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## **Supply and Demand in Innovation and R&D in the Region of Northern Hungary**

### **1. Introduction**

The most recent survey of supply and demand in 'innovation and research and development' in the region of Northern Hungary took place in the framework of the NORRIS project<sup>1</sup> between December 2006 and March 2007. The project made it possible to make a detailed analysis of the demand of small and medium-sized enterprises for innovation and research and development (demand side), as well as the services offered by various organisations in these fields (supply side). Before the survey was begun, the framework conditions were developed for conducting the questionnaire surveys and interviews parallel with each other in the district of Kosice (Slovakia) and in the three counties in the region of Northern Hungary.

### **2. Methodological foundations**

Innovation and research and development can be analysed by several methods which can also be used in economic-social analysis (BABBIE, 1995). For conducting primary investigations, questionnaire surveys are the best available methods [PAKUCS-PAPANEK, 2006].

The European Union has conducted several surveys concerning the member states of the Union, called Community Innovation Surveys (CIS), the methodology of which is given in the Oslo Manual (KSH, 2003).

The projects aimed at creating the Regional Innovation Strategy (RIS) funded by the EU were begun in 1994 (GROSZ-RECHNITZER, 2005), through them currently approximately 150 regions have their Regional Innovation Strategies, with some being developed at present. The European Commission has established an organisation consisting of expert bodies: Innovative Regions in Europe (IRE), with the primary task of providing professional support to ongoing RIS projects (LIPPÉNYI, 2004). This has resulted in a methodology for the preparation of Regional Innovation Strategies (KOCZISZKY, 2004), which is periodically updated by IRE and supplemented by the experience of the regions [IRE Secretariat, 2007].

In the development of Regional Innovation Strategies six areas have to be focused on with the strategic priorities based on demand factors:

- Consensus on the innovation situation in the region.
- An analysis of the innovation demands of the enterprises in the region (bottom-up approach).
- Understanding the most important trends in technology and industry, forecasting their impacts on the region.
- A survey of the demands for support and services.
- Formulating the strategy.
- Developing the framework system for implementing the strategy. (GROSZ-RECHNITZER, 2005)
- On the basis of the six areas it can be seen clearly that the questionnaire survey is of key importance for developing the appropriate strategy.

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<sup>1</sup> [www.norrisproject.eu](http://www.norrisproject.eu)

In developing the methodology for the analyses used in the NORRIS project the consortium took into consideration the above methodologies, then the demand analysis was conducted under coordination by the University of Kosice (NORRIS WP8), while the University of Miskolc coordinated the survey of the supply side (NORRIS, WP7).

## **SURVEY OF THE SUPPLY SIDE**

### **3. Research objective, presenting the research method**

The objective of the research is to map the organisations supporting the innovation activities of enterprises in the region of Northern Hungary, with special regard to the following questions serving as topic areas for the analysis summarising the findings of the survey (NORRIS D7.4).

- What is the organisation's mission in terms of research and development and innovation activities?
- What are the innovation programmes implemented in the region?
- What funds are used by the organisation for R+D and innovation activities?
- What capacities does the organisation have for performing R+D and innovation activities?
- What services does the organisation offer for SMEs in R+D and innovation?
- What size is the gap between those providing innovation and those demanding it?
- What efficiency and coherence do partner connections work with in R+D and innovation?
- What extent does networking have among organisations working on the supply side?

The population serving as the basis of the research consisted of three parts:

- Knowledge centres involved in research and development and innovation and organisations producing technology.
- Business support organisations.
- Public institutions.

The list of the organisations in the population included 45 entities<sup>2</sup>. All the questionnaires sent out and all the requests for interviews produced in all 31 responses that could be evaluated. The spatial distribution of the responses showed the dominance of Borsod-Abaúj-Zemplén county, where 70 % of the responses originated with 22 % from Heves and 8 % from Nógrád counties.

The methodology in the research used a questionnaire survey and deep interviews.

Two methodology materials were used to evaluate the potentials, opportunities and opinions of institutions on the supply side of the innovation and research and development market:

- Questionnaire for technology providers and public institutions<sup>3</sup>. (NORRIS D4.1),
- Deep interview guidelines for business support organisations<sup>4</sup>. (NORRIS D4.3).

The findings of the survey were recorded in reports (NORRIS D7.1, D7.2, D7.3).

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<sup>2/</sup> The list of addresses for the questionnaires sent out was obtained from the county Chambers of Commerce and Industry of the region and from the Innovation and Technology Transfer Centre of the University of Miskolc.

<sup>3/</sup> The questionnaire was based on the questionnaire used by the Department of Regional Economics of the University of Miskolc in surveying innovation potential [Kocziszky, 2004].

<sup>4/</sup> It was prepared with contributions by Tamás Madarász Ph.D, Department of Hydrogeology - Engineering Geology of the University of Miskolc.

#### 4. Presenting the respondents

The following is a summary of the findings of the 22 questionnaires returned and the 9 deep interviews.

*Table 1: Composition of the respondents (pcs)*

| Organisation type                        | Number of samples |
|--|-------------------|
| 1. <i>Technology providers</i>           | 20                |
| 2. <i>Business support organisations</i> | 9                 |
| 3. <i>Public institutions</i>            | 2                 |

*Source: authors' work based on the data of the survey*

The organisations providing innovation in the region include mainly research institutes and higher education institutions, or organisations established by them. There exist also recently established for- and non-profit organisations that usually have the classic forms (limited companies, etc.), but co-operations of a new type are also present (cooperating research institutes and incubators). These types of cooperation can be successful in the fields of innovation and innovation transfer, not only in the region, but all over the country.

#### 5. Decisive organisations in the region

One of the outstanding research and development and innovation organisations of the region of Northern Hungary is the University of Miskolc, thanks to its numerous departments (more than 100), close to 74% of which are in some way involved in innovation or research and development activities, as well as to its significant R+D+I human resource capacity. It is mainly the engineering faculties and that of economics that are involved in research activities of several years' standing with the SMEs of the region, but these faculties also work together with such large companies as Bosch or MOL. The infrastructure required for basic and applied research is largely available at the University. Investments of infrastructure type and developments are continuous in the institution, but infrastructure as old as 20 years can also be found at some departments.

#### 6. Main research fields of the research organisations examined:

- Combustion technology and heat engineering.
- Electro-technique - electronics.
- Energy utilisation.
- Geophysics.
- Production processes.
- Environmental technologies.
- Logistics.
- Mechatronics.
- Management and economics.
- Agriculture
- Production methodology.

Technology providing organisations provide various types of services related to their main research fields primarily to the SMEs in the region (Table 2).

Table 2: Services provided by the organisations examined

| Services   | Technology providers | Business support organisations | Public institutions |
|--|----------------------|--------------------------------|---------------------|
| Development of R+D projects  | 6                    | 0                              | 0                   |
| Support for purchasing R+D or innovation equipment                     | 0                    | 1                              | 0                   |
| Trainings  | 15                   | 0                              | 0                   |
| Quality and certification.   | 0                    | 0                              | 0                   |
| Experiments and analysis   | 2                    | 0                              | 0                   |
| Developing new products  | 4                    | 0                              | 0                   |
| Technology presentation  | 10                   | 0                              | 0                   |
| Technical consulting   | 2                    | 0                              | 0                   |
| Support for process development (system automation)                    | 1                    | 0                              | 0                   |
| Searching for technology information (patents, equipment)              | 3                    | 4                              | 0                   |
| Searching for partners   | 2                    | 5                              | 1                   |
| Support for innovation management                                      | 2                    | 2                              | 1                   |
| Support for starting up business/additional benefits                   | 1                    | 4                              | 1                   |
| Support for industrial property protection                             | 0                    | 0                              | 0                   |
| Technology offers  | 11                   | 0                              | 0                   |
| Technology requirements  | 0                    | 0                              | 0                   |
| Searching for capital.   | 1                    | 4                              | 1                   |
| Support for preparing proposals for national/regional projects         | 1                    | 6                              | 2                   |
| Support for preparing proposals for European/international projects    | 1                    | 6                              | 2                   |
| Information on national/regional guidelines and public subsidies.      | 0                    | 1                              | 1                   |
| Information on European/international guidelines and public subsidies. | 0                    | 1                              | 1                   |
| Support for preparing a business/product plan                          | 0                    | 0                              | 0                   |
| Support for business management (human resources, accountability)      | 0                    | 0                              | 0                   |
| Activities for encouraging entrepreneurial dynamism                    | 2                    | 5                              | 2                   |
| Venture capital  | 0                    | 2                              | 0                   |
| Support for making business international                              | 1                    | 4                              | 0                   |
| Analysing the national market  | 2                    | 0                              | 0                   |
| Analysing the international market                                     | 1                    | 0                              | 0                   |
| Financial support.   | 0                    | 2                              | 0                   |

Source: authors' work based on the survey

## 7. Number of employees related to innovation supporting activities

On the basis of the responses to questionnaires and interviews, the number of direct employees in the activities supporting innovation and of research and development is in general 10-49 persons in the individual institutions<sup>5/</sup>. About 70 % of the employees of technology providers work in R+D fields (mostly university departments and research institutes), while business support organisations work only with a small number of employees (2-5 persons).

Opinions of the respondents show several similarities on the innovation climate of the region (Table 3). A felmérésben megkérdezettek véleménye a régió innovációs környezetéről sok hasonlóságot mutat (3. táblázat). The respondents stressed the following as clear strengths:

- the free accessibility of research and human resources,
- expertise in certain research fields,
- the well-operating consultation service background,
- flexible reaction to changing market requirements,
- efficient national and international cooperation networks,
- continuously developed infrastructure.

Table 3: Opinion and evaluation of the respondents on the situation of research and development and innovation in the region of Northern Hungary<sup>6/</sup>.

|   | <b>Technology providers</b>   | <b>Business support organisations</b>  | <b>Public institutions</b>   |
|---|---|--|--|
| <b>Availability, accessibility and patterns of use of capital connected to regional innovation:</b> | <ul style="list-style-type: none"> <li>– Complicated processes and administration procedure.</li> <li>– Slow decision making.</li> <li>– Difficulty of obtaining funds.</li> <li>– Long procedural processes.</li> <li>– Bureaucratic procedures.</li> <li>– Limited availability.</li> <li>– The mostly recurrent opinions on the distribution of regional innovation capital are rather pessimistic.</li> </ul> | <ul style="list-style-type: none"> <li>– Project/proposal possibilities are taking the right direction.</li> <li>– Program-type supports were more efficient.</li> <li>– Sustainability of programs/projects is improving, enabling continuation of the projects.</li> </ul> | <ul style="list-style-type: none"> <li>– Closed system.</li> <li>– Continuous accessibility is required.</li> <li>– Beneficiaries should come from a wider range of organisations.</li> <li>– Rational utilisation process is required.</li> <li>– Decision making time should be shortened.</li> <li>– Faster payments to beneficiaries, with much less bureaucracy.</li> </ul> |

<sup>5</sup> In higher education institutions the respondent departments are considered to be units, thus the category number of employees refers to them.

<sup>6</sup> Responses are summarised based on analysing the questionnaires of the survey and the contents of the interview reports

|  | <b>Technology providers</b>   | <b>Business support organisations</b>   | <b>Public institutions</b>   |
|--|---|---|--|
| <b>Cooperation with the partners:</b>                          | <p>All technology providers asked stressed national and international research cooperation. Different forms of cooperation were chosen but some common topics can be mentioned:</p> <ul style="list-style-type: none"> <li>– Publishing joint manuals and textbooks.</li> <li>– Writing project FP5-7.</li> <li>– Joint research projects.</li> <li>– Mainly training activities (training courses).</li> <li>– Participation in and organising conferences.</li> </ul> <p>In some cases language difficulties represented problems</p> |   | <ul style="list-style-type: none"> <li>– Looking for cooperation with potential partner organisations.</li> <li>– Acquiring as much as possible national and EU funding is typical.</li> <li>– Attempts at generating project-partners (founding consortiums) in order to achieve higher efficiency in cooperation.</li> </ul> |
| <b>Man driving force of the innovation-related activities:</b> | <ul style="list-style-type: none"> <li>– Free accessibility of research and human resources.</li> <li>– Existing cooperation with experts.</li> <li>– Good relations with other research institutes.</li> <li>– Personnel.</li> <li>– Innovation potential.</li> <li>– Knowledge base.</li> <li>– Excellent personnel and laboratory (equipment).</li> <li>– Control tools are decisive.</li> </ul>   | <ul style="list-style-type: none"> <li>– Improving experience and expertise in the organisations.</li> <li>– Only few companies in the region make demands (negative).</li> <li>– Encouraging SMEs to provide innovation service support is a separate task.</li> <li>– Training, open days, dissemination of information.</li> </ul> | <ul style="list-style-type: none"> <li>– Continuously arising demand (from the business sphere)</li> </ul>   |

*Source:* authors' work based on the survey

### 8. Major findings of the survey

- In higher education institutions the slowness of decision making was the most often stressed obstacle to innovation and research and development, which process is further complicated by the various levels involved (faculty, finance board, university senate). It appears as a positive feature that cooperation with companies is much more efficient in the current legal environment.
- It is essential for increasing efficiency that cooperation be strengthened between researchers and innovation experts (economists, lawyers, sociologists, etc.).

- All those asked follow the local, national and European markets, but consider opportunities outside Europe to be less important. This point of view naturally differs from one professional field to the other. At the national level R+D and innovation services, products and technologies are the most important, but in the international market technology transfer appears beside the products. Services mean mainly search for partners, market exploration and search for financial support (foreign funds).
- Traditional ways of contact (official presentations, events, bilateral talks) as the most efficient methods of communication are kept by the institutions; however, new solutions (e.g. focus groups, ‘innovation café’) are also accepted.
- Establishing R+D+I cooperation forms seemed difficult in some cases due to the financial situation of the SMEs. For solving this problem it appears as a solution if the companies enter into R+D contracts instead of paying money into the innovation fund.
- For R+D+I cooperation to be established, both companies and research units have to make initiatives.
- According to opinions on the equilibrium of the supply and demand sides of innovation, the difference is significant in many cases. The main problem that only a small proportion of the companies consider innovation by themselves arises mainly due to financial causes and to the conservative way of thinking (currently companies mostly show a “next user” mentality and are not aware of new issues or are not willing to consider them). Both sides are to be improved: the supply side has to shape applied research according to market requirements, has to improve its infrastructure background and increase its human resource capacity. And on the demand side, the sensitivity to the innovative way of thinking has to be improved.
- In general fast results can be achieved by improving the operation of the information channels, because sometimes the supply and demand sides are not even aware of each other (each other’s requirements).
- Efficient cooperation makes incubation and the high quality of the innovation chain including the whole projects essential, including the presence of venture capital.

## **SURVEY OF THE DEMAND SIDE**

### **9. Research objective, presenting the research methods**

The fundamental objective of the research was to survey the demands for innovation and research and development at the level of small and medium-sized enterprises in the region, with special regard to the following three groups of questions which served as topic areas for the analysis summing up the findings of the survey.

- General presentation of the organisation.
- Necessity for innovation, product and service development, excluding technology development.
- Necessity for technology innovation.

The consortium of the NORRIS project had previously adopted the methodology of using a questionnaire<sup>7</sup>, which was recorded in a separate project document (NORRIS D4.6). Accordingly, the methodology, following the economics and industry classification of International Standard Industry Classification (ISIC) (TEÁOR being its Hungarian equivalent),

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<sup>7</sup> The first version of the questionnaire was written by the Department of Regional Economics of the University of Miskolc under the leadership of Dr. György Kocziszky.

determined the sectors to be included in the analysis, based on employment in the regional sectors, location quotient (NORRIS D4.6), and also took regional priorities into account.

The population serving as the basis of the research consists of two parts in the region of Northern Hungary:

- Small and medium-sized enterprises.
- Large companies.

The methodology of the research comprised a questionnaire survey and deep interviews focused on large companies.

The survey of the demand side of the innovation and research and development market was supported by two methodology materials:

- A questionnaire for technology providers and public institutions,
- Deep interview guidelines for large companies.

The findings of the survey were recorded in reports.

## 10. Evaluation of the questionnaires

Out of the 750 questionnaires<sup>8/</sup> sent out in the region of Northern Hungary the number of questionnaires filled in and returned was 103, with a spatial delimitation of close to even<sup>9/</sup> that is 46% of the questionnaires came from Borsod-Abaúj-Zemplén county, with 34% and 20% from Heves and Nógrád counties, respectively (Table 4).

The following table sums up the distribution of the questionnaires returned according to the industries previously agreed on.

*Table 4: Sectorial distribution of the demand side questionnaires (pcs)*

| Sectors                          | Number of questionnaires returned |
|----------------------------------|-----------------------------------|
| Machine industry                 | 27                                |
| Electronics and optical industry | 19                                |
| Food industry                    | 18                                |
| Raw material production          | 21                                |
| Environmental industry           | 18                                |
| <b>Total</b>                     | <b>103</b>                        |

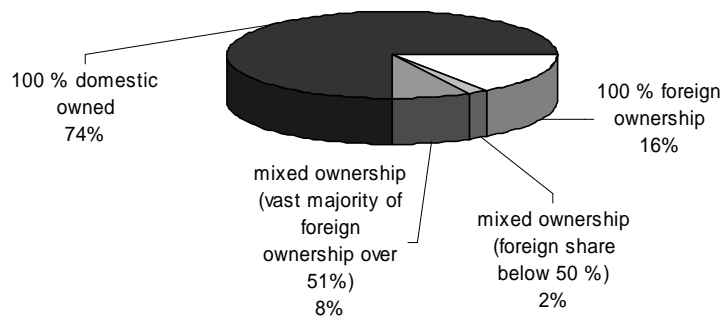
*Source: authors' work based on the survey data*

Looking at the ownership structure of the respondents, close to 75% were fully in Hungarian ownership, while 15.5% were fully in foreign ownership, which was primarily typical of large companies (Figure 1).

<sup>8</sup> The list of addresses for the questionnaires sent out was obtained from the county Chambers of Commerce and Industry in the region and the Innovation and Technology Transfer Centre of the University of Miskolc.

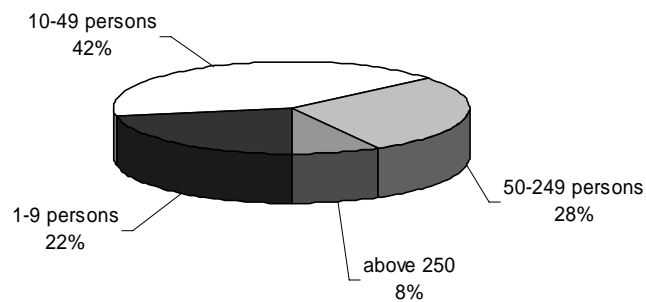
<sup>9</sup> In developing the methodology, in accordance with the RIS methodology, priority attention was paid to spatial equilibrium. The number of questionnaires sent out was determined so that it should correspond both to industrial classification and to the population rates of the counties, thus attempting to maintain the representativeness of the sample examined. Regarding the questionnaires returned, in order to maintain representativeness, additional questionnaires had to be sent out repeatedly.





*Figure 1. Ownership structure of respondents*  
*Source: authors' work based on the survey data*

On the basis of the number of employees of the enterprises investigated, 22% were micro enterprises, 42% qualified as small enterprises, 28% as medium-sized ones and 8% as large companies (Figure 2).



*Figure 2. Categories of employees of the respondent enterprises*  
*Source: authors' work based on the survey data*

50% of the respondent enterprises indicated that the national market was important for them, while only 35.6% regarded international markets as important. The local-regional market of neighbouring countries was indicated as important by outstandingly few respondents (4%) (Figure 3).

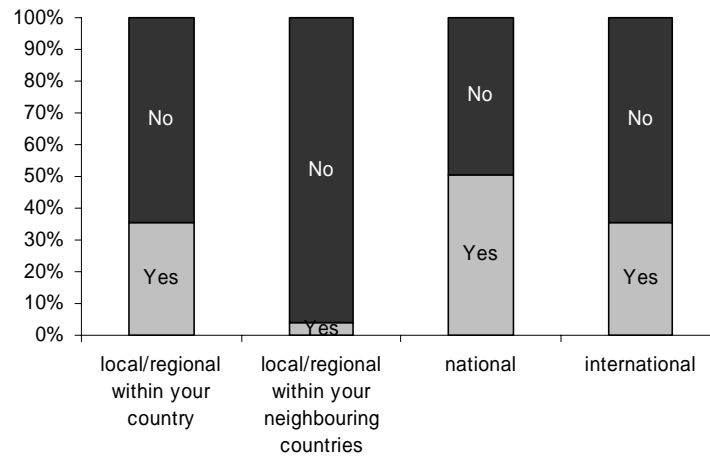


Figure 3. Markets regarded as important by the respondents

Source: authors' work based on the survey data

Examining the lifetime of the products of the companies analysed is decisive in evaluating the innovative character of the enterprise. The products of 44.6% of the respondent enterprises have a lifetime of more than 9 years, which is a rather high value and may represent rather slow and troublesome innovation (Figure 4).

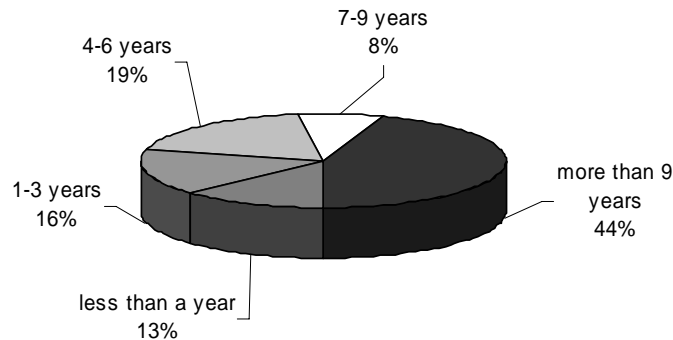
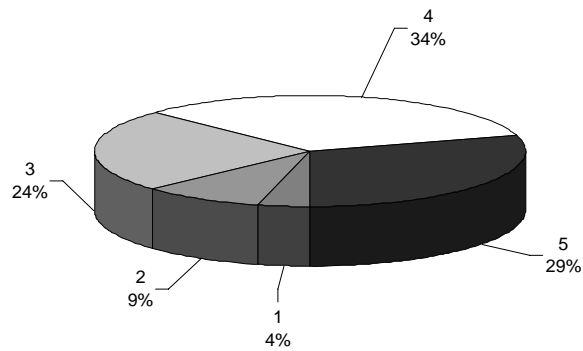


Figure 4. Product lifetime of the companies

Source: authors' work based on the survey data

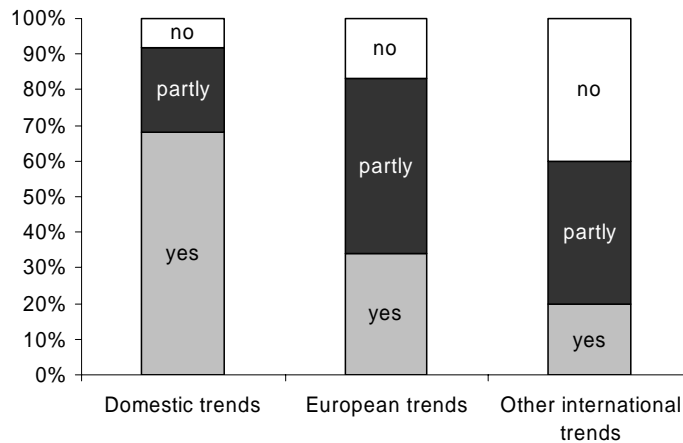
Examining the innovation needs related to the products of the enterprises, 64% of the respondents marked the answers 'important' and 'very important'. This, by all means, shows a high susceptibility to product innovation, or the fact that the enterprises are aware of the meaning and importance of innovation (Figure 5).



*Figure 5.* Product innovation needs of the enterprises  
(5 – very important; 1 – not important)

*Source:* authors' work based on the survey data

In surveying the needs of the enterprises it is an important question to what extent they themselves are aware of the tendencies and trends of the topic areas they consider to be important. On the basis of the questionnaires returned, the enterprises follow domestic processes (68%), partially follow European trends (49%), and are not or are only partially aware of other international tendencies (40%) (Figure 6).



*Figure 6.* Trends having an impact on enterprises

*Source:* authors' work based on the survey data

The answers to the question on what enterprises based their product innovation needs the largest percentage of the responses was own ideas and feedback from customers, while the involvement of experts had the lowest value. This may mean that the majority of enterprises do not trust the recommendations of external experts (Figure 7).

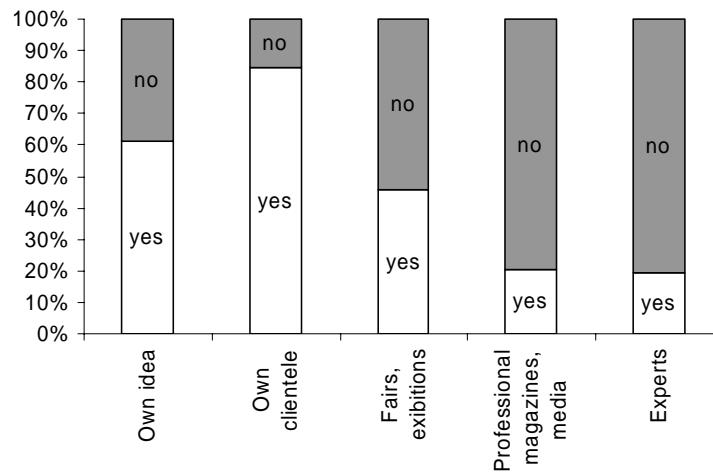


Figure 7. The basis of the product innovation needs of enterprises  
 Source: authors' work based on the survey data

In relation to the previous question, we examined what forms of cooperation the enterprises trusted if there was product innovation. As before, enterprises showed more confidence in personal relations and the integration of suppliers/customers as in cooperation obtained either at exhibitions or events (Figure 8).

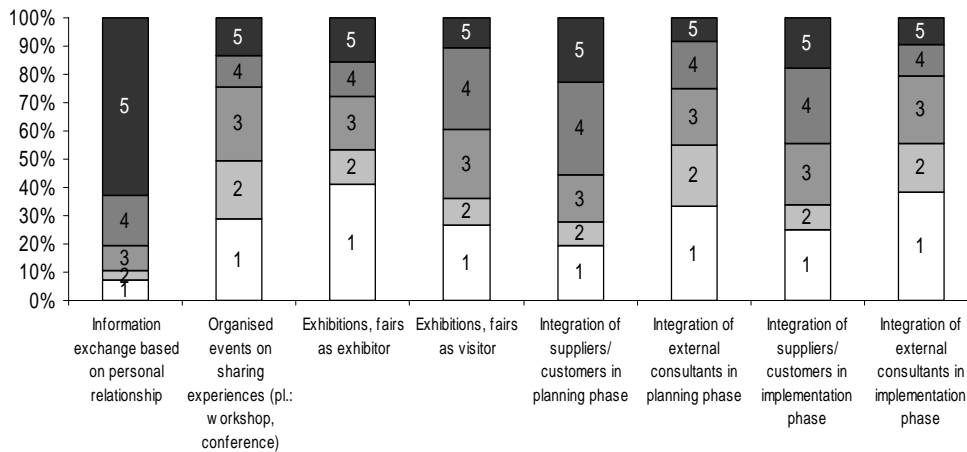


Figure 8. Cooperation forms regarded as important in the product innovation of enterprises  
 (5 – very important; 1 – not important)  
 Source: authors' work based on the survey data

Only 30 % of the respondents regarded the needs for product-related technology innovation as 'important' and 'very important'. This is surprising because in case of an innovation, technology innovation would be the most obvious possibility, but for the respondents this was either capital-intensive or the product itself was such that it was not possible to develop the technology (Figure 9).

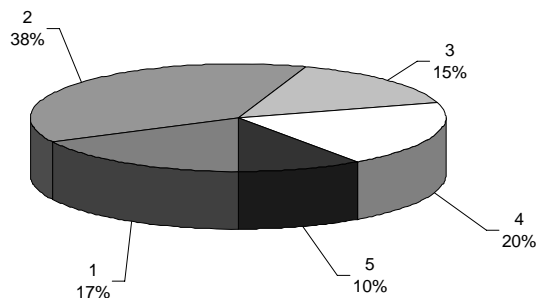


Figure 9. Importance of technology innovation in the enterprises asked  
(5 – very important; 1 – not important)

Source: authors' work based on the survey data

For the detailed analysis the reader is referred to the webpage of the NORRIS project<sup>10/</sup>.

## 11. Summary

The number of newly established enterprises in Hungary is relatively small, which is also contributed to by the increasingly weakening entrepreneurial spirit, due to the relatively high financial (taxation and additional costs) and administrative burdens. These trends represent problems also because in the neighbouring Slovakia, as a result of the entrepreneur-friendly regulations and more favourable economic environment there are more and more enterprises starting up (often with Hungarian owners). In the region of Northern Hungary this phenomenon is to be followed with attention, for due to the geographical location of the region and the increasingly favourable infrastructural potentials, a close cooperation with the district of Kosice may carry serious potentials for an economic revival.

In the past years the number of R+D+I projects as well as the number of SMEs involved have significantly increased as a result of initiatives supporting innovation activities at the national and international levels. These initiatives exert a positive influence on the development of both regional and innovation awareness.

In the region of Northern Hungary there are significant differences between the different economic sectors. The mechanical and machine industries as well as the raw material producing industries have traditions of several years or even decades in the region, and the majority of the companies in these industries are active participants of innovation and R+D efforts. They maintain close connections with their suppliers and customers, taking advantage of the benefits of the various information channels and thus improving collaboration and efficiency. Both research institutes and the university are important partners for these companies in their innovation activities.

The environmental industry (sector) is playing an increasingly important role in the region. Even in the SMEs sector there are numerous companies involved in research, technical and technological developments related to the field. Developing partnerships shows continuity at regional and national levels.

The food industry has shown a small decline in Northern Hungary since 2004; however innovation activities are present also in this industry.

It can be stated that in the region of Northern Hungary the system of innovation conditions is increasingly favourable, although the extent of national subsidies is still low according to

<sup>9</sup> [www.norrisproject.eu](http://www.norrisproject.eu)

those asked. This is a problem first of all in the opinion of enterprises developing products, whose developments respond primarily to market demand. Unfortunately, only part of the Hungarian companies is acquainted with international innovation trends and patents, excepting the companies in foreign ownership. Among the information channels mostly professional journals and exhibitions and fairs are regarded by the respondents as useful.

The greatest problem in the regional innovation system can be found in the fact that the companies do not have sufficient confidence either in the organisations involved, or in the organisations appearing on the innovation supply side. There is a lack of day-to-day efficient collaboration; although due to the initiatives mentioned above the situation seems to be slightly improving recently. In this area the institutions on the supply side and the organisations involved carry outstanding responsibility in maintaining the newly established cooperation forms in the long term and in winning the confidence of SMEs both for the sphere of research and for higher education.

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