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Regional Innovation System in West Transdanubia

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1 Introduction

Responding flexibly to the permanently changing external circumstances and a constant ability for renewal are of an utmost importance in our world having accelerated and globalised during the past decades. This is true not only in the context of individuals, entrepreneurs or large multinational firms but also applies to settlements, urban areas or larger spatial units. Developments responding not only to external processes but at the same time actively shaping them somehow by triggering technological and organisational changes as well as by creating new products or services may even be of higher importance. All these abilities influencing competitiveness in unanimously a positive way and the activities behind them are generally labelled by the term innovativeness or innovation. By today it have become common that activities being in relevance somehow to the innovation of firms and their supporting systems (such as infrastructure, institutional network and policy) with the interrelationship of various actors (e.g. SME, big firms, universities, research institutes, intermediary organisations etc.) are embedded into a specific regional dimension which serves as a basis of a certain regional innovation system. This regional innovation system can simultaneously increase the competitiveness of the region's businesses and of the overall region as well.

Our paper is aimed at revealing and presenting the innovation processes in Hungary's West Transdanubian region. Our research was based on the detailed surveys carried out within the project 'The Foundation and Operation of Pannon Novum West Pannon Regional Innovation Agency (WPRIA)[1] 'and its results have been published in the earlier papers of WPRIA in Hungarian language (Innováció a Nyugat-Dunántúlon, 2006, 2007, 2008; *Csizmadia–Grosz*, 2008). Besides the results of these surveys we used several professional papers and publications having been prepared during the last few years on the development of the region's economy, innovation and development policy (EDOP, 2007, *Grosz* 2007, 2008; *Grosz–Rechnitzer* 2005; *Grosz–Smahó* 2007; ROP, 2007). Our research is aimed at presenting an overview on all the major dimensions of regional innovation policy. Its major segments are covering in totality the region's innovation environment and processes ranging from regional level campaigns affecting them, through the activity of entrepreneurs until innovation services and the systems of regional innovation. Our paper is going to analyse the major issues of regional innovation as follows: a) the region's location, information on general socio-economic trends with special regard to the prominent role of innovation policy and its network instruments; b) analysing the region's innovation and research-develop-

[1] Funding organisation: Hungarian National Office for Research and Technology, Budapest: Baross Gábor Programme, 2004–2007. Project leader: Dániel Magyar, West Pannon Regional Development Agency.

ment potential (based mostly on secondary data); c) mapping the innovation activities of the region's business organisations (by a representative survey investigating the types, the key areas and the driving forces of innovation with the major cooperation partners); d) the innovation service demands of business enterprises (the palette of innovation services used in the past few years and the expected demands in future); e) mapping the supply side of innovation services (the actors' objectives, their target groups, services, parallel services, missing services); and f) a complex evaluation on the region's innovation system and outlining an ideal system of regional innovation (actors' roles, relations and institutional system).

All in one this paper's primary intention is providing a synthesis on the practical experiences, results and inter-connections based on the three year period of research and on the ten year experiences gained in innovation policy as well as presenting and highlighting how an empirical 'screening' of a regional innovation system may contribute to turn planning and development processes into success stories.

Before going into the details of the innovation activities of the region's businesses and introducing its regional innovation system it would be useful by all means to provide some background information on the area's socio-economic processes and on the major features of innovation environment.

2 The West Transdanubian Region

Hungary is an over-centralised state with Budapest, the capital, functioning not only as a political but also as an economic, transport, educational, scientific and cultural centre. By the NUTS 3 territorial level Hungary is divided into 19 counties and Budapest, which theoretically fits into the EU's traditional sub-national administrative system but their licenses and competences are strongly limited especially in the fields of research, technology development and innovation. Moreover counties are too small for serving as a catalyst for regional development. Therefore it is the NUTS 2 planning-statistical regions to serve as the main arenas of regional development policy.

The West Transdanubian region is one of Hungary's seven planning-statistical regions which although have no autonomy in self-government, i.e. no elected board, parliament or governance and regional development councils, having been established in 1997 and re-organised in 1999 functioning as decision-making boards of delegated representatives through regional development agencies as the councils' operative organisations, are turning to be an increasingly important territorial actors of regional development policy even if their authority scope and financial resources are strongly limited.

West Pannon Regional Development Council (WPRDC)[2] was established by the Act on Regional Development and Physical Planning in 1997. The Council's membership consists of the representative of counties, of cities with county rank, microregions, and ministries. Its major tasks are running and management of a competition system for decentralised funds, preparing regional plans and programmes, and coordinating economic development on regional level. West Pannon Regional Development Agency (WPRDA) is an organisation being in the 100% proprietary ratio of WPRDC, playing a role in formulating the future image of West Transdanubia, being responsible for the realisation of regional development programme, performing the tasks relevant to the responsibilities of WPRDC, promoting and facilitating the flow of information relevant to the region's development, fostering local and micro regional initiatives and organisations and organising and coordinating conferences, discourses and practical training courses. During its activities the Agency built a wide-scaled cooperation relation system with regional, governmental and international organisations.

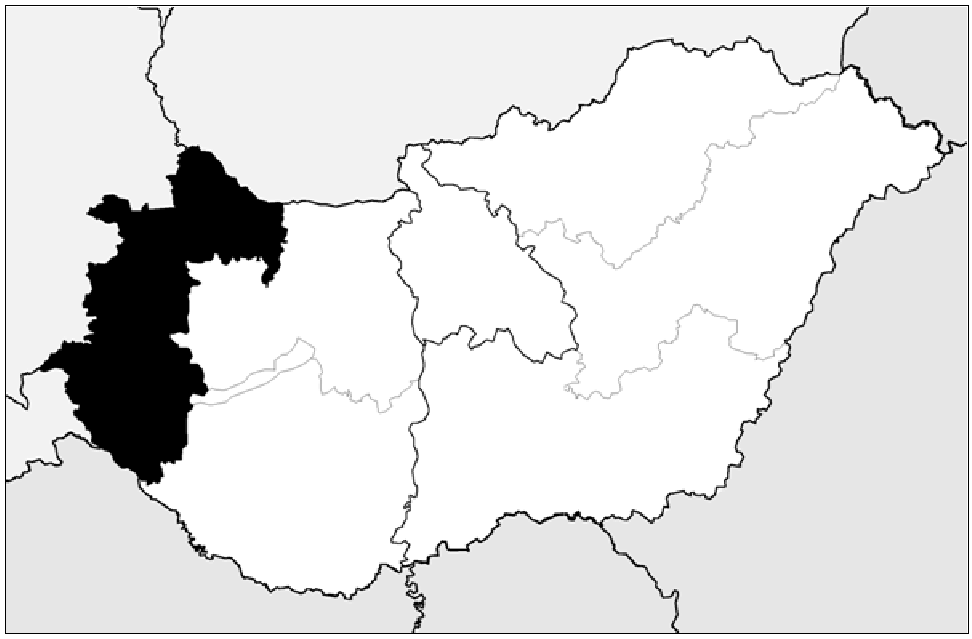
The West Transdanubian region on Hungary's western part comprises three counties (Győr-Moson-Sopron, Vas and Zala, see *Figure 1*) on a territory of more than 11,000 km^2 with one million inhabitants. The region has no official seat but there are five cities with county rank on its territory (Győr, Sopron, Szombathely, Zalaegerszeg, Nagykanizsa) with 50–130 thousand inhabitants each; the network of these five cities is serving as a basis for spatial development. However economic development is concentrated rather into the region's northern half, namely into Győr-Moson-Sopron County, especially into Győr and its vicinity with 130 thousand inhabitants. Despite a moderate inflow the region's population number is slowly decreasing.

West Transdanubia is often referred to as Hungary's gateway to West Europe. It is located at the meeting point of five countries and has a common border with Slovakia, Austria, Slovenia and Croatia. Sixty percent of Hungary's foreign trade flows through the West Transdanubian Region which is a proof for the region's very significant role in transit traffic. The western borders, the region's proximity to the countries of West Europe and to the West European economy are all very important factors from the point of economic development processes and naturally from the point of corporate and regional level innovation as well. For companies and other organisations this specific endowment of the region offers a wide scale of opportunities for international cooperation which may further increase the region's innovative potential.

[2] Although the region's official name is West Transdanubia, the majority of regional organisations prefer using Pannonia in their English or sometimes in their Hungarian names instead of Transdanubia. Pannonia was the original Latin name of West Hungary in the age of the Romans.

Figure 1

Planning and Statistical Regions in Hungary and West Transdanubia



Source: Own elaboration based on Eurostat.

In the socialist era West Transdanubia was not a heavily industrialized region so it was less dramatically hit by the crisis generated by the general recession of the industrial sector and by the rising unemployment than Hungary's other regions. Nevertheless West Transdanubia also had some key industrial sectors in the past which had to be renewed after the 1989 change of regime (e.g. mechanical engineering, textile and food industries). In the past 15 years West Transdanubia turned into Hungary's most dynamically developing region thanks mostly to foreign direct investments (FDI) – from Germany and Austria the neighbour state. In 2005 the region's per capita GDP PPS reached 63,7% of the average of the EU 27 countries. The majority of businesses settled down here are involved in motor-vehicle and electronic industries and have significant export activities. The quick economic restructuring process in the region had created a strong export oriented economic structure generating a quick and dynamic growth in the economy of West Transdanubia. There was a rapid increase in the number of businesses generating a permanent growth in the number of jobs, while unemployment rate dropped to a very low level in comparison to other Hungarian regions and new industrial sectors emerged beside the existing ones. However even in the late

1990s there were some phenomena questioning the long-term sustainability of this dynamic economic growth.

The resources of the policy of attracting and settling down new firms to serve as a basis for maintaining supply oriented industry and services (such as cheap trained labour, manufacturing costs advantages, financial support, tax redemptions etc.) are gradually running out in the region. The majority of the existing export oriented sectors is generally made up of assembling industries and hired work needing imported input in a high ratio with less qualified labour and producing low added value. In the early 2000s some sectors producing low added value already suffered from negative investment which in the future may raise serious employment problems in some micro regions. From the point of long-term dynamic development the low interoperability of enterprises, the scarcity of common projects and the extremely low intensity of interrelations between economic, higher education and research sectors are raising another problem situation. R&D capacities in higher education, research and corporate sectors alike are lagging far behind the region's overall economic performance.

The gradually exhausting predominantly extensive development factors of the region's economic structure will increase the role and importance of SMEs with high added value economies demanding knowledge-based and intensive intelligence based industries. Besides restructuring and reorganisation economic and regional development policies should be targeted at such key issues as intensive factor based development and services to be delivered by new institutions and organisations of fostering innovation and permanent reforms. Some industrial sectors now seriously think in demand side ruled cluster oriented development.

3 Regional innovation policy and networking tools

Due to recognizing the above-listed trends not only direct and indirect services assisting to entrepreneurial activities but also a growing number of advanced business and innovation-oriented services with technological services emerged in some industrial parks of West Transdanubia (Győr, Szombathely, Sopron) since the late 1990s.

West Transdanubia was among the first regions of Hungary where in 2000 on the grounds of international experiences a regional innovation strategy was prepared for improving the regional innovation system of West Transdanubia (RIS, 2001). The strategy was aimed at setting up a medium-term (10-year) priority system to serve as a guideline for the preparation and efficient management of a new regional innovation system and network. This strategy was based on three major objectives: 1) Creating the missing institutions for the existing innovation

system and improving the existing ones as well as integrating them into a network; 2) increasing the innovativeness of businesses by organising programmes and a competition system for fostering innovation; 3) providing an extra support for activities generating knowledge-based and value added products as an output. To achieve these targets four intertwined priorities were set up (*Table 1*).

The region can improve its productivity and regional competitiveness by renewing and increasing its innovation capacities which will definitely serve for increasing the living standards of local inhabitants. The coordinator of the first phase of the implementation of the innovation strategy was WPRDC with WPRDA as its background organisation. As a result of implementing this strategy and of giving a greater preference to decentralisation in the government's central innovation policy in the end of year 2004 WPRDA with four other regional actors founded the Pannon Novum West Pannon Regional Innovation Agency (WPRIA) and in the first half of 2005 with further co-founders the West Pannon Regional Innovation Council was founded (WPRIC).

Table 1

The Priority Structure of the RIS for West Transdanubia

Priorities	Measures
1 The improvement of the region's innovation environment	1.1 Innovation award and premises marketing 1.2 Promotion of best practice 1.3 Interregional co-operation
2 The development of the knowledge base and stimulation of knowledge diffusion	2.1 Support research and development, and innovation projects 2.2 Promotion and support of innovation oriented trainings 2.3 Innovation networks, clusters and development co-operations
3 The development of innovation infrastructure	3.1 Support the purchase of research and development instruments 3.2 Innovation centres and research centre co-operation network 3.3 Network development of innovation experts and consultants
4 Financing innovation.	4.1 Foundation of the regional innovation funds 4.2 Tender preferences

Source: RIS for West Transdanubia, 2001.

Although very limited resources were available for the funding of the Innovation Agency until 2005, the year of accommodating the regionally decentralized part of Innovation Fund[3] into the system, several successful initiatives fitting pretty well into the regional innovation strategy were launched during the past few years. New innovation, technology and competence centres built up, new cooperation research and university knowledge centres created, new regional cluster organisations and a special economic initiative launched and the annual awarding of regional innovation prizes founded are all just examples for that.

The approved in 2001 regional innovation strategy was followed by the region's Technology Foresight Programme (*TEP*, 2004) in year 2004 which was the first one in this category. This programme highlights some key sectors in the region's economic structure having long-term and fundamental impacts on the region's socio-economic development. They are as follows: 1) automotive industry, electronic industry and their servicing sub-contractor background industries; 2) tourism, especially thermal tourism and a wide scale of services associated with a healthy style of life and health care; 3) environmental technologies, environmental resources and their background industries; 4) knowledge industry – now only in the phase of a new candidate sector which can completely be based upon the region's universities. The regional innovation strategy built on the results of the Regional Foresight approved three vertical and three horizontal sectors as key areas in further development projects. This means that automotive industry having the deepest impact on the region's economy will still enjoy priority in development planning as well as wood and furniture industry as a sector of local importance. These sectors are accompanied by fostering information and communication technologies, environmental industries with special regard to renewable energy resources and a knowledge industry based higher education system.

In Hungary perhaps the West Transdanubian region is the most active and maybe the most successful one regarding its past activities in the field of cluster-oriented or cluster-based economic development. In the region's key sectors different cluster initiatives have been launched since 2000. These initiatives in the majority of cases are fostering clusterization processes within a certain sector by performing and providing tasks, services and functions having missed so far in the region.

Their majority are fostering cooperation as well as information and knowledge exchange between the business and non-profit sector (higher education, research & development, special services and infrastructure). Clusters are capa-

[3] The Hungarian Parliament by passing the 2003 XC Act has introduced a new financial instrument under the name of 'Research and Technology Innovation Fund' for a better and more reliable funding of R&D and of new knowledge as its product. It serves also for fostering social interests relevant with them. Innovation Fund is a short name of 'Research & Technology Innovation Fund'.

ble for identifying the major areas of development, for mobilising the relevant enterprises, for formulating their own ideas and strategies and articulating them towards political decision-makers and the relevant development actors and agents. Cluster organisations are actively improving the region's innovative milieu by fostering cooperation among cluster members and by facilitating the spread of best practices (*Grosz*, 2006).

Between 2000 and 2005 five cluster initiatives were launched in the region but two of them proved not to be real success stories. On the basis of sector analyses and past experiences further clusters were founded at the end of year 2005. Today eight clusters are operating in the region and some of them look back to 1-3 years of experiences only. The founded regional clusters received significant financial support from the region's very strictly limited funds. In West Transdanubia all clusters have been founded as a result of bottom-up initiatives. These eight clusters are as follows:

- Pannon Automotive Cluster (PANAC), 2000
- Pannon Wood and Furniture Cluster (PANFA), 2001
- Pannon Thermal Cluster (PANTERM), 2001
- Pannon Logistic Cluster (PANLOG), 2005
- Pannon Textile Cluster (PANTEX), 2005
- Pannon Local Product Cluster, 2005
- Pannon Mechatronics Cluster (PANEL), 2006
- Pannon Renewable Energy Cluster, 2006
- Pannon IT Cluster (under organization)

In 2001 for creating an attractive and innovative economic environment, for strengthening internal economic cohesion, for improving innovative skills and for improving the quality and competitiveness of economic networks and clusters the Pannon Business Initiative (PBI) was founded. PBI was launched as a kind of network linking together the region's other institutions and organisations concerned in economic development, business promotion and regional development. The management tasks of the initiative were undertaken by WPRDA (*Pannon Business Initiative*, 2006).

In 2006 the five working cluster organisations founded the Pannon Business Network (PBN) then the region's all the 24 industrial parks joined this network. PBN is responsible for taking part in the improvement of the professional skills of the region's labour force and in improving the competitiveness of regional business organisations. The Network's major objective is integrating all the firm groups representing the region into a united corporate network which proves to be successful and truly represents the region's major economic sectors, the regional distribution of firms and the scaling of companies as well. Industrial parks are

capable for representing all the multinational firms that are present within the region (*Pannon Business Network,* 2007).

In the West Transdanubian Region the relationship between clusters and innovation can mostly be identified by examining the working cluster organisations' role in creating the missing elements and in improving the interrelationship between the existing elements of clusters. Through their past activities, professional and sectoral competences clusters have already contributed to the filling in the missing elements of the regional innovation system and since the foundation of WPRDA they are continuing this job as its strategic partners. Through their members and their associated professional organisations, institutions, associations etc. they get sufficient information on the special needs and demands their key industrial sectors are concerned. They are capable for communicating and articulating their special development issues towards development actors as well as for activating and mobilizing their business partners to achieve success in their programmes. Moreover these cluster organizations are definitely promoting the improvement of the region's innovative milieu as one of their major tasks is improving cooperation within the region by facilitating the diffusion of best practices among members. The participation of clusters on international fairs, events and displays is another way of fostering the region's common site marketing.

The new R&D infrastructures serving for the cooperation between the university and business sector having been built during the past few years and concentrating on networking process are also bound to clusterization. Therefore the automotive industry oriented Automotive, Electronic and Logistic Cooperation Research Centre (SZE KKK) founded by the leadership of Széchenyi István University as well as the Regional University Knowledge Centre for Vehicle Industry (SZE JRET) are just examples for that. SZE KKK and SZE JRET projects may both encourage in medium-term the foundation of a scientific research centre of motor vehicle industry which through its comparative research network may function as a centre for car industry and motor vehicle manufacturing not only for Győr and the North-Transdanubian region but also for Slovakia's fast developing automotive sector. The Regional University Knowledge Centre of Forest and Wood Utilization (NYME ERFARET) founded by the University of West Hungary and the Environment Resource Management and Protection Cooperation Research Centre (NYME KKK) at the same university (both of the centres located in Sopron) through their activities are closely bound to wood and furniture industry.

To sum it up the foreign direct investments of the past 13 years introduced new technologies and new methods of management for the region. They increased the professional knowledge of local labour force which expanded the region's innovative capacities. Thus, the region – unlike Hungary's other territories became capable for adopting new organizational models, techniques and development instruments at a greater speed and efficiency. Industrial parks, innovation

centres and incubator houses were built for fostering development and for facilitating innovation, the foundation of new firms and the activities of SMEs, new networks and cluster organizations were established for fostering and intensifying cooperation. Nevertheless, there is a great shortage in the know of networking and management which could just provide a great help towards the successful implementation of these strategies.

4 The region's R&D and innovation potentials

The capability of a regional economy for a constant renewal or in other words a region's innovativeness is one of the key factors of its durable competitiveness. Although the meaning of the term innovation is by far wider than of R&D as it can be affected by several other factors, yet the R&D activities preceding innovation are still play an important role in it. In the following part of our paper we are going to present the changes having undergone in the major indicators of the West Transdanubian Region's R&D activities with special regard of the following items: the number of the region's R&D sites, the number of employees on R&D sites, the number of R&D themes investigated by R&D sites and the amount of R&D spending.

If we take only the secondary data of R&D into account (sums of R&D spending, the number of employees in the R&D sector, the number of research units, research themes and tasks, the number of employees with scientific degree) we must notice that the West Transdanubian Region's weight regarding R&D potentials is by far lagging behind the region's economic weight or even behind its population share of the total national population. Nevertheless, since the mid–1990s several positive processes have been going on in the region and in almost all segments of socio-economic development West Transdanubia shows the most remarkable progress of development.

As regards the performance of the R&D sector – mostly because of the extremely low base values and of some other factors making the situation more complicated (the structure of the economy, the scarcity of business-oriented activities or the absence of researcher universities) the majority of indicators are still below the average of the Hungarian provincial regions (we excluded Budapest from the calculation of average). Due to its high spatial concentration of scientific sector Central Hungary's share from total R&D indicators is over 50%.

Although the number of research units has doubled in the region during the past 10 year period the region's percentage from the national average of R&D indicators – excluding a few greater extreme values in some years – has remained the same in fact. It was 7.5% both in year 1996 and 2006. As regards the number of research units a very balanced growth can be observed during the past 10 years.

Almost in all regions the number of research units increased by the same percentage (75-95%) which has stabilized the former spatial differences. It was only Central Transdanubia that produced a significantly higher growth (190%) but even this was sufficient for taking the last but one position among the Hungarian regions. Regarding the absolute figures West Transdanubia could precede North-Hungary and Central Transdanubia only, while comparing the same values to the number of inhabitants the situation slightly improved as the West-Hungarian values of the R&D sector have preceded the values of North Great Plain.

By examining the number of research themes and research tasks we get a better impression on the ongoing processes as the 190 themes per 1,000 inhabitants value in 2006 is the second best after the Central Hungary. Regarding the history of the past 10 years it seems obvious that while these values increased by 55 per cent on national level, this region produced a 137 per cent growth regarding the number of R&D themes and tasks which is the highest increase rate all over Hungary.

Although the spatial differences of R&D within the region have decreased during the past few years but they are still high even now. Győr-Moson-Sopron County's share from the spatial distribution of research units decreased to 60% and regarding research themes and research tasks this share dropped to 61% in 2006 from 75% in 1996. The spatial concentration of R&D within the region is still too high anyway. The most important hosting organizations of research units are still the local institutes of higher education especially the two university centres of Győr-Moson-Sopron County (University of West Hungary and Széchenyi István University) which with their strengthening KKKs and RETs are further increasing their importance on the expense of others. Academic research institutes especially in the field of technical sciences have marginal role here only and the number of industrial research units is also low even though the number of multinational firms and local SMEs recognizing the high importance of R&D is increasing now.

During the past 10 years the West Transdanubian Region was capable for increasing the number of its R&D employees in the highest rate. This increase rate was triple of the national average. Its 3.5% percentage from the total national value in 1996 increasing to 5.2% by year 2006 is strongly correlating with this fact but it is still heavily lagging behind both by its population based regional weight and by its earlier R&D indicators not to mention the region's own economic potentials. Despite this growth even the figure of 2,625 employees working in the R&D sector could grant only the 6th position by preceding the North Hungary only among the Hungarian regions and regarding the number of inhabitants West Transdanubia preceded only one more, the Central Transdanubian Region. The situation is just the same when we compare not the absolute figure of R&D employees but only the number of researchers and development experts (*Table 2*). By looking at the data in a 10 year perspective we can notice that Central Transdanubia starting from a very low position was able to supersede the region's aver-

age growth rate. Although West Transdanubia's share from the total national value increased from 4% in 1996 to 5.5% by 2006 of which more than 0.5% is the result of the past two years the region – just as in case of regional R&D employment data is still taking the 6th (or by the number of inhabitants the 5th) position among Hungarian regions. The spatial breakdown of employees working in the R&D sector within the region is obviously correlating with the pattern of the spatial concentration of research units and research themes. Győr-Sopron-Moson County's values are the highest regarding all the two indicators.

Table 2

Development of the Number of Researchers and Developers

	Share from national, %				Number of researchers and developers per 100 thousand inhabitants			
	1996	2000	2004	2006	1996	2000	2004	2006
Győr-Moson-Sopron County	2.9	4.0	3.3	3.7	141.5	259.3	230.6	275.4
Vas County	0.9	0.9	1.1	1.3	65.8	97.0	125.4	157.7
Zala County	0.2	0.1	0.5	0.5	16.7	10.0	50.9	55.1
West Transdanubia	4.0	5.1	4.9	5.5	83.4	141.2	149.5	179.5
Central Hungary	59.4	60.6	57.6	57.9	429.8	596.9	619.7	664.9
Central Transdanubia	3.5	5.2	5.6	5.6	65.7	128.2	153.8	166.9
South Transdanubia	6.8	6.6	7.9	7.5	143.1	184.8	244.5	254.7
North Hungary	5.6	4.6	5.2	4.9	89.9	98.3	122.7	127.9
North Great Plain	10.6	8.9	9.4	9.1	143.8	158.7	185.7	193.6
South Great Plain	10.2	9.0	9.3	9.5	155.8	182.3	207.6	230.2
Hungary	100.0	100.0	100.0	100.0	205.0	273.3	300.7	325.4

Source: Own elaboration based data from Hungarian Central Statistical Office.

Comparing the number of researchers and development experts to the total number of employees working in the R&D sector we can observe that their 68.4% ratio in West Transdanubia is the highest of all preceding the values of all the other Hungarian regions even Central Transdanubia the number one in all region. The picture is even more interesting if we compare the employees working in R&D sector per research unit values. In the West Transdanubian Region the number of research units and of employees working in the R&D sector increased by the same rate, therefore no significant changes have occurred, the average 12–13 persons per research unit has been maintained. However in other regions this value decreased significantly leading us to the conclusion that the increase of research units was much higher than of R&D employees. The earlier values of 20–25

persons per research unit dropped to 14–18 everywhere, while in the Central Hungary the earlier 30.5 person per research unit value dropped to 21.1 by year 2006 which is a sign of fragmented R&D capacities. The changes in the per research unit number of researchers and development experts are clearly reflecting this process. Although the region's 8.5 value is the lowest in Hungary a spatial equalisation tendency can be observed in the period of the last 10 years as West Transdanubia was the only region where this 8.5 value was a result of an increase from the earlier value of 7.6 in all the other regions a declining tendency can be seen. There the 11–12 persons per research unit values in 1996 dropped to 9–10 by 2006.

The number of researchers with scientific degree also dynamically increased during the past 10 years as the number of scientists with CSc and PhD degree nearly reached 550. This is quadruple of the value in 1996. The number of researchers with MSc degree is also fairly high as it has doubled during the past 10 years and by 2006 the region's R&D activities were strengthened by 80 'academic doctors'. The intensity of growth was the highest in both fields here in the West Transdanubian Region but nevertheless the region's share – 5.2% (CSc and PhD) and 4.2% (DSc) – from the total figure is still low, even lower than the share of employment in R&D sector. With these values the West Transdanubian Region takes the 6th position among Hungarian regions. The analysis of the percentage of researchers with scientific or academic doctor degree in the total umber of inhabitants will give a better result as in this case West Transdanubia is taking the 5th position by preceding Central Transdanubia and North Hungary but still cannot compete with regions having long-time traditions in higher education and big university campuses. The presence of universities greatly influencing the number researchers with scientific degree is well reflected by the region's internal heterogeneity as well. The values of Győr-Moson-Sopron County are more than double of Vas County and 4–5 times higher of Zala County having the weakest institutional system of higher education within the region. Moreover intraregional differences further increased during the past few years.

The competitiveness and fundraising abilities of the higher educational and research centres of Budapest, East Hungary and South-Transdanubia (primarily Debrecen, Szeged and Pécs) are much better now than of the West Transdanubian Region. Regarding these indicators the share of Budapest and Pest County is even higher reaching nearly the value of 70%. Furthermore, after a 4–5 year period of decline the weight and importance of the agglomeration zone of Budapest is now increasing again. In case of R&D expenditures excluding R&D investments the situation is slightly better but the concentration of R&D investments here is exceeding the ratio of 76%. On the grounds of this it is not surprising that the share of some provincial regions from R&D investments is extremely low which problem is much more serious in West Transdanubia region suffering from the scarcity of R&D capacities.

Regarding R&D indicators West Transdanubia usually takes the 5-6th position among Hungarian regions and a significant improvement of this position is unlikely in the near future though due to some national programmes the region's higher educational system is undergoing profound changes just to mention KKK and RET developments as examples. In the West Transdanubian Region the total amount of R&D funds exceeded the sum of 9.3 billion HUF of which 12.5% a lower rate than the national average was allocated for R&D investments and 8.5 billion HUF was spent for financing the running costs of R&D activities (*Table 3*). In the past 10 years it was the activation of the corporate sector that increased the ratio of R&D investments to 19–20% in West Transdanubia and Central Transdanubia. The per capita values of R&D expenditures are neither better. In the region the spatial concentration of R&D expenditures is even higher than of other R&D indicators (the per capita value of R&D expenditures in Győr-Sopron-Moson County is double of the other two counties' indicators. The new infra-structures attached to universities (KKKs and RETs) will probably further in-crease the present differences.

Table 3

Development of Expenditures of Research and Development Places

	Share from national, %				Expenditures of R&D places per researchers, 1000 HUF			
	1996	2000	2004	2006	1996	2000	2004	2006
Győr-Moson-Sopron County	2.6	2.4	3.7	3.1	7.24	8.92	25.40	23.60
Vas County	0.3	0.3	0.4	0.7	2.4	5.36	8.20	14.68
Zala County	0.1	0.1	0.6	0.3	1.84	11.20	29.12	18.00
West Transdanubia	2.9	2.8	4.8	4.0	5.88	8.32	21.92	21.00
Central Hungary	68.9	70.3	67.5	69.9	9.48	17.32	26.60	34.36
Central Transdanubia	5.7	5.0	6.3	4.9	13.2	14.56	25.28	24.52
South Transdanubia	3.1	3.8	3.3	3.0	3.68	8.48	9.60	11.20
North Hungary	3.0	2.4	2.7	3.2	4.36	7.80	12.04	18.24
North Great Plain	7.2	7.8	8.5	7.8	5.56	13.12	20.56	24.40
South Great Plain	9.3	7.9	6.9	7.3	7.48	13.04	16.84	21.84
Hungary	100.0	100.0	100.0	100.0	8.16	14.96	25.40	28.44

Source: Own elaboration based data from Hungarian Central Statistical Office.

To sum it up, it can be stated that the West Transdanubia's share and R&D potentials are lagging behind the share of the region's economic performance or even behind the region's population share from Hungary's total figures. Although since the mid–1990s very positive processes are undergoing in the region and

West Transdanubia showed the most dynamic progress in almost all segments during the past ten years its R&D performance indicators are still lagging behind the average of the Hungarian regions (excluding Budapest). The competitiveness and fundraising capabilities of the strong higher educational and research centres of Budapest, East Hungary or even South Transdanubia today is still stronger than of West Transdanubia. West Transdanubia regarding R&D indicators in most cases takes the 5–6th position among Hungarian regions and a significant improvement in this position is unlikely in the near future.

It is well-known that the Lisbon Objectives have set up increasing significantly the sum of R&D expenditures by year 2010 to reach at least 3% of the national GDP as a key objective for maintaining the competitiveness of the European economy on the global arena. During the past few years this indicator was just a little bit over 1% in Hungary and 0.3% in West Transdanubia. All these figures are verifying the need for a more intensive development both on national level and principally in our own region for closing up to the economically advanced regions. The most recent data of EIS (*European Innovation Scoreboard 2006*) show that West Transdanubia is now in a less handicapped situation in comparison to Hungary's other regions as its 0.25 per cent value is significantly exceeded by Central Hungary and Central Transdanubia only. But comparisons with the EU averages (EU25: 0.45, EU15: 0.5) or even the nearby regions (Slovenia: 0.52, Styria: 0.58, Bratislava: 0.66) show a very high rate of backwardness. West Transdanubia is taking only the 176th position on the ranking list of 203 regions in this respect which frankly speaking is not the very result we should be too much proud of.

The region's incompetence in fundraising is well illustrated by the fact that in 2005 it could win only 7% of the government's development funds while its share from Hungary's total population is 9.8% (VÁTI–ÖTM, 2007). This is even more true in case of economic development grants as from all of the state funds designated for economic development objectives only 3% was allocated for the region and the per capita value of economic development funding is less than one-third of the national average. Even the funding of the area is spatially very diverse. In West Transdanubia the vast majority – almost 67% – of the state grants designated for economic development (1.5 billion HUF) is allocated for innovation and research which is due to the heavy funding of regional university knowledge centres. In national context – due to the low number of nationally registered research units – the situation seems to be less advantageous as the region received only 5% of the total grants allocated for research. Thus the per capita ratio of state grants allocated for research is only half of the national average (VÁTI–ÖTM, 2007). The majority of state grants in the region were concentrated into the micro regions of university cities (Győr, Sopron, Mosonmagyaróvár, Keszthely and Szombathely) and the region's other micro regions won only a minimum of state grants designated for agricultural, innovation or research.

The problems of the region's R&D potentials may threaten the area's economic sustainability even in medium-term therefore eliminating their dichotomy should be a first-rate priority. Fostering innovativeness by creating and supporting spatially organized economic and principally development-oriented networks would be very important parts of this task. In the further chapters of our paper we are going to provide an overview on the past activities, attitudes and future plans of the region's economic actors and other members of the innovation system i.e. those segments that can well explain the successes and failures achieved so far and will at the same time be the primary targets of future developments and supports.

5 The innovation activities of enterprises

In the spring of year 2007 we conducted a survey on the innovation activity of West Transdanubian enterprises through interviews. Our present analysis is demonstrating the results of a three-year period between 2004 and 2006. Our questionnaire can be divided into three main sections. The first section is collecting general information on the region's business enterprises: their site, activity scope, size, annual revenues and spatial relations. The second section is assessing the special features of the business firms' innovation activities with special emphasis on the possible four types of innovation such as product, process, organisational/corporate scheme and marketing innovation. In the final section of survey the implementation conditions of innovation, the future development plans and the area's innovative potentials are presented.

In the sampling period we did not intend to provide a comprehensive survey on the enterprises' and region's general situation of innovation by investigating all the business enterprises. Instead we rather selected a group of firms being presumably rather more concerned and more active in innovation activities. Therefore our survey data are not relevant for all enterprises of the region as we rather focused on agricultural and industrial enterprises and some servicing segments directly attached to R&D were also involved into our survey. There were two outstanding factors that were taken into account during the sampling process. One is – as it has just been mentioned – the limited scale of enterprises was selected according to their main business profile. The other is that micro- and private enterprises employing less than 5 people were excluded from our survey. The purpose of the set-up criteria was the maximization of the elements of relevant responses so our conclusions drawn from the representative sample of 401 enterprises can be generalized only with taking the above-mentioned sampling criteria into consideration.

Between 2004 and 2006 the enterprises investigated spent 3.44% of their revenues on R&D on the average but 70% of the enterprises did spend nothing on R&D at all. 41.4% of the firms surveyed have a kind of quality assurance system. The general specifications of the sample are shown by *Table 4* while research-development specific data are provided by *Table 5*.

Table 4

Detailed Data of Companies in Sample, 2004–2006

	Representative sample with 401 companies	
	number of companies	number of companies
Location of headquarter, by counties		
Győr-Moson-Sopron	186	46.4
Vas	96	23.9
Zala	119	29.7
Location of headquarter, by type of settlement		
Town with county rank	215	53.9
Other town	91	22.8
Village	93	23.3
Main activity of companies (by NACE code):		
Agriculture, hunting, forestry	59	14.7
Mining and quarrying	6	1.5
Manufacturing	294	73.3
Electricity, gas and water supply	4	1.0
Computer and related activities	12	3.0
Research and development	2	0.5
Architectural and engineering activities and related technical consultancy and technical testing and analysis	13	3.2
Others	11	2.7
Employment (2006)		
Average	58.34	
Median	18	
Maximum	1420	
5–10 staff	151	37.8
10–50 staff	166	41.5
51–250 staff	65	16.3
251 or more staff	18	4.5
Total turnover, 1000 EUR (2006)		
Average	3.96	
Median	0.688	
Maximum	460	
Part of a company group? Yes	62	15.5

Source: Own elaboration based on enterprise survey, 2007.

Table 5

Main R&D Data of Companies in Sample, 2004–2006

	Representative sample with 401 companies	
	number of companies	%
Share of R&D expenditures in total turnover		
Average		3.4
R&D expenditure by share of turnover		
0%	282	70.3
1–5%	62	15.5
6–10%	19	4.7
11+%	38	9.5
Average yearly R&D expenditure, 1000 EUR		
Average	348	
Median	0	
Maximum	92,000	
Average R&D expenditure per employee, 1000 EUR		
Average	2.76	
Median	0	
Maximum	100	
Share of employee with higher education		
Average		14.5
Median		10.0
Maximum		100.0
Share of R&D employment (average in 2004–2006 years)		
Average		3.3
Median		0.0
Maximum		100.0

Source: Own elaboration based on enterprise survey, 2007.

Regarding the acquisition and sales activities of enterprises the county enjoys a preference against other geographic locations with a dominance of 44.4% in the area of acquisitions and 52.1% in the area of sales. The low values indicate weak regional cohesion, weak intraregional economic relations and a spatial mismatch of planning-statistical regions with real economic processes.

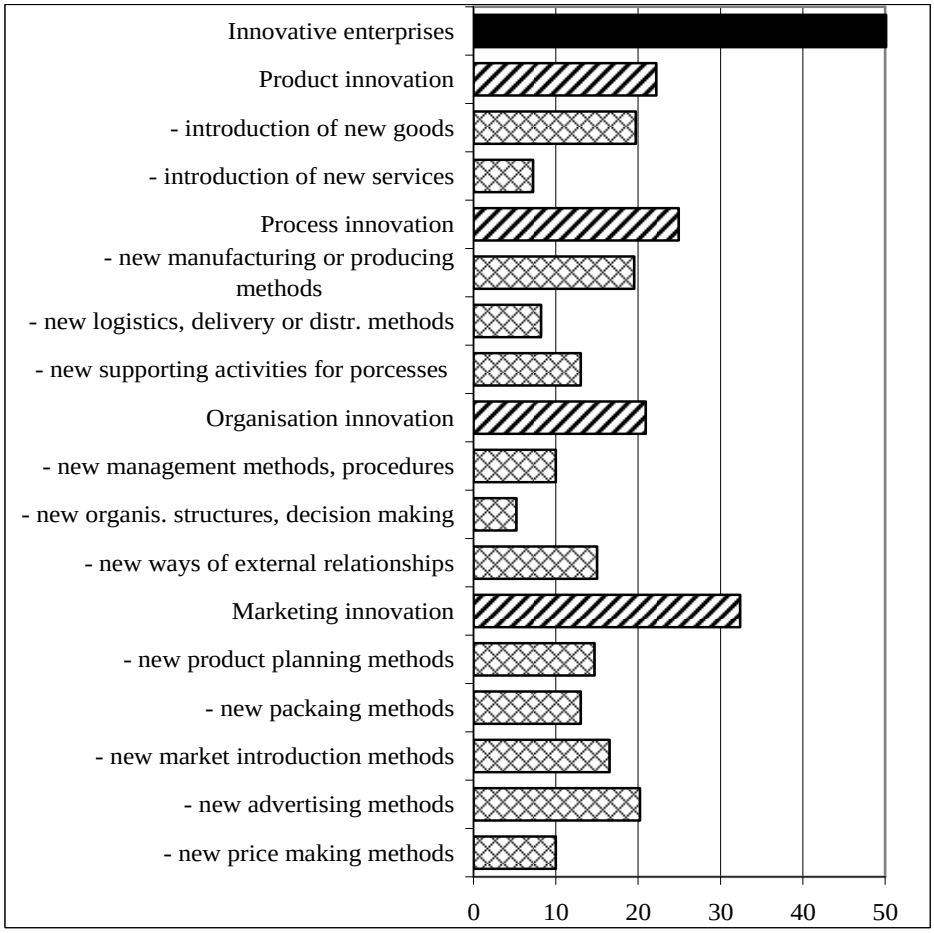
50.1% of West Transdanubian enterprises implemented one of the four main types of innovation[4] which means that half of the region's enterprises can be re-

[4] During the survey in accordance with CIS4 Survey we investigated the four types of innovation (product innovation, process innovation, marketing innovation and organizational/corporate structure innovation) as defined by the Oslo Manual (*Oslo Manual* 2005). We defined an enterprise as innovative in case of giving or marking at least one of the four types on the questionnaire within the time period of the past three years of its activity.

garded as innovative. During the survey period 22.2% of the region's enterprises implemented product, 24.9% process, 20.1% organisational/corporate scheme and 32.4% marketing innovation (*Figure 2*).

Figure 2

Frequency of Different Type of Innovation, % of Enterprises



Source: Own elaboration based on enterprise survey, 2007.

The majority of firms implementing product innovation introduced new products (88%) and only one-third reported on introducing a new service. Innovations had the greatest impact on the expansion of product range or service palette but companies regard quality improvement as a factor of same importance. In case of

process innovation the improvement of manufacturing methods was the most important target of innovation (78%) and its greatest impact was manifested by a greater flexibility of manufacturing or services. 84 enterprises reported on a corporate scheme innovation. At most companies (71%) the new methods and procedures applied were manifested in the methods of maintaining external relations and this type of innovation had the greatest impact on increasing the efficiency of maintaining external relations. The majority of enterprises reporting on marketing innovation tried to improve their product advertisement methods (62%) and these innovations had about the same impact on increasing the company's market share and on getting better information on their consumers' demands.

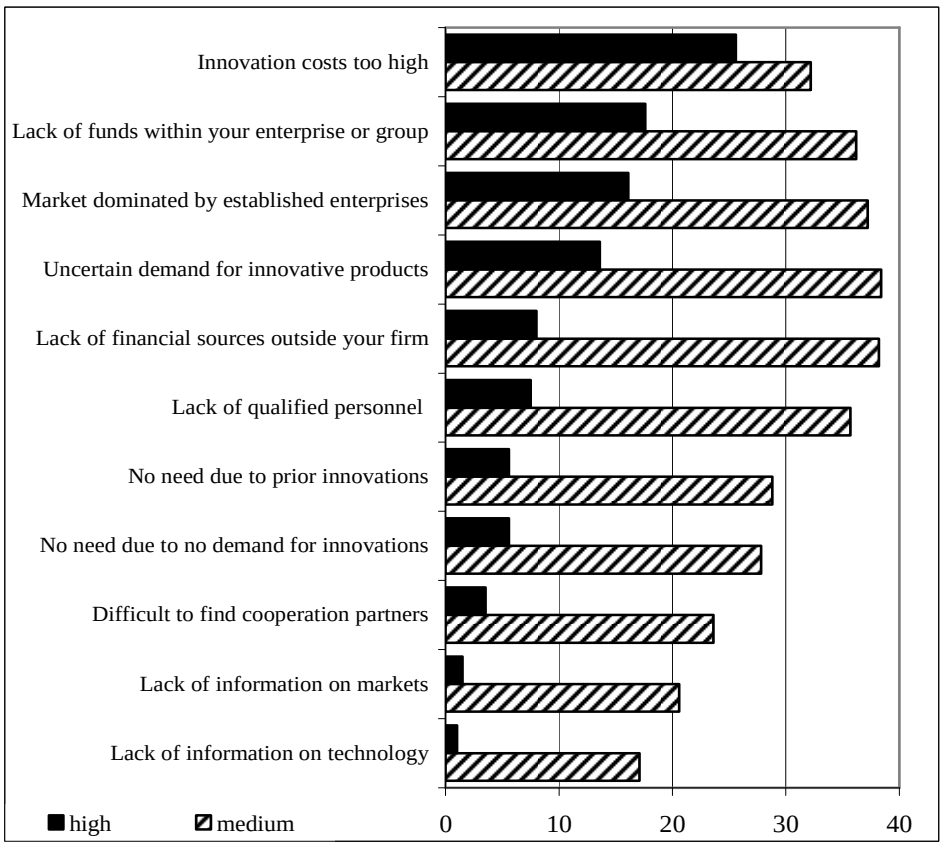
On a 1–10 scale innovative firms ranked their own innovation activities for 6.7 on the average while on a 1–100 scale where score 100 marked the competitor's innovation level they ranked themselves by score 89.56 on the average so they ranked their innovativeness below their competitors' score. The toughest limitation forces of innovation activities or of the implementation of projects are financial expense factors, namely the high expenses of innovation while the softest limitation force is the absence of relevant technical information (*Figure 3*).

As regards future development plans it can be stated that the development of applied technology is the most preferred factor as 70.6% of the innovative enterprises are going to apply this method of innovation in the next years. The training of staff and professional retraining have similar importance (66.2%) as well as of product development (68.7%). 55.4% of the business enterprises of the representative sample consider IT, 47.1% services and 32.9% marketing and sales as the key areas of innovation while the management and corporate scheme development seem to be the least preferred innovation areas for the business firms participating in our survey. Assessing the region's innovative potentials the participants of our survey consider good subcontractors, suppliers and adequately trained labour force as the two strongest sides of our region. We can see that these factors are relatively highly appreciated in the region but the greatest difficulties are directly arising from factors stemming from the funding of innovation such as the financial support of innovation and economy in general, the amount of working capital or the availability of risk capital (*Figure 4*).

Of innovation support services product qualification, product sampling and market research are the most frequently used (33–42%) and these services seem to be the most popular in the future as well. By popularity these services are followed by technology related services such as technology development, technology shows, technology assessments, tools for measuring and testing the use of special machinery and so on (12–16%).

Figure 3

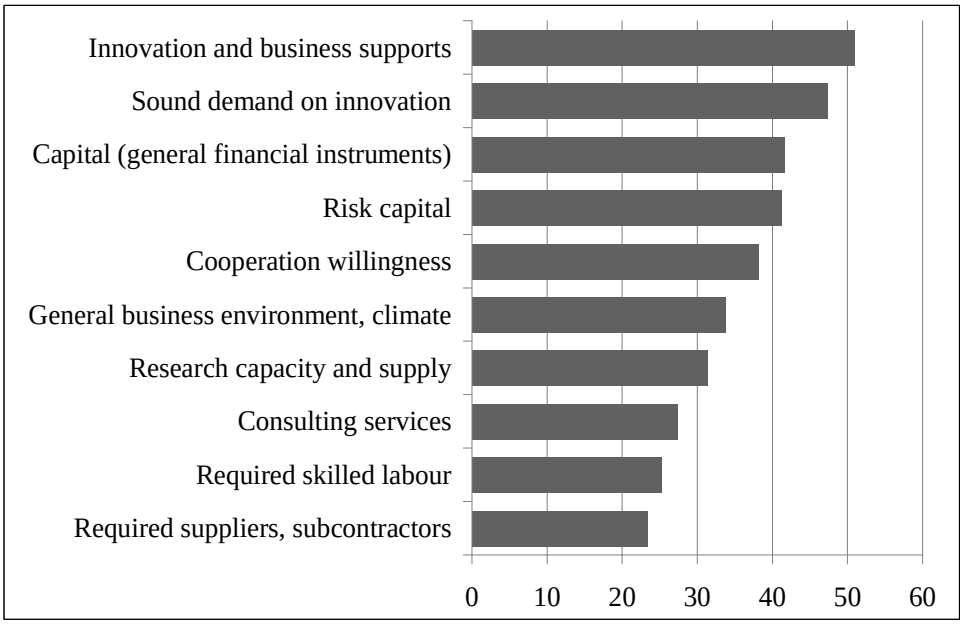
Factors Hampering for Innovation Activities, % of Enterprises



* The percentage of enterprises evaluated the factor's hindering extent high or medium level.
Source: Own elaboration based on enterprise survey, 2007.

Figure 4

Most Problematic Factors Regarding to the Implementation of Innovations in West Transdanubia, % of Enterprises



* The percentage of enterprises evaluated the factor low level in the regions.
Source: Own elaboration based on enterprise survey, 2007.

6 The differentiation of innovation activities by firm groups

It is worth comparing the probability of the occurrence of innovations on the basis of the enterprise's profile. In our case profile is a compound multivariable system of features. The analysis part of our investigation comprising the most important results of our survey has revealed the connections between the business enterprise's revenues, staff, share of foreign ownership, the orientation of research-development and the probability and intensity of innovation. The region's firms on the basis of an eight component corporate parameter system and using cluster analysis method were sorted into different groups and were typified. Then within each company group the probability of each innovation activity was calculated.

Our first question was that how many and what kind of firm groups can be differentiated in the sample by the general indicators of economy and R&D. If an

appropriate criteria system for grouping has been set up we would like to see how the different firm types differ from each other by their innovation activities.

Of the possible classification procedures we chose the so-called two-step clustering method. We did so because on the one hand during the procedure the model offers alternative cluster for further analysis (so we do not have to define the number of firms in advance) on the other hand it uses checking statistics to assess the role of cluster variables in defining each group. The content of the sample did not change in this case either. We proceeded with the original 401 firms. Finally 372 firms were surveyed after filtering out the missing data.

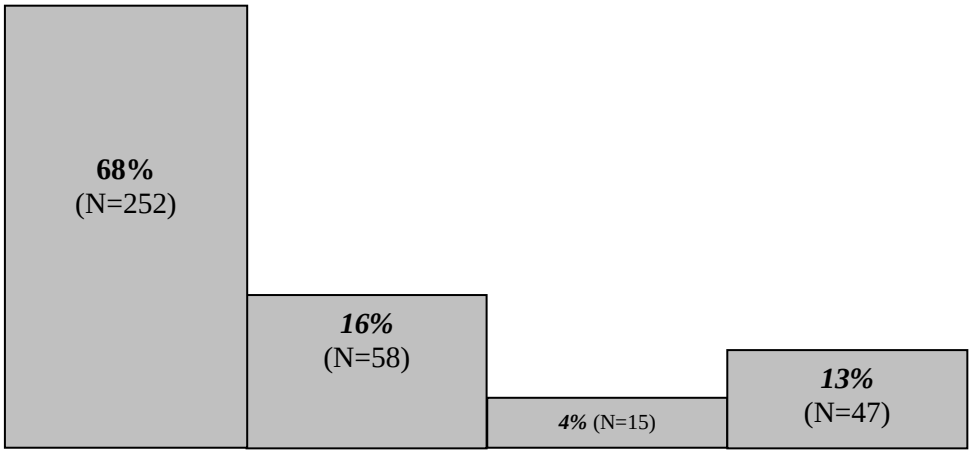
The final result of cluster analysis is influenced by several factors. One is the set of variables serving as a basis for grouping. We used eight general organizational parameter indicators: besides the well-functioning original data sets (year of foundation, the share of foreign proprietorship, the amount of net revenues, the number of staff) indicators measuring R&D orientation were also used in the survey (the amount of R&D expenditures, the number of employees working in the R&D sector, the share of employees with university or college degree, self evaluation of innovation). We deliberately chose such indicators that are in close relationship with innovation because we are on the opinion that today these types of knowledge-oriented indicators are generally regarded as those describing the general situation of entrepreneurs. In the final phase of the two-step clustering method having taken all the eight parameters of firms into consideration four clusters were differentiated (*Figure 5*). The sizes of the groups are greatly differing from each other.

On the basis of the enterprises' R&D indicators the group of relatively active big firms can clearly be identified (4%) as well as the group of knowledge intensive SMEs mostly owned by Hungarians (13%), the group of foreign owned SMEs with moderate development inclinations (16%) and the group of Hungarian owned SMEs doing only minimal development activities and being in a handicapped position regarding innovation activities (68%) which is more than two-thirds of the surveyed business enterprises.

One of our conclusions is that the group structure of firms is strongly differentiated. About 70% of the region's firms are domestic, small-scale business enterprises with low revenues, minimal expenditures and R&D human resources. They even evaluate their own innovation activities very low. To cut it short, their innovation is at minimal level. On the level of SMEs the absence of R&D activities is surely not such a big problem as in case of bigger firms as they are more flexible and very often they rather concentrate on the adaptation of new technologies instead of technical modernization.

Figure 5

The Groups of Companies by Innovativeness and Main Characteristics of the Individual Groups (cluster centres)



Hungarian SMEs – minimal development willingness	*Foreign SMEs – moderate development willingness*	*Large companies*	*Strongly R&D oriented SMEs*
Foundation: 1994	Foundation: 1995	Foundation: 1984	Foundation: 1995
Foreign own: 0.2%	Foreign own: 93%	Foreign own: 25%	Foreign own: 9%
Turnover: EUR 0.5 Mio	Turnover: EUR 1.4 Mio	Turnover: EUR 30 Mio	Turnover: EUR 0.8 Mio
Employment: 15	Employment: 25	Employment: 600	Employment: 11
With higher educ.: 9%	With higher educ.: 15%	With higher educ.: 12%	With higher educ.: 45%
R&D employment: 0.7%	R&D employment: 1%	R&D employment: 2,5%	R&D employment: 20%
R&D expenditure: 1.05%	R&D expenditure: 1.2%	R&D expenditure: 4.4%	R&D expenditure: 20%
Innovation level comparing to competitor: 71	Innovation level comparing to competitor: 107	Innovation level comparing to competitor: 72	Innovation level comparing to competitor: 135
Mainly small enterprises (more than 70%)	Mainly small enterprises (more than 80%)		

* The self ranked innovation level is 100, if the firm evaluates his innovation capability the same as his most important competitor. If it is better than the competitor the firms had to score higher, if it is worst it had to score below 100. In case of percentage and score values data are the averages, in other cases they are the medians to filter the distortion effect of extreme values.

Source: Own elaboration based on enterprise survey, 2007.

Another third part of the companies is divided into three distinctly separable groups. In this set firm parameters are better and we should pay a special attention for those 47 knowledge and development oriented small enterprises that are interested in the fields of engineering, computer technology, mechanical engineering, technical development and electronics. High care should be paid for another 10% part of small mostly foreign owned enterprises. Our survey indicates that besides the traditional multinational firm oriented economic trend an increasing attention should be paid for foreign owned small enterprises in the north-western border zone of Hungary as their presence is significant among the region's economic actors. It can be stated – even without listing the concrete innovation activities of firms – that there is a wide gap between the performance of the region's companies and this demarcation line is separating a small group of competitive firms from the majority of weakly competitive firms.

The four innovation types comprise all the 13 innovation activities (*Table 6*). Actually, only the members of the first two company clusters are more active in innovation. In fact marketing innovation is the only exception of this rule. In this field the difference between firm clusters is smaller. There are very extreme differences among companies in the field of process and corporate scheme innovation although the size and complexity of firms cannot be disregarded. The innovation activity of the 252 mostly Hungarian owned SMEs is almost minimal especially if we consider how comprehensive and permissive our definition was on the meaning of the term: 'innovation' (the word may refer to further improved or newly introduced products, processes or methods at a firm as well).

Based on the results we can conclude that on the grounds of the past years' experiences only big firms or knowledge and development oriented small enterprises can be regarded as innovators or adaptors. The problem is that their ratio of the total is 17% only and this result was born in such an innovation definition context which interprets innovation not only as finding out a new product and introducing it into the market but also as transferring or adapting products and methods new for the firm itself but already existing on the market and might be existing for a long time.

As our survey data indicate there are two ways for innovation policy. One is tuning up a small group of innovative firms (10–15%) that can successfully live and work in the present environment and the other is closing up the majority or at least a part of non-innovative Hungarian SMEs and making them realize the importance of innovation by stimulating their activities of this sort.

Table 6

Frequency of Innovation by Company Groups, %

Innovation type	Large companies	R&D oriented SMEs	Foreign SMEs	Hungarian SMEs	Average of all firms
	N=15	N=47	N=58	N=252	N=401
Product innovation					
introduction of new goods	20	40	21	15	20
introduction of new services	13	19	10	4	7
Process innovation					
new manufacturing or producing methods	67	45	21	11	19
new logistics, delivery or distribution methods	40	23	5	5	8
new supporting activities for processes	47	32	7	8	13
Organisation innovation					
new management methods, procedures	33	21	5	8	10
new organisational structures, decision making	33	17	2	2	5
new ways of external relationships	27	47	14	9	15
Marketing innovation					
new product planning methods	20	38	9	10	15
new packaging methods	27	19	12	12	13
new market introduction methods	27	28	15	14	16
new advertising methods	33	38	22	15	20
new price making methods	13	28	12	6	10

* Table contains only the Chy-square probe significant results. There is significant difference among the four clusters (sig. = 0.001).
Source: Own elaboration based on enterprise survey, 2007.

7 Co-operation in innovation and paths of information flow

Manufacturing new products (or introducing new services) may often be very expensive activities. In the hierarchy of the inhibiting factors of innovation high expenses, the absence or insufficiency of funding resources or the functional inadequacy of external financial environment have leading role. Cooperation in innovation may be a solution for these problems as good contacts among enterprises and common development concepts may save time and money for stakeholders. This is the reason why in our time it is a key issue whether innovation

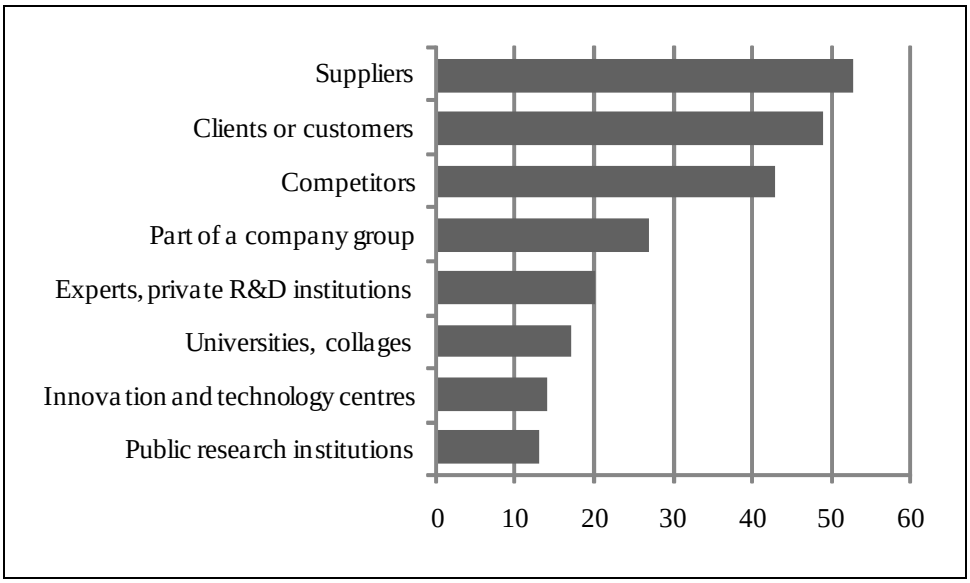
cooperation initiatives, their basic models or even networks have already been established or not. In this phase of our analysis we are trying to find an answer for the question how much part of the region's enterprises is involved in this issue, what are the most typical forms of cooperation and what types of cooperation partners have been proved valuable and useful from the point of the enterprise's innovation activities. The data are gathered from the first series of our questionnaire survey of innovation carried out in year 2005.

Our starting question was that whether there had been any cooperation between the enterprise and other firms in the field of innovation within a three year period between 2002 and 2004. Can every active role playing in innovation not necessarily yielding commercial benefits for both partners be regarded as cooperation when even tasks are not to be subcontracted? By setting up these criteria 38% of the region's innovative enterprises can be regarded as cooperative. As a rule this means that every third enterprise has implemented its innovation programme by participating in a programme of another organisation or institution through a kind of joint project or sub-project. Of course these contacts were of different kind and their intensity was also different so this figure does not tell too much about the strategies and situations of the actual cooperations themselves.

For a detailed analysis we should see who the partners are (*Figure 6*). On the basis of the occurrence probability data three major actor patterns can be differentiated in the region's innovation cooperation schemes. The first and the second types comprise economic actors playing key role in the productive and servicing capacities of enterprises. In case of 53% of enterprises subcontractors and of 49% customers/clients were concerned as active participants in the implementation of new products or services. It is not surprising from the point of the operation mechanism of sectors as maintaining a kind of contact is indispensable from the point of input and output. The next type of partnership – the third in the row of the frequency of occurrence – implies the competitors of enterprises or other firms operating within the same economic sector (43%). Between the elements of the firm group the number of innovation cooperations may also be very high especially if we consider that of the 161 selected enterprises only 40 are members of a firm group (25%) and of them every second reported on having an internal cooperation partner. The active presence of the expert, consulting, university and research sectors in this circle is by far less reaching only the share of 15–20% on the average.

Figure 6

The Probability of Co-operation with..., % of Enterprises

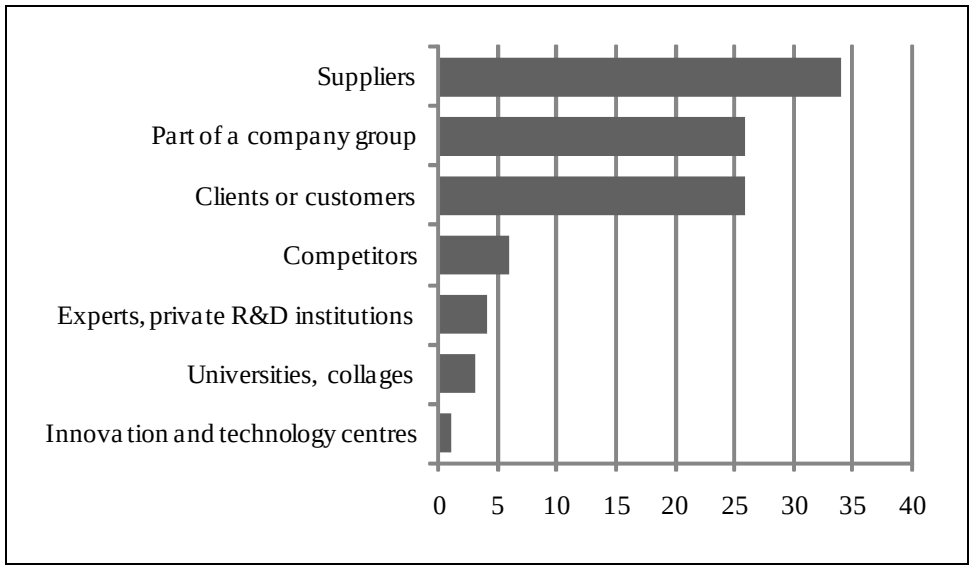


Source: Own elaboration based on enterprise survey, 2005.

Of eight possible partners the interviewees had to mark in the questionnaire those that proved the most valuable/useful during the implementation of their development projects (*Figure 7*) so we have the answer for the question if there exists a ranking of importance, a kind of utility value regarding their cooperation in innovation. The naming of the three most important partner types did not significantly changed the earlier presented system nevertheless it marks the border between the groups more clearly. In the contact system of the region's enterprises subcontractors, clients/customers, other enterprises of the same economic sector and potential competitors are the most dominant elements. The only difference from this pattern and structural change can be observed in the third group of responses, here we can face a phenomenon where there is a 15–20% of firms for which institutes of higher education, expert and private R&D firms prove to be useful and are valuable 'target objects' for active cooperation in innovation.

Figure 7

Most Important Cooperation Partners, % of Enterprises



Source: Own elaboration based on enterprise survey, 2005.

The region's information system consists of several components. These with more or less success can contribute to the renewal of the region's enterprises as they provide useful and interesting for creating new ideas, for bringing new inputs into processes, for solving problems and for reducing costs. Of course it is also useful if we are aware of the role of resources, communication fields and platforms on regional level but perhaps it may be more useful to measure the impact, role and efficiency of these forums and channels. By this we mean such resources which provided information to new innovation projects or contributed to the completion of the existing ones. If we were able to set up a ranking of importance for regional channels and sources of information (*Table 7*) we could not only better understand the background mechanisms of innovation but also see those points of reference which could be set up as targets for an innovation support and development policy. Responses attaching high importance to a resource have high impacts on the 'formulation of the ranking system' and on selecting dominant resources.

Personal contacts have outstanding importance in innovation projects. 57% of the enterprises appreciated the role of formal and informal contacts as of high importance and another 25% as of average importance. Beyond them three additional resources can be defined as key communicational platforms. They are:

knowledge acquired through contacts within the enterprise's own organisational system, the knowledge gained through the enterprise's partnership system: clients, customers and subcontractors.

Table 7

Rank of Information Sources Connecting to Innovation

Information sources	Importance							
	high		medium		low		no source	
		%		%		%		%
Personal contacts and relationships	92	57.1	40	24.8	6	3.7	23	14.3
Inside information	71	44,1	50	31,1	6	3,7	34	21,1
Clients and customers	68	42.2	48	29.8	19	11.8	26	16.1
Suppliers	55	34,2	60	37,3	16	9,9	30	18,6
Conferences, trade fairs, exhibitions	44	27,3	51	31,7	16	9,9	50	31,1
Competitors, other enterprises	41	25,5	45	28,0	34	21,1	41	25,5
Scientific periodicals, professional and technical publications	39	24,2	55	34,2	25	15,5	42	26,1
Professional and sectoral associations	24	14,9	39	24,2	33	20,5	65	40,4
Experts, private R&D institutions	22	13,7	27	16,8	21	13,0	91	56,5
Universities, collages	12	7,5	14	8,7	19	11,8	116	72,0
Public research institutions	6	3,7	10	6,2	16	9,9	129	80,1
Innovation and technology centres, business development organisations	6	3,7	11	6,8	24	14,9	120	74,5

Source: Own elaboration based on enterprise survey, 2005.

Knowledge centres (universities, research institutes) and service centres and organisations supporting the region's business actors (innovation, technology and business promotion organisations) have minimal role in this. 70–80% of firms did not regard them as relevant information resources from the point of using them for preparing and implementing their development projects. And naturally we should not even forget that the applied response categories are not homogenous as they may comprise complete relation systems as well: such as nodes and even flexible contact sets (customers for example) and concrete organisational types. The lower ratio of universities or research institutes in the set of information resources may be explained by their preference of participating in extensive and large-scale cooperation which occur less frequently. But the interviewees' negative image on the functional role of innovation and technology centres as well as

of business promotion centres cannot be explained by such reasons as their missions are definitively targeted at fostering the region's all enterprises competent or concerned in innovation.

The most important sources of innovation belong to the enterprise's own authority scope. Personal contacts are resources eliciting positive outcomes through the special and individual constellation of the enterprise's staff structure – in similar way to the internal knowledge set and knowledge resources refilled after a long-term activity in the market. The management and sampling of clients and subcontractors' partnership system are also carried out within the enterprise's organisational structure and do not depend on external factors or information providers.

8 The enterprises' demand on innovation services

Several services are trying to foster and improve the innovativeness of business enterprises. Their facilities are used mostly by SMEs as big firms generally have the financial and human resources as well as the infrastructure necessary for a continuous renewal, for the introduction and adaptation of new products, manufacturing procedures and technologies.

The major questions for assessing the demands towards a service provider can be summarized as follows: What are the most popular services? Are there any differences between the service demands of innovative and non-innovative enterprises and if so how can they be characterized? How can enterprises with complex and/or special servicing demands be typified? How will the demand towards services look like in the future?

Our assessment on the demands for services covering 39 forms of services was conducted by a corporate questionnaire survey. (1. During the past three years have you ever – not necessarily recently – used any innovation oriented services? 2. Are you going to use these services in the near future?) The bundle of innovation services simultaneously comprises the routine basic activities of business promotion (primarily used by SMEs) (such as business consulting), the incubation elements (such as offices, secretariat) the needs arising from primarily technology oriented development activities (product testing, calibration, laboratory use)) and some solutions yet new in Hungary but to be used in the future by a narrow circle of companies (such as business angel, risk capital, factoring etc.).

The classification of services was performed by factor analysis. Ten service factors were separated from each other of which several can be bundled into a more comprehensive service package. The services are as follows: 1) consulting services associated with the running of business (taxation, accounting, legal services); 2) services associated with the enterprises' tendering operation; 3) opera-

tional services (secretariat, manpower leasing); 4) Leasing and crediting services; 5) The imaging and communicational elements (marketing, business contacts, information provision, cooperation) are relatively clearly separated and 6) special knowledge related demands (market research and research) as well as regulation and investment elements playing an important role in innovation (patents, risk capital, investment consulting) are bundled into a special package. And finally although in three packages and with some overlaps but 7) technological demands associated with product development and qualification (such as positioning, profitability revision, production planning, sample testing, product qualification, laboratory use) should be regarded as a distinct group of services.

It can be stated as a rule that traditional and special innovation and business oriented services are clearly separated at the enterprises participating in our survey but we can still clearly see what kind of service demands are likely to form pairs (e.g. grants won through a tender coupled with support for writing tender applications, or traditional business consulting services (in the fields of taxation, accounting or legal affairs).

On the basis of the assessment on the region's business enterprises demands towards innovation services we can declare that enterprises generally use several interrelated services simultaneously. The majority of enterprises do not have a complex system of servicing demands in general they turn to external service providers in particular matters only. Service demands can be ordered into a special hierarchy (*Figure 8*), the majority of demands refer to various business consulting related (legal advisory, accounting, taxation and financial counselling) services, to product qualification and testing, to leasing, to current assets credit solutions and to competition system related components. Very few firms use innovation specific services (such as mentoring, business angel, patent consulting, risk capital, special laboratory measurements, technological assessments etc.). On the other hand innovative firms have much stronger demands for specific services than the standard ones. In the next few years the structure and the level of servicing demands will presumably follow the present scales.

As it was expected, medium-size and big firms with higher than average revenue have a complex demand structure for innovation services (*Figure* 9). The basic structure of expected demands can clearly be seen: Above average (innovation) service demands are raised by young, development-oriented foreign Hungarian owned big and medium-sized firms with high revenues and selling their products mostly on foreign markets. During the next few years no significant changes can be expected in the demands against innovation services and in the group of firms these services are delivered to.

Figure 8

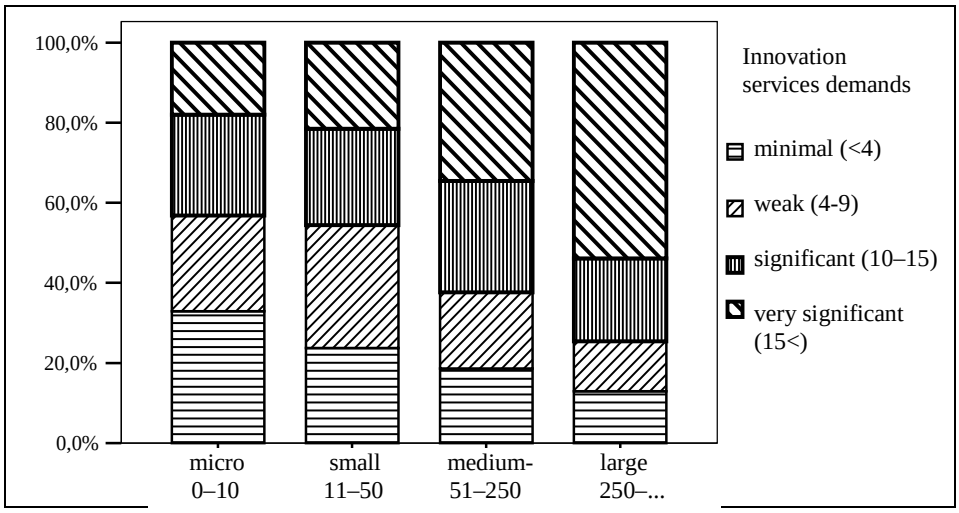
Frequencies of Demand Services by the Innovativeness of Enterprises, %

* An enterprise is innovative if at least one of the four innovation types (product, process, organisation or marketing) was mentioned for 2003–2005.

Source: Own elaboration based on enterprise survey, 2006.

Figure 9

Complexity of Service Demanded by the Number of Employment



Source: Own elaboration based on enterprise survey, 2006.

9 The supply side of the innovation system

West Transdanubia has several organizations and institutions delivering such services that somehow foster or facilitate the innovativeness of enterprises or provide a solution for problems arising in their everyday activities. The group of these organisations is very heterogeneous. It comprises chambers of commerce and industry looking back to old traditions in this field as well as business promotion organisations who also can boast with more than 10 years of practice but several new organisations have also emerged in this market often functioning as a means of development policy with the aims of delivering, customized, innovation facilitating services in several cases for a very limited circle of companies (for example innovation centres, cluster organizations, university knowledge centres, research centres and their different regional level combinations). For assessing the widest cross-section of innovation oriented companies a personal interview was made with 33 heads or persons responsible for innovation affairs at West Transdanubian companies with the purpose of revealing the supply side of their services.

There are substantial discrepancies and disparities in the accessibility of innovation services. The majority of the palette of services has been delivered for 5–6 years within the region which means that somewhere at the turn of the millennium

there was a blasting increase on the supply side of innovation services with a massive emergence of new institutions, functions and responsibilities.

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In general we can see a great number of parallelisms and overlaps in the region's innovation service mechanism, as basic services are available at almost all non-R&D oriented institutions. However the availability of specific services is very limited as they are only delivered by only one or two actors having been founded a few years ago only and still seeking for their own functions and roles in the system of innovation services. In many cases even their existence and future is ambiguous. So on one side there is a relatively big and complex system of institutions working side by side, sometimes against each other where the expert knowledge and competence necessary for competitiveness is available but the service providers capable for responding for the demands set up by the needs of innovation and principally by the needs of individual research and development are just in the phase of formation yet: they have already been founded by now but their future is ambiguous. The present institutional setting may serve as a basis for establishing an innovation servicing system of an appropriate complexity in the region (*Table 8*). The different organisational types of the innovation system have certainly different servicing profiles of course. There seem to be great differences among them and although some of their reasons seem to be justified, the size of differences does not seem to be acceptable (*Table 9*).

It is evident that innovation parks and innovation centres are the nodes of the supply side. They, located in largest centres, constitute 9% of the total organizations surveyed. They reported on 14–26 services available directly at them. This means that they must coordinate 18 different activities on the average at an appropriate aspiration level. Regarding the full institutional system – to make the results comparable – a typical service provider delivers 10 different services on a market basis for its area's business enterprises. Not calculating with training-educational institutions (they are the weakest links in the system due to a dissonancy between their servicing potentials and their real possibilities) we can see that almost the same size of service palette – limited to 8–10 elements – is available for each institutional sector.

Table 8

The Frequency of Innovation Services in the 33 Organisations, %

	Currently Available	Not Available, but Plan in the Future	Not Available, not Plan in the Future
Special education programmes	64	18	18
Tender preparation	61	9	30
Enlargement of business partnerships, partner mediation	61	6	33
Participation to trade fairs and exhibitions	46	21	33
Regular information providing	49	9	42
Marketing and communication	49	6	45
Tax and financial consulting	43	9	48
Market research	43	9	48
Mentoring	40	9	51
Technology analysis	24	18	58
Business plan making	27	12	61
Technological cooperation possibilities	24	15	61
Investment consulting	30	9	61
Accounting consulting	30	6	64
Location, office, workshop	21	15	64
Special laboratorial analysis	18	18	64
Legal consulting	27	6	67
Technology development	18	15	67
Scouting	21	12	67
Product qualification	18	12	70
Use of special machineries	21	9	70
Patent, intellectual property consulting	27	0	73
Product analysis	18	6	76
Infocommunication technologies	18	6	76
Risk capital involvement	9	15	76
Preferential operating credit	18	3	79
Secretary services	18	3	79
First sample analysis	12	9	79
Loan of measuring and analysing tools	9	12	79
Tender support	18	0	82
Guarantee funds	15	3	82
Economy examination of technologies	6	9	85
Business Angel	6	9	85
Leasing	9	3	88
Calibration of measuring and analysing tools	3	9	88
Factoring	3	9	88
Production planning, production preparation	6	0	94
Cleaning, operating services	3	0	97
Labour loaning	6	3	91

Source: Own elaboration based on the institution's interviews, 2006.

Table 9

The Number of Services Provided by the Different Types of Organisation

Organisation Types	Average	N	%	Median	Min	Max
Innovation (parks and centres)	18.3	3	9	15.0	14	26
R&D	9.1	8	24	11.5	0	17
Education (esp. higher)	2.5	4	12	2.5	0	5
Development (regional and business)	9.3	6	18	10.5	0	17
Chambers	10.4	5	15	11.0	7	12
Clusters	9.1	7	21	8.0	4	17
Total (33 Organisations)	9.4	33	100	10.0	0	26

*ANOVA sig = 0.013
Source: Own elaboration based on the institution's interviews, 2006.

10 The evaluation of the regional innovation system

In the interviews the experts of the organisations of the demand side of innovation services tried to evaluate the efficiency of the formulating regional innovation system and tried to outline a vision of an optimal – or ideal – system on the basis of the summary of expert attitudes and ideas.

In the interviews the experts expressed their views on what level of organisation the system has achieved so far and what they think as optimal. After summarizing the expert's attitudes and ideas three questions were asked. 1) What problems are the concerned organisations facing now regarding innovation (what advantages and disadvantages they see)? 2) Proceeding from the present situation what kind of opportunities and threats can be identified in the system? 3) What standards should the ideal regional innovation system meet if we consider efficiency and optimal functioning as of priority? Although it was not directly asked but from the opinions we received a definite answer was formulated for the most important question – Can we talk of a regional innovation system at all? If not, why and what tasks are ahead of us?

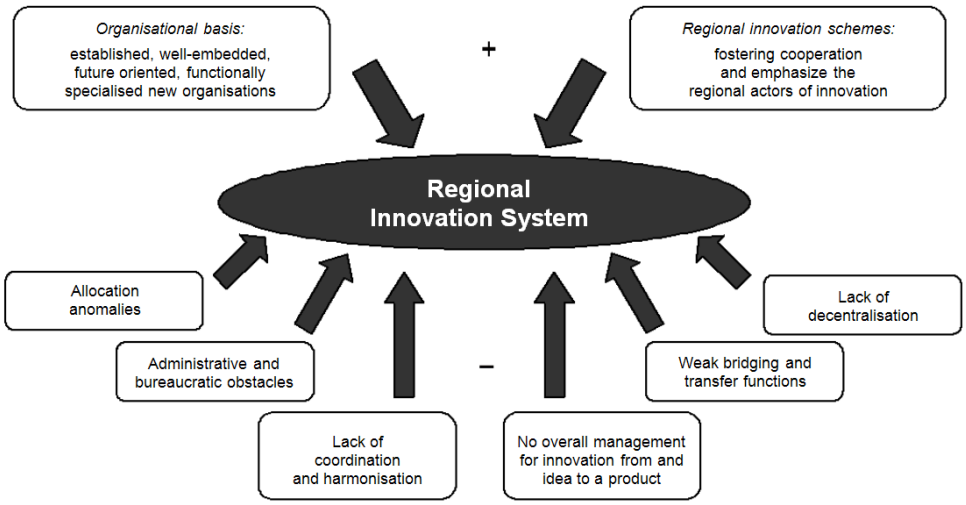
Regarding the innovation system as a whole the interviews with the most important actors point out that unfortunately we cannot yet talk of a homogenous system. The establishment of such a system requires a certain level of autonomy and today the share of ambiguity and risks is too high to speak of a reliable system. The support and funding system of innovation is just in an embryonic phase now on regional level but right at the initial phase it is too complicated, slow and in several cases unreliable as well. This will not really encourage the building of comprehensive and integrating cooperation among the actors of innovation.

Whether to formulate a hierarchical or vertical schemed cooperation system is not decided yet in the region but without cooperation and coordination no systemic organization can be built. The really operating intermediary agents mediating information and activities towards and from economic actors are also missing from the system. And finally, the issue of full coverage, servicing and support of an innovation process has not been solved yet.

In fact several interviews went around the major issues by reporting on positive phenomena (*Figure 10*) and they can be interpreted by reacting to the events of the past two years: 1) the organisational foundations have been set up, they are well-embedded into their environment and the new organisational forms are progressive and functionally separated; 2) The tendering system of regional innovation has been launched, they are stimulating cooperation and upgrading the role of the actors of the regional institutional system and even the formulating system itself.

Figure 10

Evaluation of the Regional Innovation System

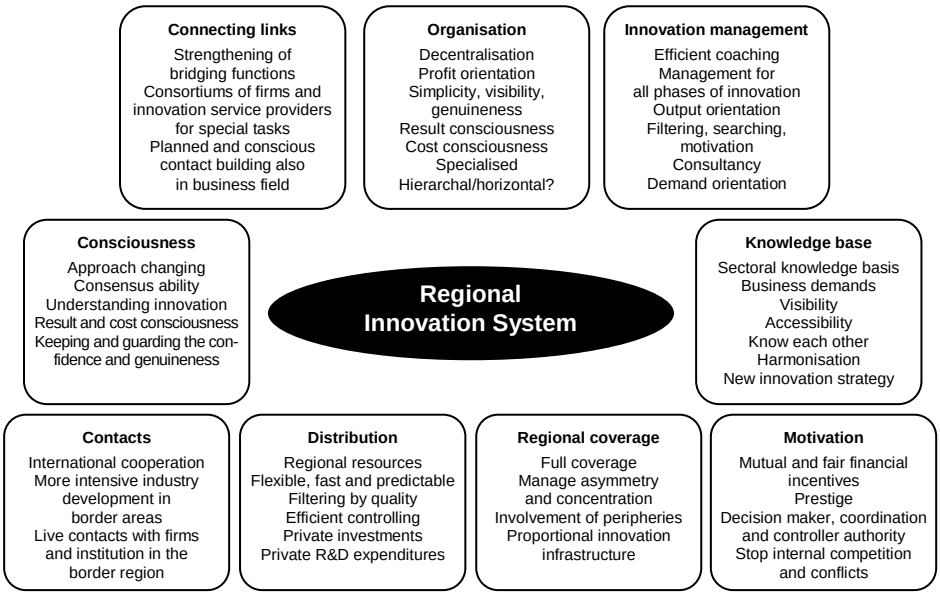


Source: Own elaboration based on the institution's interviews, 2006.

As regards the improvement of the system the different actors expressed their opinions not only on the organisational financing and management type components but besides the improvement of the three fundamental components the approach, the knowledge base, the characteristic features of the system's contact maintenance, integration, motivational and spatial coverage also were evaluated by the majority of interviewees as influencing factors (*Figure 11*).

Figure 11

Hypothetical Ideal State of the Regional Innovation Systems



Source: Own elaboration based on the institution's interviews, 2006.

On the grounds of the common knowledge base such a complex idealistically typified system can be outlined which although implies some contradictions and antagonistic elements but still can serve as a compass for planning the next steps. Almost every components of such an innovation system can make use of the potential advantages of inter-organisational cooperation partnerships and the innovation networks built on their grounds. The two most tangible network aspects of the presented idealistically drawn image are the intensification of international contacts and the bettering of the bridging, intermediary and integrating functions within the system itself. The support, follow-up counselling-type coordination and the servicing of innovation seems to be more and more indispensable. Filtering and sorting out companies successfully is more and more difficult without a living and well-functioning contact system. In the organizational and financing dimension the alternative of centralization (a central organisation) – decentralization (clones or shared functions creating a network) may build different networking and contacting structures but a well-designed communication and resource sharing system will surely most easily meet the demands set up without any regard what scenario will be implemented in the future.

In the West Transdanubian region the organisation and delivery of concrete innovation services as well as the building of new innovation structure facilities (such as innovation and technology centres, research centres of cooperation, regional university knowledge centres for servicing the demands of business sector: vehicle industry, wood industry, renewable energy) with the facilitation of networking and clustering are the major instruments of increasing competitiveness. Although the region does not have a homogenous cluster-oriented policy, both the ongoing processes and the future developments can be interpreted as parts of an organic development policy in which the primary target is providing, maintaining and increasing comparative advantages for the region's key sectors by ensuring an adequate regional business environment and innovative milieu.

11 The future of the system – the basic components of an ideal scenario

In the future clusterization processes and the promotion of SMEs must still be the priority areas of regional economy and innovation. Improving the innovativeness of the SME sector, building their innovation capacity, supporting their innovation activity which should be focused on cooperation contacts, the ability of learning lessons from each other should have a primacy in the programmes of innovation centres, cluster organizations and other development agents. This is the only way of enabling the region for increasing the ratio of intelligence and knowledge based activities in its economic structure and to sustain their dominance in a long-term perspective. With launching the Pannon Economic Initiative, the first of this type initiatives in Hungary, with building cluster organizations, with the completion of innovation centres starting filling them up with content and with the establishment of the regional innovation agency and regional innovation council the institutional network, an organisational network serving as a basis for the innovation system of West Transdanubia has been created. The decentralized utilization of a part of Innovation Fund is serving as a financial basis for the target oriented running of the institutional system of innovation and for the utilization of funds for innovation purposes. Beyond these functions not only the trivial organizational financing and management components should be developed.

Besides the basic components not only the trivial organisational, financing and management segments should be developed. Expert opinions are outlining such a complex, nine agent composed, idealistically typified system which although implies some contradictions and antagonistic elements but still can serve as a compass for planning the next steps. Almost every components of such an innovation system can make use of the potential advantages of inter-organisational cooperation part-

nerships and the innovation networks built on their grounds. The two most tangible network aspects of the presented idealistically drawn image are the intensification of international contacts and the bettering of the bridging, intermediary and integrating functions within the system itself. The support, follow-up counselling-type coordination and the servicing of innovation seems to be more and more indispensable. Filtering and sorting out companies successfully is more and more difficult without a living and well-functioning contact system. In the organizational and financing dimension the alternative of centralization (a central organisation) – decentralization (clones or shared functions creating a network) may build different networking and contacting structures but a well-designed communication and resource sharing system will surely most easily meet the demands set up without any regard what scenario will be implemented in the future.

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Annex

Interviewed Institutions and Organisations from the Regional Innovation System's Supply Side

Innovation and Technology Centres (3)

- INNONET – Innonet Innovation and Technology Centre
- SIIP – Sopron Innovation and Business Park
- CLAUDIUS – Claudius Business and Innovation Park

Knowledge Centres, Competence Centres, Research Institutions (9)

- SZE KKK – Széchenyi István University – Automotive, Electronic and Logistic Cooperation Research Centre
- SZE RET – Széchenyi István University – Regional University Knowledge Centre for Vehicle Industry
- NYME ERFARET – University of West Hungary – Regional University Knowledge Centre for Forest and Wood Utilisations
- NYME KKK – University of West Hungary – Environment Resource Management and Protection Cooperation Research Centre
- NYME KIK – University of West Hungary – Environment Competence and Innovation Centre
- NYME FAIMEI – University of West Hungary – Faculty of Wood Sciences, Laboratory for Material and Product Analysis
- ETI Sopron – Hungarian Forest Research Institute, Sopron Experimental Station
- ETI Sárvár – Hungarian Forest Research Institute, Sárvár Experimental Station and Arboretum
- MTA RKK NYUTI – Centre for Regional Studies, West Hungarian Research Institute

Business Development Organisations (3)

- KVA – Kisalföld Foundation for Enterprise Promotion
- ZMVA – Zala County Foundation for Enterprise Promotion
- VRVA – Vas County and Szombathely City Regional Foundation for Enterprise Promotion

Regional Development Organisations (4)

- NYUPAN – West Pannon Development Co.
- WPRDA PBI – West Pannon Regional Development Agency, Pannon Business Initiative
- WPRIA – Pannon Novum West Pannon Regional Innovation Agency
- PBN – Pannon Business Network

Chambers (5)

- GYMSKIK – Chamber of Commerce and Industry for Győr-Moson-Sopron County
- VMKIK – Chamber of Commerce and Industry for Vas County
- ZMKIK – Chamber of Commerce and Industry for Zala County
- Sopron KIK – Chamber of Commerce and Industry for Sopron
- Kanizsa KIK – Chamber of Commerce and Industry for Nagykanizsa

Higher Education (4)

- PE GMK – Pannon University , Georgikon Faculty of Agriculture
- NYME MÉK – University of West Hungary, Faculty of Agriculture and Food Science
- BGF – Budapest Business School, Collage of Finance and Accountancy, Institute of Zalaegerszeg
- REMEK – Szombathely Regional Education Centre

Cluster Organisations (7)

- PANAC – Pannon Automotive Cluster
- PANFA – Pannon Wood and Furniture Cluster
- PANTERM – Pannon Thermal Cluster
- PANLOG – Pannon Logistics Cluster
- PANTEX – Pannon Textile Cluster
- PHTK – Pannon Local Product Cluster
- PANEL – Pannon Mechatronics Cluster

Abbreviations

CIS – Community Innovation Survey
EIS – European Innovation Scoreboard
EU – European Union
EUR – Euro
FDI – Foreign Direct Investment
GDP – Gross Domestic Product
HUF – Hungarian Forint
KKK – Cooperation Research Centre
NUTS – Statistical Nomenclature of Territorial Units
NYME ERFARET – University of West Hungary, Regional University Knowledge Centre for Forest and Wood Utilisations
NYME KKK – University of West Hungary, Environment Resource Management and Protection Cooperation Research Centre
PBI – Pannon Business Initiative
PBN – Pannon Business Network
PPS – Purchasing Power Standard
R&D Research and Development
RET – Regional University Knowledge Centre
RIS – Regional Innovation Strategy
SME – Small and Medium Sized Enterprises
SZE JRET – Széchenyi István University, Regional University Knowledge Centre for Vehicle Industry
SZE KKK – Széchenyi István University, Automotive, Electronic and Logistic Cooperation Research Centre
TEP – Technology Foresight Programme
WPRDA – West Pannon Regional Development Agency
WPRDC – West Pannon Regional Development Council
WPRIA – West Pannon Regional Innovation Agency

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