UNIVERSITY-INDUSTRY LINKS: A PANACEA FOR INNOVATION IN TRANSITION?
A SUMMARY OF THE BUDAPEST EVENT

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1. Preliminaries

In the first (Brighton) proceedings of the RECORD project, members of the consortia advanced the potential quantitative and qualitative benchmarks that are a priori reasonable for comparing the innovative performance and practice of RTD organisations in the new member states of the European Union (see Dévai–Papanek–Borsi [2002]).

However, in the Budapest conference (2-3 October 2002), members of the RECORD network further developed their ideas of benchmarking “centres of excellence” in the Central and Eastern European region (for the relationship between the theory and practice of the RECORD benchmarking exercise see the paper by Papanek–Borsi–Papaioannou–Perényi in this volume). The number of conference attendants exceeded 130 and Hungarian policy makers were well represented in the event.

In our summary of the Budapest conference, which was dedicated to university-industry\(^1\) links, we would like to emphasise the essential complexity of benchmarking innovative research and development in the new EU member states. So debated issues as well as contradictions constitute the backbone of this follow-up. However, we do not resolve them here. Rather, our aim is to show that the new member states have competitive RTD capacities and are capable of innovation in Europe. The reasonable degree of national RTD specialisation should also be considered.

The starting point is of course that the 1990s saw quite a few changes in the transitional national innovation systems of Central and Eastern European countries (CEECs). One thing that has become clear during the proceedings is that, in spite of great similarities, the countries involved in the project have to be considered from the points of view of their individual context, their socio-economic background, their research institutions and their social capital. This calls for a twofold treatment of all the results of the RECORD project:

\(^1\) Industries – in line with the common use of the term – cover the whole business sector. Thus, manufacturing as well as public utilities, services, agriculture etc. all can be included in the category of “industry”.
when generalisation is made, the implications have to be considered in the context of each country’s specific situation, especially in case of policy recommendations;

however, there are also common points in the way that successful RTD organisations contribute to innovation. Finding these common features (potential and useful benchmarks; especially as far as the quantitative ones are concerned) of RTD units in CEECs is an important task of the RECORD consortia.

The glasses, through which we view the RECORD activities, have this dual-focal lens. Our viewpoint is reflected in the Budapest proceedings.

In the first part the role of universities in innovation is explained in a context-specific way. Hence, it is not surprising that the general context of non-CEE members of the RECORD network, such as Ireland and Malta, is different. Careful reading of the case studies presented in the second part of this volume indicates that the new member states will show both unity and diversity in the near future. The third part presents articles that show the way to the further work in RECORD. The conference participants made use of those lectures, which were finally not included in this volume. The lectures by Siegler, Balogh and Viszt as well as Dévai discussed characteristics of the Hungarian innovation system.

Before elaborating more on the socio-economic context, the (background of) different RECORD benchmarks, the university-industry links and the practice of different scientific domains (including “industrial” sectors, organisations, researchers, etc.), the above general remarks had to be made. We also need to stress that the summary as well as the book mainly include papers delivered in the Budapest conference by participants from Austria, the Czech Republic, Hungary, Ireland, Malta, Poland, Slovakia, Slovenia, and the United Kingdom (the RECORD member countries) and - where applicable - Yugoslavia.

In this summary, we will make references to the set of quantitative and qualitative benchmarks agreed in Brighton. For a detailed description of those benchmarks, see Dévai-Papanek-Borsi [2002]. However, Papanek-Borsi-Papaioannou-Perényi in this volume also provide a summary of the overall RECORD methodology.

2. The socio-economic context and some benchmarks in RECORD

As has been already argued in the Brighton Proceedings (see Papaioannou [2002]), understanding the socio-economic context of CEECs is essential for understanding the content of the RECORD project - when both similarities and differences are concerned. In this volume the case of Ireland presented by Gallagher et al., is contrasted with other examples from CEECs. The rise of the ‘Celtic tiger’ may be explained by the fact that Ireland is a small country that received large amounts of capital from both the European Union and the United States. Another explanation may be that Ireland succeeded to built an ‘open’ economy with a dynamic enterprise sector. The question is whether Eastern European countries in transition could take Ireland as an example of technological and economic development.
2.1. Was there a strategy of transition?

After all the political changes taking place in CEECs, different economies followed different transitional innovation ‘strategies’. As Kutlaca argues, after the ‘dissolution and fragmentation’ phase, a period of ‘restructuring, consolidation and rebuilding’ and finally, a ‘new integration’ can take place. Kutlaca quotes a study by Dyker & Radosevic according to which only three out of fifteen countries could be described as ‘active’ in restructuring (East-Germany, Slovenia and Poland). At the same time, we must be aware of the fact that a clear policy strategy is necessary for success. The paper by Gallagher et al. also supports this view and highlights the responsibility of politicians. Of course, political transition was rather unexpected in CEECs. However, after the first years of shock, clear policy visions were developed as regards the further process of transition towards the capitalist market-economy.

Another aspect to be considered here concerns the main topic of the RECORD project, i.e. benchmarking R&D organisations. As regards the restructuring of R&D sector, monitoring of the process could have been the first step towards dealing with the situation in CEECs. It turns out that this notion divides CEEC’s into two groups. Firstly, a group of countries such as Poland have already started and continue with the restructuring process of R&D. Secondly, a group of other countries such as Slovakia still consider this process to be a ‘music for the future’. Kerékgyártó-Jankó reveals that this does not only apply to individual countries but also to individual organisations.

The importance of strategic view is recognised at both national and organisational levels. As it is highlighted in Loudin’s paper, ‘defined strategy’ - one of the RECORD benchmarks - is extremely relevant.

2.2. Shock approach versus gradual approach

One of the issues that divides CEEC’s, is their dilemma to choose a gradual path of economic transition or to apply the so called ‘shock method’. Kutlaca discusses the effects of this dilemma in relation to the process of restructuring the RTD sector. Given the fact that positive effects of both strategies can be named, it is impossible to say which is the ‘right’ path to success. Former East Germany is the best example of a country that adopted a shock approach in combination with an active restructuring process. However, other countries such as Poland and Slovenia adopted a gradual approach.

2.3. Top-down or bottom-up approach to innovation?

Because of the lack of active restructuring, it is difficult to speak of an initiative for change. As Kutlaca points out, the process started with the collapse of the old system. Then, there was a process of survival in which organisations fought for their own sake. Spontaneous re-grouping took place and finally, governments attempted - in some countries more than in some others - to re-gain control. This implies that only in the last couple of years one could talk of a top-down movement while the bottom-up approach is not structural but incidental, based on self-interest motivation. Jablecka also supports this view, arguing that individual interests are considered to be more important than social benefits from dissemination of knowledge and improvement of innovation in economy.
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From a policy point of view, it seems obvious today that the transformation of CEECs’ innovation systems should have been more regulated; it should not have been left to “free-float”. The damages caused by the lack of regulation are huge in some cases. Nonetheless, the economies of CEECs are relatively open today. In the business sector, one could see substantial innovation-processes (e.g. technology transfer) and market-economy conditions (including advantages and drawbacks).

A group of benchmarks - the external factors in the qualitative benchmarking questionnaire - deal with the RTD organisations’ environment, including the role of government.

2.4. Multiple jobs versus decreasing quality

No matter which model of transition was applied, a common pattern of decreasing salaries in RTD sector could be noticed throughout CEEC’s. Kurzydlowski argues that, because of this pattern, many talented young researchers were attracted to multinationals and as a result, the quality of research in universities was compromised.

Another problem of this kind of researcher mobility is concerned with the knowledge flow. The transfer of young and talented researchers to multinationals is an example of mobility. Nevertheless, in CEECs this transfer was permanent and so it did not contribute to the development of knowledge flow. In her paper, Jablecka points out some more general consequences of mobility in Poland. One crucial issue she discusses is the necessity for researchers to maintain additional jobs in order to make a living. This problem is common to almost all post-socialist countries. In some particular cases it has proved to be a positive influence of knowledge - for instance when the educational work of researchers is concerned - but generally speaking the impact is negative. The responsibility of multiple jobs shifts the researcher away from his/her main profession, resulting in compromising the quality of his/her research.

Quality of research and mobility of researchers are of course interrelated. There are two aspects of mobility dealt with in the RECORD project:

- guest researchers and
- “real” mobility of researchers (i.e. mobility of people “not grown inside” the given institution).

The hypothesis is that centres of excellence in CEECs are capable of playing a crucial role in economy and of attracting foreign researchers. Both capabilities imply high mobility of research personnel.

2.5. Contracts on project basis or institution financing

One aspect that influences innovative research is the prevalent system of contracting. The legacy of the old system is rather a rigid approach to permanent contracting for an indefinite period of time (so-called institution financing). It is understood that this will not enhance a dynamic research area in terms of mobility. What it will enhance is economic and social security of researchers. Jablecka discusses positive effects of contract-based research such as investigation of new topics. Problems arise when the old and the new systems have to interact in order to address problems of researchers who operate in both systems (for instance, lifetime employment of researchers / directors, etc.).
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There are of course areas of basic research that face difficulties to attract funding. Nonetheless, as Kutlaca argues - the weight of basic research in CEE is still considerably higher than in Western European countries. If the shift to applied research could be made, project financing would become a widespread practice, provided that a relevant regulatory framework was also introduced.

In line with Western experience, which stresses the positive impacts of project management, the issue comes up in the RECORD benchmarking methodology as well. For instance, the percentage of revenues received on a competitive basis and the practice of project management constitute performance and practice indicators respectively.

2.6. Research experience versus innovation experience

One of the notions of the whole RECORD exercise concerns the focus of research being performed. The point to be made is that research in CEECs is not necessarily innovative. A great number of institutes have permanent programmes of basic research, which have been going on for many years, without making any innovative contribution to the so called knowledge base. When the general context of universities is considered, research performance can be understood in terms of factors such as socio-economic circumstances, the model of the university, etc.

To explore innovative research, a number of our benchmarks highlight the practice of innovation in RTD organisations. This is the reason why, for instance, publications is not the only performance indicator and why there are further questions on patents, software, new products, services to industry, etc. One group of the qualitative factors - benchmarks of knowledge utilisation - also focuses on innovation performance.

2.7. Transitional impact on sectors, organisations and researchers

In R&D systems of CEECs, the source of research funding, the sector of performance and the number of researchers differ from Western systems (see e.g. EC (2002)). For instance, government share is very high in financing research and the number of researchers employed by RTD organisations. This is in principle not surprising. What is probably more interesting is that although the ‘mere amount’ of research performed in industry in CEECs is quite similar to that in Western Europe, the number of researchers employed in industry is relatively low, especially when the Russian Federation is excluded. In addition, the amount of research performed in the higher education sector (HES) is relatively low when it is compared with the number of researchers employed. This corresponds to Fazlagic's statement that great amount of machinery is still unutilised.

Despite the infrastructure ‘surplus’, the quality of research machinery and equipment varies greatly from one RTD organisation to another. Competitiveness of the infrastructure is one of the quantitative benchmarks of RECORD.

Kutlaca points out how different the development of these various sectors was in Western Europe. While CEECs were characterised by a rigid separation of sectors, Western European countries were based on a great interdependence of sectors and multi-level relationships. When the Soviet system was ‘opened’ to market forces, it literally fell apart and interdependence of sectors became a requirement. This resulted in a ‘brain-drain’ and in great ‘bottlenecks’ because of the lack of attitude and experience of the process of market co-
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ordination. Although many CEE universities did a lot to open themselves to the business sector (see the papers by Adamowicz, Kerékgyártó-Jankó or Kurzydlowski), the contrast with the ‘Western World’ is still considerable (see Micallef’s contribution). Kutlaca argues that differences at the level of technological development of particular industries and S&T fields are too large. Furthermore, absence of market (projects, consultancy) and non-market (informal knowledge transfer, education) links between the R&D sector and industrial organisations in the socialist period cannot be overcome easily. Finally, the type of R&D results produced by some research organisations - “packages” ready for implementation - constitute an inadequate form of supply of technologies for the new market economy. This results in poor patent activity and scientific output.

In this respect, there is a difference arising between the remnants of the old sectors and the newly emerged private sector. Researchers had been employed within the old mental structure and suddenly found themselves within a new mental structure and technology. This obviously resulted in low efficiency and inadequate university-industry communication. Nonetheless, it is interesting to see in Kurzydlowski’s paper how the largest Polish technical university made substantial efforts to establish links with business (and how some of these efforts faded away).

Links to industry and ability to learn from the business world constitute an integral part of the RECORD benchmarking methodology.

This difference between the various sectors was further enhanced by the brain drain of Higher Education. Researches moved to the business sector - often to multinationals - mainly because of the higher salaries they were offered there. At some points this is a positive development because it reduces the relatively high number of researchers in the education sector. However, the problem is that researchers who move to the business sector are often the most skilled ones. This notion is supported by Jablecka’s suggestion that one of the main problems of achieving innovation is the conservative mentality of some researchers. This can be a great obstacle in achieving a dynamic R&D system with fundamental university-industry links. A concrete effect of this notion is that the same researchers are also executives of the higher education sector. This is particularly interesting when one considers the question of interdependence of different sectors in terms of university-industry collaborations. Here, of course, the case of Malta is an exception since the collaborations that Micallef describes are based on personal initiatives of researchers. The characterisation by Jablecka is obviously based on the view that the ‘trajectory’ of researchers was influenced by the ‘old’ system. An international trend - also in the ‘entrepreneurial universities’, which are discussed by Jozwiak - is the incompetence of researchers to communicate their scientific output with the public. This implies that, apart from the general conservative attitude of some researchers, they also lack the necessary commercial focus. It can be argued that this applies only to the phase after producing scientific output, not to the process.

The ‘human factor’ is one of the most important clustering ideas behind the RECORD benchmarks. First of all, the centres of excellence need ‘critical mass’ in terms of the researcher staff. Secondly, real excellence is indicated if a RTD organisation can attract high-calibre researchers from over the boundaries of the organisation. Thirdly, the qualitative benchmarks cover a number of human factors such as flexible leadership, communication, training, human resource management, etc., which seem to have relevance in formulating the competitiveness of RTD organisations.
3. Industry and University

Before presenting the Budapest debate on university-industry links in Central and Eastern Europe, some remarks have to be made about the general situation in these two sectors.

3.1. Universities

3.1.1. Entrepreneurial versus ‘Humboldtian’ universities

In her contribution, Jóźwiak presents two university categories: the traditional (often termed as ‘Humboldtian’) university and the entrepreneurial one. Over the past 30 to 40 years, a departure could be noticed from the traditional model of university to a more modern approach, which is in general more entrepreneurial. The distinct feature of the latter, in comparison with the ‘old’ model, is the focus on quality and efficiency of managing the limited resources of university. The development of this type of university is due to the scarcity of resources. Universities were forced to seek new strategies of financing and had to find their position in the dynamic world of information. The paradox is that they themselves enhanced the movement that stimulated their own change. An important conclusion is that this approach to university enhances university-industry links and knowledge-flow, while maintaining the traditional role of university and academic objectivity.

3.1.2. Research or education?

A requirement for upholding the high standard of the knowledge-based society is the link between research and education. However, due to the fact that the social changes in CEEC’s resulted in an enormous growth of student numbers, as mentioned by Kurzydlowski, educational matters often dominate research. On the other hand, if exclusively involved in research, universities run the risk to place serious restrictions upon careers in education. Finding a balance between research and education is not an easy matter.

3.1.3. Innovation versus service provision

Just as with the above notion, universities shall find the healthy balance between being able to contribute to innovations and to provide services. Two services tend to be continuous features of universities:

- the service to society, i.e. fulfil the basic university mission of delivering higher education and scientific knowledge (serving industry needs indirectly);
- the service to firms in forms of measurement, testing, study-writing, etc. (serving industry needs directly).

Providing service to industry is easier to implement but harder to launch. This is because providing innovation to industry is perhaps easier to launch and more difficult to implement. This seems to be a typical trade-off in CEECs (resulting from the linear concept of innovation). Policy makers in Central and Eastern
Europe must bear in mind that extensive university services to industry are probably able to create an innovative environment (for further argumentation see Tidd-Bessant-Pavitt [2001] or Rush et al. [1996]).

### 3.1.4. Large clients versus small clients

So far, even though we have only a few cases of RTD organisations from CEECs, we may say that ‘excellence’ in the ‘best’ research units is probably distorted towards large clients. In this respect, we should also distinguish between multinationals and ‘local giants’: both Loudín and Kerékgyártó-Jankó reveal that large companies have excellent contacts with university departments whereas no particular account is given to extensive relations between universities and SMEs. We know of course that this is also a problem for Western Europe.

### 3.2. Industry

#### 3.2.1. Product innovation versus survival and later technology absorption

Now we probably have enough experience to say that in the first 10 years of transition the corporate sector was busy with trying to find ways to survive. There was neither time nor money for “classical” product innovation, i.e. when a new product development is tested and launched into the market. As companies were left alone in the market competition, they chose different strategies to survive. Nevertheless, one thing was common: they made extensive use of technology (knowledge) imported from abroad (see Dyker [1997]). Although there are some good examples of innovative firms in the CEE region, many companies still struggle with financial difficulties (lack of capital), management deficiencies (lack of company ownership culture) and the uncertainty of socio-political environment (lack of clear policy focus and stable rules).

#### 3.2.2. Own research base versus contracts to RTD organisations

An important issue for the private sector is this: should companies develop their own research base or should they contract other RTD organisations instead? Especially for multinationals, this was an important question at the beginning of the 1990’s. But then, of course, there was another element to be taken into consideration: RTD could be kept in multinational organisations while making profit from a relatively low-cost labour abroad. According to Kurzydlowski, salaries paid by multinationals for product development or applied research are still higher than university salaries in CEECs.

#### 3.2.3. High scientific performance versus cheap labour

In the CEE region, new companies were established after the regime change. The ones founded by foreign capital were exposed to market forces unknown before the change. The most important micro-level factor of competitiveness was the low prices (as a result of cheap labour force). However, low prices should not continue to be the determinant factor if CEECs wish to catch-up. Some of the foreign direct investment (FDI) targeted high value-added research based sectors while a substantial portion of foreign capital was invested in
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outward processing trade or in industries where the source of competitiveness was cheap but skilled labour force.

From the RECORD project’s point of view, knowledge value-added products are more desirable in industry. It is in industry that the “scientific gap” between economy and the R&D sector could shrink. Also, there would be more research results and researchers available in economy. Therefore the university-industry relationship is a crucial issue.

3.3. Partnerships: university industry links

3.3.1. Top-down versus bottom-up incentive

From the point of view of economy, either the researchers can initiate a research topic of economic use (bottom-up incentive) or companies may turn to scientists to solve problems by means of research. When the issue of university-industry partnerships is considered, a double image arises. On the one hand, some contributors discuss (e.g. Jablecka) the conservative attitude of researchers in general. On the other hand, some cases (e.g. Micallef or Loudin) point out personal initiatives as bases for collaboration. Also a simple ‘lack of information’ or a negative opinion of other institutes turn out to be obstacles, even when collaboration between potential Centres of Excellence in the same field of research is considered. In this respect, the attitude of executives of different institutions would be an interesting topic for analysis.

3.3.2. Collaboration in research versus other types of co-operation

Besides collaboration in research - shared projects, co-authorship of publications, etc. - a number of other forms of co-operation can arise among institutions of different sectors. Jablecka, for instance, points out possibilities for universities such as services, teaching, expert consultations for industry and administration. On the other hand, Micallef names possibilities for industry such as sponsorships, awards, student projects, internships, etc. The important issue here is that, at least, contact is established, even though this does not explicitly guarantee particular research collaborations. But, of course, even if particular research collaborations were guaranteed, this would not automatically indicate economically productive relationships. To test the economic impact of university-industry collaborations we need evidence of new firm creation based on university research and their subsequent success (Kodama-Branscomb [1999]).

In CEECs, research collaboration is often problematic from the intellectual property rights (IPR) point of view. In order to maximise profit, companies endeavour to minimise researchers’ IPRs. Unfortunately, researchers cannot adequately protect their IPRs. The reason for this is twofold: on the one hand researchers often find themselves lost in legal matters and on the other, the institutions responsible for enforcing their IPRs often do not operate properly (see e.g. Déval et al. [2001])
3.3.3. Structural collaboration versus incidental collaboration

A general remark is that, in order to achieve a dynamic research field, RTD organisations in CEECs cooperate with industry on contract basis. Kerékgyártó-Jankó mentions, for example, that the strategic co-operation between the university’s faculty of electric engineering and informatics and industry is actually, a structural one. This structural co-operation has been featured for many years now. Adamowicz also refers to large Polish companies which systematically seek research capacities in the Warsaw University of Technology. However, we can assume that such ‘structural’ collaboration is prevailing in most CEECs, especially in sectors that more or less manage to catch up. It would be important to turn the policy focus on incidental examples of collaboration because these indicate that the business sector trusts the university to resolve research-problems. Probably in Malta, incidental co-operation is more common than in CEECs (Micallef also mentioned this in his lecture), simply because companies know exactly what sort of problem-solving they can expect from university.

3.3.4. Industrial research results in education versus university research results in industry

Another important issue to mention is the relation between research and education. It would be desirable to integrate the two activities as much as possible. This implies that the output of excellent research could be immediately taught in classroom. However, in the case of research performed in industry the link to education is often missing.

4. The case studies presented in Budapest

To see how the RECORD benchmarks can be practically applied, a few cases of potential “centres of excellence” were presented in Budapest. These cases are considered as the first input into RECORD’s experimental map of ‘centres of excellence’ in Central and Eastern Europe.

4.1. Czech Technical University of Prague: Department of Cybernetics

One feature of this department is the young age of its researchers: over two-thirds are under 35 years old. Research is carried out in two co-operating centres - The Gerstner Laboratory and The Centre of Machine Perception - both established by grants of the Ministry of Education of the Czech Republic in 1996. Nowadays, 72 per cent of the revenues is gained on a competitive basis. Management occurs in a business-like style, aiming at excellence, for instance, ignoring contributions to less relevant journals and conferences.

Knowledge generation is indicated by 62 publications, 11 innovations (OECD definition) and 7 patents or commercialised software in the last three years. Also international collaboration - in terms of hosting 14 foreign researchers, 6 researchers doing research abroad and 32 joint development projects with 2.1 million EUR revenue - is an important basis for this. Knowledge generation is based on flexible teamwork and supported by training and education for employees.

2 presented by Jiri LOUDIN (Science, Society and Technology Studies at the Institute of Philosophy, Czech Academy of Sciences)
Utilisation of knowledge takes place through 3 spin-off firms. When mobility is concerned, lower figures turn out above the age of 30, due to the “age” character of both department and respective branch, and to the highly specialised research in a small country. Brain drain is almost exclusively due to the role of multinational firms. Furthermore, there are 17 industrial and commercial projects. About 12 of these projects are international and 5 are domestic, involving prestigious companies and institutions. Domestic demand is relatively weak, due to “lower high-tech” character of Czech industry as well as shortage of capital.

Diffusion of knowledge takes place through researchers’ membership of editorial committees, 26 PhD and postdoctoral studies, 100% teaching researchers and 174 conference presentations (in the last 3 years). The developed internal communication infrastructure is an important achievement.

4.2. Budapest University of Technology and Economics: Faculty of Electrical Engineering and Informatics

One of the difficulties within the Faculty of Electrical Engineering and Informatics was what could be called an ‘island-like culture’. This culture was based on the former system that failed to support co-operative research and on the lack of central control.

Knowledge generation occurs through participation in international programmes, co-operation with prestigious multinationals and local giants. This co-operation also contributes to knowledge utilisation in a commercial sense. It is important to realise that the trend has a highly stimulating effect on the training of undergraduate and postgraduate students because of the emphasis companies put on co-operation. This is additionally supported by internal PhD conferences.

An important factor of knowledge diffusion is the direct link between research and education. This is so despite that fact that the amount of time spent in education puts pressure on research. In addition, there is training of PhD students, even though this is strongly connected to the brain drain problem, due to salary differences (1:3-4) between various sectors but also between graduates and experienced researchers.

4.3. Warsaw University of Technology: Faculty of Materials Science and Engineering

Just like the Czech institute, the Faculty of Materials Science and Engineering is a young organisation, but with approximately half the number of researchers (about 44). Within the faculty two centres of excellence were established under the 5th EU framework programme: Nanocentre and Presafe. More than 60% of the annual budget is based on competitive sources. It is worth mentioning that the faculty has actively been involved in the Polish economic transition.

Knowledge generation as well as utilisation are based on strong international co-operation - many internationally funded research projects - and on links with industry. The Nanocentre’s focus is mainly on knowledge generation within the framework of the university while applied research takes place in other Polish institutes. Presafe targets both the Polish academic and business environments. Also, the applied research of institutes can clearly be seen as knowledge utilisation. Output includes 680 publications over the past three
years as well as 40 innovations and 11 patents. Mobility, however, is quite low: in the current personnel, 90% of staff were among the centres’ founders and only 1% of staff was educated in another institute.

4.4. Slovak University of Technology: Department of Microelectronics - ONMiST

In spite of what was argued about the separation of research and education in the socialist era, the educational Department of Microelectronics has always had strong links with R&D projects since its establishment in 1961. In 2000, an ON² Semiconductor Centre - ONMiST - was developed. During the 1990’s, funding from the Slovak Grant Agency has been relatively stable - EU and bilateral collaboration grants were stabilised in the middle of the 1990’s - but grants based on industry links have increased sharply.

Knowledge generation is again based on extensive international co-operation - throughout Europe - with universities, research laboratories and industrial partners. Co-operation is in this case not one-sided: researchers come in and go out, something that also applies to students. The strong co-operation might influence positively the business slowdown in the field of microelectronics. However, there was a large decrease in the number of researchers and MSc graduates - and smaller decrease of teachers - during the 1990’s. At the same time, a strong rise in the number of PhD students took place. The foundation of ONMiST is important in this sense. The improved infrastructure enabled students’ long-term projects. Also, it helped them to contribute to both education and research.

The strong links between research and education are important for knowledge diffusion. Important is also the fact that almost all publications are made in English. The fluctuation in this respect can clearly be noticed from the up-and-down figures, of which a linear trend is difficult to establish.

4.5. VIGO-System Ltd., Warsaw, Poland

VIGO was founded in 1987 with the limited capital of 100 monthly salaries. Even so, it managed to survive the severe economic crisis of the time. In contrast to other case studies, VIGO is a joint-stock company: 80% owned by the original founders and 20% by an American investor. The gross added value of their products is approximately 96%. Still this type of high-tech production is often less profitable than sophisticated production in a country like Poland. In addition, funding is difficult to be obtained from banks.

The company specialises in applied research and product development for large international market, using their generated knowledge. Interestingly, 28 out of the 44 employees are without a scientific degree and only 8 of them hold PhD or equivalent degree. Co-operation with universities is impossible because of the short production cycles in combination with bureaucracy. In order to be able to create a ‘market standard’, VIGO needs to grow further.

Knowledge diffusion and generation are strongly supported by the emphasis that the company’s management puts on strategic internal communication. It is argued that the Internet decreases the importance of attending conferences for the sake of networking.

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1 presented by Daniel DONOVAL (Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava)
2 Name of a Slovak company.
3 presented by Amir FAZLAGIC (Centre for Social Innovation, Vienna)
4.6. Welding Research Institute (VÚZ), Bratislava, Slovakia

The VÚZ Welding Research Institute is mainly concerned with applied research, development and introduction of technologies, products and software. Revenues are mainly generated from commercial use of this output, but also from consultancy. According to figures, 22% of their products are competitive in international markets, and 80% are competitive in domestic markets. The separation of Czechoslovakia meant a market loss for VÚZ. Furthermore, international firms entered this smaller market and increased competition. The parallel decrease of state funding implied other problems as well.

Knowledge is generated by 310 employees, of which 65 are researchers. Only 25 of them hold a scientific degree. There are signs that the organisation is ‘becoming younger’, because of recently recruited 13 researchers who are under the age of 30. International collaboration takes place in research projects, international networks and standardisation organisations. All these are supported by personnel training and progressive human resource management.

Knowledge utilisation is one of the core activities of VÚZ. Through its presence in standardisation organisations, VÚZ can also make use of its special knowledge. As far as knowledge diffusion is concerned, it is important to mention VÚZ’s links to education, which are achieved by researchers teaching at the Slovak Technical University.

4.7. The keynote speech and the cases in Budapest

As has been mentioned earlier in this summary, one of Kutlaca’s statements refers to the legacy of rigid ‘Soviet model’ of organising science. However, in the 1990’s the walls of this model collapsed and science was left out in the marketplace to interact with industry. The case studies of university R&D in this volume show the importance of science-industry interaction in CEECs. Kerékgyártó-Jankó refers to collaboration between a university research-institute and the newly emerged private sector (both multinationals and local giants). Loudin also refers to international partnerships with universities and to collaboration between Academy and university. Adamowicz and Donoval discuss international collaboration on project basis. Also spin-offs were mentioned in two (of the five) case studies. This is a positive sign since spin-offs constitute one of the four characteristics which Kutlaca names for the Western science model. However, there is still a marked difference between Central and Eastern Europe and the West.

In reference to Kutlaca’s overview of the different phases of the transformation of the R&D sector (dissolution and fragmentation - restructuring, consolidation and rebuilding - new integration) it is very interesting to follow the history of the institutes included in case-studies. With the exception of Adamowicz’s case - the faculty was founded almost immediately after the transition, in 1991 - all the other cases refer to potential centres of excellence that are part of older academic institutions. These are clear signs that the university R&D sector has to go through a process of restructuring in order to be able to survive the science-industry interaction in the capitalist market economy.

In his contribution Kutlaca also argues that the mental structure of the former regime had a negative impact on researchers, making them relatively unable to cope with new technologies. This statement cannot

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8 This case study was not presented “live” in Budapest, but was given as a contribution to the Budapest Proceedings by Alojz JAJCAY (Welding Research Institute, Bratislava).
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be traced in the case studies. A few arguments can be only given. First of all, Loudin points out that two-thirds of researchers of the institute under analyses are under 35 of age. This implies that the majority of researchers can hardly have any relevant working experience in the ‘old system’ and therefore, they cannot have been influenced by its ‘mental structure’. Furthermore, the case study discusses increasing possibilities for PhD and master students to take part in research and to have sensitivity on the issue (specifically stimulated by co-operation with the private sector). However, Kerékgyártó mentioned this in his lecture as something ‘unnatural’: he argued that ‘Even young lecturers and researchers manage their own research projects’, implying that ambitious “youngsters” are seen as “something new”.

As has just mentioned, the influence of the private sector has some positive effect on renewing an organisation. In general, the case studies support Kutlaca’s argument that the presence of some multinationals in the R&D sector of CEECs has a positive impact on the development of best practice and on improving research infrastructure. Nevertheless, in the manufacturing sector the motive for foreign investment is mainly cheap labour, not resulting in opening major R&D departments. This seems to contradict Kerékgyártó-Jankó’s contribution in which examples are given of the opening of laboratories within the local organisation.

5. Conclusions and the future work in RECORD

In conclusion it might be said that potential Centres of Excellence (or RECORD CoEs) have managed to overcome some of the bottlenecks - both domestic and international - of economies and societies in transition. This often required institutions and individuals to adopt a completely new approach to R&D. Especially in the case of institutions with long tradition in academic teaching and research this often turned out to be problematic. A critical analysis of organisations (and that analysis can ideally be a benchmarking exercise) can help to identify practices that lead to innovation.

The RECORD network proposed a set of benchmarks to show that innovative excellence can be identified both in terms of performance and practice. University research communities and the increased importance of university-industry links seem to be fields in which the RECORD benchmarks could be applied.

In terms of methodology, the RECORD network reveals some progress since the collection of quantitative and qualitative benchmarks has started. The examples of university research presented in Budapest indicate the organisations to be presented in the RECORD Experimental Map.

As far as policy recommendations are concerned, the Budapest conference reinforced the view that the implementation of any policy option based on the RECORD exercise, requires some analysis of the unique characteristics of individual countries. Apart from analysing success stories, probably failures also need to be considered.

After the Budapest event, the RECORD network is going ahead to collect the quantitative benchmarks (for 20-25 RTD organisations in each country) and the qualitative factors (for at least 2-3 cases) from the CEECs. The pilot benchmarks will enable us to identify sound policy options, to make policy recommendations and to compile the RECORD Manual and Experimental Map.
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