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Innovation and Cooperation Networks in Hungary

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CONTENTS

List of figures

List of tables

1 Introduction

In our time recognising the necessity and values (benefits) of cooperation together with building, maintaining and developing cooperation systems are the essential prerequisites of competitiveness and innovative skills. After taking the initial steps, Hungarian research on inter-organisational networks and institutional partnerships did not achieve a sufficient 'critical mass' to turn into the subject of broader and deeper comparative studies. Nevertheless, the idea of a national innovation system, regional innovation systems, and their realisation in innovation policy are increasingly crying for nationwide empirical social science research; to investigate the collaborative willingness and the concrete cooperative activities of the actors of the innovation system as well as to study the degree of organisation and structure of economic and development networks. In recent years, inquiries have typically been conducted in certain regions to map the innovation activities of enterprises and their cooperation systems (*Csizmadia–Erdős* et al. 2007; *Csizmadia–Grosz*, 2006, 2008, 2009; *Csizmadia–Grosz–Tilinger,* 2007; *Szépvölgyi–Baranyai* et al. 2009) or they attempted to explore the interconnection between cooperation and innovation capacity on a regional-level sample (*Csizmadia*, 2009a, 2009b). In addition, research approaching the problem from the other side, investigated rather inter-firm contacts and cooperation forms without any regard to the issues of innovation and innovation activities (*Chikán–Czakó–Kazainé Ónodi*, 2006; *Imreh*, 2005; *Kolos*, 2006; *Nyiry*, 2006; *Pecze*, 2005).

Our research project comprises a questionnaire-based, representative, nationwide survey which was conducted among Hungarian small and medium-sized enterprises to serve as a basis for presenting the characteristics of the innovative capacities of firms, the social network parameters of economic and innovation partnerships, the patterns of the sectoral and regional differences and the set of motivating and inhibiting factors of cooperation. This paper summarises the first results of research basically with descriptive purposes, so that the basic pattern of the main corporate properties related to the two main topics could clearly be identified. Thus, it can also be considered as an initial diagnosis focusing on certain important factors of the competitiveness of Hungarian economy.

Today, it is no longer necessary to argue the importance of innovation by referring to a mass of citations in scientific papers. On the other hand, it is worth briefly discussing what kind of economic or social action benefits are gained by social capital, organisational level cooperation or network membership. The 'strength of weak ties' theory and the idea of 'the social embeddedness of economy' are the most famous classical summaries of this issue (*Granovetter*, 1994; *Szántó*, 1994), which today are extended by the theories of 'network society' and 'network economy' (*Castells*, 2005). On the organisational level,

these theories are telling us that the key factor of an institution's collective social and economic achievements, success, or in market term competitiveness (besides other factors), is the types and dimensions of contacts it has. What networks it is a member (if at all), what positions it fulfils there, which networks it is left out from, or even in a more complex approach, the structure of its organisational environment, i.e. the possible virtual cloud of potential contacts where its prospective partners may come from. Our research serving as a basis to this paper is seeking to provide some empirically-based up to date facts of which the most important initial results are published here.

2 The methodological background of the survey

Before exploring any significant correlations between the innovation activities of firms and their formal and informal cooperation contacts, the interpretation of research results requires a description of the methodological background of the questionnaire survey. Thus, our goal is to give a detailed description of the criteria of sampling and their implementation, as well as the most important parameters of company sampling.

The study is based on a sample of 1,835 randomly selected businesses, which is representative in sectoral, regional and company size aspects. The personal interview of businesses involved in the survey and the querying of questionnaire survey took place in the first half of 2010. Therefore, the responses they give refer to the year 2009 and the replies to some questions concern the previous three years (2007–2009) of the query. In terms of representativeness, however, we should draw attention to some important criteria.

The first question concerning the size and selection of the sample was which sectors should be included in the survey. Similar previous studies typically focused on processing industry as being more engaged in product innovation and process innovation, or in scientific research and technological development activities (*Csizmadia–Grosz*, 2006, 2009). However, proceeding from the basic issues of research we found it more reasonable to start from a broader interpretation of innovation which comprises organisational and marketing innovation as well. Finally, due to these considerations, the main business activities in all sectors of the A–N NACE categories are included in the survey, so the representativeness of the sample covered the following 9 additional sectors/classes: A – Agriculture, forestry and fisheries; BCDE – Industry; F – Construction; G – Trade, motor vehicle repair services; H – Transportation and storage; I – Accommodation and catering services; JKL – Info-communication, finance, insurance, real estate, M – Professional, scientific, technical activities, N – Administrative

and service support activities. The ratio of O–S industries excluded from the O–S make up only 3% of the entire statistical population.

One of the fundamental aims of the survey is to present regional disparities within the country, so the representativeness of the regions was an important criterion. As the geographical location of businesses in our country shows a very strong concentration in Budapest and Pest County, it seemed reasonable to underrepresent the capital with its surroundings in the sample so we had a sufficient number of samples. Thus, in Central Hungary region, the sample size was maximised in 400, 47% of the total elements needed for representativeness. This means that the results had to be weighed back to nearly double of their original values for regional level analyses. As a result of this, for the rest of the non-capital regions, it was possible to create sub-samples of 200–300 businesses so the weight of each region showed the same degree of distortion.

In order to ascertain relevant responses, it seemed reasonable to limit the inclusion of businesses to a certain scale in the representative sample. As the results of past experiences show, innovation-based collaboration is less important for micro-enterprises run only by a small staff, so the inclusion of companies with a staff below three in the sample was certainly out of question. The analysis of base population, however, revealed that even with the inclusion of businesses run by at least 5 people, 51% of the sample would have consisted of businesses of less than 10 people, which still most likely would have led to less relevant responses from the aspects of the aims of research. Thus, the retrieved base data and sample was limited to companies run by a minimum of 10 employees, i.e. micro enterprises were not included, and we believe other methodological means are more suitable for exploring their activities in this field. Nevertheless, this limitation has made it possible to survey 5.8% of the base population since the CSO based company database indicates 31,555 firms with over 10 employees, of which 1,835 companies were queried. In terms of size the survey on small businesses, medium-sized enterprises and large companies is certainly representative.

3 R&D and innovation activity of Hungarian enterprises

Before the detailed analysis of the interrelation between the innovation activity of firms and their parameters of inter-organisational relationships we first need to overview the most important characteristics of the research and development and innovation activity of Hungarian enterprises. The latter will be explored by the incidence of the different types of innovation, the motivating factors and the most important obstacles hindering it.

3.1 Corporate R&D activities

Research and development and innovation activities are not necessarily associated with a company's life, but there are typically strong linkages between the two activities, particularly in the case of product and process innovation (*Table 1*). The companies' own R&D activities were measured by two input indicators: the volume of R&D expenditures and the ratio of workers employed in the R&D sector. Those respondents were regarded as R&D performing companies that reported either on R&D or R&D expenditures for the three-year period between 2007 and 2009. On this basis, the total sample of 525 enterprises, i.e. 30% of the respondents performed some kind of R&D activities over the past three years. The ratio of companies reporting on R&D expenditures (505 firms, 28.9%) was slightly more than those employing workers in the R&D sector (359 enterprises, 20.5%).

It can be concluded that the surveyed companies spent nearly 2% of their revenues on R&D activities in recent years on the average, but there were certainly huge differences among individual corporate values. If we investigate only the 525 firms, the average reached 6.7% and the median 3%, i.e. companies active in the field of R&D activities spent at least 3% of their revenues for these purposes. Analysing the human capital directly involved in R&D we can say that of the total businesses in our sample, an average of 1.88% of workers were employed directly for R&D purposes. If we again turn back only to companies with R&D activities, it turns out that 6.45% of the employees are directly involved in such activities, although the median value in this case does not exceed 1%, which is rather low, we must say.

There is a clearly significant correlation between the size of a corporation and the existence of R&D activities, although not a very strong relationship is observed. However, between firm size and the ratio of R&D expenditures compared to the total revenues, or even the share of employment in R&D, i.e. the degree of R&D activities, there are no significant correlations. Thus, while more than a quarter (26.9%) of small business were involved in R&D activities, the ratio of medium-sized companies has exceeded 40%, while approximately two-thirds of large firms (63.8%) proved to be active in this area. In contrast, no significant differences can be detected between the three company size groups in their average investment rates, or in their average number of employees in R&D.

Analysing regional differences within the country, it turns out that firms in Central Hungary including Budapest, the capital, are the most active (37.3% of them are performing R&D activities), while in the other four of the six regions the ratios of companies engaged in R&D activities are very similar (31–34%), or slightly below the value of the metropolitan area. In contrast to this, in Southern Transdanubia and Northern Hungary, two of the country's least developed re-

gions, the proportions of such firms are significantly lower (15.3% and 18.6%). Thus, compared to our previous assumptions, differences do not primarily arise between the capital city and the provincial areas.

Table 1

Main characteristics of R&D activity

	Number of firms	%
The share of R&D expenditures in turnover (%)		
0% – no R&D expenditures	1242	71.1
Under 1%	82	4.7
1.0– 4.9%	180	10.3
5.0– 9.9%	112	6.4
10.0–24.9%	99	5.7
Above 25%	32	1.8
No answer	88	4.8
Average		1.98
The share of R&D employment in total employment (%)		
0% – no R&D employment	1396	79.5
Under 1%	38	2.2
1.0– 4.9%	154	8.8
5.0– 9.9%	52	3.0
10.0–24.9%	80	4.6
Above 25%	35	2.0
No answer	80	4.4
Average		1.88
The existence of R&D activity (R&D expenditure or R&D employment)		
Yes	525	30.1
No answer	92	5.0

Source: NETINNOV Enterprise Survey 2010, N=1835

3.2 The innovative activities of firms

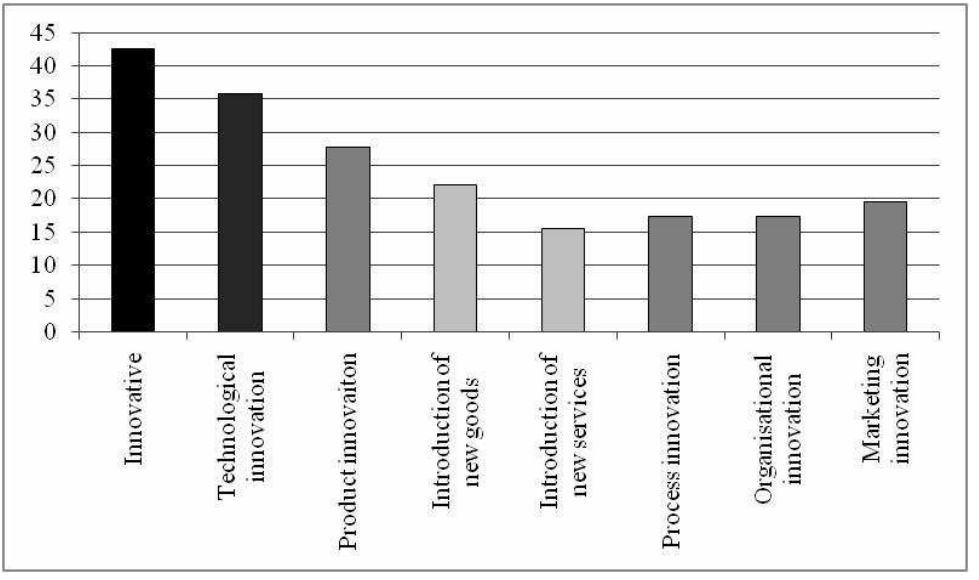
We would like to examine the innovation activities of enterprises according to the interpretation of the innovation concept of the OECD *Oslo Manual* (2005), which means that we investigated the existence of four types of innovation activities: product innovation (goods and/or services), process innovation, organisational innovation and marketing innovation (*Figure 1*). Among them, those were considered innovative which had implemented three of the four major types of innovation during the three year period between 2007 and 2009, while the group of

firms considered to have implemented technological innovation consisted of firms reporting on the implementation of either product and/or process innovation.

To questions concerning the innovation activities of the companies interviewed only four did not respond, so the responses can safely be generalised to the Hungarian business sector of over 10 people. The responses of Hungarian companies, slightly more than two-fifths (779 enterprises, 42.5%) can be regarded as innovative. Moreover, a significant part of these innovative firms are engaged in the implementation of technological innovation, more than a third of all enterprises (655 enterprises, 35.8%) reported on having introduced a new product or having successfully implemented process innovation in the last three years.

Figure 1

Innovation activity of enterprises between 2007–2009, %



Source: NETINNOV Enterprise Survey 2010, N=1835.

Of all the innovation activities product innovation clearly turned to be the most popular (27.7% of all businesses and around two-thirds of the innovative enterprises). The other three innovation types occurred in similar proportion in the sample (about 17.5 to 19.5%). Within product innovation, clearly more and more companies report on the introduction of new products. Basically, a trend very similar to the previous innovation activities may also be observed in plans for the next three years. Only a few percentage points of change can be observed in almost all innovation types; however, it should be appraised positively that in all

areas – even if only slight – growth can be expected in the businesses' demand for innovation. Certainly, a very strong correlation is seen between the past and the future innovation activities, and it definitely deserves some thought that half of all the surveyed firms may be regarded as completely passive, i.e. their activity is characterised by the lack of innovation during the last three years, nor in the future will they be ready for new things.

As regards the corporate parameters of innovative and non-innovative firms, we can say that in most cases, a significant interconnection can be discovered. From the aspect of innovativeness, a very strong positive correlation can be indicated among the existence and extent of R&D activity, its provision of own products and the complexity of the geographical concentration of sales contacts (not just from the point of focusing on the aspects of a narrower market, e.g. local, regional, or national sales).

There is also a typically strong and positive correlation between company size and participation in formal co-operative networks (cluster organisation, consortial cooperation, strategic alliances), the complexity and orientation of purchasing relations (toward foreign markets), belonging to a larger group of companies, the enterprise's place in the business sector (professional, scientific and technical activities, industry, info-communications, finance, insurance, real estate industry versus agriculture, construction, transportation, warehousing, administrative and service support activities) and the company's geographical location (Western Transdanubia and Central Hungary vs. South Transdanubia and Northern Hungary).

It seems reasonable to get into a more detailed analysis on the relationship between the innovation activity of firms and their spatial location. This means not only the proportion of innovative firms, but the proportion of firms engaged in technological innovation as well (product and process innovation or presence) and the incidence of certain types of innovation as well. The proportion of innovative firms is the highest in Western Transdanubia (53.4%), but better than average in Central Hungary and the Southern Great Plain regions (48.6% and 44.7%). By contrast, from Southern Transdanubia only 29.5% of the companies reported on the earlier introduction of some innovation, and also in the North-Hungarian region, barely one in three companies are considered innovative. Businesses in Central Transdanubia are close to the national average, while for those in the Northern Great Plain, the frequency of the occurrence of innovation is slightly lower.

Certain types of innovation (product, process, organisation, organisational and marketing) certainly do not have the same weight in different regions. On the basis of the responses it can be stated that compared to the national trends, the situation is balanced in Central Hungary, as each of the four innovation types occur approximately to the same extent, approximately 15% higher than the na-

tional average. There is also a fairly consistent trend in Southern Transdanubia but on the negative side and with even a greater difference (typically 40–50% lower than all types, but the situation is not much better in Northern Hungary region either.

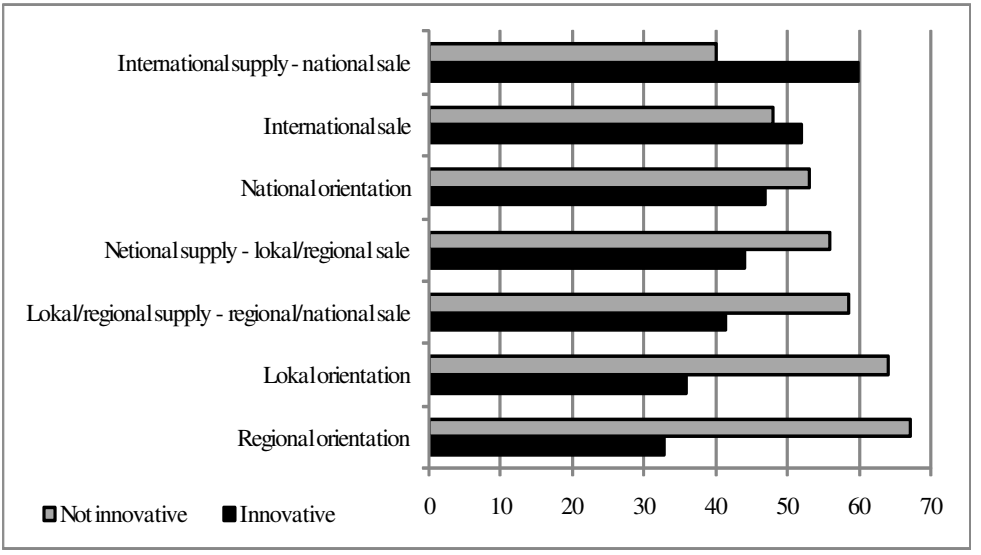
Companies operating in the Southern Great Plain region showed significant (20% higher than the national average) activity particularly in the field of marketing innovation, and it is very probable that this is the very reason why they seem to be more innovative than the majority of others in different regions. In contrast, in the innovativeness of companies in Western-Transdanubia, said to be the most innovative region, technological innovation plays a huge role. The rate of businesses implementing both product and process innovation is much higher (the former higher by 36% and the latter by 29% than the national average), while in the field the softer types of innovation (organisation–organisation and marketing), Western Transdanubian companies are already lagging behind the national trends. The competitiveness of the enterprises of Central Transdanubia is weakened primarily by the lack of innovation in marketing, while in the Northern Great Plain clearly by a very low rate of product innovation.

On the basis of the territorial embeddedness of the companies' purchases and sales (each of which may be locally, regionally, nationally or internationally oriented), we tried to arrange the respondent companies into relatively homogeneous groups by using cluster analysis which resulted in seven distinct groups of companies. 19% and 20% of the activities of companies are locally or regionally oriented. 18% of these companies are more or less concerned with local or regional sales besides nationwide acquisition, which, from the aspects of the narrower area, means a non-revenue generating activity. 12% reported international sales markets to be the dominant sources of their income, while a further 8% are also linked to a kind of base activity because their local/regional acquisitions are combined with regional/national sales, which therefore involve a larger area.

There are clear differences among these company groups regarding the incidence of innovation (*Figure 2*). Companies integrated into international markets clearly show higher innovation skills, and firms with at least a national purchasing and marketing orientation reported a higher than average frequency of implementing some sort of innovation project. In contrast, among businesses focusing on local or regional markets, which means no more than integrating into the economy of a much narrower area, the proportion of innovative firms was significantly lower.

Figure 2

The share of innovative and non-innovative enterprises by regional embeddedness, %



Source: NETINNOV Enterprise Survey 2010, N=1732.

3.3 The motivational factors and the obstacles of innovation activities

An interesting question might be which factors motivate firms in their activities, which are the main reasons that urge them to continuous renewal? The responses tell us that motivations for innovative activities typically go back to multiple reasons; more than half of the innovative companies identified at least three factors. Of the reasons behind innovation activities, the expansion of product range, quality improvement and the appearance on new markets were mentioned with a very similar frequency, in the case of slightly less than half the firms (45–48%), they had a role in encouraging innovation. Typically the main motivation was to improve efficiency which was identified by more than 60% of the firms; market or technological needs were identified in half as many cases, while in the least of cases, profile change associated with innovation (less than 5%) was marked.

No significant correlations were detected between the motivating factors of innovation and company size, only in the case of quality improvement did we find the rule that the larger a company, the more important it is to renew its qualitative dimension. The reasons behind innovation are typically independent of the sec-

toral affiliation of companies; what is really detectable at all is primarily due to the nature of different activities, and no significant regional differences can be observed among them (they are typically similar in all regions of the country).

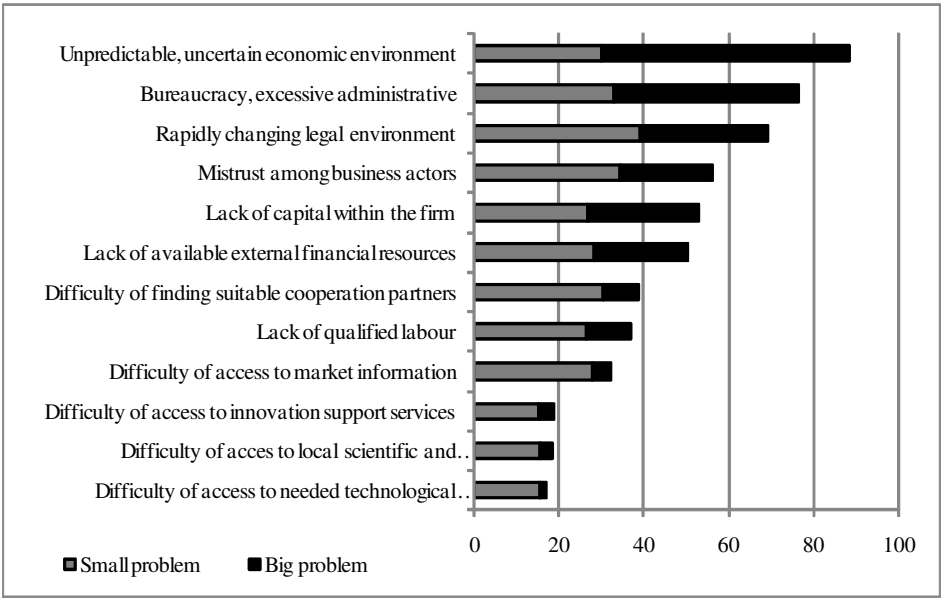
We attempted to explore the obstacles to the innovation activities of firms not only in the case of innovative firms, but also for those who over the past three years have not implemented any innovation projects. Within their sphere, the obstacles rather may be linked to their successful operation and competitiveness. The responses showed that the indirect macro-level factors are much more serious problems for firms than the typical weaknesses they face in their narrower local/regional environment. Among the most common hindering factors of innovation, such reasons were listed as for example the unpredictable economic environment, the rapidly changing regulatory environment and bureaucracy, excessive administration (at least two-thirds of the companies identified all of them as a problem). Mistrust among business actors or the scarcity of internal and external financial funding resources for the company limit every second company's innovation activities. Accessing local scientific and technological infrastructure and innovation support services as well as technology information were the smallest problems in the innovation activities of firms; less than 20% of them were impacted by such difficulties only.

Innovative firms see each factor to be an obstacle in higher proportion than non-innovative ones; moreover, the degree of impediments is typically serious in case of the most problematic factors (*Figure 3*). The innovative enterprises, in comparison to the non-innovative, found the unpredictability of the macroeconomic environment extremely problematic (almost 90% mentioned it). Moreover, bureaucracy and mistrust among firms and matchmaking with a suitable cooperation should be emphasised, naturally beyond the classic eternal problems of underfunding.

Of the obstacles, only in a few cases could a significant correlation be detected with company size; especially for smaller firms, their financial situation and the scarcity of available external resources, the uncertain economic environment, lack of trust among business partners and excessive bureaucracy mean more serious problems in comparison with larger companies. The frequency of mentioning the obstacles in most cases is irrespective of what sector the company operates in, the over-representation of certain sectors was observed in case of a few less problematic factors only. Significant differences between regions are found only in the assessment of indirect macro factors only, and curiously, no major differences were detected between the evaluations of the smaller local/regional dimension; however, of the business communities from Central Hungary and the Southern Great Plain, where these differences were more often in evidence, significantly fewer companies mentioned them.

Figure 3

Hindering Factors of Innovation Activity in Innovative Firms, %



Source: NETINNOV Enterprise Survey 2010, N=779.

4 Inter-organisational relationships

After presenting the innovation activities of businesses, we are going to introduce the basic properties of the inter-organisational relationships. We are using several social network parameters with the aim of highlighting the most important features of the contacts of economic organisations established with other institutions. Our investigation covered two main issues. First, the organisational direction of contacts was examined, with 11 different kinds of potential partners in total, such as:

1 suppliers, subcontractors
2 clients or customers
3 direct competitors
4 other firms within the industry (potential competitors)
5 universities, colleges
6 public and private research institutes
7 professional organisations (e.g. federations, associations, companies)

8 organisations engaged in economic development (e.g. chambers, foundations, business development, the Investment and Trade Development Agency of Hungary etc.)
9 other innovation support organisations (e.g. innovation agencies, technology and innovation centres, etc.)
10 local governments, regional bodies (operating on the regional, county and micro-regional levels)
11 central government organisations, authorities, offices.

Next we investigated the areas and contents of cooperation serving for seven different kinds of purposes: purchasing and logistics, sales marketing, production and service; R&D, innovation activities, information gathering and the utilisation of external services. Essentially they all make up the basic dimensions of the structural and functional analyses on which more than 30 social network parameters can be laid out and used for analysis even in the descriptive phase. As these parameters made it possible to measure very different aspects of these cooperation activities were bundled into five major packages of analysis. By using them we are trying to demonstrate the incidence, size, complexity, and formalisation of the areas of cooperation, the characteristics, the functional features of partnerships, the spatial coverage of partners, and the spatial aspects of inter-organisational contacts.

4.1 The incidence and areas of inter-organisational contacts

On the basis of the responses given to the questionnaire survey, we can clearly state that today, cooperation between organisations should be regarded not as an exception, but rather as a basic feature of economic actors. There were merely five businesses in the database, having not established any forms or contents of inter-organisational cooperation during the test period of three years. The majority of businesses reported having contacts with more or less cooperating partners.

However, there are very large differences in the importance of some types of organisations as a potential cooperating partner. To put it simply, the organisational environment of cooperation among economic actors, as a possible social network milieu can be divided into four segments on the basis of how likely they are to get into the view and cooperation system of the different types of organisations and firms (*Table 2*).

Firms are most likely to cooperate with suppliers and clients (more than 95%). More or less in every second company's inter-organisational contact a competitor, an authority, agency or regional organisation emerged as a direction. Economic and trading organisations make up the third layer of relationship in terms of directions, while in the fourth layer of frequency (from the 11 possible kinds of

contacts), R&D and innovation have primary importance. Consequently, corporate mergers with higher education, research or innovation support institutes occur only in a much narrower circle of companies.

Table 2

Directions of inter-organisational relationships

Potential cooperation partners	Number of firms	%	Standard deviation
Clients or customers	1760	96	.198
Suppliers, subcontractors	1735	95	.227
Direct competitors	1061	58	.494
Local governments, regional development organisations	906	49	.500
Central governmental organisations, authorities, offices	839	46	.498
Economic development organisations	782	43	.495
Professional bodies, organisations	715	39	.488
Other firms in the same sector	679	37	.483
Universities, colleges	371	20	.402
Innovation support organisations	184	10	.300
Public and private research institutions	125	7	.252
No contacts with other actors	5	0.3	.040

Note: Relationship means that the firm had at certain intervals, repetitive (not once, but not necessarily regular) contacts with the other organisation, institution in the last three years in supply, production, sales, research and development or other areas. Such relationships, inter-organisational cooperation is not subject to the formal, contractual relationship.

Source: NETINNOV Enterprise Survey 2010, N=1835.

Collaborative projects by their content (goal) do not tend to occur with equal probability within the institutional environment of enterprises. Businesses develop synergies with other actors primarily for an efficient access, provision and sharing of input factors connected to their everyday activities. In case of both tangible and intangible components, (acquisition, logistics, as well as information gathering and sharing oriented cooperation) the proportion of collaborative contacts was above 85%. 60–70% of companies engaged in external services, marketing and sales and concrete manufacturing and services show some kind of cooperation. Innovation and R&D collaborative projects are evidently relevant only for a narrower circle, so in this aggregate approach a much smaller ratio of figures can be observed (every fifth enterprise). The average functional heterogeneity index of business contacts is somewhere between 4 and 5, which means they develop collaborative contacts in so many areas of the possible 7 types.

In the various areas of cooperation, the composition of partners is certainly not homogenous. Different types of cooperating partners occur more frequently in the cooperation fields of information gathering and sharing, or research and development and innovation. Three major functional approaches can be identified from the results of the division of labour in social networking. In areas closely linked to the core business of enterprises (the first three functions: acquisition and logistics, production and service, marketing and sales) the majority of cooperating partners are market players. Other businesses of suppliers, subcontractors, firm groups, clients and customers and industry partners are the dominant directions of cooperation. The TOP-3 'players' of R&D and innovation cooperation groups implicitly are made up of knowledge generator, broker and support institutions (research institutes, universities and innovation support organisations are present in both cases but listed in a different order). In case of information and service links the role of big umbrella (professional) network organisations (development) and central official organisations is appreciated.

4.2 The size and complexity of contacts

By complexity, we mean how many types of organisation has a business established simultaneous contacts with in total. This can be used as a simple indicator of heterogeneity for an interactional organisational environment. The average value of the index is around five; thus, the number of the type of organisations an average business organisation simultaneously maintains contacts with in some way out of the possible eleven. A low value of complexity (1–2 types of incidences) has been identified only in case of about 14% the companies. Only a smaller group (about 15%) can be characterised by extremely high heterogeneity values (over 8 different types). The majority have collaborative contacts with 3–6 types of organisation, and the ratios (15–16%) are very similar for each type.

The sampled enterprises can be grouped on the basis of these values and there is an opportunity here to analyse the correlation between complexity and the directions of contacts. We seek an answer to how new players are entering into and building them while the complexity of contacts is growing. In the simple structure which organisation types are dominant, and how a more complex interactive organisational milieu is emerging? Its evolution is relatively simple and follows the logic of the rules of economy and the market. Those enterprises that are basically cooperating with only a few types of organisations are focusing primarily on their market partners (suppliers, subcontractors, clients and customers). Other types of collaborative contacts rarely occur among them in other directions. In the second stage (at a value of between 4 and 5 in the complexity index) of contacts competitors, businesses in other sectors, economic and professional

organisations and (even though at a lower rate) agencies, authorities, local and central administrative organisations are emerging. In the largest group (with a value between 6 and 7; 42%) the structure remains the same, but incidence chances are higher and tertiary education institutions are also emerging as potential cooperating partners. Finally, companies that have the most complex relationships tend to have a greater inclination to cooperate with innovation and research institutions in addition to universities.

These structural parameters, as standalone values, certainly cannot tell us anything about the 'utilisation value' of these contacts. The examination of the size of collaborative contacts may be a step forward in this direction. Respondents had to estimate the number of cooperating partners in each direction. Of the previous partner types, excluding clients and customers would be reasonable (in several cases, a large company may show extreme values, and it may be difficult to fit it into the same category with such organisations, having in several cases only a few partners in the company's operating environment).

On the basis of responses, it can be declared that a typical firm has a total of 24–25 cooperating partners on the average. Half of the 1,829 companies analysed here have cooperating partners in a value range of 12 to 51. However, in the top 10%, the number of cooperating partners is over 100. Since we inquired about so many different directions of collaborative contacts, these results may be composed of completely different internal ratio values in case we consider the nature of the partner organisation as well. Therefore, a relatively simple picture of a homogenous pattern emerges before us, verifying the earlier conclusions that in the cooperation contacts of businesses, the share of other firms represent the greatest weight (suppliers, subcontractors, competitors and industry partners make up the core of these corporate relationships).

Certainly, one must be aware that the group of partners shows very significant differences in size with extremely high values in case of some organisations. However, there is a significantly positive linear connection between the complexity of the contacts and the size specified by the number of partners. With the increase in the number of contacts their structure will also turn increasingly diverse.

4.3 The grouping of firms based on the size and complexity of their contacts

By combining the number of partners with the various possible forms and types of partner organisations, Hungarian economic organisations can be classified or divided on the basis of a new pattern. As a result of a two-step cluster analysis, five discrete models can be developed so the group size ratio would not go very high (the largest group would only be one and half times greater than the smallest one).

Assuming that both indices can be simplified to three parameters (below average, average and above average), the number of possible groups could be nine. In reality, the picture is simpler as the actual sampling of firms does not follow such a differentiated pattern.

Characterising our groups by using cluster centres, it can be stated that 45% of companies have an entirely small and homogeneous structure of cooperation partnerships. The good news is that the 'very homogeneous' group is of smaller proportion (13%), and the group of companies with a small and below-average complexity index of contacts is the largest cluster (32%) in the entire sample. The next step represents businesses (22%), with an average size of partnerships, and slightly above the average of the index of heterogeneity, because they are oriented towards up to 6–7 different types of cooperating organisations. The three groups of companies are totalling up to two thirds of the entire sample.

The remaining one-third of firms can be divided into two further company groups, where outstanding social network activity can be observed in both cases. However, their qualities are differing: 13% of firms make up the group where the number of partners and the complexity of contacts are the highest (at least 60 organisations with a minimum of 8 types of cooperating partners). There are two important ratios to highlight: 1/3 and 2/3, in case we want to find the proportion of companies with above-average social network characteristics; and 13% / 87%, in case we want to illustrate the proportion of companies with extremely large and complex collaborative networks.

4.4 Forms of networked collaboration

Embeddedness into collaborative networks is something 'different and even more' than the so far surveyed set of bilateral inter-organisational contacts. Nowadays, we talk more and more about entrepreneurship networks, network organisations, clusters and consortia. The questionnaire survey asked the firms

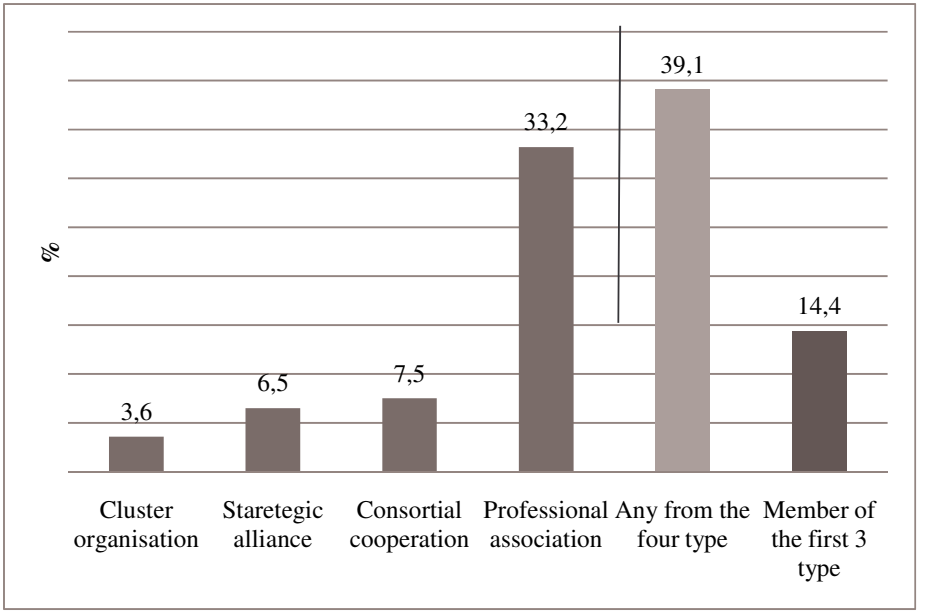
- on the one hand, which of the different collaborative network formations (cluster organisation, strategic alliance, a syndicated cooperation, trade association), they were the members of during the survey period;
- and on the other hand, surveying the 12 organisational contacts one by one in each direction, we asked whether the organisation together with its cooperating partners is a member of some collaborative network or not.

Based on these results, we can say that professional associations cannot be analysed in the same framework with the other three much more specific network solutions (*Figure 4*). If all four types are included in the economic analysis, approximately 40% of businesses are involved in some kind of network cooperation.

However, only 14% of the sample firms were the members of at least one of the first three forms. For 63% of companies, professional association membership is the only form of network cooperation, which in several cases means merely a single group membership. Clusters, multi-member strategic alliances and consortia were typically formed of less than 10% of firms, a very low value. In addition, economic agents would typically be integrated into the organisational environment only through one network type. Only 50 companies (3% of the total sample) were identified to be involved in complex (including at least two types of) collaborative network activities.

Figure 4

Involvement in different network cooperation forms, %



Source: NETINNOV Enterprise Survey 2010, N=1835.

If we ask whether they were the members of joint collaborative networks, with their various potential cooperating partners the resulting rate is even lower. Overall, a quarter of companies were members of a network over the past three years. Here also the dominance of professional organisations (21%) can be observed. The second largest group of the potential networked partnerships of firms consists of suppliers, subcontractors and economic development organisations. It is an exciting change compared to the previous rankings that universities, research institutes and institutions for innovation play a more important role (12%) in net-

works. It is clearly visible that the structure of the counterparties to the network synergy is completely different from the profile of the full relationship encompassing predominantly bilateral partnerships.

Our presentation on the basic features of networking will be finished by demonstrating the correlations between the areas of cooperation and the intensity of networking activities. We are seeking for the answer how the overall network participation rate (25%) varies in the seven areas of cooperation, and whether a higher incidence rate can be expected in certain directions of cooperation in the emergence of the networked forms of organisation? Our results suggest a definite yes for the answer. Those organisations that are interested in innovative or R&D cooperating partners are nearly twice as likely to be members of network cooperations as well (42.4% and 40.4%). Such deviations in the other five areas cannot be observed. The ratio of information-related connections is third in rank (26.9%). In case of other activity related collaborative projects, no significant correlations have been detected. Despite the fact that the questionnaire survey did not ask about the details of certain areas of collaborative contacts and the data of only one company were available in a certain field of the existing collaborative contacts with another parameter of behaviour of social network, it can clearly be seen that network solutions really occur in higher proportion in areas where the complexity, high expenses and high risks of activities particularly justify them.

4.5 The spatial location of cooperating partners

Next, we are seeking the answer to the question in which cases does territorial proximity mean benefits in terms of establishing contacts, and whether in certain types of contacts local or regional organisations are preferred. What characterises the spatial location of other institutions, organisations within the relationship of business actors? Four spatial categories were used to survey the location of the contact partners: the distinction of local, regional, national and international partners was our main goal. Of course, a connection from both directions of the four spatial categories could be identified, as it is possible that a certain type of partnership lacks spatial concentration.

Nearly two-thirds of respondent companies (65.7%) did not have international partnership contacts. In case of contacts located in Hungary, the spatial proximity of partners increased the frequency of incidence; contacts are most likely to be established in the local zone (93.9% of firms), but more than 80% of the respondents had nationwide connections as well. The partner organisation complexity of contacts pointing towards spatial relationships is also radically different. The contacts established with partner organisations located closer in space are much more likely to show a heterogeneous structure. As we move towards more remote

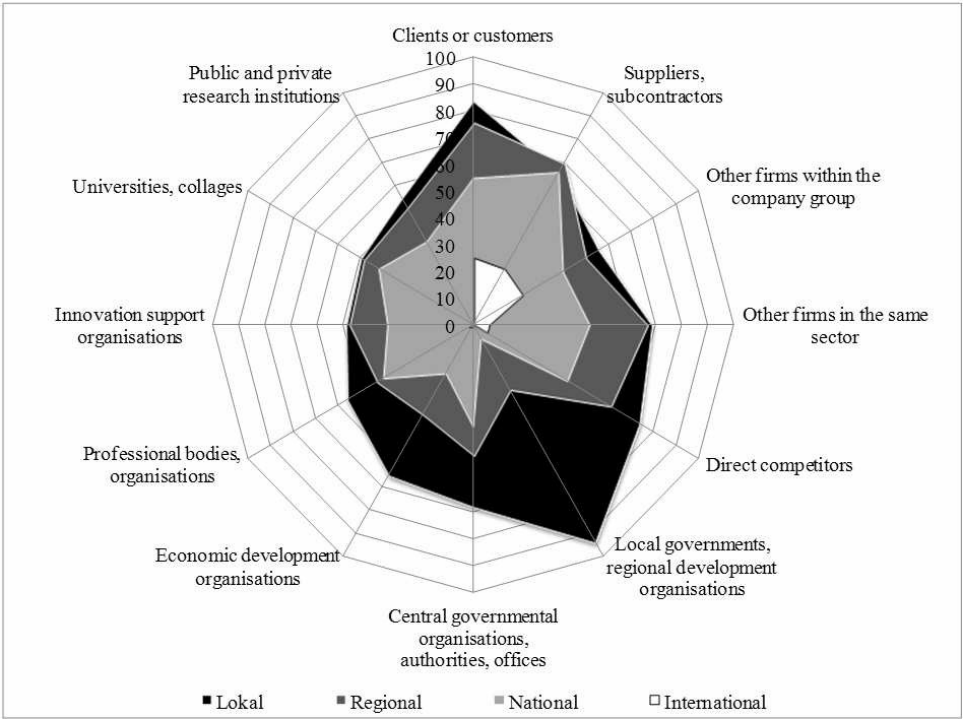
regional, national and international contacts which are increasingly less likely to occur, there is an increasingly smaller set of companies whose organisational milieu built through their relationships would not turn more homogeneous and simplified.

Their contacts with foreign firms are built to cooperate almost exclusively with their suppliers, their customers and possibly other companies within the group. In scale, this means a quarter of firms having such kind of international contacts. Other types of organisations are almost completely lacking international contacts. With their 6% rate, they also emerge just within the field of economy: other firms within the same sector.

In addition, it can clearly be seen that companies are most likely to establish contacts and cooperation on the local level (*Figure 5*). Almost in all directions at each location, the prevalence rate of local partners is the highest, and with the increase of spatial distance their incidence chances decrease accordingly.

Figure 5

Location of the Cooperative Partner Types



Source: NETINNOV Enterprise Survey 2010.

The incidence values of local and intra-regional cooperation are closer to each other, the first major gap may be observed at the national (i.e. beyond regional), level, while the second, much greater falloff tendency is seen at the international level. Thus, spatial proximity may have a role in choosing a partner company when in certain areas the involvement of external organisational resources is planned through cooperation or purchasing a service.

Analysing the spatial orientation of the complexity of contacts, it turns out that geographically complex corporate cooperation contacts are targeted at other economic organisations as well as clients, customers. By contrast, economic development, regional development, and innovation support organisations most frequently have partner companies strictly within one spatial category. This was mainly due to the spatial division of labour in this type of task performance (regional authorities, institutions).

5 The organisational features shaping the differentiation of social network parameters

It is also worth looking behind the directions and forms of inter-organisational cooperation presented in the previous section. We are attempting to identify the organisational characteristics shaping the parameters of the social network and being responsible for their differences. The main question is how complex the system influencing the connections between organisations is and whether there exists a common scheme or some parameters stand out from the possible determinant factors. The question is to decide whether the basic features of economic organisations are emerging rather randomly, in an ad-hoc way among the differentiating factors of social network capabilities, or there is a single, always returning simpler scheme suitable for easily identifying the corporate circle showing higher involvement in networking and greater readiness for cooperation. Due to the group nature of the majority of independent variables, we used primarily cross-analysis and variance analysis to reveal interconnections. As a first step let us see the explanatory factors which will be followed by the main social network parameters.

5.1 The correlations between the explanatory variables

A total of seven organisational parameters will be treated in this round of analysis as dependent variables. They are as follows: number of employees (size), industry affiliation, year of foundation (age), foreign ownership ratio, firm group membership, spatial orientation of purchasing and marketing, the existence of high-tech or

knowledge intensive activity (high-tech sector, based on *Lengyel–Leydesdorff*, 2008) .

The key methodological question is to clarify the extent and direction of interconnection between explanatory variables. As it has been expected, certain interconnections between background characteristics most likely exist on the basis of size categories measured by the number of employees (*Table 3*). To put it simply, we can say that significant differences can be observed between small and medium-size or large-scale enterprises. Medium- or large-scale enterprises in much higher proportion are parts of firm groups, have stakes in foreign ownership, international or national sales/purchases, and were operative even before 1989. The variables of sectoral affiliation and high-tech nature do not tend show such clear condensation or shift tendencies.

It is well visible that the proportion of medium and large-size companies is 18% in the full sample, while their representation in other possible explanatory variables is almost double. Larger companies are generally more likely to be part of company groups, among them the proportion of foreign ownership firms is higher, international markets play more important role from the point of their sales and purchasing, and even companies founded in before the regime change are over-represented in this group.

Table 3

Relationships between factors of organisational characters and company size

Reference parameter	Over-representation
1) Medium-sized (14.8%) or	Part of a company group (38%)
2) Large (3.1%) company	Foreign ownership ratio (36.9%)
	International (34.2% or
Total 17.9%	Nation-wide (23.1%) supply/sale orientation
	Foundation of the company: before 1989 (31%)
	High-tech or knowledge intensive activity (22.5%)

Source: NETINNOV Enterprise Survey 2010.

5.2 The incidence chance of collaboration in innovation and research-development

Of the different contact lines, we are now dealing only with more important ones in terms of innovation, in particular with partnerships established with higher education institutions, research institutes and innovation support institutions (*Table 4*). As we have seen in the organisational milieu of social networks, these institutions are the least likely to occur as they are linked to specific activities

Table 4

Background factors of relationships with different organisations of the innovation system

Parameters	Direction	Significant factors
Relationship with higher education institutions (average: 20,2%; 369 firms)		
Size	+/46%	Medium-sized or large companies
Sector	+/38%	Professional, scientific and technical; Agriculture; Info-communication and finance
	– /11%	Transportation and storage; Construction
High-tech or knowledge intensive activity	+/29%	Yes
Supply/sale orientation	+/25%	International (import or export activity) Local supply with nation-wide sale
	–/17%	Local or regional orientation
Foreign ownership ratio	+/27%	Yes
Part of a company group	+/35%	Yes
Age	+/24%	Founded before 1995
Relationship with research institutions (average 6,8%; 125 firms)		
Size	+/18%	Large companies
Sector	+/19%	Professional, scientific and technical; Agriculture
	–/3%	Construction; Accommodation and food service
High-tech or knowledge intensive activity	+/12%	Yes
Supply/sale orientation	+/12%	International (import or export activity) Local supply with nation-wide sale
	–/4%	Local or regional orientation
Foreign ownership ratio	+/12%	Yes
Part of a company group	+/11%	Yes
Age	+/8%	Founded before 1995
Relationship with innovation support organisations (average 10%; 184 firms)		
Size	+/27%	Medium-sized or large companies
High-tech or knowledge intensive activity	+/14%	Yes
Part of a company group	+/14%	Yes
Age	+/19%	Founded before 1989

Source: NETINNOV Enterprise Survey 2010.

rather than functioning as vital channels of economic activity and being part of the basic social texture of social embeddedness of Hungarian enterprises (here we mean supplier and customer contacts and bilateral economic cooperation with other business entities). Of the corporate parameters determining the likelihood of linkages pointing towards the three institution types, we are describing only the significant pairs of correlations. In all cases, we refer to link direction (+ and – direction of impact), and to the level of the resulting difference (not to the difference itself, but rather to the actual over- or under-representation, which is comparable to the average of the sample).

Such inter-organisational connections are typical among large companies especially if they are foreign-related or members of an international firm group or purchasing and sales-oriented, and have been on the market for longer period (up to 1995 or even before 1989). By sector, the technical and scientific, the agricultural (although the number of sample elements is very low), and ICT-financial activities are more likely for such a cooperation, while the inclination for cooperation is the least in construction, transportation, warehousing and tourism industries. Also in high-tech or knowledge-intensive production or service activities, the rate of prevalence is higher. However, among Hungarian local and regional oriented new small businesses the incidence of such contacts is nearly at minimum level.

If focusing on the content of cooperation in particular on R&D&I synergies; therefore on those that are most likely to appear in the case of universities, research institutes and innovation support institutions similar connections emerge between partners (*Table 5*).

Currently, in case of innovation cooperation systems involving economic actors (the support organisations of economy, education, research and innovation systems), the majority of cooperating partners coming from the private sphere are primarily medium- or large-scale foreign-owned companies and knowledge intensive/high-tech professional scientific or technical firms.

Overall, it can be stated that factors influencing the incidence of special inter-organisational contacts oriented towards innovation and research and development, organised in a form of networking and higher education, science and innovation system show a relatively homogenous picture. Today, the size of companies (and the resulting economic, market characteristics) is the primary determinant factor in this matter. A significant difference was detected in the majority of explanatory variables. The majority of explanatory variables changed synchronously in case of each social network parameter. The higher number of employees, the proportion of foreign ownership, firm group membership, the international territorial orientation of acquisitions and sales, the “age” of the firm, and even in a smaller ratio high-tech activities also increase the probability of cooperation in innovation and R&D.

Table 5

Background factors of innovation and R&D relationships

Parameters	Direction	Significant factors
Relationship in R&D activity (average: 18,3%; 334 firms)		
Size	+/41%	Medium-sized or large companies
Sector	+/28%	Professional, scientific and technical; Agriculture;
	–/10%	Administrative and support service
High-tech or knowledge intensive activity	+/25%	Yes
Supply/sale orientation	+/28%	International (import or export activity) Nation-wide orientation
	–/13%	Local or regional orientation
Foreign ownership ratio	+/25%	Yes
Part of a company group	+/30%	Yes
Relationship in innovation (average: 22,4%; 410 firms)		
Size	+/46%	Medium-sized or large companies
High-tech or knowledge intensive activity	+/29%	Yes
Supply/sale orientation	+/29%	International (import or export activity)
	–/17%	Local or regional orientation
Foreign ownership ratio	+/28%	Yes
Part of a company group	+/35%	Yes

Source: NETINNOV Enterprise Survey 2010.

5.3 The complexity of contacts

The complexity of contacts towards the different types of organisations has shown how heterogeneous the organisational environment of firms is. The more types of institutions are members of the relationship of a business the richer is the organisational milieu it is embedded in. We calculated with 11 possible organisational directions, because a firm group as a partner cannot be regarded as a cooperation channel for every company so it had to be excluded from the drafting of this parameter. A business enters into contact with five types of organisations on the average. If this indicator is considered a multi-stage ordinal scale, where increasing values are referring to a greater diversity of contacts, a variance analysis can be a suitable method for investigating the mean of this scale in the groups of explanatory variables. From the differences in group averages,

we may conclude what company circumstances will contribute to the most complex conditions, or even the one-sided system of contacts. Surprisingly, in the 11 point social network index, in case of the majority of explanatory factors there were significant but very small differences (maximum 0.5 points) between group averages. Only in the number of employees could be observed a greater, one point difference in favour of large companies (*Table 6*). Presumably, the lack of differentiation originates from the fact that most companies had mainly only had contacts with other economic actors, and thus the indicator of organisational complexity in its complete form is incapable of grasping the differences.

Table 6

The complexity of relationships by size

Company size	The number of institution types to cooperate with (max: 9)		
	Average	Number of firms	Standard deviation
Small	2.9	1505	2.05
Medium-sized	3.8	271	2.25
Large	4.1	56	2.69

Note: ANOVA: F=27.636; Sig=0.000; Eta=0.171; Eta square =0.029.
Source: NETINNOV Enterprise Survey 2010, N=1828

The index can be refined by the elimination of supplier and customer connections as they occurred at almost every company. In this case, the number of the possible lines of connection is reduced to nine, but in this case the presence of contacts beyond the closer environment of economic contacts with their diversity or one-sidedness from the aspects of organisational directions is more highlighted. 11% of the firms at this stage have a heterogeneity index of zero; they have no further contacts beyond suppliers or customers. On average, three directions can be detected in the contacts of firms. But even in this case, a few decimal differences remained between the groups of explanatory variables, and only in the case of firm size could pronounced differentiation be observed, a kind of linear connection between the increase in the number of employees and the increasing complexity of contacts.

Overall, when using the index, no striking differences can be observed in the complexity of the environment of organisational partnerships formed through corporate links. A weaker positive linear connection is detectable only by size. Later on, the complexity used as a group-making variable will be analysed again.

5.4 The size of contacts

The size of the relationship of firms was measured by the total number of partners they related to each of their cooperative channels. It is customers and suppliers who really make up the total bulk of corporate relationships. As a result, seeing the evolution of the overall relationship, it is not surprising that it is to a major extent determined only by firm size, namely by the result of the suppliers' group.

Normally, the group of partners and customers were excluded from this indicator. To avoid distortions due to outliers, a few (altogether 11) extremely high values of partners have been eliminated (if as residuals exceeded the three units of standard deviation in the number of a firm's partners). The average of the resulting size indicator is 51, its median is 24. Therefore, our possible benchmark is that the sample companies have 51 partners on the average. What may be interesting here is the degree and direction of deviations from these values. Most of the explanatory variables do not show significant differences on the basis of the results of One-Way Analysis of Variance (ANOVA) models. However, it is worth examining the differences in group averages in case of three attributes as follows: purchase and sales orientation, company size and firm group membership (*Table 7*).

Table 7

The difference of the size of relationships (One-Way ANOVA)

Factors	The size of the relationships (average: 51)		
	Average	Nr. of firms	Standard deviation
Supply and sale orientation			
International supply with nation-wide sales	75	145	157
International sales	61	199	130
Local orientation	40	333	78
Regional orientation	42	343	84
Sig=0.006; Eta=0.103; Eta square=0.011			
Size			
Small	41	1495	77
Medium-sized	93	268	155
Large	133	52	195
Sig=0.000; Eta=0.231; Eta square=0.053			
Part of a company group			
Yes	68	254	116
No	48	1561	96
Sig=0.003; Eta=0.069; Eta square=0.005			

Source: NETINNOV Enterprise Survey 2010.

Our data show that a company's size, purchasing and sales profiles are making up the major differences in the average size of contacts. Companies focusing on international acquisitions have the highest number of 'organisational faucets' and the trend is clear: companies bound to the environment of local economies/markets have smaller circles of businesses partners. Here again, of course, the merger of two factors plays a significant role due to the over-representation of larger companies in the internationally oriented group.

Thus, supplier contacts are worth a separate analysis, and it seems reasonable to create a reduced index on the size of contacts eliminating suppliers and subcontractors. In order to avoid distortions, the size index of overall connections has been divided into three parts. Suppliers and contractors are treated separately (a), the type of competitor or industry partners, (b), and a group of all other non-economic institutional partners (c). In the summary table, significant differences are indicated; namely, by using median values for eliminating the distorting effects of extreme values, in the estimation of median values (*Table 8*).

Table 8

The differentiation of the number of partners by the three main direction type of relations

a) Suppliers, subcontractors		b) Competitors and firms from the same sector		c) Other partners from non business sector	
Factors	Median	Factors	Median	Factors	Median
Large company	45	No significant effect		Large company	7
Medium-sized	22			Medium-sized	7
Small enterprise	10			Small enterprise	4
Part of a company group	20	No significant effect		No significant effect	
Not part of a company group	10				
With foreign ownership	15	No significant effect		No significant effect	
Without foreign ownership	10				
Trade	20	No significant effect		Professional, scientific and technical	6
Administrative	5			Agriculture	7
Medians for the groups	10		8		5

Source: NETINNOV Enterprise Survey 2010.

Explanatory factors are normally 'operable' only in case of supplier contacts, and in the mean values of other more specific connections, no significant or minimal differences could be observed. Significant differentiation in the number of partnerships associated with the size and organisational characteristics of the companies involved can no longer be observed in other directions. This stems from the fact that in these network channels the majority of firms already have a much smaller number of partners, and thus standing merging into a large homogeneous mass, they do not tend to show any specific properties.

The final solution can be drawing the profile of undertakings formed on the basis of the complexity and size of contacts based on the number of employees. Here we have a much clearer pattern of separation even in case of using size variables only. We highlighted two heterogeneous clusters (framed cells) and the special characteristics of individual size groups (the grey cells of percentage column), where some densifications are observed (*Table 9*).

Table 9

The differentiation of the complexity and size of the relationships

		Cluster 5: really heterogeneous and large relationships	Cluster 3: heterogeneous and large relationships	Cluster 2: heterogeneous and average sized relationships	Cluster 1: homogeneous and small relationships	Cluster 4: really homogeneous and small relationships	Total
Small enterprise	Row %	10.8	17.7	23.4	33.9	14.2	100.0
	Column %	67.2	74.4	87.0	86.8	88.7	82.1
	Total %	8.8	14.6	19.2	27.9	11.6	82.1
Medium-sized	Row %	23.0	29.3	15.9	24.4	7.4	100.0
	Column %	26.1	22.3	10.8	11.3	8.4	14.9
	Total %	3.4	4.4	2.4	3.6	1.1	14.9
Large company	Row %	29.1	21.8	16.4	20.0	12.7	100.0
	Column %	6.7	3.4	2.3	1.9	2.9	3.0
	Total %	0.9	0.7	0.5	0.6	0.4	3.0
Total		19.6	13.1	22.1	32.1	13.1	100.0

Note: Pearson Chi-square= 76.190; Sig=0.000; Phi=0.205; Cramer's V=0.145.
Source: NETINNOV Enterprise Survey 2010, N=1813.

Several important conclusions can be read from the results. The separation of the different types of contacts on the basis of company size is clearly visible. The tiered structure (grey highlight) clearly indicates that particularly large and medium-sized actors are embedded in a large and complex organisational environment (about every second one). However, only about one-quarter of small businesses have larger and more heterogeneous connections than the average. The percentages of the entire group also make it clear that only 10% of the players of the Hungarian economy are active in such social network systems. 40% of companies are embedded into small and homogeneous organisational environment only on the basis of the direction and size of their contacts.

The last statement is worth deeper analysis. Here the structure of small businesses in this group should be analysed focusing on factors determining the more active cooperation potential.

If only small enterprises are analysed, the members of the 5th and 3rd cluster have several individual properties that are not purely coincidental, but statistically significant effects are also behind them. Commercial and post-industrial services are over-represented, particularly companies involved in professional, scientific and technical activities. On the basis of regional orientation in acquisition and sales, small firms characterised by orientation in international acquisition and nationwide sales, despite their smaller size, have a more diverse and larger circle of contacts. Therefore, it seems that if the size variable is eliminated, it is the major profile of firms with their closely related market orientation that turn into the primary factors of influence. Also, a significant correlation may be observed with the sector small businesses are operating in. In the service sector the ratio of businesses with more heterogeneous and larger contacts is higher.

Correlations in the other three dimensions were also investigated. No major differences can be observed between the importance values assigned to collaborative projects, the content based complexity of certain channels of contacts and the spatial location of partners by the organisational properties we set as priority. It seems even a more pronounced differentiation in the number of employees does not mean a major distinguishing factor.

5.5 Factors behind international partnership

Descriptive analyses reveal that one third of the Hungarian enterprises are cooperating with foreign partners. Of course, a significant part of them are limited in contact numbers and directions but nevertheless it is regarded as an important issue which these businesses are, what kind of organisational parameters increase the likelihood of the emergence of such contacts, and what structural and functional characteristics an international partnership has.

Why? The major theoretical standpoint of our research is that a firm is not an isolated, free-floating entity in the economic and social space of power. The more embedded in its network, group, field or as we call it organisational milieu, the more likely it will efficiently respond to market demands and remain competitive. In essence we are talking here of integration. Here we mean integration in local, regional, national and international context. On the level of analysis the organisational distinction of these four zones of organisational milieu entitled with different territorial authority scopes makes sense. Here we will ask the question who and how could already integrate through their cooperative links into the international circuit, how they have formed a kind of their own international organisation milieu, which of course is a part of the tissue of the global networked economy and society being in a direct contact with a firm.

First, let us examine the potential active components. Of the factors we use, the major activity of firms significantly increases the development of international partnerships, channels (industry 47%, commerce 40%), obviously foreign ownership ratio (68%), whether the enterprise is a member of a firm group (48%), whether it is not a small enterprise (47%) and its orientation towards purchase or sales (85% are involved in international sales, 87% in international purchase). It is clearly visible that the activity character of business firms is what really matters, namely what kind of markets they are involved in and therefore how much they are dependent on these partners. It is shocking, but the local and regional-oriented companies are in partnership with the international incidence of 11–13% probability.

What are the structural characteristics of this integrative solution of embeddedness? The international directions of partnerships can be provided on the basis of the probability of foreign partner incidence in case of the 12 organisational directions each (*Table 10*).

In case of international contacts, those set up almost exclusively within the economic sphere are relevant. The involved foreign companies established collaborative contacts with their customers, suppliers, other group-members, or perhaps with enterprises operating in a different sector. The international organisational environment of cooperation from the aspect of embeddedness paths is almost exclusively based on market players and related to international activity. It is shocking, but for example out of the total sample only 3 businesses did cooperate with foreign universities altogether. In certain directions no major activities can really be expected but this is not entirely irrelevant in the fields of research, training, innovation, or even the representation of professional interests.

Unfortunately, the formula is relatively simple: international market-oriented medium-sized or large, often foreign-owned companies establish international contacts primarily with strategic economic partners profiled in areas connected to their main functions. Other potential agents of organisational environment are

virtually excluded from the "game". The logic of complexity having been learnt in case of descriptive analyses also shows that for the majority of these companies, merely one channel of inter-organisational contacts serves as the basis of embeddedness. The majority of economic actors in terms of collaborative contacts are isolated in international context, and even those having such partners do not base their embeddedness on a complex system of connections.

Table 10

The most important directions of international partnerships

Partner type	%	Share, % *
Clients or customers	73	25
Suppliers, subcontractors	69	24
Other firms within the company group	39	21
Competitors	18	6
Other firms in the same sector	17	6
Universities, collages	3	1
Research institutions	0	0
Professional bodies, organisations	5	2
Economic development organisations	2	0.6
Innovation support organisations	0	0
Local governments, regional development organisations	0.3	0.1
Central governmental organisations, authorities, offices	1.1	0.4

Note: Share only within the group, in which this kind of relationship was mentioned.
Source: NETINNOV Enterprise Survey 2010, N=1813.

6 Summary

If we start from the assumption that a firm's economic and social efficiency, success, or if we want to use a more fashionable term its competitiveness is fundamentally influenced by its inclination for innovation, by the recognition and implementation of the opportunities for cooperation, by the stronger embeddedness into organisational environment, the texture of this networked economy, then it is worth learning about the features of these two factors as much as possible. In the first phase of this cognitive process, we introduced the basics: we focused mainly on how these two skills and activities are present in the economic field, and what differences can be observed in the business community.

– From the aspects of innovation, a very strong positive interconnection can be detected between R&D activities, the existence of own product and the complexity of the geographical concentration of sales contacts, but also the

size of firms, participation in formal cooperation networks, the complexity and orientation of procurement contacts, the belonging to larger firm groups the enterprise's sector or geographical location.

- In Hungary, the proportion of innovative firms in the economically advanced regions, Western Transdanubia and Central Hungary was the highest (53.4% and 48.6%), while the country's most backward regions it was by far behind the national trends. In Southern Transdanubia and Northern Hungary, only 29.5 to 34% of the firms reported on the earlier introduction of some innovation.
- Thus, it can be concluded that from the aspects of the territorial embeddedness of business connections in acquisition and sales, the innovativeness of firms is increased if they do not focus on just a narrow market (e.g. local, regional markets), but attempt to integrate into a wider economic area, trying to be competitive in several markets. In addition, companies with international connections by all means are more innovative (linked to the global economic space whether through sales or purchases). Such peculiarities of the innovativeness of Hungarian enterprises have not been investigated so far even by the research of the CSO carried out under the EU's common survey on innovation (CSO, 2010).
- Of the obstacles to innovation activities, in contrast to our expectations, not the site-specific factors were the most important. The surveyed firms reported that in their own local environment, there were basically no problems with the accessibility of technological infrastructure, information technology and with the availability of special services. The continuous renewal of firms is much more hindered by the unpredictable macroeconomic and legal environment, and excessive bureaucracy.
- In the area of social networks, some of the most important of the large number of network parameters having set up during our research have been presented. It has become clear that cooperation channels must be investigated in more and more specified and targeted forms because businesses have to be more and more open for them. They do not represent a closed system, but in different directions and with different motivational and economic backgrounds, they are embedded in the texture of social networks through bilateral or more complex clusters. Naturally, the dominant co-operating partner is usually another market actor, but also a group of businesses is evolving who already think in complex, large-scale, modern, network-based cooperation solutions. Today, their rate does not yet exceed 10–15% among the companies surveyed.
- The average number of partners in the inter-organisational relationship of firms is 25, but the top 10% keep contacts with even more than 100 other

organisations simultaneously. Naturally, most of these partners are suppliers, and the problem is just that: other lines of contacts only rarely include more than one or two additional partners. Another problem is that almost half of the companies not only have very few cooperating partners but the composition of their partnership is also homogeneous, or to make it clear, their connections are unilateral and limited. On the basis of the results achieved within the framework of this project, serve as a basis of revealing factors affecting social network activity as well as the interconnection between innovation and collaborative contacts which alone require further studies in the future.

- In case of the independent variables measuring the major organisational parameters of businesses the issue of size seriously affects the interpretation of individual effects. Essentially, the sample should be divided into two major groups. Small enterprises fundamentally differ by their quantity and main organisational features from the other two members of size classes by being more alike to each other. This gap is present in almost all the indices of social network.
- In almost in all of the selected and thoroughly analysed key indicators of social networks, large company size, foreign ownership ratio, belonging to a firm group and sales-purchase orientation were the most significantly differentiating factors. As a result, these effects could be relatively easily identified. Another of its closely related factors is the orientation of firms, what kind of markets they are manufacturing or provide services for and from where they acquire the necessary inputs for these activities. There was a very strong correlation between the spatial orientation of activities and of the social network. It also follows that size is not everything, market realities play a vital role in shaping and using the inter-organisational contact environment, whom to compete with, where customers and suppliers are located etc. This pressure also affects small businesses, and prevails even when we keep the number of employees under control.
- The situation of international contacts emerged as a new problem which we tried to assess by investigating whether the firm had foreign partners. The integration into the space of economic and social organisations is an extremely important issue from the aspects of economic development. What we are seeing now is a two-faced phenomenon. On the one hand there already exists a group of firms in the Hungarian economy which to some extent have already been integrated into the international circulation of economy. The problem is with the rates, with the composition, and with the one-sided structure of integration channels, and cooperative paths.

– Thus, large firms, or more specifically, those subjects of the survey who were thinking and operating on the nation-wide or rather international scale had more favourable social network parameters from all respects. The exception to this pervasive rule is entry into international markets irrespective of the size of the firm. When small businesses are found with better social network parameters (though it occurs very rarely), this entry factor with the readiness for orientation factors are present in almost all cases.

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