from its different stresses. This also produces a requirement for intense use-based

maintenance. Wear allowance as defined by DIN 31051 is employed as a characteristic that quantifies condition. It is defined as the allowance of potential functional performance under defined conditions, which possesses a unit of analysis based on manufacture, repair or upgrade (DIN 31051). This static analysis allows determining a unit of analysis's potential functional performance characteristic at a particular time as its probability of survival. The time curve of diminishing wear allowances is potted to describe the dynamic of asset utilization and the effects of alternating stresses on wear in order to initiate condition-based maintenance actions.

ORGANIZING CONDITION-BASED MAINTENANCE

Applying the right maintenance strategy (Figure 1) decisively determines technical assets' reliability and maintenance costs. Since the effects of modifications of the maintenance strategy normally only appear in the medium and long term and are often affected by other influencing factors (e.g. product changes and workloads), a concrete demonstration of cost reductions in maintenance proves to be difficult. A correlation between the maintenance strategy and the utilization of the wear allowance of technical assets' components and the downtime caused by failures is demonstrable (Maennel, 1988).



Source: Matyas, 2002

Figure 1. Maintenance strategies according to Matyas

Applying a condition-based maintenance strategy, frequently also called an inspection strategy or proactive maintenance, promises the briefest downtime while utilizing the wear allowance excellently. The two strategies differ in the time when a maintenance unit takes actions to detect potential failures or delay the occurrence of a failure. A condition-based strategy is applied when a potential failure is detected. A proactive strategy already starts earlier. Attempts are made in operation and by preventive maintenance actions to eliminate potential sources of failure, to forecast them before they become evident and to take actions that sustain condition. Thus, even more time is ultimately gained to plan and implement maintenance actions and lower the risk of asset failures.

A significant feature of a condition-based strategy is that time or utilization cycles (e.g. hours of operation, number of starts and landing) no longer serve as the controlled variable that triggers maintenance actions as they do in classic periodic preventive maintenance. Instead condition dictates the initiation of actions.

Figures 2 and 3 illustrate the differences among the controlled variables for maintenance actions. Clearly evident are the better utilization of wear allowances when a condition-based maintenance strategy is applied and thus cost cutting potentials through lower replacement part consumption and a reduced number of actions as a function of the useful life.

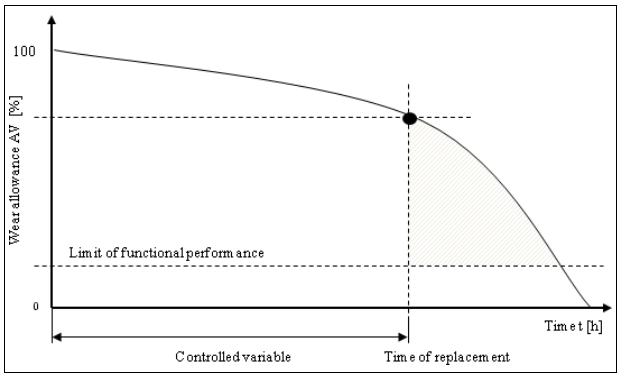


Figure 2. Periodic preventive maintenance with the controlled variable of time

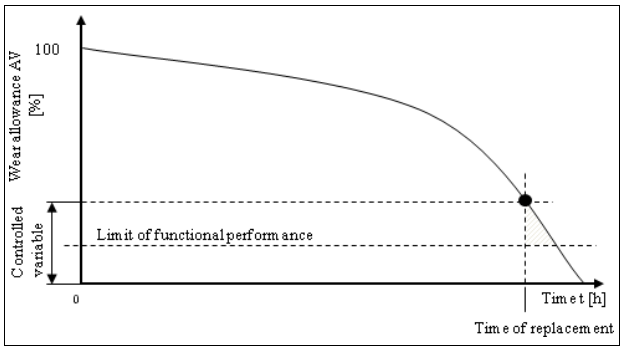


Figure 3. Condition-based maintenance with the controlled variable of wear allowance

Two conditions must be met for condition-based maintenance to be applicable. First, the change of wear allowance must be measureable, i.e. technically feasible (e.g. reduced thickness of a brake disk and increased effective oscillation). Second, the metrological capture of parameters that determined condition must also be economically justifiable.

Effective methods and tools of technical diagnostics are available for condition monitoring. In its simplest form, a person performs monitoring during routine inspections that includes measuring and evaluating parameters relevant to condition. The person may be supported by technical equipment such as vibrometers, endoscopes and thermographic cameras. Continuous monitoring by means of condition monitoring systems (CMS) substantially reduces the time and labor manual inspections require. This has a positive effect on

maintenance costs. Current studies reveal a growing tendency to establish condition-based maintenance in companies (Schuh et al., 2005; Müller-Jungjohann, 2007). In one survey (Schuh et al., 2005), 65% of the respondent industrial companies surveyed have employed condition-based maintenance for approximately seven years. The companies primarily cite the reduction of revenue losses by downtimes and the reduction of maintenance costs as advantages, the first point being crucial for decisions about implementation. The benefits of implementing condition-based maintenance include (Schuh et al., 2005):

- ➢ better planning of downtimes,
- ➢ fewer unnecessary repairs and less disassembly,
- ➢ enhanced efficiency in maintenance,
- ➢ longer maintenance-free machine running time,
- ➢ less time spent troubleshooting,
- ➢ lower production losses because of unplanned equipment downtimes and
- ➢ lower maintenance costs.

In general, many potentials of condition-based maintenance are still not exploited. Many methods are not applied universally. One reason is often the high cost of investing in the equipment needed for technical diagnosis. For many companies, condition monitoring is either technically too complex or too expensive. Moreover, the organization of condition-based maintenance necessitates applying methods to obtain and interpret condition information in order to ascertain service lives, economic lives and replacement intervals. Present solutions are frequently based on the application of statistical or analytical methods, which are based on statistical evaluations of the failure mode, equivalent loads, load spectra or a description of material changes. These may include:

- ➢ analytical models based on known or empirical distribution functions of the times between failures,
- ➢ failure mode and effects analyses (FMEA),
- ➢ risk analyses, fault tolerance analyses and creation of redundancies (e.g. RCM),
- ➢ cost-utility analyses, life cycle costing and total cost of ownership,
- ➢ business management models (e.g. investment theoretical approach)
- ➢ event-oriented simulation models,
- ➢ methods of artificial intelligence (e.g. artificial neural networks for fault detection) and
- ➢ special diagnostic methods directly related to the physical and chemical factors that influence an asset's condition.

The input variables required to apply the methods mentioned are frequently in the possession of the asset manufacturers and are among their best kept secrets. Thus, they are not passed on to the operating phase for use. This is problematic for users. Moreover, a concrete technical asset, i.e. its performance rather than the performance of a statistical population, is always of interest to maintenance. This also requires considerable effort to perform the analyses and sound knowledge in the field of mathematical statistics and probability theory from the individual involved. Again and again, uncertainties always present in statistical methods because of the multitude of necessary input variables and calculation with probability cause problems with acceptance among users.

One solution relies on the asset operator's and many maintenance service providers' own considerable sound experience with their concrete assets' operating and failure modes. However, such experience is frequently not available as a priori knowledge. Instead, it is implicitly contained in the operating and maintenance staff's minds and notes. The method described below provides asset management support to acquire such knowledge and render it usable for maintenance decisions.

EMPIRICAL DETERMINATION OF WEAR ALLOWANCES BY MEANS OF FUZZY LOGIC

The model employed for empirically based determination of wear allowances in technical assets covers three integral elements (Ryll, 2008; Schenk, 2010).

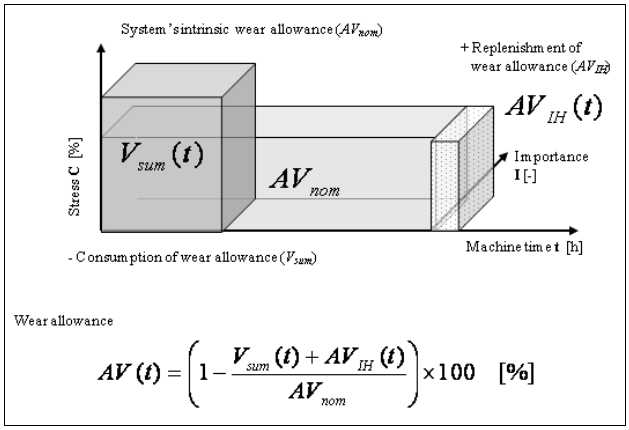


Figure 4. Base model of empirically based determination of wear allowances

The engineering of every technical asset with its necessary features during the design process so that it may be used as intended constitutes the starting point of the analyses. This also includes the probability of its performance of the stipulated functions under defined nominal stresses over a specified period. This originally extant functional performance characteristic is defined as a system's intrinsic wear allowance (AVnom) and can be described with the following dimensions:

- ➢ Probable expected service life (e.g. manufacturer information on mean time

between failures and internal service life calculations)
- ➢ Nominal stress (=100%)
- ➢ Importance of the component for the overall asset.

A system's intrinsic wear allowance constitutes the reference variable in the evaluation model, i.e. it represents the rated life under nominal operating conditions, which is theoretically available during asset operation. The importance of components is dependent on the target function of the evaluation of an asset's condition. From a commercial perspective (target function: monetary asset value), the importance is frequently determined by a component's repurchase or replacement price. From a technical perspective (target function: functional performance or operational reliability), the importance is determined by the consequences expected when components fail. These are quantifiable, for instance, by ascertaining a risk priority number, which incorporates the probability of failure, probability of detection and consequences of failure.

The system's intrinsic wear allowance AV_{nom} is continually consumed during machine time. This consumption of wear allowance (V_{sum}) is a function of the acting stress and its exposure time. When the time is identical, higher stresses accelerate and lower stresses delay the consumption of wear allowance. The amount of stress and the duration of its action on the component is determined in regular time intervals. The consumption of wear allowance is ascertained for every time interval and is subtracted from the system's intrinsic wear allowance. The end of a component's service life is reached when the system's intrinsic wear allowance has been consumed. A maximum bearable stress is additionally determined. When it is exceeded, the wear allowance abruptly drops to the value of zero. In practice, this is manifested when safety systems respond to excessive stress or components malfunction in short time.

A complete or proportional replenishment of wear allowance (AV_{IH}) factors in maintenance actions. The effect is 100 % when a component is replaced. The effect of maintenance actions or reconditioning must be evaluated proportionate to system's intrinsic wear allowance.

The quantification of the consumption of wear allowance V_{sum} necessitates determining a component's instantaneous stress. First, parameters are defined, which relate to the stress. These are predominantly process, operating and diagnostic data (e.g. workpiece dimensions, speeds, pressures and oscillations), as well as data from the asset's environment (e.g. operation temperature and dust concentration) and maintenance data (e.g. time interval since the last lubrication). Only input data is purposely selected, which relate to the component's stresses and condition changes according to the opinions of various experts or experience with operation. Since such data are normally already on hand in a company, their acquisition does not generate any additional labor. They tend to be used to obtain additional information from them and to combine them with knowledge about the asset.

Figure 5 presents a typical set of input parameters with its sources of data, which determine the stress of an electric motor mount.

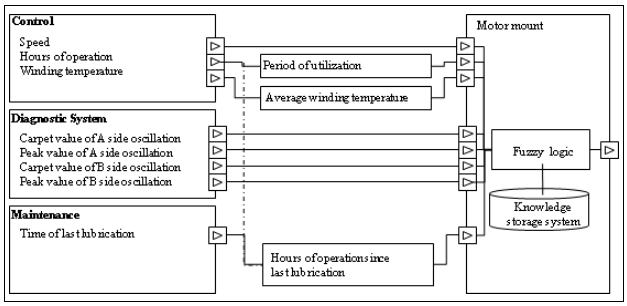


Figure 5. Set of input parameters to determine the stress of a motor mount

Input data are processed by processing logic, which is designed as a fuzzy controller in the applications. Fuzzy logic reasons on the basis of rules generated from colloquial contents by the cause and effect relationships of a technical asset's operating and failure mode (Stoecker, 1999). First, every input parameter must be fuzzified, i.e. linguistic variables must be defined with terms (e.g. characteristics such as low, medium, high) and membership functions. Figure 6 illustrates this transformation process with the parameter of average winding temperature as an example.

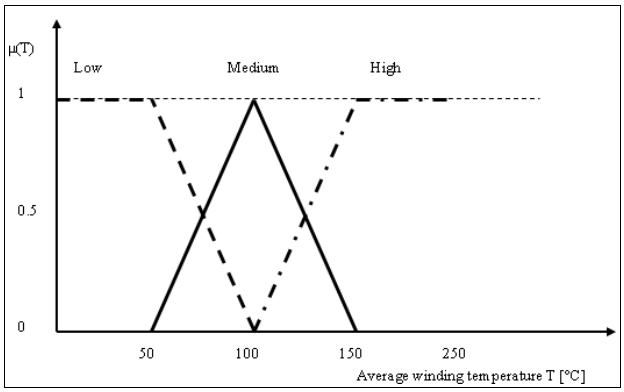


Figure 6. Fuzzy variable of average winding temperature with membership functions

Afterward, a set of linguistic rules is used to process the fuzzy variables into an evaluation of the stress. This constitutes a knowledge storage system that stores the cause and effect relationships between the defined input variables and the stress as IF-THEN relationships. The chief advantage of this type of knowledge storage is the capability to map, amend and correct even complex relationships. Initially, the a priori knowledge from asset operators, manufacturers, maintenance service providers and other experts is collected in interviews and utilized. The logic automatically incorporates identical as well as

contradictory opinions from experts (Lutz-Wendt, 2000). The knowledge storage system can be modified and upgraded at any time. Three processing rules that describe the influence of the parameter "average winding temperature" on a motor mount's stress serve as an example here:

- ➢ Rule 1: IF (winding temperature is low) THEN (stress is low)
- ➢ Rule 2: IF (winding temperature is high) THEN (stress is very high)
- ➢ Rule 3: IF (winding temperature is medium) THEN (stress is nominal)

The incremental sequence of actual processing entails the fuzzification, inference and composition of rules followed by defuzzification (Stöcker 1999).

Several fuzzy terms and rules are linked by logical operators (e.g. minimum and maximum method). The center of gravity method and the definitions formulated for the positions and shapes of the fuzzy terms are applied to produce the instantaneous stress as a weighted center of gravity between defined stress classes, subsequently given the shape of a scale. Figure 7 presents an example of the fuzzy processing of two input parameters with two rules and the calculation of a motor mount's stress according to a weighted center of gravity method.

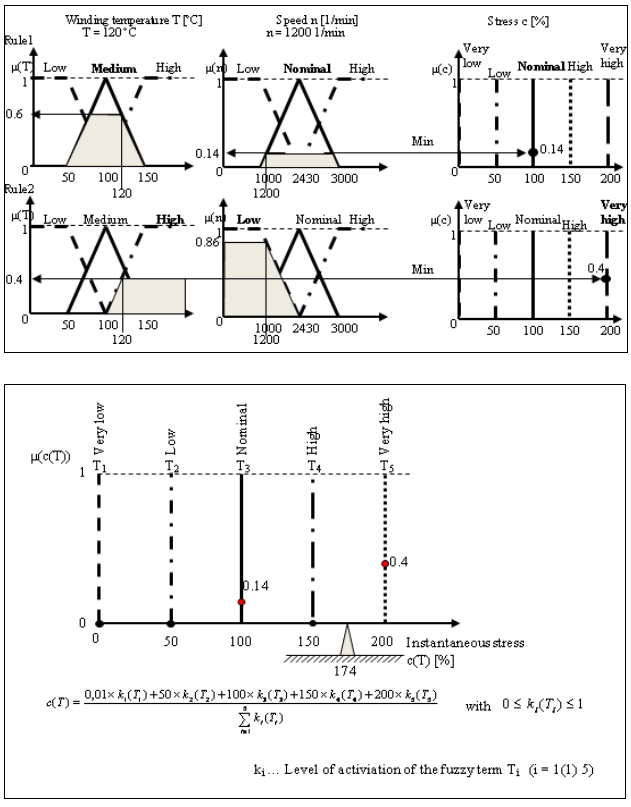


Figure 7. Steps of fuzzy processing to determine stress

A thusly ascertained stress acts on the component until it is recalculated on the basis of a new set of input parameters. Thus, the variability and currency of the result are a direct function of the input data's temporal resolution. Once the current stress has been ascertained, the consumption of a component's wear allowance it causes and, thus, the still extant wear allowance are determined.

Maintenance actions generate positive influences, i.e. they improve technical assets' condition. Therefore, their influence on the replenishment of wear allowances must be allowed for when developing the method. In principle, the replenishment can be represented so that a component is resupplied an additional time allowance, which, in turn, can be consumed in order to reach the planned useful life of the component or start a new life cycle after its replacement. Several characteristics must be considered when describing the effect of maintenance actions. When the action is a replacement of components, the effect is clearly evident. The component abruptly returns to its original condition with 100% of the system's intrinsic wear allowance. The wear allowance currently available at the time of replacement does not play any role.

Assessing the effect of other preventive maintenance actions, e.g. lubrication, adjustment and cleaning, proves to be more difficult. If at all, the visible manifestations of the effect following such actions appear only after a longer period after such work has been performed or not performed. However, diverse interactions with the effects of actions and the influences from asset utilization appear until that time, i.e. the manifestations can no longer be related to past actions.

One feasible method relies on the empirical values from asset manufacturers' maintenance engineers and service technicians and involves compiling catalogs with effects of maintenance actions in percentages.

A complex technical asset's wear allowance is derived from the wear allowances of its individual components. This necessitates incrementally aggregating the component up to the asset level. The evaluation's target function must be borne in mind when forming the aggregation.

A summation is expedient when a monetary asset value has to be determined for a commercial evaluation of condition. This yields the value of the asset as a sum of the components' individual values. The aggregation must be performed differently when an evaluation of an asset's probable functional reliability has to be delivered. The asset structure must be incorporated from the functional perspective. Since the probability of survival and reliability of a unit of analysis is ultimately inferable from the wear allowance, the simplified method of determining concatenated systems' probability of survival is applied. When they are serially concatenated, it multiplies the individual probabilities of survival (Beichelt, 1993).

APPLICATION AND BENEFITS

The method described augments typical monitoring systems by interpreting the effects of different factor that influence asset condition. In the first stage, current and compressed information on stresses and the available wear allowance of components and assets is made available to the operator and maintenance unit as a traffic light with a control function (Figure 8).

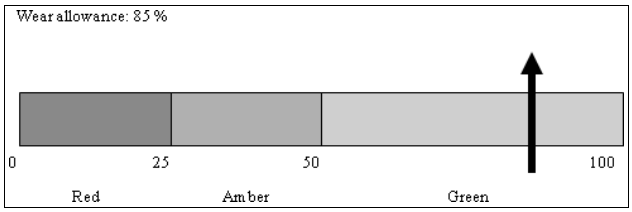


Figure 8. Traffic light display of the current wear allowance

A change in the traffic light's color triggers recommendations for the execution of maintenance actions and changes needed in the operating regime to reduce stresses. The history and forecast of asset utilization as well as the physical and financial resources are incorporated.

The traffic light's amber color indicates that half of the wear allowance has been consumed and an onsite inspection is advisable. Then, maintenance logistics processes are initiated as a function of the result of inspection in order to procure replacement parts in good time, for instance. The traffic light's red color indicates an acute need for action since the wear allowance has largely been consumed and thus a high risk of asset downtime exists. A maintenance asset's ability to now independently signal maintenance requirements and control the subsequent processes ought to be considered as a new approach.

Another visualization option entails plotting the temporal characteristic of the consumption of wear allowance (Figure 9). Influences from stresses during asset operation are revealed in the drop of the consumption curve. Effects from maintenance actions ought to be evident by sudden improvements of the wear allowance. This representation provides an aid to review the planning and effects of maintenance actions as a function of variance analyses and to adjust them to the current requirements. In addition, a series of other applications are produced, ranging from monitoring of external maintenance service providers' adherence to schedules through the design of business models with stipulated condition indicators.

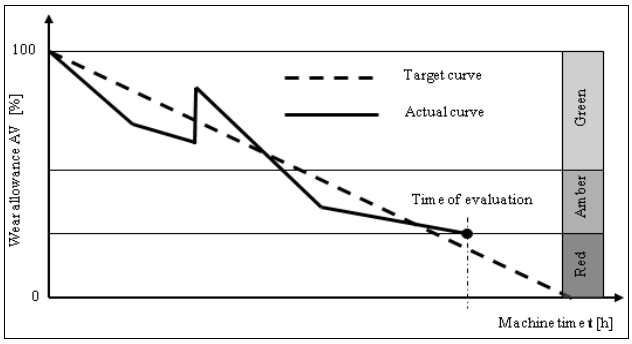


Figure 9. Graph of the history of the consumption of wear allowance

The method described may additionally be used to prepare forecasts of the future characteristic of the depletion of wear allowances. The anticipated input parameters are supplied to the fuzzy controllers and the calculation is updated into the future. During a forecast, every maintenance job is generated, which is necessary based on the expiration of time intervals or undershot wear allowance thresholds. Forecasts effectively support resource planning and budgeting, the description of scenarios for particularly reliable and cost effective asset operation and maintenance and the determination of times for removal from operation.

One significant advantage of evaluations based on the method described here is the availability of current and objective information on asset condition to infer decisions. All partners accept the decisions since they all have the same level of objectified information. The knowledge base and evaluation logic are constantly being perfected by new actors, experiences and discussion of the results of the evaluation. Finally, the results of this learning process are collected in a valuable knowledge base. Thus, asset know-how is generated and lastingly preserved even when generations of maintenance staffs come and go.

The high transparency of the decisions supports a paradigm change in asset management, i.e. a shift from simply following defined rules to actively solving problems. In order to derive sustainable improvements for asset operation and maintenance, it is essential to integrate the ongoing evaluations in a maintenance unit in a continuous process to provide decision support and learn asset performance. Direct coupling to other processes to continuously improve maintenance (e.g. Kaizen and TPM) is often an expedient means to provide support.

CONCLUSION

The formulation of a condition-based maintenance strategy holds great potentials to ensure that technical assets are operated reliably and cost effectively. Their implementation necessitates a quantification of the abstract variables of a technical asset's condition with methods that appropriately describe operating and failure modes.

Using condition indicators to obtain knowledge of condition directly from the process by means of methods of technical diagnostics is often technically unfeasible and expensive. An interpretation often proves difficult because of the complexity of the influences.

Applying the method of empirically based determination of wear allowances described here significantly reduces the complexity of the task. It makes it possible to describe effects of utilization, stresses, and maintenance actions on assets' condition sufficiently precisely and to derive recommendations for action. The evaluation methodology developed is based on the theory of fuzzy logic, which has proven itself in control engineering even in complicated processes. Its advantage is the capability to formulate and continuously modify complex cause and effect relationships by means of simple verbal descriptions as if-then relationships even without knowledge of the underlying physical or mathematical relationships. This makes empirical knowledge available to the many actors in maintenance.

The Fraunhofer IFF developed Statelogger®, a modular software system supported by a database, to apply the evaluation methods and has implemented it in various assets (air compressors, handling systems, wind energy converters and vehicles). The system may be used stand-alone or integrated in already existing operating data acquisition, diagnostic and maintenance planning and control systems. By providing the requisite input information, the evaluations and forecasts deliver a supporting basis for the implementation of concepts of life cycle costing (LCC) and total cost of ownership (TCO).

A holistic analysis can be expected to reduce medium-term cost in maintenance while simultaneously lowering the risk of failure.

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The Short Put Ladder Strategy and its Application in Trading and Hedging

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SUMMARY

The first aim of this paper is to propose another way of an option strategy formation known as Short Put Ladder, describe the functions of profit in their analytical forms and propose an optimal algorithm for the use of this strategy in trading. The other goal is to propose the application of the Short Put Ladder Strategy in hedging against a price drop of the underlying asset and compare the result with the results of hedging using the known Long Combo option strategy.
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INTRODUCTION

Option strategies formed by the application of the so-called European-style vanilla options can be found in several publications. Probably most option strategies are listed in the work of (Jílek, 2002). The same procedure is used in the analysis of option strategies. There is a description of the way, or ways, of the given option strategy formation and a graph of the function of profit.
A different way was used in the works of (Šoltés V., 2001), (Šoltés V., 2002), (Šoltés V. - Šoltésová, 2003), (Šoltés V. - Amaitiek, 2010). It is based on the search for the functions of profit in analytical form, which enables us to find an optimal algorithm of the option strategy application in the case when the strategy can be formed in several ways. We are going to use this approach in our paper as well. It will enable us to find the optimal algorithm for trading and express exactly the secured position in hedging against a price drop of the underlying asset. Subsequently, we are going to apply hedging using the Short Put Ladder strategy for SPDR Gold Shares stock and compare hedging using this strategy with hedging using the Long Combo option strategy, which the authors dealt with in the paper (Šoltés V. - Šoltés M., 2005).

POSSIBILITIES OF A SHORT PUT LADDER OPTION STRATEGY FORMATION

In order to form it, we need three options for the same underlying asset with the same expiry and different strike prices.
I. Let us form a Short Put Ladder option strategy by purchasing n put options with a strike price X_1 and an option premium P_{1B} per option and, at the same time, by purchasing n put options with a higher strike price X_2 and an option premium P_{2B} per option and, at the same time, by selling n put options with the highest strike price X_3 and an option premium P_{3S} per option. The function of profit from the purchase of n put options with the lowest strike price X_1 and an option premium P_{1B} per option is as follows:

$$P(S) = \begin{cases} -n(S - X_1 + \bar{P}_{1B}) & \text{if } S < X_1, \\ -n\,\bar{P}_{1B} & \text{if } S \geq X_1. \end{cases} \qquad (2.1)$$

The function of profit from the purchase of n put options with the higher strike price X_2 and the option premium $\overline{P}_{2B}$ per option is as follows:

$$P(S)=\begin{cases} -n(S-X_2+\overline{P}_{2B}) & \text{if } S<X_2, \\ -n\,\overline{P}_{2B} & \text{if } S?\ X_2. \end{cases} \tag{2.2}$$

And the function of profit from the sale of n put options with the highest strike price X_3 and the option premium $\overline{P}_{3S}$ per option is as follows

$$P(S)=\begin{cases} n(S-X_3+\overline{P}_{3S}) & \text{ak } S<X_3, \\ n\,\overline{P}_{3S} & \text{ak } S\geq X_3. \end{cases} \tag{2.3}$$

The function of profit from the whole Short Put Ladder option strategy in the particular case can be obtained by adding functions (2.1) to (2.3). As $X_1<X_2<X_3$, we get

$$P_I(S)=\begin{cases} -n(S-X_1-X_2+X_3+\overline{P}_{1B}+\overline{P}_{2B}-\overline{P}_{3S}) & \text{if } S<X_1, \\ -n(X_3-X_2+\overline{P}_{1B}+\overline{P}_{2B}-\overline{P}_{3S}) & \text{if } X_1\leq S<X_2, \\ n(S-X_3-\overline{P}_{1B}-\overline{P}_{2B}+\overline{P}_{3S}) & \text{if } X_2\leq S<X_3, \\ n(\overline{P}_{3S}-\overline{P}_{1B}-\overline{P}_{2B}) & \text{if } S\geq X_3. \end{cases} \tag{2.4}$$

If we select the strike prices of the individual options so that the following is true

$$\overline{P}_{3S}-\overline{P}_{1B}-\overline{P}_{2B}>0, \tag{2.5}$$

then there are no expenses needed for its formation, i.e. it is a zero-cost strategy.

The graph of this strategy's function of profit is as follows

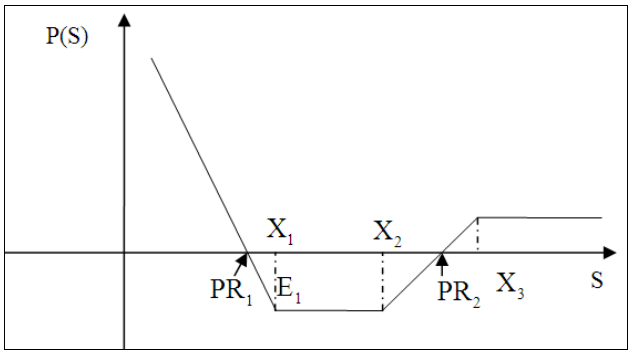

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Figure 1: Profit Function of the Short Put Ladder Option Strategy

By analyzing the profit function we get:

- There is always one profitability threshold PR_1 and it can be calculated from the equation $PR_1=X_1+X_2-X_3-\overline{P}_{1B}-\overline{P}_{2B}+\overline{P}_{3S}$.

  The strategy is definitely profitable, if $S<PR_1$, where the profit grows linearly with the spot price S drop.
- If the condition (2.5) is met, then the strategy has one more profitability threshold, $PR_2 = X_3+\overline{P}_{1B}+\overline{P}_{2B}-\overline{P}_{3S}$.
- The strategy is loss-making, if $S\in(PR_1,PR_2)$, where the maximum loss is $P_{max}=n(X_3-X_2+\overline{P}_{1B}+\overline{P}_{2B}-\overline{P}_{3S})$, if $S\in\langle X_1,X_2\rangle$ at time of the options expiry.

II. Now let us form a Short Put Ladder strategy by purchasing n put options with a strike price X_1 and an option premium $\overline{P}_{1B}$ per option; at the same time by purchasing n call options with a higher strike price X_2 and an option premium P_{2B} per option; and, at the same time, by selling n call options with the highest strike price X_3 and an option premium P_{3S} per option.

The function of profit from the purchase of n call options with a higher strike price X_2 and an option premium P_{2B} per option is as follows

$$P(S)=\begin{cases} -n\,P_{2B} & \text{if } S<X_2, \\ n(S-X_2-P_{2B}) & \text{if } S\geq X_2, \end{cases} \tag{2.6}$$

and the function of profit from the sale of n call options with the highest strike price X_3 and the option premium P_{3S} per option is as follows:

$$P(S)=\begin{cases} n\,P_{3S} & \text{if } S<X_3, \\ -n(S-X_3+P_{3S}) & \text{if } S\geq X_3. \end{cases} \tag{2.7}$$

By adding the functions (2.1), (2.6) and (2.7) we get the function of profit from the whole strategy

$$P_{II}(S)=\begin{cases} -n(S-X_1+\overline{P}_{1B}+P_{2B}-P_{3S}) & \text{if } S<X_1, \\ -n(\overline{P}_{1B}+P_{2B}-P_{3S}) & \text{if } X_1\leq S<X_2, \\ n(S-X_2-\overline{P}_{1B}-P_{2B}+P_{3S}) & \text{if } X_2\leq S<X_3, \\ n(X_3-X_2-\overline{P}_{1B}-P_{2B}+P_{3S}) & \text{if } S\geq X_3. \end{cases} \tag{2.8}$$

From the relation (2.8) it is obvious that it is a profit function similar to the profit function expressed by the relation (2.4).Thus, it is a different way proposed by us to form a Short Put Ladder strategy, which means that the first aim of this paper has been reached.

OPTIMAL ALGORITHM OF THE SHORT PUT LADDER STRATEGY APPLICATION IN TRADING

As there are two ways to form a Short Put Ladder strategy, naturally a question arises which way is better. The answer to this question depends on the decision-making criterion.

If the decision is based on the size of the profit (or loss) at any given value S of the underlying asset at time of the options expiry, then the way proposed by us would be better in case the following condition is met $P_{II}(S) > P_{I}(S)$ for any given S.

Using the analytical expressions of the profit functions, i.e. the relations (2.4) and (2.8) we can easily find out that the following statements are true:

- If $X_3 - X_2 + \overline{P}_{2B} + P_{3S} - P_{2B} - \overline{P}_{3S} > 0$, (3.1) then the second way proposed by us is better than the first way, which has been known so far.
- If $X_3 - X_2 + \overline{P}_{2B} + P_{3S} - P_{2B} - \overline{P}_{3S} < 0$, (3.2) then a better result can be achieved the first way.
- If $X_3 - X_2 + \overline{P}_{2B} + P_{3S} - P_{2B} - \overline{P}_{3S} = 0$, (3.3) then the profit functions in both cases are the same. In this case we will use the 1st way (I.) as its advantage is that if the condition (2.5) is met, we do not need any start-up costs to form this strategy. Unfortunately, this is not true if the Short Put Ladder strategy is formed the other way (II.).

The table below shows the prices of the selected call and put options for the SPDR Gold Shares stock, which were on offer on 22/9/2010 with expiry on 17/12/2010. The spot price of the SPDR Gold Shares stock was 126.11 on 22/9/2010.

Table 1. Call and put options for the spdr gold shares stock with expiry on 17/12/2010

Strike Price	Call Option		Put Option	
	Bid	Ask	Bid	Ask
100	26,35	26,50	0,16	0,22
112	14,70	15,20	0,79	0,86
123	6,20	6,30	3,00	3,05
128	3,65	3,80	5,45	5,55
144	0,62	0,66	18,35	18,55
150	0,37	0,39	24,05	24,30

Source: www.finance.yahoo.com

Example 1. Let us form a Short Put Ladder strategy in both way I and way II. By using options from Table 1, where n=100, X_1=100, X_2=112, X_3=123, $\overline{P}_{1B}$=0.22, P_{2B}=15.20, $\overline{P}_{2B}$=0.86, P_{3S}=6.20, $\overline{P}_{3S}$=3.00.

Solution:

In this case $X_3 - X_2 + \overline{P}_{2B} + P_{3S} - P_{2B} - \overline{P}_{3S}$ = 123-112+0.86+6.20-15.20-3.00 = -0.14 <0. The condition (3.2) is met; therefore a better result can be reached when applying the first way.

The functions of profit from this strategy are as follows

$$P_I(S) = \begin{cases} -100(S-90{,}92) & \text{if } S<100, \\ -908 & \text{if } 100 \le S<112, \\ 100(S-121{,}08) & \text{if } 112 \le S<123, \\ 192 & \text{if } S \ge 123, \end{cases} \quad (3.4)$$

$$(S) = \begin{cases} -100(S-90{,}78) & \text{if } S<100, \\ -922 & \text{if } 100 \le S<112, \\ 100(S-121{,}22) & \text{if } 112 \le S<123, \\ 178 & \text{if } S \ge 123. \end{cases} \quad (3.5)$$

Figure 2 depicts the function of profit from this strategy, formed in way I (red color) and also the function of profit from this strategy, formed in way II. (blue color). We can see that the formation of the Short Put Ladder strategy using way I really is more profitable as it has a better function of profit at any given spot price S.

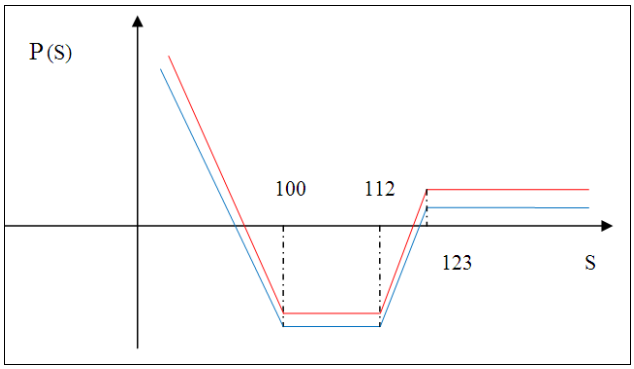

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Figure 2 Graph of the Short Put Ladder Strategy Profit Function (ways I. and II.)

Example 2. Let us form a Short Put Ladder strategy in ways I and II. Using options from Table 1, where n=100, X_1=100, X_2=128, X_3=150, $\overline{P}_{1B}$=0,22, P_{2B}=3.80, $\overline{P}_{2B}$=5.55, P_{3S}=0.37, $\overline{P}_{3S}$=24.05.

Solution:

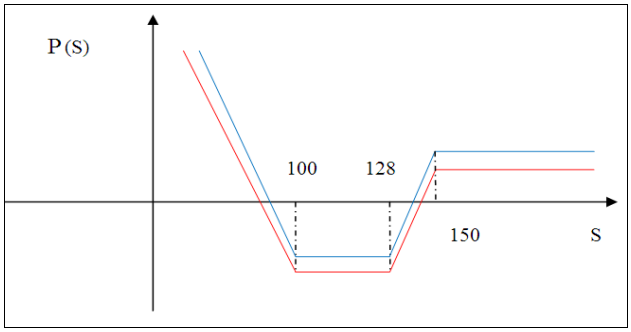
In this case $X_3 - X_2 + \overline{P}_{2B} + P_{3S} - P_{2B} - \overline{P}_{3S}$ = 150-128+5.55+0.37-3.80-24.05 = 0.07>0, where the condition (3.1) is met and therefore a better result can be achieved using way II.

The functions of profit from this strategy are as follows

$$P_I(S)=\begin{cases}-100(S-96{,}28) & \text{if } S<100,\\ -372 & \text{if } 100\le S<128,\\ 100(S-131{,}72) & \text{if } 128\le S<150,\\ 1\,828 & \text{if } S\ge 150,\end{cases} \tag{3.6}$$

$$P_{II}(S)=\begin{cases}-100(S-96{,}35) & \text{if } S<100,\\ -365 & \text{if } 100\le S<128,\\ 100(S-131{,}65) & \text{if } 128\le S<150,\\ 1\,835 & \text{if } S\ge 150.\end{cases} \tag{3.7}$$

Figure 3 depicts the function of profit from this strategy formed in way I (red color) and also the function of profit from the strategy formed in way II (blue color). We can see that the formation of a Short Put Ladder strategy in way II really is more profitable.



Source: Own design

Figure 3 Graph of the Function of Profit from the Short Put Ladder Strategy (ways I. and II.)

Example 2 proves that the Short Put Ladder strategy formed by us in way II is of practical use and can be applied in investment practice.

HEDGING AGAINST THE UNDERLYING ASSET PRICE DROP USING THE SHORT PUT LADDER STRATEGY

Let us suppose that at time T in the future we want to sell n items of an underlying asset but we are afraid its price might drop.

The function of profit from an unsecured position is as follows

$$P(S) = nS, \tag{4.1}$$

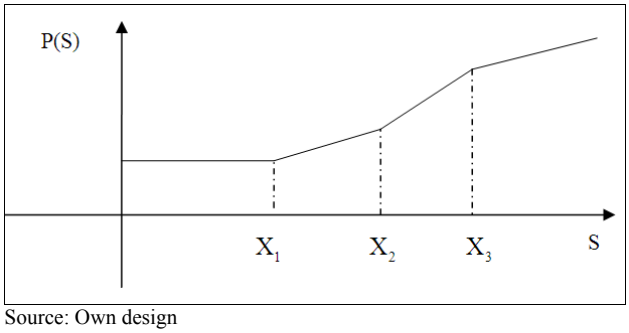
where S is the spot price of the underlying asset at time T. The lower the S is, the lower the profit which we will get from the sale of the given underlying asset. Therefore, we will decide to hedge against a price drop using the other way of a Short Put Ladder strategy formation proposed by us.

We will buy n put options with a strike price X_1 and an option premium $\overline{P}_{1B}$ per option; at the same time we will buy n call options with a higher strike price X_2 and an option premium P_{2B} per option; and, at the same time, we will sell n call options with the highest strike price X_3 and an option premium P_{3S} per option.

The function of profit from this secured position can be obtained by adding the function of profit from the Short Put Ladder strategy (2.8) and the function of profit from the unsecured position (4.1). We will get

$$ZP(S)=\begin{cases}n(X_1-\overline{P}_{1B}-P_{2B}+P_{3S}) & \text{if } S<X_1,\\ n(S-\overline{P}_{1B}-P_{2B}+P_{3S}) & \text{if } X_1\le S<X_2,\\ n(2S-X_2-\overline{P}_{1B}-P_{2B}+P_{3S}) & \text{if } X_2\le S<X_3,\\ n(S+X_3-X_2-\overline{P}_{1B}-P_{2B}+P_{3S}) & \text{if } S\ge X_3.\end{cases} \tag{4.2}$$

The function of profit from the unsecured position is as follows



Source: Own design

Figure 4 Graph of the Function of Profit from a Secured Position Using the Short Put Ladder Strategy

By analyzing the function of profit (4.2) from the secured position we will get the following statements:

- If at time of the options expiry $S<X_1$, then the hedging proposed by us secures a constant price of $X_1-\overline{P}_{1B}-P_{2B}+P_{3S}$ i.e. a price equal at least to the lowest strike price lowered by the sum of the option premia necessary for the formation of this strategy. The lowest strike price is of key importance to the value of the secured price.
- The secured position yields a better result Z, if $S<X_1-\overline{P}_{1B}-P_{2B}+P_{3S}$, but also if $S\ge X_2+\overline{P}_{1B}+P_{2B}-P_{3S}$.
- The great advantage of hedging using the Short Put Ladder strategy is that in the case of a potential, but not anticipated, increase in S above $X_2+\overline{P}_{1B}+P_{2B}-P_{3S}$, the profit from the secured position grows linearly. It is not limited from above and it is even higher than with an unsecured position.

APPLICATION OF HEDGING USING SHORT PUT LADDER STRATEGIES FOR SPDR GOLD SHARES STOCK

Let us suppose that we have a portfolio made of 100 shares of SPDR Gold Shares and we are afraid their prices might drop. We will decide to hedge using way II. of the Short Put Ladder option strategy formation. We will show 3 possibilities of this strategy formation using selected options from Table 1.

1. We will purchase 100 put options with a strike price X_1=100 and an option premium $\overline{P}_{1B}$=0.22 per option, at the same time we will buy 100 call options with a higher strike price X_2=112 and an option premium P_{2B}=15.20 per option; and, at the same time, we will sell 100 call options with the highest strike price X_3=123 and an option premium P_{3S}=6.20 per option. When we insert the data into the function of profit from the secured position (4.2), we get

$$ZP_1(S)=\begin{cases} 9\,078 & \text{if } S<100, \\ 100(S-9{,}22) & \text{if } 100\le S<112, \\ 100(2S-121{,}22) & \text{if } 112\le S<123, \\ 100(S+1{,}78) & \text{if } S\ge 123. \end{cases} \quad (5.1)$$

2. If we form the Short Put Ladder strategy by purchasing 100 put options with a strike price X_1 = 128 and an option premium $\overline{P}_{1B}$= 5.55 per option, at the same time by purchasing 100 call options with a higher strike price X_2 = 144 and an option premium P_{2B} = 0.66 per option and, at the same time, by selling 100 call options with the highest strike price X_3 = 150 and an option premium P_{3S} = 0.37 per option, then the function of profit from the secured position will be as follows

$$ZP_2(S)=\begin{cases} 12\,216 & \text{if } S<128, \\ 100(S-5{,}84) & \text{if } 128\le S<144, \\ 100(2S-149{,}84) & \text{if } 144\le S<150, \\ 100(S+0{,}16) & \text{if } S\ge 150. \end{cases} \quad (5.2)$$

3. Let us form a Short Put Ladder strategy also by purchasing 100 put options with a strike price X_1 = 100 and an option premium $\overline{P}_{1B}$= 0.22 per option, at the same time by purchasing 100 call options with a higher strike price X_2 = 128 and an option premium P_{2B} = 3.80 per option and at the same time by selling 100 call options with the highest strike price X_3 = 150 and an option premium P_{3S} = 0.37 per option. In this case, the function of profit from the secured position will be as follows

$$ZP_3(S)=\begin{cases} 9\,635 & \text{if } S<100, \\ 100(S-3{,}65) & \text{if } 100\le S<128, \\ 100(2S-131{,}65) & \text{if } 128\le S<150, \\ 100(S+18{,}35) & \text{if } S\ge 150. \end{cases} \quad (5.3)$$

By comparing the profit functions (5.1) and (5.3) and solving the relevant unequations, we get the following statements:

- If the spot price of shares at the options expiry fell below 121.69, then it is best to hedge using the second way. In which case, at any given price S<128 we get a secured price of 122.16 per option.
- If the spot price of shares at the options expiry was within the interval (121.69; 133.43), then the best result can be achieved using the first way. In this case, the secured position is not constant, it is even higher than without hedging.
- If, despite the anticipated drop, the spot price of shares at the options expiry rose above 133.43, then the best result will be achieved using the third way. The secured price in this case grows linearly, and it is higher than without hedging.

It can be concluded form the above statements that if the investor anticipates a more significant price drop of SPDR Gold Shares stock, the he will use the second option to hedge. The secured minimum price of 122.16 is only lower by 3.11 % than its current price. The profit from hedging would grow linearly with the stock price drop.

If the investor anticipates only a moderate drop, then he will use the first option. It is a combination of hedging with a speculation, as at a moderate change in price the secured price is higher than without hedging.

The third option is basically a speculation on a significant increase, where at a significant drop (more than 23 %) the loss is limited.

Table 2 indicates the results of hedging for some of the anticipated spot prices at expiry, which we got from the functions of profit from the secured positions (5.1) through (5.3). They confirm the above mentioned statements.

Table 2. Results of hedging using the short put ladder strategy with some of the anticipated spot prices

Option	Anticipated Spot Prices										
	S<100	112	121,69	122	128	130	133,43	134	144	150	158
1.	9 078	10 278	12 216	12 278	12 978	13 178	13 521	13 578	14 578	15 178	15 978
2.	12 216	12 216	12 216	12 216	12 216	12 416	12 759	12 816	13 816	15 016	15 816
3.	9 635	10 835	11 804	11 835	12 435	12 835	13 521	13 635	15 635	16 835	17 635

Source: Own design

COMPARISON OF THE RESULTS OF HEDGING USING THE SHORT PUT LADDER STRATEGY WITH THE RESULTS OF HEDGING USING THE LONG COMBO STRATEGY

In this section we are going to compare the results of hedging proposed by us using the Short Put Ladder strategy with the results of the Long Combo strategy.

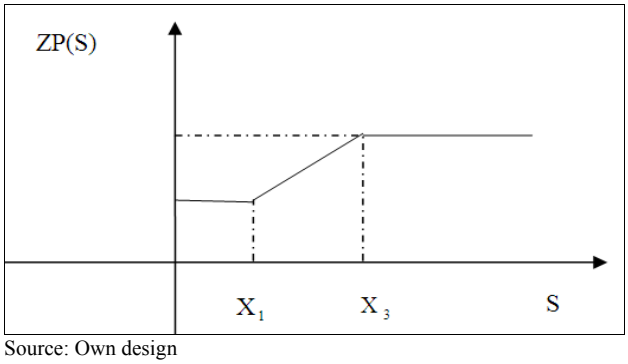
The Long Combo strategy is formed when buying n put options with X_1 and a premium $\overline{P}_{1B}$ and selling n call options with X_3 and a premium P_{3S}, where the options are for the same underlying asset and have the same expiry date.

The advantage of this strategy is that if $(P_{3S} - \overline{P}_{1B})$ is positive, or at least it equals zero, from the option premium, which he will get from the sale of a call option, he will pay the option premium when buying a put option. In this case it is a zero-cost strategy.

The function of profit from a secured position using the Long Combo strategy (see Šoltés V. - Šoltés M., 2005) is as follows

$$ZP(S)=\begin{cases} n(X_1 - \overline{P}_{1B} + P_{3S}) & \text{if } S<X_1, \\ n(S - \overline{P}_{1B} + P_{3S}) & \text{if } X_1 \le S < X_3, \\ n(X_3 - \overline{P}_{1B} + P_{3S}) & \text{if } S \ge X_3. \end{cases} \quad (6.1)$$

Figure 5 depicts the function of profit from a secured position, if $(P_{3S} - \overline{P}_{1B})>0$.



Source: Own design

Figure 5. Graph of the Function of Profit from a secured position Using the Long Combo Strategy

By comparing the function of profit from a secured position using the Short Put Ladder strategy expressed by the relation (4.2) and the functions of profit from a secured position using the Long Combo strategy expressed by the relation (6.1) we will get the following statements:

- If $S<X_2 + P_{2B}$, then the price secured using the Long Combo strategy is higher than the price secured using the Short Put Ladder strategy, i.e. by a premium P_{2B}.
- If $S \ge X_2 + P_{2B}$, then hedging using the Short Put Ladder strategy yields a better result (even much better when the increase is big).

Let us assume again that we have 100 shares of SPDR Gold Shares and we are concerned that their prices might drop. We will now use the Long Combo strategy to hedge and the options from Table 1.

1. First we will hedge by buying 100 put options with X_1 = 100 and a premium $\overline{P}_{1B}$ = 0.22 per option and, at the same time, by selling 100 call options with X_3 = 123 and a premium P_{3S} = 6.20 per option. The function of profit from the secured position in this case is as follows

$$ZP_1(S)=\begin{cases} 10\,598 & \text{if } S<100, \\ 100(S+5{,}98) & \text{if } 100 \le S<123, \\ 12\,898 & \text{if } S \ge 123. \end{cases} \quad (6.2)$$

2. If we buy 100 put options with E_1 = 128 and a premium $\overline{P}_{1B}$ = 5.55 per option and, at the same time, we will sell 100 call options with X_3 = 150 and a premium P_{3S} = 0.37 per option, the function of profit from the secured position is as follows

$$ZP_2(S)=\begin{cases} 12\,282 & \text{if } S<128, \\ 100(S-5{,}18) & \text{if } 128 \le S<150, \\ 14\,482 & \text{if } S \ge 150. \end{cases} \quad (6.3)$$

3. Let us form a Long Combo strategy by buying 100 put options with E_1 = 100 and a premium $\overline{P}_{1B}$ = 0.22 per option and, at the same time, by selling 100 call options with X_3 = 150 and a premium P_{3S} = 0.37 per option.

The function of profit from the secured position in this case is as follows

$$ZP_3(S) = \begin{cases} 10\,015 & \text{if } S<100, \\ 100(S+0{,}15) & \text{if } 100 \le S < 150, \\ 15\,015 & \text{if } S \ge 150. \end{cases} \quad (6.4)$$

Table 3 depicts the results of hedging which we got by inserting selected spot prices at expiry T into the functions of profit from the secured positions using the Long Combo strategy (6.2) through (6.4).

Table 3. Results of hedging using the long combo strategy at some of the anticipated prices

Option	Anticipated Spot Prices											
	S<100	112	115	116,84	127,2	128	128,83	131,8	134,13	140	144,66	S≥150
1.	10 598	11 798	12 098	12 282	12 898	12 898	12 898	12 898	12 898	12 898	12 898	12 898
2.	12 282	12 282	12 282	12 282	12 282	12 282	12 365	12 662	12 895	13 482	13 948	14 482
3.	10 015	11 215	11 515	11 699	12 753	12 815	12 898	13 195	13 428	14 015	14 481	15 015

Source: Own design

Table 3 clearly indicates that the second option is again the best one when anticipating a bigger drop; when the price oscillates moderately, the first option is the best; and only in case of a big increase, the third one is the best.

Table 4 summarizes the results of hedging using the Short Put Ladder (SPL) strategy and the Long Combo strategy (LC).

Table 4. Comparison of the results of hedging when using the short put ladder strategy and when using the long combo one

Option	Anticipated Spot Prices											
	S<100	112	116,84	127,2	128	128,83	131,8	134,13	140	144,66	150	158
1. SPL	9 078	10 278	11 246	12 898	12 978	13 061	13 358	13 591	14 178	14 644	15 178	15 978
1. LC	10 598	11 798	12 282	12 898	12 898	12 898	12 898	12 898	12 898	12 898	12 898	12 898
2. SPL	12 216	12 216	12 216	12 216	12 216	12 299	12 596	12 829	13 416	13 948	15 016	15 816
2. LC	12 282	12 282	12 282	12 282	12 282	12 365	12 662	12 895	13 482	13 948	14 482	14 482
3. SPL	9 635	10 835	11 319	12 355	12 435	12 601	13 195	13 661	14 835	15 767	16 835	17 635
3. LC	10 015	11 215	11 699	12 753	12 815	12 898	13 195	13 428	14 015	14 481	15 015	15 015

Source: Own design

Table 4 shows that if the investor anticipates a big drop, then the second option using the Long Combo strategy, is most suitable for hedging.

If the investor anticipates a moderate price fluctuation, in any direction, then the most suitable is the first option using the Short Put Ladder strategy.

If the investor speculates on a higher increase, while at the same time he wants to secure a minimum price of at least 96 at any given drop, then the most suitable is the third option using the Short Put Ladder strategy.

CONCLUSION

The presented paper represents two main theoretical benefits. The first one is the creation of a different way of the Short Put Ladder option strategy formation, the analytical expression of the function of profit from this approach and the proposal of an optimal algorithm for the use of this strategy in trading. The other one is the proposal of this strategy application in hedging against the underlying asset price drop and its comparison to hedging using the Long Combo strategy, which can also be used in practice as a priceless aid in deciding which hedging strategy is the most suitable.

The practical benefit is the application of hedging using the Short Put Ladder strategy and the Long Combo strategy for the SPDR Gold Shares stock, where we focused on 3 real options of the three strategies formation and on their comparison. Also, we compared these real options of the Short Put Ladder strategy formation with the Long Combo strategy, whereby we have proven the statements which we concluded on the basis of the comparison of the individual functions of profit from secured positions.

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Pharmaceutical Market(ing): Theory and Reality

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SUMMARY

The pharmaceutical market represents one of the most dynamic and controversial markets. Its specific features are rooted in the specific nature of its products and in the complex interests of the main constituents of market demand. Finding ways to improve marketing practice in the pharmaceutical sector lie in understanding marketing theory and best practice logic and comparing it with on-going everyday practice. Sensitive circumstances of using pharmaceuticals, their potential for abuse and harm, as well as a high level of public scrutiny make pharmaceuticals one of the most challenging practices.
Key words: pharmaceutical marketing, marketing, customers, market, analysis, market trends.
Journal of Economic Literature (JEL) code: M31, M37, I19

THE INDUSTRY, POTENTIAL AND REASONING

The pharmaceutical market is an important one. Besides being important it is surely one of the most interesting or most intriguing markets. Thinking and writing about it will surely be a hot topic for years to come. Through the troublesome last decade the pharmaceutical industry kept pace – staying above troubles that put other industries between the proverbial rock and a hard place. Good business results have turned in an optimistic prognosis. According to Datamonitor's report "Global Pharmaceuticals, Biotechnology and Life Sciences" (from March, 2010) figures for the industry look fairly promising (see Table 1).

Table 1. Global pharmaceuticals, biotechnology and life sciences industry value forecast

Year	US$ billion	€ billion	% Growth
2009	1,071.7	770.7	5.3%
2010	1,132.8	814.6	5.7%
2011	1,194.4	859.0	5.4%
2012	1,260.2	906.3	5.5%
2013	1,329.9	956.4	5.5%
2014	1,402.4	1,008.5	5.4%

Source: "Global Pharmaceuticals, Biotechnology and Life Sciences", March 2010.

Data on regional sales have an even greater analytic value when viewing the growth rate of individual regional markets. It is immediately obvious that placement of pharmaceuticals is predominantly related to developed countries, but at the same time, it is clear that growth potential resides in developing countries. Especially attractive markets are those achieving two-digit growth rates, such as Latin America, Eastern Europe, China and India.

The pharmaceutical industry is highly capital and technology intensive. The survival of companies in this industry is highly dependent on their research and development competence, as well as the ability to sell products, where remaining within national boundaries is not a sustainable strategy. The development potential of the pharmaceutical industry, the pace of change, high competition levels and forthcoming restructuring leave enough space for thinking about the specific aspects of pharmaceutical product marketing. The pharmaceutical market will continue to change and adapt to the new economic reality '...in which growth is shifting from mature markets to emerging ones; new product adoption is not keeping pace with the loss of patent protection by established products; specialty and niche products are playing a larger role; and regulators, payers and consumers are more carefully weighing the risk/benefit factors of pharmaceuticals' (Aitken, 2008)

How can the pharmaceutical industry count on such promising future? Understanding certain demographic and socio-cultural trends holds a lot of merit in answering that question.

The pharmaceutical industry and demographic changes stand in a direct and dual relationship. At the dawn of the 21st century, we are witnessing a demographic transition which will have changed the demographic map of the world significantly by 2050. On the one hand, changes in the availability of health protection (and access to pharmaceuticals), together with other factors, have directly contributed to the change in demographic parameters. The course of changes in the demographic structure, on the other hand, opens new potential for the pharmaceutical industry (see Table 2).

Table 2. Demographic facts: USA, Germany, Ethiopia, Hungary and Serbia

	USA	Germany	Ethiopia	Hungary	Serbia
Population (in millions)	302.2	82.3	77.1	10.1	7.5
Population 2025 (projected)	349.4	79.6	108.7	9.6	6.8
Fertility rate	2.1	1.3	5.4	1.3	1.5
Population under 15 (%)	20	14	43	15	18
Population age 65+ (%)	12	19	3	16	16.5
Life expectancy (years)	78	79	49	73	73
Infant mortality (per 1000 births)	6.5	3.8	77	8.7	8
Adults with HIV (%)	0.6	0.1	1.4	0.1	0.05

Source: CIA World Factbook, UN Population Database.

The first key change is a significant fall in the death rate. The most significant change in life expectancy since 1950 is recorded in developing countries. Maintaining mental and physical functions of the organism in mature age requires extensive health care, accompanied by increased use of medications. The second key change affecting the democratic structure is a drastic drop in birth rates induced by social and economic changes. In Western Europe, Southeast Europe, Japan[1] and North America, the population growth rate is beneath the basic replacement level.

The urbanization trend is significantly changing the social and economic picture of mankind. By 2030, 60% of the earth's population will be living in an urban setting, which will also bring about a specific change of pathogen demography. 'Western drug makers have their eye on the rising urban middle classes of India, China, Brazil and other emerging economies, with their increasing incidence of diabetes, cardiovascular disease and other rich-country afflictions.' (The Economist, 2005, p. 17). The positive effects of urbanization in developing countries are also accompanied by the concentration of population in small areas without elementary sanitary, hygienic or health care conditions, which, basically, multiplies the spread rate and scope of infectious diseases.

Revolutionary discoveries within the pharmaceutical industry have significantly shaped the contemporary picture of the world. The question is, where are the opportunities for and threats to the development of pharmaceutical industry (and its profit) in this changed picture? The increased share of elderly population logically leads to increased needs for health care and pharmaceutical products. At the same time, the growing care of an economically inactive population is a vital welfare problem[2] - and the state prefers the use of generic medications in an attempt to minimize costs. Such an approach is a problem for the strongest pharmaceutical companies with developed R&D activities, but at the same time, producers of generic medicines (such as Stada, Actavis, Sandoz or Teva) are achieving above-average sales growth. Demographic changes, in their complexity, also require changes in business logic and behavior patterns of the pharmaceutical industry as such. They will be a growth generator for all pharmaceutical companies that know how to offer the right product, at the right price, at the right place, supported by appropriate communication telling the consumer and/or the prescriber[3] that there is an appropriate product meeting a need or resolving a given problem in a manner superior to the competing products. Marketing as a science (and practice) is obviously devoted to searching for answers to these questions.

Growth, among other geographies, is in New Europe[4]. It has been an interesting experience to explore the marketing logic of pharmaceutical companies (domestic ones, but also regarding internationals), in the many ways specific Serbian pharmaceutical market. In order to assess, the room for improvement theory (or best practice) shall be put in comparison with on-going practice.

[1] *The number of elementary school entrants in Japan dropped by 3.5 million between 1994 and 2004. 2000 schools were closed down, and 63,000 teachers became redundant. Japan and Southeast Europe have an almost identical long-term birth rate of about 1.2 (the basic placement rate is 2); the disbalance in the demographic structure in these areas is a probable scenario for most developed countries. (Population Bulletin, September 2007).*

[2] *A national welfare system was created in Germany in the 1880s led by the basic idea that healthy labor was productive labor. The age of 65 as the magical retirement age was chosen because at the time life expectancy hardly exceeded this boundary.*

[3] *Prescriber – a person prescribing a prescription medicine; (s)he is usually a physician, but this term may also include persons giving advice or instruction on using a particular OTC medicine (such as a pharmacist, health care provider, etc.).*

[4] *Euphemism coined to break away from negative associations of the terms Eastern Europe or the Balkan states.*

THE ENVIRONMENT

Before we are able to tackle the challenges of pharmaceutical marketing theory and practice, we need to establish the basic logic of this market(ing), reaching out for the core difference which makes this area so unique. One of the most significant volumes on pharmaceutical marketing, Smith et al. (2002), qualifies their approach to marketing as environmentalist, thus highlighting the importance of environmental factors in marketing in pharmaceutical industry.

The essential value of content analysis of individual environment elements according to Smith et al. (2002) is undeniable, but the way they are laid out seems ambiguous and does not enable us to draw a clear distinction between controlled and uncontrolled impacts on the industry's marketing practices. The consumer is represented at the detailed analytic level, as a key factor of the internal environment, in a manner that strains the possibility of viewing the 'big picture' from the producer's aspect. The mezzo environment, or intermediate environment, is defined by the instruments of marketing mix, competitive environment and the company's internal environment, according to Smith et al. (2002). Marketers accustomed to traditional views of marketing may find such a setup confusing. Without diminishing the significance of content and elements for the successful management of pharmaceutical marketing, we shall try to elaborate the further analysis of '... the actors and forces outside marketing that [directly and indirectly] affect marketing managements' ability to' (Kotler and Armstrong, 2001, p. 87) create and deliver value added to the target market through a more rational and clearer framework of mutual influences.

With due appreciation to the key idea of marketing, the consumer/patient remains the central element, but their decisions to purchase and use pharmaceutical products (especially prescription drugs) are not independent; they are primarily determined by the influence of both prescribers and payers. All three actors on the demand side are influenced by a large number of (macro-) environmental factors, determining their process of information gathering, decision making and behavior on the pharmaceutical market. At the same time, when designing marketing mix instruments, pharmaceutical companies strive to influence the agents on the demand side in a complex competitive environment.

Macro-environmental factors act as a specific 'prism', affecting directly and simultaneously the design of marketing mix (supply) and constituents on the demand side: prescribers, patients and payers. Pharmaceutical industry marketers must understand the influence of macro-environmental elements on the target market's decision-making process and, at the same time, incorporate the influence of these elements into the creation and delivery of value to consumers through an appropriate marketing mix (see Fig. 1).

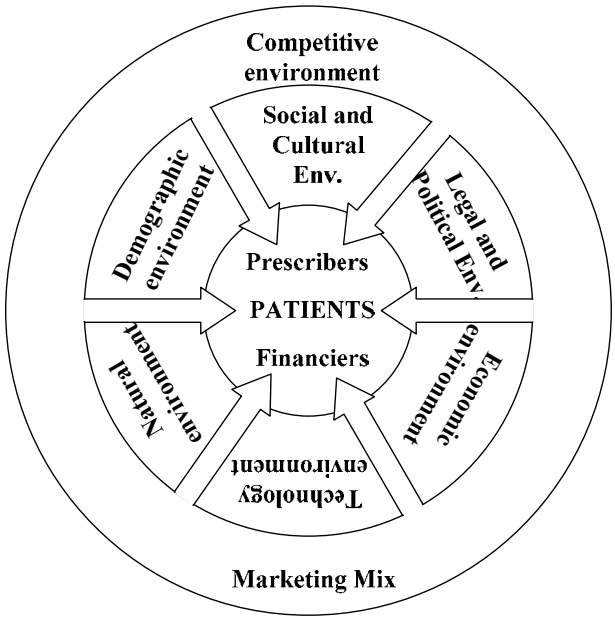

Figure 1. Complex view on the marketing environment of pharmaceutical marketing

THEORY AND PRACTICE

A special challenge that the subject raises is the existence of controversy generated from two sources. Marketing controversy stems from criticism leveled at the effectiveness and efficiency of marketing activities and the debatable ethical code of conduct. The other source of controversy is the pharmaceutical industry's profits, which result from operations on a market where the vulnerability of and/or disbalance in the organism is the motivator for purchase, which entails strong emotion in the persons in question, in their immediate social environment, but also in society as a whole. Once this profit is labeled as above-average, this may lead to the conclusion that pain and suffering are the best generators of profit. A cross-association of marketing and pharmacy produces a combination which has been the source of heated debate and fragile balance between positive and negative attitudes/emotions for decades.

Ever since the beginnings of history, medicine and pharmacy have intertwined in man's effort to overcome the biological limitations of the human organism. Both have accompanied humanity on the way from magic and divine to rational and science-based practices. The formation of the pharmaceutical industry in the second half of the 19th century marked the beginning of standardization of pharmaceutical products and regulation of the industry, and subsequently the sale and application of medicines. Now, 150 years later, the industry is one of the most vital global industries functioning on a specific market. According to Drews (2003), the pharmaceutical industry in the 20th century was marked by individuality, a primary focus on science and the process of scientific learning, while the ethics and morals of the industry derived from medicine itself.

The sum of human knowledge in the area of medicine and pharmacy has determined the pharmaceutical industry over the past few decades, and provided a theoretical basis for predicting the continued innovation that will ultimately transform the perception of the process of prevention, diagnosis and treatment. Today, discussing the pharmaceutical industry implies several burning issues:

- Blockbuster drugs – the contemporary pharmaceutical industry relies on the sale of a relatively small number of extremely successful drugs, whose annual sales, according to one of the criteria, exceed a billion US dollars. Blockbuster drugs are originator products, branded, and patent-protected drugs, the outcome of a long and costly R&D process. From the aspect of meeting humanity's medical needs, it is an objective fact that these drugs were developed to 'resolve' the morbidity statistics of highly developed countries - the chronic, high-incidence diseases of modern man. The development of new blockbusters and their survival are challenged due to the reduced efficiency of pharmaceutical companies' R&D process, generic substitution, and the trend of personalizing therapies through biopharmacy.
- Generic drugs are the outcome of the limited period of patent protection of the original pharmaceutical products, whose active ingredient becomes a 'common good' upon the expiry of patent protection. Apart from proven bioequivalence, generics guarantee the availability of high-quality drugs to the widest population, as competition in the production leads to a rapid fall in prices. Generic drugs do not bring about new quality or more effective therapy for an existing health problem, apart from wide availability of the drug. With the growing availability of healthcare, pressures on payers result in a preference for cheaper generic products. The essence of the dilemma related to the choice of (and/or preference for) the originator or generic products rests in the question of whether the pharmaceutical industry will maintain the levels of investment in R&D that will generate advances in therapy, which will mean better and more effective fulfillment of humanity's medical needs.
- Lifestyle drugs are a separate group of drugs intended for conditions that give rise to a philosophical/moral dilemma as to whether they can be regarded as pathological conditions requiring medical and/or pharmaceutical therapy. These are 'disorders' such as sexual dysfunction, hair loss, obesity, signs of skin aging, etc. This group of drugs may be regarded as the 'latest fashion' on this market, and Hawthorne (2005) terms this group of drugs 'Vanity Drugs'. The culture of the Western civilization actively contributes to the growth in demand for this category of pharmaceutical products, turning this trend into a new quest for the 'fountain of youth'.
- Biotechnology is the outcome of qualitative advances of medicine/pharmacy towards predictive and preventive medicine. The biotechnology concept is based on the use of biological systems, organisms and their derivatives. The most promising biotechological discoveries are those in the field of recombinant DNA, with the potential of tailoring a man's/individual's genetic inheritance in such a way as to enable 'bypassing' biological limitations and irregularities. Biotechnology is related to the concept of individualized medicine/therapy tailored according to individual circumstances. Despite of the still modest results, expectations from biotechnology are practically unlimited.

Marketing is both a scientific (theoretical) and practical discipline. The abundance of marketing theory in academic circles is beyond dispute. There is a developed set of patterns, a glossary of the discipline, and a considerable body of knowledge. Once this knowledge leaves the premises of academia and enters the reality of economic life, a justifiable question is posed – to what extent is a set of generalized assumptions (and similar solutions) applicable in real life. This varies greatly from one industry to another. The application of marketing in the pharmaceutical industry surpasses the framework of its application in the fast-moving consumer goods industry, where the discipline has reached its heights.

Qualitative research on an appropriate sample within the territory of Serbia, which included ten leading companies creating the offer of pharmaceuticals on this market, has shown that marketing practices function in authentically specific conditions. First of all, the marketing function exceeds the framework of marketing profession and is taken over by pharmaceutical experts, who are, by their vocation and knowledge, closer to the nature, properties and application of the product than marketers would be. Such a solution objectively entails certain limitations from the aspect of knowledge of marketing principles, models and tools, which is reflected in their application in daily activities. Another significant determinant is based on the fact that this market functions within a strict regulatory framework, facing the application of marketing with a whole range of limitations.

The extensive body of available literature in the field of pharmaceutical marketing, supplemented by primary research, confirms the hypothesis that designing appropriate marketing strategies requires appreciation of specific conditions which distinctively define the pharmaceutical marked as a separate, specialised market. However, designing and implementing an appropriate marketing strategy requires an organizational culture

supporting (and reflecting) marketing business philosophy.

The nature of the purpose of the products and specific defragmentation of the decision on the choice of products into several constituents that generate the demand for these products results in a different view of marketing. Koberstein (2001) refers to science-driven marketing, Appelt and Hauser (2006) call it clinical marketing, whereas respondents in the research conducted in the Republic of Serbia use the expression 'expert marketing'.

The objective level of development of the pharmaceutical industry in the Republic of Serbia and other systemic limitations of a relatively underdeveloped economy, as well as the modest size of the market, do not leave sufficient space for viewing the complex logic and practice of pharmaceutical marketing in one of the most controversial contemporary industries. The very size of the US pharmaceutical market and the strength of global pharmaceutical companies competing primarily on this (in many respects) 'archetype market', but also on other markets worldwide, reveal all the controversies related to the industry and its (ab)use of marketing.

Is marketing a value free, negative or positive concept? It depends on one's point of view. The marketing concept starts from the consumer. The goal of marketing is to use a careful analysis of consumers' needs (and wants) to create a value proposition that will be able to fully meet their expectations (better than that of competitors). On this task, marketing uses sophisticated methods for researching the market, consumer behavior and competition, seeking to disperse the care of consumer satisfaction throughout the whole organization through a process of internal marketing. Modern marketing is value-driven, where the consumers and other constituents of the environment are regarded as partners, and marketing itself is focused on creating and maintaining long-term relationships with the target environment, surpassing a relationship based on a simple transaction. An organization's profits (and survival) result from superior fulfillment of consumers' needs. In the marketers' words, marketing has a clear value framework. It would be naive to believe that it is practically impossible to forget and/or deliberately distort this marketing logic in order to achieve opportune interests. In contemporary marketing, content holds sway over form, as only the ideas that add consumer or stakeholder value reflect a long-term orientation of marketing through creating added value.

Interviews with professionals involved in marketing in the pharmaceutical industry have revealed that this market shows a strong orientation of marketing on the content, i.e. information and knowledge is the function of the higher quality of decisions made by prescribers, in a joint mission of providing patients with the best possible and/or available therapy. Sackett et al. (1996, p. 71) consider the concept of evidence based medicine (EBM) as '…conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.' Where does this evidence come from? It is the output of the scientific research process, clinical trials, advances in and development of the medical profession. However, according to Kushner (2007, p. 50), the 'pharmaceutical industry has inserted itself into every aspect of medical practice from medical education to basic research and clinical care.' Modern society has opened space for the pharmaceutical industry to legitimately claim the right to such impact, removing from society:

- a part (or all) of the care of continued education of physicians and pharmacists;
- the need to disseminate information in medicine/pharmacy via formal channels; and
- the conduct of clinical trials proving the effectiveness and safety of a drug at the expense of society.

In all this, the assumption on which the ethical/moral aspect of this concept rests is that commercial interest will not overpower the medical/altruistic interest. If the marketing function, marketing organizational unit and marketing activities were removed, would the problem disappear as well? Or are we trapped in a 'tangle of moral compromise', where each of the parties gives something in exchange for something, but none of them is entirely satisfied?

The crucial question is not whether the pharmaceutical industry needs marketing. The root of the issue of relation between medicine/pharmacy and the way that they fulfill the needs of individuals/society is much deeper. Peterson expresses her dissatisfaction: '…it's not the medicines that are the problem… The problem is the marketing. The marketing is distorting information that we, as patients, read and understand… There really isn't any place for marketing in medicine.' (Multinational Monitor, 2008, p. 43). The problem is in drugs also, as at the present level of development of science and technology, with the current amount of human knowledge, drugs do not provide the ideal that we strive for. Another indicative fact is that new adverse effects are still being found for verified drugs used for many years (even decades). A part of this complex jigsaw puzzle, man's struggle against biological transience, is also the fact that man's appetites are growing, with expectations bordering on what is currently regarded as science fiction. Despite all the disappointments, human expectations from medicine and pharmacy will keep growing.

'Surely, the scientists would argue, where the clinical differentiation is significant enough, marketing is superfluous.' (Moss, 2001, p. 31). Objectively, Moss' commentary is correct; however, even the best therapy will not yield satisfactory results from the aspect of the complex multitude of stakeholders if patients do not seek diagnosis and medical therapy (or at least not on time), or if the informative function of marketing activities is lacking, or a set of additional services that may raise the patient compliance levels. Marketing is not a substitute for a product's therapeutic value, but may make an

impact so as to realize this therapeutic value. According to Bearden et al. (2007, p. 445), '…developing new drugs is one thing; making them successful in the marketplace is another.'

For the 'average' consumer – the patient – oversized interests in pharmaceutical industry and the multitude of, often divergent, opinions on the benefits and/or dangers of drugs is a serious problem. Between the extremes that a drug may at the same time be a means of returning an individual's life back to normal, but also a way of permanently disrupting the functions of the organism, and even threaten life, one may very easily find oneself in an endless succession of delights and disappointments. However, the very nature of the product and the circumstances in which the individual uses them mean that humanity will never be able to distance itself from the industry – as long as it is an industry rather than something else.

Avorn (in Kushner, 2007, p. 62) argues that prescribing physicians are also bombarded with a '…plethora of information of very uneven quality.' The discourse on the mutual relationship between marketing and pharmacy can only be concluded by a lengthy debate on ethics. Is the aim of clinical trials to prove the effectiveness and safety of a drug, or to meet criteria that will enable the drug's market launch? Is the purpose of information from pharmaceutical companies to raise levels of awareness of risks, symptoms and diagnostics of a disease, or is the primary motive to boost sales and/or market share? Is risk factor a disease to be treated pharmacologically or not? Do physicians give balanced advice on alternative methods of treatment and a change of lifestyle in the patient's best interest, or is it in their interest only to prescribe pharmacological therapy? Does a prescriber give a balanced presentation of the beneficial and adverse effect of the drug (s)he is promoting? Attempts at answering these questions would probably end up in a division into those who find Jean Jacques Rousseau's ideas on the nature of mankind closer and those who argue that Thomas Hobbes' description of man is much closer to reality (see Lawson and Woliscroft, 2004). In a philosophical discourse on morality, it would be logical to pose the question of whether modern society is closer to the concept of 'commercial morality' or the concept of 'watchdog morality' presented by Thomas (2000), reflecting two utterly different concept of the social component of state/society, with implications for the medical/pharmaceutical sector as well.

WHAT THE FUTURE HOLDS

Can it be supposed in advance what the public thinks about pharmaceutical marketing? Does the solution to the controversy lie in better marketing rather than more marketing? The problems burdening both marketing and the pharmaceutical industry, as well as pharmaceutical marketing, result from the fact that the eyes of many are turned to the pharmaceutical industry, expecting it to resolve our every health (and psychological!) problem, just as the eyes of many are looking at marketing, expecting it to resolve every business problem, satisfy consumers, and meet all stakeholders' expectations. There is certainly room for improvement.

If it were for the sake of selling clothing, fragrances, electronics or cars, humanity would be impressed by the marketer's ability to anticipate and meet consumers' needs, to actively design consumers' wishes as an instrumentalisation of attainment of the consumers' expressed and/or unexpressed (conscious and/or subconscious) consumer needs. 'But drugs are different' (Carey, 2008). There are other products that may be harmful to consumers if they are not produced and/or used appropriately, and other products that not everyone can afford, but there are few products that imply so many emotions, and so much pondering about what is fair and what is not – from the human organism, nature, social environment, or force majeure. In the end, different cultures/societies have found different ways of rationalizing this controversy.

The pharmaceutical industry has done a lot to objectively extend an individual's lifespan, but people still have a finite number of years at their disposal. The complementary advances in medicine have enabled man to live longer and think less about biological limitations, but there is no supreme, ultimate and final result, approaching the mythical ideal of each individual's conception. Does such a position have a price that affects the pricing of a pharmaceutical product as well? It certainly does. But everything has a price. Marketing is the connection between R&D, the production of a pharmaceutical, and the target audience in its broadest sense.

If nothing else, marketing is what makes the pill taste less bitter.

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Die demographische und wirtschaftliche Grundlagen einer integrierten Entwicklungspolitik in ländlichen Räumen Rumäniens

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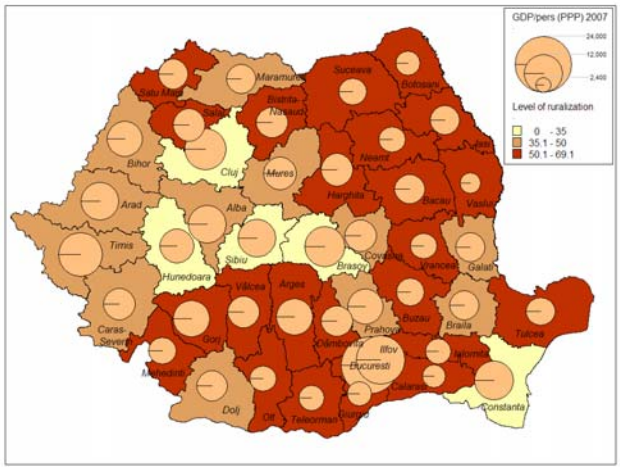
EINFÜHRUNG

Im neuen konzeptuellen Rahmen der „post-rural approaches", Ruralität ist kein homogänes Phenomän, sondern sozial-demographisch und symbolisch differenziert (Brunori and Rossi, 2007, Lowe and Ward, 2009). Es wird über ein „new rural development paradigm" geschrieben (Regoli, Vittuari and Segre, 2011) eingeleitet durch ein Wandel von der Landwirtschaft als Hauptaktivität in Richtung von Lebensmittelproduktion und Dienstleistungen im ländlichen Raum. Der neue Entwicklungs-paradigmawandel konzentriert sich auf Themen wie Diversifizierung der Wirtschaft ländlicher Räumen, Nutzung von lokalen Ressourcen oder sozialen Interaktionen.

Die Frage nach der wirtschaftlichen und sozialen Situation und Entwicklung der ländlichen Räumen ist besonders wichtig in neuen Beitrittsländern wie Rumänien, wo die ländliche Räume 87,1% des Staatsgebietes ausmachen und ein erheblicher Teil der Gesamtbevölkerung (45,1%, ugf. 9,7 Millionen Personen) im ländlichen Raum lebt (Madr, 2008). Eines der grundlegenden Problemen ist gerade mit dieser ausgeprägten Ruralität der Bevölkerung verknüpft, die auch wesentliche räumliche Differenzierungen darstellt: einerseits zeigen die Kreisen im Norden, Osten und Süden Rumäniens eine hohe Ruralitätsgrad auf, wo mehr als die Hälfte der Gesamtbevölkerung im ländlichen Raum lebt, mit Ausnahme der Haupstadt, Bukarest, und des am Schwarzmeer liegenden Konstanza Kreises; andererseits weisen die Kreisen aus dem zentralen und westlichen Teilen des Landes eine geringere Ruralität auf, vor allem die Kreise Cluj, Sibiu, Brasov und Hunedoara, die über ein gut entwickeltes Städtenetz und städtische Wirtschaft verfügen (Abb. 1).

In diesem Aufsatz konzentrieren wir uns auf die Untersuchung der aktuellen demographischen und wirtschaftlichen Prozessen im ländlichen Raum, sowie alternativer Entwicklungsmöglichkeiten des ländlichen Raumes in Rumänien. Dementsprechend wird die Untersuchung in drei Teilen gegliedert. Im ersten Teil der Arbeit wird der demographische und soziale Wandel des ländlichen Raumes und der ländlichen Gesellschaft nach 1989 analysiert. Es wird betont, dass die Kapazität ländlicher Räumen Einkommen zu produzieren immer in bestimmten regionalen Kontexten eingebettet ist, die sich funktional um Städten organisiert sind.

Im zweiten Teil wird die wirtschaftliche Situation der ländlichen Bevölkerung untersucht. Die Datenquellen für die Analyse sind die statistische Jahrbücher und eine Untersuchung der Soros-Stiftung Rumänien aus dem Jahr 2006. Die ersten Teile sollen die demographischen und wirtschaftlichen Grundlagen erläutern, die die Basis für die Einleitung einer neuen ländlichen Politik in Rumänien bilden können, im Kontext der oben erwähnten, allgemeinen eurpäischen Trend zum Wandel des ländlichen Raumes und des Verständnisses über Ruralität. Als Folge im dritten Teil der Arbeit werden Argumente für die Unterstützung eines integrierten und holistischen Entwicklungskonzeptes für den ländlichen Raum gebracht, wobei unterschiedliche Stadt – Land Einheiten im Mittelpunkt der Überlegungen stehen sollen.

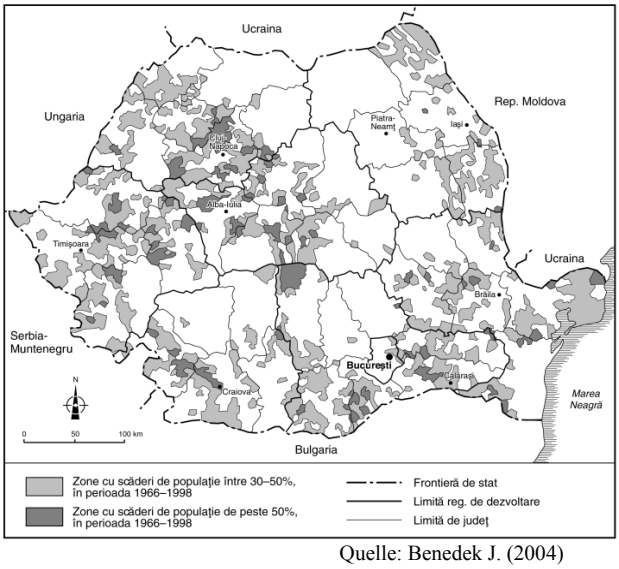


Quelle: Statistisches Jahrbuch (2008)

Abb. 1 Der Ruralisierungsgrad und die wirtschaftliche Leistung der Kreisen in Rumänien im Jahr 2007

DEMOGRAPHISCHE PROZESSE IM LÄNDLICHEN RAUM

In den ländlichen Räumen Rumäniens war in den siebziger und achtziger Jahren vorigen Jahrhunderts - als Folge der Kollektivierung der Landwirtschaft und der sozialistischen Industrialisierung - eine starke Abwanderung der ländlichen Bevölkerung in die Städten. In erster Reihe hat die Land-Stadt Wanderung die ländlichen Gebiete im östlichen Teil von Moldau, Süd- und Südost-Muntenien (um Bukarest), das Donaudelta, Süd-Oltenien (um Craiova), das Banat sowie die zentralen und westlichen Teilen Siebenbürgens betroffen, die in größerer Entfernung von den Industriezentren waren oder wenige bis keine Möglichkeiten für Pendeln hatten (Abb. 2).

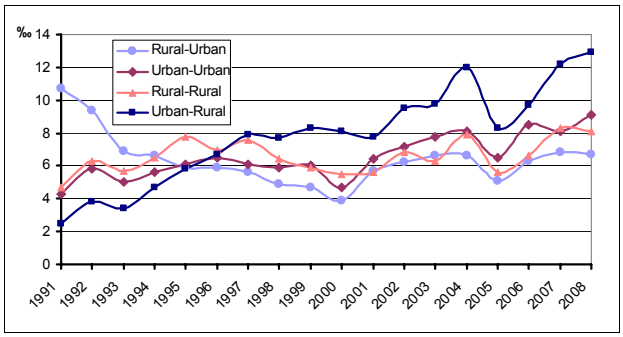


Quelle: Benedek J. (2004)

Abb. 2 Ländliche Räume mit einem starken Bevölkerungsrückgang in der Periode 1966-1992

In einem kurzen Zeitabschnitt haben die mittelgroße- und Kleindörfer ein erhebliches Teil ihrer Bevölkerung verloren (POP und BENEDEK, 1997). Der Rückgang der ländlichen Bevölkerung wurde von Änderungen der ländlichen Siedlungsstruktur begleitet: innerhalb von 26 Jahre (1966-1992) hat sich die Anzahl von Kleindörfer von 4997 (38% aus der Gesamtzahl) im Jahre 1966 an 6 648 im Jahre 1992 (50.7%) angestiegen, während die Bevölkerung der Kleindörfer um 35,2% zurückgefallen ist (eb.).

Die wirtschaftlichen Umwälzungen nach der Wende haben auch auf die räumlichen Orientierung und Intensität der Stadt-Land Beziehungen ausgewirkt. Die Form und Intensität der inneren Migrationen reflektieren die oben genannten Veränderungen. Es wird von der Prämisse ausgegangen, dass im Gegensatz zur sozialistischen Periode wurde die Wohnortsauswahl nach der Wende nicht mehr als politische Zwangsstrategie formuliert, sondern als freie Wohn- und Arbeitsortauswahl – Strategie der einzelnen Individuen (Juhász, 2005). Unter diesen Umständen die wirtschaftlichen Faktoren (Arbeitsplatz, Einkommen, Kosten des Lebens) werden ausschlaggebend. Der Verlust vieler Arbeitsplätze in der Industrie, das Ansteigen der städtischen Lebenskosten und die Landreform haben die innere Migrationsströme wesentlich geändert.



Quelle: Anuarul Statistic al României, 2010.

Abb. 3 Die Evolution der inneren Migration nach Migrationsformen

Die Stadt-Land Migration wird ab 1997 zur dominanten interne Migrationsform in Rumänien (Abb. 3). Nach einem kleinen Rückgang im Jahre 2006 zeigt sie sogar einen steigenden Trend, während die Land-Stadt Migration zwischen 1991 und 2008 ugf. auf die Hälfte zurückgegangen ist. Die anderen zwei innere Migrationsformen (Land-Land und Stadt-Stadt) sind in den letzten Jahren relativ stabil geblieben, im Vergleich zu den 90-er Jahren des vorigen Jahrhunderts sind aber gestiegen. Als Folge der geänderten Migrationsverhalten ist der Anteil der ländlichen Bevölkerung aus der Gesamtbevölkerung des Landes von 45,7% (1992) an 47,3% (2002) angestiegen (Tab. 1). Damit verfügt es über den größten Anteil der ländlichen Bevölkerung unter den EU Mitgliedsländer. Aufgrund der oben beschrieben Ziffern und Trends tendiert man zu behaupten, dass in

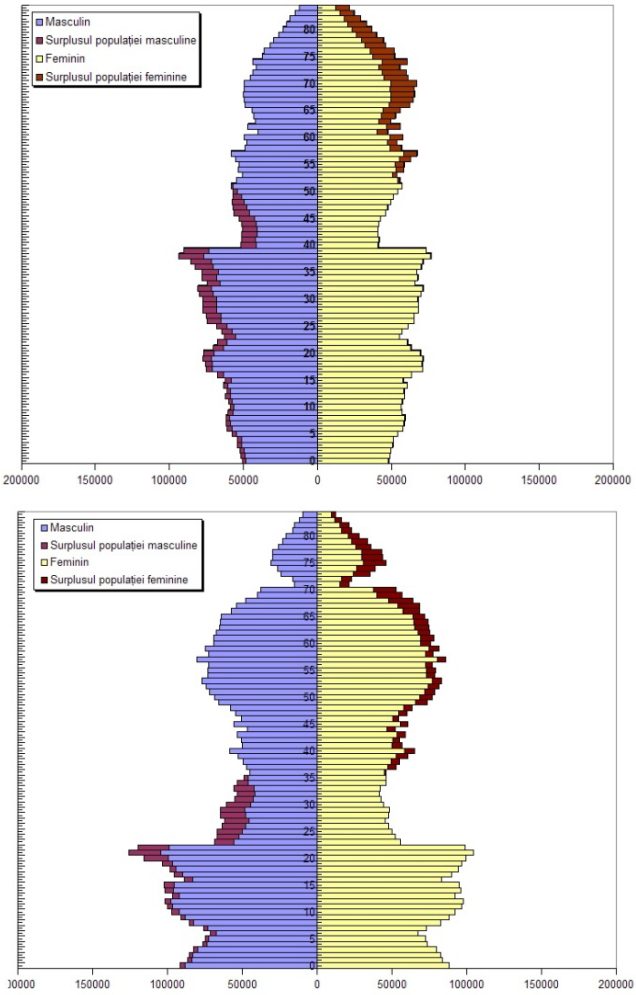
Rumänien, wie in Frankreich, England oder die Niederlande (Ward und Brown, 2009) ein dominiriender Trend zur Suburbaniserung entstanden ist. Allerdings sind ein wesentlicher Teil der Stadt-Land Migranten in Rumänien nicht Angehörigen der mittleren sozialen Schichten, die Ihr Wohnideal in Form von Familienhäusern in attraktiven und gut erreichbaren ländlichen Siedlungn realisieren möchten, sondern sie sind hauptsächlich städtische Einwohner erster oder zweiter Generation, die ihre Lebensgrundlagen in den Städten verloren haben, als Folge der Umstrukturierung der sozialistischen Industrie und der Entwicklung eines Immobilienmarktes (Benedek und Bagoly, 2005).

Tab. 1. Die Verteilung der Bevölkerung nach Siedlungskategorien in der Volkszählung 2002

	Personen	%	Veränderung zu 1992 (%)
Städte	11 436 736	52,7	92,3
Dörfer	10 261 445	47,3	98,5
Insgesamt	21 698 181	100	95,8

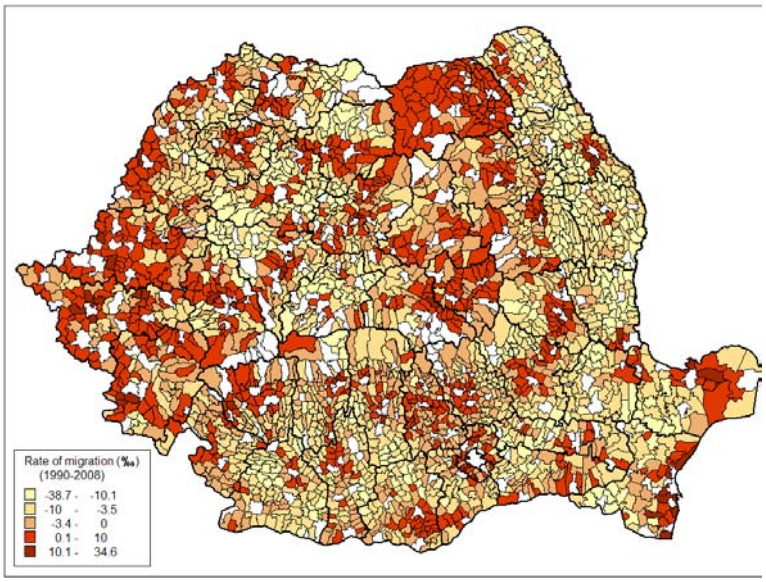
Quelle: Anuarul Statistic al României, 2010.

Die dominante Stadt-Land Migration hatte keine wesentlichen Veränderungen in anderen demographischen Variablen ausgelöst, wie Veralterungsgrad der Bevölkerung oder das natürliche Zuwachs der Bevölkerung, weil die Rückwanderer nicht die jüngeren Altersgruppen umfassten (Heller und Ianos, 2004). Aus diesem Grund konnte die Stadt-Land Migration nicht den Alterungsprozess der ländlichen Bevölkerung und die negative natürliche Bevölkerungsentwicklung in ländlichen Räumen kompensieren. Der Anteil älterer Personen (über 65 Jahre) betrug im Jahre 2007 19% aus der Gesamtzahl der ländlichen Bevölkerung (Abb. 4), im Vergleich zu 11% in den Städten, während die natürliche Bevölkerungsentwicklung beträgt – 4/1000 Personen.



Quelle: Statistisches Jahrbuch (2008)

Abb. 4 Die Altersstruktur der ländlichen Bevölkerung in den Jahren 1990 (unten) und 2007 (oben)



Quelle: Nationales statistisches Amt

Abb. 5 Die Migrationsrate ländlicher Gemeinden in der Periode 1990-2008

Die ländlichen Zielgebiete der Migration lassen sich aufgrund der Abbildung 5 feststellen. Regional unterscheiden sich einige ländliche Zonen, die sich in der Periode 1990-2008 durch positive Werte der Migrationsrate abzeichneten: die Schwarzmeerküste, das Umland der Hauptstadt Bukarest, eine Kontaktzone zwischen Bergen und Hügellandschaft um die Industriezentren Pitesti-Targoviste-Ploiesti-Buzau und Focsani, die Bukowina, einige innere Becken der östlichen Karpathen und einige ländlichen Räumen aus dem westlichen Teil Rumäniens. Ebenfalls, sind die ländlichen Gemeinden aus der Einflussgebieten mittlerer- und größerer städtischen Zentren attraktiv für Migranten gewesen.

Die internationale Migration hat nach der Wende viel zugenommen. Vor allem die internationale Arbeitsmigration der rumänischen Arbeitskräften hat großen Umfang genommen. Es sind keine offiziellen Daten vorhanden, schätzungsweise halten sich ugf. 1,5 – 2 Millionen rumänischen Staatsbürgern in EU Länder (vorwiegend in Italien und Spanien) auf (Madr, 2008). Die weitere Entwicklung der internationalen Migration rumänischer Arbeitskräfte hängt stark von der wirtschaftlichen Entwicklung Rumäniens und der Zielländer dieser Migration ab. Unter den Umständen der im Jahr 2009 eintretenden wirtschaftlichen Niedergang in Rumänien (GDP-Rückgang mit 8%), ist unwahrscheinlich, dass eine wesentliche Rückwanderung stattfinden würde.

Die Pendlerbewegungen sind ebenfalls wichtige Prozesse, die nach der Wende die räumliche Umverteilung der Wirtschaft folgten. Bei der letzten Volkszählung (2002) 23,3% der aktiven Landbevölkerung Rumäniens arbeitete außerhalb der Wohnsitzsiedlung, wegen des geringeren Entwicklungsniveau der Transportinfrastruktur erheblich weniger als in anderen Ländern. Aber immerhin deutet es daraufhin, dass einzelne Dörfer keine getrennte Gemeinschaften (oder Gesellschaften) bilden. Die wirtschaftlichen Möglichkeiten der Bevölkerung einer ländlichen Siedlung sind von einem ausgedehnten Raum gegeben, wo das Tagespendeln möglich ist. Das Einkommen und die soziale Mobilität der ländlichen Bevölkerung wird in erster Reihe nicht von der siedlungshierarchischen Position oder von der Größe der Wohnortssiedlung bestimmt sondern von der wirtschaftsgeographischen Umgebung (Juhász, 2005). Wahrscheinlich spielt auch die Zwangsmobilität noch eine wichtige Rolle. Es heißt, dass die mangelnde Arbeitsplätze in den ländlichen Räumen und/oder die teure Wohnungsmarkt in den Städten als wichtige Steuerungsfaktoren der Pendelbewegungen nicht abzuschreiben sind.

DIE WIRTSCHAFTLICHE SITUATION IM LÄNDLICHEN RAUM

Die Dorfsystematisierung der sozialistischen Ära hat zwar seine Zwecke nicht erreicht aber mittels passiven Sanierungsmaßnahmen (Verbot von öffentlichen Investitionen und Baugenehmigungen) hat wesentlich dazu beigetragen, dass zwischen den Städten und ländlichen Siedlungen erhebliche und multidimensionale Disparitäten entstanden sind. Diese Disparitäten werden auch in der infrastrukturellen Ausstattung von Haushalten reflektiert (Tab. 2).

Tab. 2 Infrastruktur-Austattung der Wohnungen in Städten und Dörfern im Jahr 2002

	Wasser-versorgung	Kanalisa-tion	Elektrizi-tät	Zentral-heizung	Toilette
Stadt	87,6%	85,6%	98,6%	67,6%	83,2%
Dorf	15,1%	12,9%	93,7%	2%	13,4%

Quelle: Anuarul Statistic al României, 2008.

Die wirtschaftliche Dynamik der ländlichen Räume nach der Wende wurde in erster Reihe durch die Landwirtschaft und die Umstrukturierung von sozialistischen großstädtischen Industrie bestimmt. Diese Situation löste die Entwicklung sektoraler Entwicklungsstrategien aus, die auf die Landwirtschaft zentriert waren. In der Landwirtschaft sind in kurzer Zeit die Institutionen der sozialistischen Landwirtschaft aufgelöst worden. Paralell wurde eine massive Landrestitution eingeführt, die noch bis heute auszieht. Die Transformation der großstädtischen Industrie wurde durch Rationalisierungs- und Privatisierungsmaßnahmen vertreten. Beide hatten als Ergebnis die starke Reduzierung der Beschäftigtenanzahl in der Industrie. Weil die Dienstleistungen diesen Rückgang nicht kompensieren könnten, ist der Anteil von in der Landwirtschaft Beschäftigten stark angestiegen, von 29% im Jahr 1991 an 41% im Jahr 2000, das letztere ein Höhepunkt dieser Entwicklung. Ab 2000, als der EU Integrationsprozess in die entscheidende Phase getreten ist, ist der Anteil der in der Landwirtschaft beschäftigten Bevölkerung ununterbrochen zurückgegangen und hat im Jahre 2007 auf 28,2% gesunken (INS, 2008). Zwei Prozessen haben zu dieser Entwicklung beigetragen: die Umorientierung eines Teiles der rumänischen Arbeitskraft auf die westeuropäische Arbeitsmärkten und die anwachsende Volumen der ausländischen Investitionen.

In Rumänien ist der Anteil der Industriebeschäftigten aus der Gesamtzahl der aktiven Bevölkerung von 38% (4,1 Millionen Beschäftigten) im Jahr 1990 an 27,1% (rund 2,5 Millionen Beschäftigten) im Jahr 1997 zurückgefallen. Dieser Rückgang ist mit der Rationalisierung und Privatisierung der staatlichen Industriebetrieben zu erklären, die eine Desindustrialisierungstendenz ausgelöst hat. Diese Tendenz dauerte bis zum Jahre 2000 an, als der Anteil der Industriebeschäftigten sich zwischen 23% und 25% stabilisiert hat. Allerdings zeigt in der letzten Jahren eine leicht sinkenden Tendenz (22,5% im Jahre 2007).

Die Dienstleistungen sind erst in den letzten zehn Jahren starker gewachsen und haben erst im Jahre 2003 die anderen Wirtschaftsektoren überholt (35,7% der aktiven Bevölkerung), nachher ist ihr Wachstum ununterbrochen (42,5% der aktiven Bevölkerung im Jahre 2007).

In den ländlichen Räume ist die Wirtschaftstruktur eindeutig von dem primären Sektor dominiert, mit 64,2% der aktiven Bevölkerung, die Industrie beschäftigt 18,7%, während die Dienstleistungen erst 17,1% der aktiven Bevölkerung im ländlichen Raum, eine nicht optimale Ausgangssituation für die Formulierung einer auf wirtschaftliche Diversifizierung orientierte ländlichen Entwicklungspolitik. Ein wichtiges Problem bleibt auch der geringe Beitrag der Landwirtschaft zum BIP, 12% im Jahr 2008 (Madr, 2008), was ein Hinweis auf die geringe Produktivität und ausgeprägte Subsistenzorientierung der Landwirtschaft ist.

Eine empirische Aufnahme der Soros-Stiftung Rumänien aus dem Jahre 2006 mit einer Stichprobe von 2016 Personen und einer Representativität für die erwachsene ländliche Bevölkerung Rumäniens mit einer Toleranz von 2,5% und ein Zuverlässigkeisniveau von 95% liefert einige interessante Aspekte über die Lebenssituation der ländlichen Bevölkerung.

Der größte Teil der Befragten (ugf. 75%) waren in unterschiedlichem Maß unzufrieden mit ihren Einkommen, aber die Situation war besser im Jahre 2006 als in den Aufnahmen, die vorher unternommen worden sind (in den Jahren 2002 und 1998). Folgende soziale Kategorien sind überdurchschnittlich zufrieden mit ihrer Lebenssituation: Personen mit höherem Bildungsniveau, Männer, Jungen, besser Verdienenden, Personen mit besseren Wohnbedingungen und Einwohner der Siedlungen, die in der Kontaktzone zwischen Gebirgen und Hügelgebieten lokalisiert sind. Gerade das letztere Aspekt ist sehr bedeutend und weist auf die starke territoriale Differenzierung der wirtschaftlichen Situation ländlicher Räumen. Nicht alle ländliche Räume sind in wirtschaftlichem Rückgang. Auch in Rumänien waren die peri-urbane ländliche Räume aus der Nähe von Bukarest und regionaler Stadtzentren (Cluj, Temeswar, Kronstadt usw.) attraktiv für die Migration von Bevölkerung und Wirtschaft (große Einkaufszentren aber auch Produktionsstätten). Eine relative wirtschaftliche Dynamik haben auch ländliche Räume mit wichtigen Naturressourcen für die Entwicklung einer lokalen Industrie: die Holzverarbeitung in der Gebirgszonen, die Nahrungsmittelindustrie, oder ländliche Räume mit guter Erreichbarkeit und billiger Arbeitskraft für die Textilindustrie in der westlichen Kreisen des Landes. Dieser sozial-wirtschaftlichen Vielfältigkeit wird in der rumänischen ländlichen Entwicklungspolitik keine Rechenschaft getragen.

Die Abbildung 1 zeigt dass das Niveau der Ruralität der Kreisen nicht in jedem Fall mit geringeren wirtschaftlichen Leistung in Verbindung steht. Im Falle des hoch urbanisierten Kreise Hunedoara ist der pro Kopf GDP kleiner als im benachbartem und gering urbanisiertem Kreis Gorj. Die geographische Lage der einzelnen Kreise sowie ihre Wirtschaftstruktur spielen ebenfalls eine wesentliche Rolle für die wirtschaftliche Leistung ihrer ländlichen Räumen.

Die Entwicklung des ländlichen Tourismus wird generell als versprechende Diversifizierungsstrategie vor allem für die Gebirgszonen betrachtet (Skuras et al., 2006). Die neuesten empirischen Studien über den ländlichen Tourismus in Rumänien klingen sehr optimistisch (Hall, 2004, Iorio und Corsale, 2010, Regoli, Vittuari und Segre, 2011), während Tätigkeiten wie Landwirtschaft und Forstwirtschaft weniger aus der Sicht der Diversifizierungstrategie untersucht werden. Trotzdem, sind in Rumänien die hohe Erwartungen gegenüber ländlichen Tourismus von den Realitäten nicht erfüllt worden. Die Einkommenswerte aus dem ländlichen Tourismus sind sehr gering, der ländliche Tourismus hat einen geringen Beitrag zum Haushaltsbudget (Benedek und Dezsi, 2001). Die kleine Gruppe von Haushalten mit größeren Einkommen aus ländlichen Tourismus haben ein hohes kulturellen Kapital, überdurchschnittliche Infrastrukturausstattung, eine gute Position innerhalb des örtlichen Tourismusnetz, gut ausgebaute Beziehungen mit ausländischen Touristen (eb.).

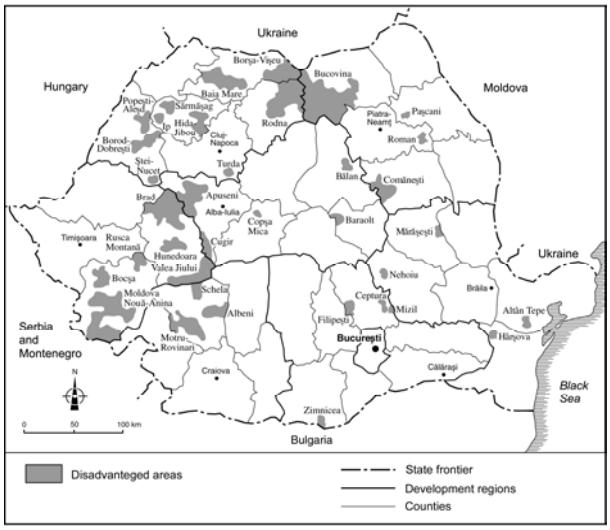
Ebenfalls kann für Rumänien festgestellt werden, dass der ländliche Tourismus keine Alternative zur wirtschaftlichen Diversifizierung des ländlichen Raumes bildet. Er ist eine auf kleinen Arealen charakteristische Tätigkeit: erst 40 Siedlungen aus den cca. 11 000 ländlichen Siedlungen Rumäniens konnten diese Tätigkeit erfolgreich entwickeln. Die Ergebnisse sind noch bescheidener auf der Ebene der Haushalten: 1400 Haushalten aus ungefär 2 Millionen ländlichen Haushalten Rumäniens betreiben ländlichen Tourismus, davon erst 140 sind als erfolgreich zu bezeichnen (eb.).

LÄNDLICHE ENTWICKLUNGSPOLITIK IN RUMÄNIEN

Unmittelbar nach der Wende war in Rumänien die Debatte um die Zukunft der wirtschaftlichen Entwicklung der ländlichen Räumen auf die Rolle der Landwirtschaft konzentriert. Mit dem Jahr 1955 wurde die EU Integrationsprozess eingeleitet, unter dessen Einfluss hat Rumänien eine endogene Entwicklungspolitik formuliert, die später, in den Vorbereitungsjahren vor dem EU Beitritt vom Jahr 2007 schrittweise europänisiert wurde. Es bedeutet, dass die nationale, sektoral ausgerichtete ländliche Entwicklungspolitik durch eine auf EU-Ebene bestimmte Entwicklungspolitik ersetzt wurde. Eine wichtige Rolle bei dieser Reorientierung spielte auch die Organisation für wirtschaftliche Zusammenarbeit und Entwicklung (OECD), die im Jahr 2006 das „New Rural Paradigm“ Bericht, wo der Paradigmenwechsel der ländlichen Entwicklungspolitik aus dem Zusammenspiel von der Faktoren erklärt wird (Ward und Brown, 2009): Konzentrierung auf die kulturellen – und Naturpotentiale, Druck für die Reform der Agrarpolitik und Entstehung einer Regionalpolitik. Daraus entwickelte sich auf eine auf

Raum- und Investitionen orientierte ländliche Entwicklungspolitik, die die alte, auf wirtschaftlichen Sektoren und Subvenzionen ausgerichtete ländliche Entwicklungspolitik in den OECD-Staaten erzetzt haben soll (eb.).

Eine der national bestimmten ländlichen Entwicklungspolitik vor dem EU Beitritt bildete die Strategie der „benachteiligten Zonen", die im Jahr 1998 gebildet wurden. Die „benachteiligten Zonen" waren Areale mit großer Arbeitslosigkeit und geringes Entwicklungsniveau der Kommunikationsinfrastruktur. Insgesamt sind 38 „benachteiligte Zonen" abgegrenzt und mit einer Reihe von unternehmenszentrierte, Steuer- und Taxenbegünstigungen unterstüzt (Benedek, 2004). Diese Zonen waren vom Bergbau und Landwirtschaft geprägt und konzentrierten sie in der Gebirgs- und Hügelzonen der Kreisen Gorj, Caraş-Severin, Hunedoara, Sălaj, Maramureş und Suceava (Abb. 6). Mit dem EU-Beitritt Rumäniens mussten auch die Steuerbegünstigungen aufgegeben werden, ein zentrales Element der Unterstützung dieser Zonen, und, als Folge, wurde diese Politik aufgegeben.



Quelle: Benedek (2004)

Abb. 6 Die „benachteiligten Zonen" in Rumänien

Eine weitere national bestimmte ländliche Entwicklungspolitik wurde von der „neuen Urbanisierung" vertreten. Sie wird durch die Erhebung von 46 ländlichen Siedlungen auf den administrativen Status von Stadt repräsentiert, die zwischen den Jahren 2001 und 2005 abgelaufen ist (Benedek, 2006). Das zugrunde dieser Entwicklungsstrategie liegende Idee war die öffentliche Dienstleistungen in ländlichen Räumen zu verbessern, wo Städte in einem Umkreis von 25-30 qkm fehlen (Benedek, 2004). Das Problem ist, dass der Wandel des administrativen Status wurde nicht von weiteren Maßnahem gefolgt. Das einzige Effekt dieser Strategie war das Anstiegen des Anteils der städtischen Bevölkerung Rumäniens mit 2,5%.

Nach dem EU-Beitritt wurden die in der Verordnung des Rates Nr. 1698/2005 formulierten Ziele über die Förderung der Entwicklung des ländlichen Raums (Steigerung der Wettbewerbsfähigkeit der Landwirtschaft und Forstwirtschaft, Verbesserung der Umwelt und der Landschaft und die Verbesserung der Lebensqualität und Förderung der Diversifizierung der Wirtschaft im ländlichen Raum) von Rumänien übernommen. Es wurde ein von der Europäischen Kommission zugestimmtes Nationales Programm für die Entwicklung des ländlichen Raumes 2007-2013 (NPELR) als Hauptmittel der Förderung der ländlichen Peripherien entwickelt (Madr, 2008). Eine Auswertung der Effekten dieser Entwicklungspolitik wird es erst nach 2013 möglich. In diesem Moment können wir erst festlegen, dass die Zielsetzungen dieses Dokumentes den europäischen Stand der Probleme reflektieren. Drei Hauptziele (Axen) wurden formuliert: Steigerung der Wettbewerbsfähigkeit landwirtschaftlicher- und forstwirtschaftlicher Produkten, das Management landwirtschaftlicher und forstwirtschaftlicher Flächen (pro Fläche Unterstützung von benachteiligten Gebieten aus der Gebirgszone und von der ökologischen Landwirtschaft), und die Verbesserung von Lebensqualität im ländlichen Raum. Wichtig ist die Einbeziehung der Forstwirtschaft als Adressat ländlicher Entwicklungspolitik, da sie über ein erhebliches Potential zur nachhaltigen Entwicklung hat, mit ugf. 25% Waldanteil an der Gesamtfläche Rumäniens. Zur ersten Zielgruppe gehört auch eine Subvenzionszahlung von 1500 Euro/Jahr für subsistenzorientierten Haushalten. Das letzte Ziel umfasst auch zwei Objektiven zur wirtschaftlichen Diversifizierung, wie die Unterstützung des ländlichen Tourismus und die Entwicklung nichtlandwirtschaftlicher Tätigkeiten. Ebenfalls zur letzten Zielgruppe gehört die Erneuerung von Dörfern sowie die Leader Initiative. In dieser Form integriert das NPLR die Perspektive der europäischen Entwicklungspolitik, die noch immer von der Landwirtschaft beherrscht wird (Keating and Stevenson, 2006). Die Maßnahme der Direktzahlungen an subsistenzorientierten Bauern ist ein Beispiel für die Durchsetzung dieser Perspektive, obwohl eine starke „farming lobby" in Rumänien nicht der Fall ist. Unter diesen Umständen wird in Rumänien die Frage nach der Artikulierung einer ländlichen Entwicklungspolitik ebenfalls „top-down" gestellt. Es heißt, dass im Zuge der fortschreitenden Europänisierung der rumänischen Entwicklungspolitik wird diese komplexe, transversale Politik mit Ausschließung anderer Möglichkeiten und mechanisch übernommen. Eine integrierte Entwicklung des ländlichen Raumes sollte mehreren, wirtschaftlichen und außerökonomischen Dimensionen (Bildung, Gesundheitsdienstleistungen, demographische Prozesse) erzielen. Giessen berichtet über teilweise erfolgreiche Umsetzung von Programmen der integrierten ländlichen Entwicklung in Deutschland (Giessen, 2010) und behauptet, dass eine starke Koalition aus Anhägern des Ansatzes notwendig sei um die starke Agrarinteressen entgegenleisten zu können. In Rumänien ist es noch zu früh um eine solche Konklusion zu ziehen.

Zu den oben erwähnten sektorübergreifenden Ansicht ist auch eine interessante Ergänzung von Caffyn und Dahlström (Caffyn und DahlstrÖm, 2005) erwähnenswert, die die

Notwendigkeit einer holistische Untersuchung von Stadt und Land behaupten. Die Anwendung einer holistischen Perspektive ist in Rumänien dadurch behindert, dass im Unterschied zu einigen westeuropäischen Ländern (z. B. in England), als Folge der geringen Suburbanisierung, zeigt in Rumänien die Beschäftigtenstruktur noch immer wesentliche Unterschiede zwischen Stadt und Land. Dementsprechend sind die Raumkategorien Stadt und Land funktional differenzierter. Eine integrierte ländliche Entwicklungspolitik in Rumänien sollte auch die dynamische Dimension der Stadt-Land Verflechtungen integrieren. Obwohl eine Reihe von Ereignissen und Dokumenten der EU die zunehmende Rolle der Untersuchung von Stadt – Landbeziehungen betonen, davon ist es kaum bis wenig in den maßgebenden entwicklungspolitischen Dokumenten Rumäniens durchgesetzt. Zwar wird es im Nationalen Raumordnungsplan Rumäniens den Klein- und Mittelstädten eine Rolle als Dienstleistung- und Industriezentren zugeteilt, aber es wird nicht als Gegenstand räumlicher Entwicklungspolitik unmittelbar unterstützt.

Wie Giessen betont, „der regionsorientierte Ansatz der integrierten ländlichen Forschung trägt der Tatsache Rechnung, dass manche Entwicklungspotentiale erst dann nutzbar gemacht werden können, wenn Räume nicht (nur) in ihrer administrativen Form betrachtet werden, sondern sich Regionen entlang innovativer Kriterien entwickeln." (Giessen, 2010, S. 6). Als solche Kriterien könnten die Arbeitsmarktbeziehungen oder die wirtschaftliche Verflechtungen zwischen ländlichen und städtischen Siedlungen fungieren. In dieser Hinsicht bildet erneut der Nationale Raumordungsplan die Basis (Benedek, 2004). Hier werden die Grundlagen für die Bildung von Partnerschaften zwischen regionalen Stadtzentren und der umliegenden ländlichen Räumen (Metropolregionen) formuliert. Weil keine verbindliche Übertragungsnotwendigkeit von raumordnerischen Objektiven in entwicklungspolitischen Dokumenten (wie das NPELR) gibt, bleibt auch dieses Element ausgeschlossen. Der Ansatz wird auch als City-Region Modell kennzeichnet und ist stark in strategischen europäischen Dokumenten reflektiert, wie das Europäische Raumentwicklungskonzept. In diesem neuen räumlichen Kontext können die Wechselbeziehungen und Komplementarität zwischen Städten und ländlichen Siedlungen angemessener in der Planung und Entwicklung des Arbeitsmarktes, der Housing sowie der Dienstleistungen berücksichtigt werden.

Ein anderes Aspekt, wenig bis kaum berücksichtigt in der gegenwärtigen ländliche Entwicklungspolitik, ist die starke Differenziertheit des ländlichen Raumes. Die Situation der suburbanen ländlichen Räumen unterscheidet stark in demographischer, sozialen wie auch wirtschaftlichen Hinsicht von der Situation der peripheren, von großen städtischen Agglomerationen weit entfernten ländlichen Räumen. Daher die Notwendigkeit einer differenzierter ländlichen Entwicklungspolitik.

SCHLUSSFOLGERUNGEN

Als Konklusion kann festgestellt werden, dass in Rumänien die Landwirtschaft noch immer eine wichtige Säule der Wirtschaft ländlicher Räume bildet. Deswegen hängt die Entwicklung ländlicher Räume in größerem Masse als in der Mehrheit der EU-Länder von der Landwirtschaft ab. Aus diesem Grund blieb nach der Wende die Entwicklungspolitik der ländlichen Räume auf die Landwirtschaft und Landreform konzentriert. Daraus resultiert, dass die Entwicklungsstrategien der ländlichen Räume sich auf sektoral orientierten und in engen räumlichen Kategorien (Stadt und Land) eingeteilten Sachverhalte ausgerichtet war. Allerdings konnte sie die Entstehung und Fortsetzung einer vorwiegend subsistenzorientierten Landwirtschaft und die Steigerung des Armuts der ländlichen Bevölkerung nicht verhindern (Laney, 2006).

Diese Tatsache schließt nicht die Möglichkeit aus, an die Erweiterung des Konzeptes der ländlichen Entwicklungspolitik über die Landwirtschaft heraus zu schieben. In diesem entwicklungspolitischen Rahmen konnten wichtige, von der allgemeinen wirtschaftlichen Reform ausgelösten Prozessen im ländlichen Raum wenig berücksichtigt werden: die Desindustrialisierung, Desurbanisierung, Stadt-Land Wanderung und internationale Wanderung. Hinzu kommt noch die Tatsache, dass unterschiedlichen Inwertsetzungen von ländlichen Räume nur in stadtbezogener räumlichen Kontexten effektiv sind. Alternative Funktionen zur Landwirtschaft, wie die Energiegewinnung, der Tourismus, die Erholung, der Naturschutz, das Wohnen, die Kulturlandschaftpflege sind in erheblichem Masse von in Städten konzentrierten Nachfrage und Investitionen abhängig. Diese Alternativen sind in der gegenwärtigen ländlichen Entwicklungspolitik zwar als Entwicklungsobjektive anwesend, eine offene Frage bleibt wie sie konkret in die Praxis umgesetzt werden können.

Eine weitere Zukunftsfrage ist, ob in Rumänien, als Folge der Gemeinschaftlichen Agrarpolitik, eine Verlagerung von einer produktivistischen- zu einer post-produktivistischen ländlichen Raum stattfinden wird, wie z.B. für England berichtet wird? (Halfacree, 2007). Die demographischen und wirtschaftlichen Prozessen im ländlichen Raum unterstützen die Idee einer solche Entwicklung in Rumänien kaum. Die ländliche Räume in Rumänien sind zwar durch einen starken wirtschaftlichen Wandel nach 1989 kennzeichnet: in den letzten zwanzig Jahren ist der Anteil der Erwerbstätigen in der Landwirtschaft zurückgegangen und die Einkommensquellen sind weniger von der Landwirtschaft abhängig geworden. Allerdings waren die oben erwähnten Änderungen nicht so intensiv, dass man überradikal veränderten Verhältnissen der ländlichen Entwicklung sprechen könne.

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