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The effect of sectoral innovation system on the access to the innovation subsidy - Cross case study of Czech Republic

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on my Diploma Thesis titled õThe effect of sectoral innovation system on the access to the innovation subsidy - Cross case study of Czech Republicö solely and completely on my own and that I have marked all quotations in the text. The literature and other material I have used are mentioned in the Bibliography of the Thesis.

Prague

Signature of the student

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Vliv inova ního systému v jednotlivých odv tvích na erpání inova ní dotace ó P ípadová studie eská Republika

The effect of sectoral innovation system on the access to the innovation subsidy - Cross case study of Czech Republic

ního systému v jednotlivých odv tvích na erpání inova ní dotace. Cílem práce je vybrat faktory, které umofl ní analýzu inova ního systému v jednotlivých odv tvích, popsat jaké nástroje ve ejné intervence tento systém ovliv ují a za pomoci vybraných faktor porovnat jednotlivá odv tví. Dále pak na základ t chto charakteristik definovat jaké bariéry k inova ním dotacím vyvstávají z rozdíl mezi odv tvími a navrhnout doporu ení jak pro úpravu dota ního programu, tak pro úpravu inova ního systému v jednotlivých odv tvích.

Praktická ást této práce je vypracována pomocí p ípadové studie, kde je sledováno 8 podnik p sobící ve strojírenské a v chemické výrob . Jednotlivé p ípady jsou pozorovány pomocí osobních pohovor s reprezentanty podnik , které inovace implementovali. Výsledky byly analyzovány a porovnávány s teoretickými poznatky získanými v literární re-er-i.

Na základ výsledk praktické ásti byly vyvozeny záv ry týkající se charakteristik inova ních systém a s nimi spojenými p ekáfl kami k ud lení inova ních dotací. Výzkum ukázal, fle mezi odv tvími existují rozdíly, které by m ly být brány v potaz p i vytvá ení dota ních program . Dále pak výsledky poukazují na to, fle n která kritéria inova ního programu mohou být výhodn j–í pro jeden sektor a naopak. Na záv r bylo navrfl eno n kolik doporu ení jak na úpravu inova ního systému, tak na úpravu dota ního programu.

Klí ová slova:

Inovace, innova ní systém, inova ní dotace, charakteristika odv tví

n investigating the impact of the sectoral systems of innovation on the access to the innovation subsidies in the Czech Republic. The objective of this research is to select the factors to analyse the innovation system in particular sectors, to describe what are the tools of public intervention and their impacts on the sectoral systems of innovations, what are the characteristics of the sectors and how do these characteristics impact the possibility to draw up the innovation subsidies what could be recommended for the innovation subsidy programme and for the innovation system.

Empirical part of the research is elaborated through a comparative study of 8 innovative companies operating in engineering and chemical sector. The cases are investigated through the personal interviews with the companiesø representatives that were involved in the innovation implementation.

On the basis of the empirical results the conclusion are drawn on the sector characteristics and on the barriers to the innovation subsidies. The research shows that there are differences between the characteristics. From the research implies that some criteria for the innovation subsidies might be favourable for one sector and the other for the second sector. In the conclusion, several recommendations have been done.

Key words:

Innovation, innovation system, innovation subsidies, sectoral characteristics,

1. Introduction

Since the 1990s the Ministry of Industry and Trade of the Czech Republic (MIT) had been contributing to the support and development of SMEs through different services and programmes. In the Czech Republic, as well as in the countries where the economy transition took place, the companies (especially the small and medium ones) are still suffering from the low competitiveness. After privatisation of the companies, the markets opened and the companies started to head the international challenges. As the competition is considered as innovation based, it became essential to enhance the innovation to increase and promote the competitiveness (Mytelka, 1999).

Simultaneously with the integration of the CR into the EU in August 2004, the Czech Government approved a programme of the National Innovation Strategy of the CR. Its goal was to enhance the innovation, which is essential in the procedure of globalisation of the market and in the increasing competitiveness. The strategy is focused on the organisation of innovative environment, growing of innovative activities, infrastructure and reacts on the challenges occurred after joining the EU. Great emphasis is placed on innovation of the whole industry (not just traditional sectors), on the branches of business which are important for the diversification of economics and for the quality of services provided to the local entrepreneurs (Jasansky, 2006).

For the purposes of investment in innovations, MIT has launched a sub programme Innovation within the frame of Operational Programme Enterprise and Innovation for the period 2007 ó 2013 (OPEI) which is among others part of the National Innovation Strategy. The OPEI has been designed for the SMEs operating in several sectors of manufacturing industry. This innovation scheme has been set up to decrease the costs of the private investors and enable the projects which would not be carried out without the financial support. One of the most criticised aspects of the distribution policy is a complicated application, realisation administration and complicated access to the funds and allocation.

The innovation system determining the innovativeness resulting in competitive advantage has been affected by the sector and its structure. The practices and habits of the companies vary across the sectors and have different characteristics. This means that the policies should be adjusted to the sector (Castellaci, 2003). In the case of the OPEI, there is only one programme for several sectors of the industry. The differences in innovation systems across the industry might result in the barriers to the successful innovation and therefore to the subsidy for certain sectors. As the Innovation programme OPEI is designed for certain number of the sectors within the industry, than the programme should be accessible to all listed sectors.

For the MIT, it is important to stimulate the private activities to produce positive externalities like future economic growth, increase of employment and of economic dynamics, contribution to the industry, strengthen the competitiveness and create competitive conditions and environment on the home and international level (Keizer et al., 2000). Good conditions for innovation play an important role in the sustainable

competition in all countries without regard on the level of development (Mytelka, 1999).

From the companies' point of view, there are several reasons for the financial support need. The main reasons have been mentioned in the previous paragraph. Concerning the innovation subsidies, several researches have been carried out, which show the importance of the financial support in the innovation processes in the companies. The financial support of the innovations enables the innovation projects to be carried out and increases the competitiveness of the particular companies (Keizer et al., 2000). According to the author, the innovation subsidies are the most important factors enhancing the innovations projects within the companies. Another research focused on the innovation barriers within the companies shows that the financial barrier belongs to the biggest weaknesses of SMEs regarding the innovations (Asheim, 2003). Furthermore the results by (Berube & Mohnen 2009) show that the companies granted subsidies made more product innovations and were more successful in commercialising the innovations than the companies not receiving the financial support. It is therefore important for the policy makers, as well for the companies that the innovation subsidies are accessible to companies from all sectors of the manufacturing industry.

As the program OPEI is not even in the middle yet, there is time for recommendations. It would be therefore useful for both the policy makers and applicant to investigate this problematic. First of all the investigation would distinguish, which barriers to the innovation subsidies arise from the innovation systems of particular sectors. Further, the investigation would distinguish which barriers to the subsidy drawing arise from the subsidy programme itself and how do they differ between sectors. The study would enable to make recommendations for the programme adjustment, which would make the subsidy programme accessible for more companies in from all listed sectors as well as the recommendations for the adjustment of policies determining the innovation systems.

It would interesting to create a theoretical framework describing the factors to analyse innovation system in the sectors, public intervention tools impacting these factors and how do these relations determine the characteristics of the sectors and sectoral systems of innovations.

Understanding these barriers might lead to facilitation of the whole procedure in the future. This report could give the potential innovation subsidy applicants an insight into the problematic and into the obstacles, so that they could prevent the failure of the project. Further, it would be useful for the policy makers of particular calls to look at the aspects of the programme which obstruct the subsidies drawing.

From the academic point of view, the research will show the case, when there is one policy for innovation subsidies for several sectors, while the innovation context differs across the sectors and require adjusted policies.

2. Objective of thesis and methodology
Research objective

The objective of this research is to select the factors to analyse the innovation system in particular sectors, to describe what are the tools of public intervention and their impacts on the sectoral systems of innovations, what are the characteristics of the sectors and how do these characteristics impact the possibility to draw up the innovation subsidies what could be recommended for the innovation subsidy programme and for the innovation system.

The confrontation of the innovation system in the Czech Republic with the literature findings would distinguish what barriers to innovation subsidies arise from the innovation system of the Czech Republic and what barriers arise from the policy itself. The practical part will show the concrete example of barriers met by the innovation management or by people involved in the innovation subsidy drawing process in particular companies with regards to the sector. This will enable to make recommendations for observed sectors in the future.

The project is considered as practise-oriented research project: õIt is about intervention in order to change an existing practical situationõ(Verschuren & Doorewaard, 2005, p.36). The project context is considered as diagnosis project context: õAfter the problem has been identified as such and acknowledged by all stakeholders, in the diagnostic stage the background and the cause of the identified problem are examinedõ(Verschuren & Doorewaard, 2005, p.37-38).

Research issue

For realising the objective, it is necessary to define what kind of information has to be gathered and analysed. This might be defined by formulating the central research question and several sub questions *(*Verschuren & Doorewaard, 2005, p.65).

The central research question:

What are the factors to analyse the innovation system, what are the characteristics of the innovation systems in particular sectors, how can the public policies intervene in the sectoral systems of innovation, what are the characteristics of the Czech innovation system and how does it influence the access to the innovation subsidies, and what are the recommendations for innovations system and for the innovation subsidy programme?

The research sub questions:

1. What relevant information can be extracted from the literature on factors to analyse the innovation system?

2. What are the characteristics of to the sectoral systems of innovation with regard to the factors?

3. What are the tools of public intervention influencing the sectoral systems of innovation?

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4. What is the theoretical framework based on the findings from the scientific literature?

5. What is the design of cross case studies and interviews?

6. What are the characteristics of the observed sectors compared to the literature findings?

7. What are the criteria for receiving subsidies from the programme Innovation belonging to the Operational Programme Enterprise and Innovation of the Czech Republic?

8. What are the barriers to the subsidy drawing arising from the innovation programme in particular companies?

9. What are the barriers to the subsidy drawing arising from the characteristics of the innovation systems in observed sectors

10. What are the recommendations made by the representatives of the companies that might contribute to the innovation system improvement?

11. What are the recommendations for the innovation procedure made by the companies representatives and made based on the conclusion from the sectors characteristics?

All the sub questions should have a contribution to the answering of the central research question. Research sub question 1 will summarise the literature findings on factors to analyse innovation system. Sub questions 2 will give the characteristics of particular sectoral systems of innovation found in the literature. Sub question 3 will summarise the literature findings on possible public intervention in the innovation system. Based on the first three questions the literature framework will be described, which will answer research question 4. Based on the sub question 5 research design including the interview design will be described. The sub question 7 will describe the innovation subsidy program OPEI. Last five questions will enable to analyse Czech innovation systems and related barriers to the innovations and subsidies and make recommendations.

Answering all sub questions will answer the central question which will lead to fulfilling the objective of the report. This means describing the innovation system in the Czech Republic, defining the barriers to the innovation subsidies and making recommendations for the future applicants and policy makers. The answers to these questions will be contributing to the realisation of the research objective.

Research framework

To reach the ob**j**ective, it is necessary to sketch the steps to be taken. The visualisation of the intended steps will help the definition of the research questions *(*Verschuren & Doorewaard, 2005, p.56).

To realise the objective several information resources will be used. For the purposes of this research the following notions are essential: factors to analyse the

innovation system, characteristics of the sectoral systems of innovation and public intervention tools impacting the innovation system.
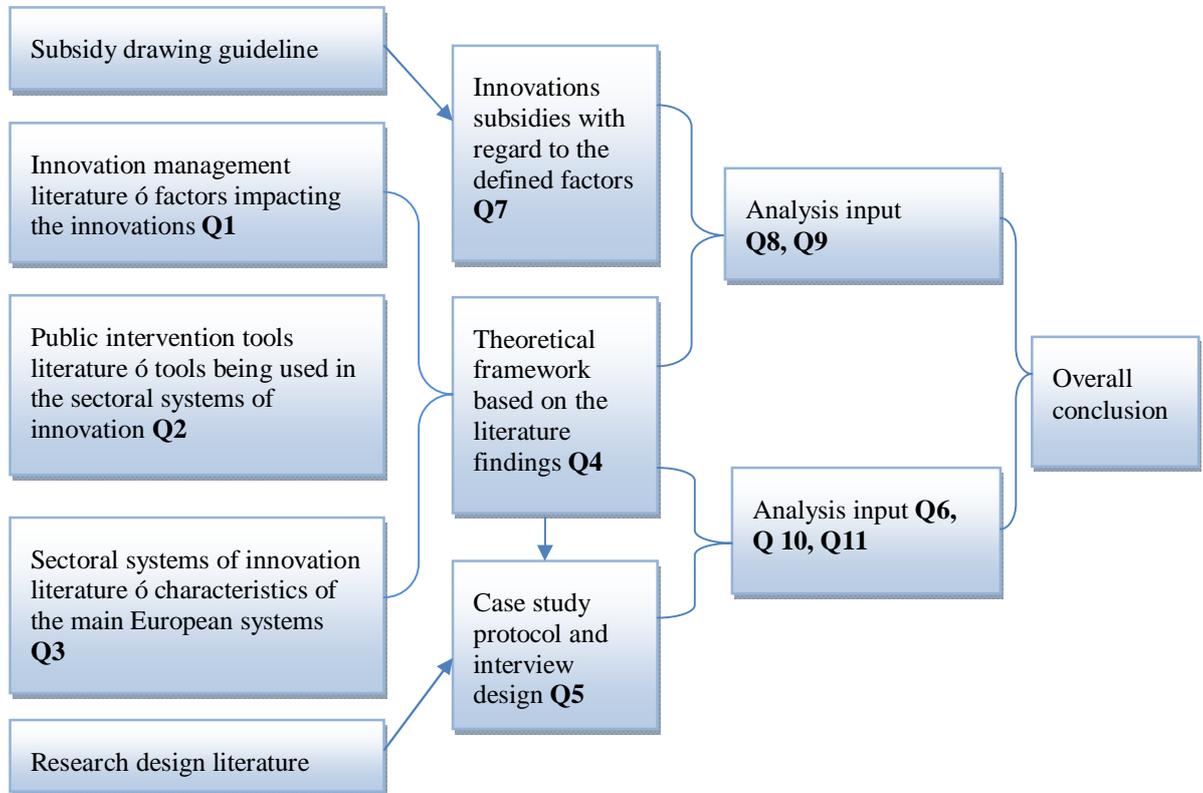
The first part of the literature research will enable the creation of the theoretical framework which will summarize the literature findings concerning of the innovation system, the characteristics of the sectors and the means of public intervention. The second part of the literature research will describe particular phases and required criteria of the empirical part.

In terms of the literature framework, the empirical part of the research design will be carried out. Through the use of the comparative case study, which will have two phases, the research objective will be reached. In the first phase, the study protocol design will be elaborated. This protocol will describe each step of the study, which will ensure gathering of relevant information, thus reaching the objective of the research. In the next step, the phase of the data collection will performed.

After having collected the information essential for the research, the analysis of these will be performed. In one step, the confrontation of the literature framework and information gathered in the field will be done. This stage will determine characteristics of the sectors and the barriers arising from the innovation system in particular sectors and in particular companies. In the second step the findings will be confronted with the criteria for the subsidy drawing. These will be compared later on, which will help to identify the factors hindering the subsidies drawing among the sectors and eventually among the companies within the sectors.

The result of the data analysis will serve for the identification of the barriers for the subsidy drawing and making the recommendations for the policy makers and future applicants of innovation subsidies from OPEI.

Definition of concepts

Before proceeding to the construction of the technical research design, it is important to define the key concepts and provide their exact meaning.

Small and medium enterprise = enterprise employing less than 250 employees, having the year turnover less than 50 million þ or the total of the balance sheet does not excess 43 million þ.[1]

Sectoral system of innovations = products and agents carrying out the interaction for the creation, modification and diffusion of new technologies in particular sectors (Malerba, 2003).

Factors to analyse the innovation system = the elements that create the sectoral system of innovation (Malerba, 2003).

Public intervention tools = public action that influences the innovations and innovation system (Edquist, 1999).

Innovation subsidies policy = subsidy programme meant to enhance the innovation activities (implementation of new technologies, products and services) in the companies.[2]

Technical research design
Research material

For constructing the technical research design, it is useful to start with listing the material which will be included in the research.

- Books, scientific articles and journals on factors to analyse sectoral systems of innovations

- Books, scientific articles and journals on the typology of sectoral systems

- Books, scientific articles and journals on the characteristics of the sectors

- Books, scientific articles and journals on public intervention tools

- Books, scientific articles and journals on the innovation subsidies

- Guidelines on Structural Funds provided by the European Commission, by Ministry of the Industry and Trade of the Czech Republic and by Czech Invest

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[1] Small medium enterprise definition: official websites of CzechInvest [online]. 2009-09-15 [cit. 2009-09-15]. Available on: < http://www.czechinvest.org/definice-msp> .
[2] Ibid.

- Scientific articles and journals on the Structural funds

- Information material provided by the Czech Invest, by Ministry of the Industry and Trade of the Czech Republic

- Books on research design and research methods

Research strategy

For the purposes of the thesis, the case study has been chosen as the research approach, because its characteristics meet the requirements of the research objective. This type of the research gives the researcher an insight into the object restricted in time and space. The research will concern two sectors of the industry, which means small number of research units will be analysed. (Verschuren & Doorewaard, 2005).

As the variant of the research strategy the cross case study has been chosen. This variant gives an opportunity to study not an individual case. As the sub variant, the hierarchic method has been chosen, because the cases will be examined separately independently on each other in the first phase. In the second phase, the results from the first phase will be used to make a cross case analysis of all the studied cases (Verschuren & Doorewaard, 2005).

3. Literature overview

Chapter three will concern the literature study and its aim is to answer first four sub questions. (1) What relevant information can be extracted from the literature on factors to analyse the innovation system? (2) What are the tools of public intervention influencing the sectoral systems of innovation? (3) What are the characteristics of to the sectoral systems of innovation with regard to the factors? (4)What is the theoretical framework based on the findings from the scientific literature? The purpose of this chapter is to obtain the model which will serve as an input for the empirical part of this research.

3.1. Innovation management literature

Literature part innovation management will emphasize the factors influencing the innovation management, which enables to analyse the innovation system. For the purposes of this work, those factors that are being impacted by public intervention will be selected.

Key issues in innovation management

Innovation is the renewal of core process within the firm; renew their product structure, technology and organizational practices (Todtling & Kaufmann, 1998). For the purposes of this study, two types of innovation are relevant: product and process innovation. Product innovation is a process of changes in the goods and service which an organisation offers, process innovation is a process of changes in the ways in which products are created and delivered (Tidd et al., 2005).

According to Tidd et al. (2005), all types of innovations vary with the degree of novelty. The degree of novelty is going from the incremental to radical change. The incremental level represents small improvements (updating of contemporary product), while the radical change represents the complete change in way of use (completely new concept). The most radical innovation can lead to introduction of new product or process opening new market. The authors mention that the degree of novelty is similar for the companies within one sector. The strategy is the long term goal of a company (Foss, 2003) and depends on the type of the innovation (process or product innovation) and on the degree of novelty (radical or incremental) (Evangelista et al. 1997 in Castellacci, 2003).

Networks among the actors

Innovation requires the networks among the actors in the sector in order to develop and commercialise new product. Among the actors companies, research centres, universities, educational institutions, organisations, associations, chambers, incubators, users/customers, suppliers, institutions, government, technology centres, consultant services, etc. can be included. Each actor has a specific behaviour, which influences networks, which therefore vary across the sectors (Tidd et al., 2005). The company has a choice to take a closed approach to the innovation strategy (make the whole development on its own) or to take an open approach to the innovation and accept the elements developed by other actors in the sector (Chesbrough & Appleyard, 2007). Collaboration within networks reduces costs and risk, enables economies of scale, reduces the time and promote the shared learning (Tidd et al., 2005).

Todtling & Kaufmann (1998) show that many firms consider, due to the lack of trust, innovation as internal process. On the contrary the SMEs, even though they have more barriers (for example they have less to offer in comparison with the large companies) they have more need for partners (Todtling & Kaufmann 1998). According to Narula & Hagedoorn (1999), large firms tend to create more alliances than SMEs. The authors conclude that there exist significant differences among the sectors or industrial groupings. They add that in the frame of one sector, the companies behave in the same way.

The main actor is the company, because it implements the innovation. The company can be user, producer and input supplier. The special focus is put on the users, because they are determining the demand, which is seen as a kind of interaction with producers (Malerba, 2003). Universities are the source of knowledge, as well as the source of skilled labour. Further the market needs play a role in innovative projects. Analysis of customersø requirements enables the firm to create process or product value satisfying the customersø needs (Tidd et al., 2005). At a certain stage, the innovative companies start focusing on differentiation and seek the gap on the market. In order to provide product or service differentiated from the competition, knowledge of the customersø needs is essential. In market analysis, the industry experts are essentials for development and preparation of innovative projects (Tidd et al., 2005). The importance of learning from the market varies with the degree of novelty of the innovation (OøConnor, 1998). The author adds that the role of the market research is more important in incremental innovation, than in the radical one, because the customers cannot specify the requirements for entirely new product.

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Source of knowledge

The knowledge is one of the most important factors for the innovation capabilities of the firm (Tidd et al., 2005). Author states that each sector has a specific knowledge base, which represents the major constraint for the firms operating in the sector. While in large organizations the source of knowledge is the own R&D, in small firms new knowledge flows more from external sources, from other actors of the sector, from the trade and technical journals, training and advisory services, consultants, patents (Tidd et al., 2005).

In Europe in general, there are important barriers in the knowledge flow among the regions and among the sectors (Maurseth & Verspagen, 2002). The share of knowledge is important for enhancing the innovation and its performance. The way knowledge can be commercialised by selling or buying intellectual property rights (patents). Patents are considered as an external source of knowledge and enable the knowledge flow across the firmsø boundaries (Caloghirou et al., 2002).

Institutional settings

Institutions are setting the context, in which the actors interact. They are shaping the behaviour of the actors and setting the rules. Institutions can be divided into two groups: regulative institutions setting the standards and constraints, regulating conflicts among the actors and supportive institutions providing incentives and rewards. They have impact on the innovative extent of the firms (Edquist, 1999).

Some institutions are national, while others are specific to sectoral systems. õOften the characteristics of national institutions favour specific sectors that fit better the specificis of the national institutionsö (Malerba, 2003, p.334). It can be expected that some sectors have weaker innovation system that the others (Todtling & Kaufmann, 1998). The key role of institutions is to facilitate the organisation of innovation, particularly in areas where the market fails (Edquist, 2005).

One of the institutional regulations is concerning the environment. Innovation can solve the environmental problems as well (Murphy & Gouldson, 2000). The authors argue that the innovation of technologies can contribute to the ecology. They state that while the innovation encourages technological change, in some companies or sectors it is difficult to support the ecological concern or the radical innovations associated with the ecological protection. Sectorsø prevention and cleanup costs increase the prices and decrease the competitiveness. All sectors are impacted by environmental regulations, but some are more affected than others, for example electronics, chemicals. The cost of environmental regulations can be decreased by innovation projects.

Educational level

The educational level is another source of the different characteristics of the innovation among the sectors. Skilled and qualified staff is a key factor determining the innovation potential in each company. The contemporary trend focuses on connecting the education, employment, research and innovation and macroeconomic policies (National Institution of Technical and Vocational Education). The educational structure, especially the share of people with university degrees, varies across sectors (Dolezalova

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et al., 2007). There is a need to increase professional and innovative skills (Myskova, 2000). One of the tools increasing the innovativeness and performance of the firm is the training of employees (Tvrdon, 2006).

Conclusion

This section has provided an overview of factors to analyse the system of innovation which varies among the sectors. First, there is variation in the type of innovation and degree of innovation. Next it was found, that the innovation system is impacted by three factors: the networks among the actors in the sector, the source of knowledge which is necessary for successful innovation and the institutions which are determining the innovation system. At the end another factor has been defined, educational level of employees in innovative firm. The overview is shown up in the Table 1.

Table 1 Factors for the innovation system analysis

Factor				
Type of innovation	process	product		
Degree of novelty	incremental	radical		
Networks among the actors	companies, research centres, universities, educational institutions, scientist, organisations, associations, chambers, incubators, users/customers, suppliers, institutions, government, technology centres, consultant services			
Source of knowledge	internal R&D	external R&D		
Institutional setting	regulatory	supportive		
Educational level	low or high number of employees with university degree			

3.2. Innovation policies

This section will emphasise the role of policies and policy tools on the factors introduced in the first section. The section will seek for the answer on question: What are the tools of public intervention influencing the sectoral systems of innovation?

Policies differ across the sectors, institutions, and each country has different outcome, they are therefore country specific. But there exist a general common principle (Nauwelaeres, 2000).

Public intervention

Public interventions in innovations are meant to reduce market failures, to generate positive externalities of knowledge production and usage, and to reduce negative externalities. These interventions are justified if they help to achieve the goals (Boekholt & Larosse).

According to Malerba (2003) there must be two conditions for public intervention. The first one is that there must be a problem and the second one is that the intervention must be able to solve the problem. The problem is arising within the context of a sector. The policy makers have to be aware that they are inside a sectoral

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system. Identification of a problem should be accompanied with an analysis of its causes as a basis for the design of an innovation policy.

Innovation policy tools

Innovation policies are a set of related tools influenced by many factors, which in isolation do not produce desired outcome. Governments are choosing set of parameters maximising the innovations at the national level (Mohnen & Roller, 2003).

Degree of novelty

Tellis et al. (2009) have identified three factors considered as the main driver of the radical innovation with possible public intervention: skilled labour, capital and government regulations. For the support of radical innovations, the following tools are being used. Concerning the skilled labour, intervention is in the form of support of education especially in the scientific and technological field. As for the capital, the direct support in the form of loans and financial support. Government public intervention involves the support of the intellectual property (enabling the developers of knowledge to be rewarded), encouraging the collaboration among the universities and firms (enables move of knowledge from universities to the firms). The authors contrast, that these three factors do not distinguish the firms from each other. They conclude that the firmøs culture is the strongest driver of the radical innovation.

For individual companies, the most common barrier is the lack of financial resources. Under the assumption that the companies are launching only privately profitable projects, the aim for most European regions is to reduce the costs of the companies. The interventions focused on new equipment expenditures, expenditures on employees training, new product introduction and investment. Tools being used to intervene: R&D subsidies, subsidised loans, grants for new companies, R&D tax incentives (Asheim et al., 2009, p122). The companies are using the financial support even if they could finance the innovation using their own resources, which is decreasing the effect of public support (Czarnicky, 2002). In some countries the programme was administratively difficult, and only bigger firms could benefit (Asheim et al., 2003, p.121).

Source of knowledge and networking policies

The role of policies is to increase the capability of companies to innovate and enforce the diffusion of knowledge, enhance the collaboration among the actors, learning within the firms and within the region (country). There is not a unique policy mechanism which works in each region, but there are certain general elements (Nauwealeares, 2003). To create an interactive intervention mechanism, the policies should be designed in cooperation with the beneficiaries, and the policy implementers could be partners in the supported projects. In majority of 11 observed European countries, there is a lack of coordination among the particular tools. The majority policies have been designed top down, and do not take the user in consideration (Asheim et al., 2003). According to Nauwealeares, (2003) the tools can be characterised by the target level of support: firm oriented and system oriented.

Firm oriented support includes the tools decreasing the lack of knowledge in the companies. These include subsidies for hiring the technicians and managers, training subsidies; support of research centres, technology centres and universities, innovation management training and advice, transfer units in universities and technology transfer schemes (Asheim et al,. 2003, p.121). Research centres are not just resource of knowledge, but also of skilled workforce.

System oriented tools aim to increase interaction between the private, public sectors and diffusion of knowledge among these and influence regional system of innovation (Asheim et al., 2003, p.121). By identifying the companiesø needs and matching those with the technological potential of the institutions the companies are included into the innovation system (Asheim et al., 2003, p.134). Further targets of these tools are an increase and acceleration of the implementation of R&D results; enforcing the basic research, researchersø education and research infrastructure; support of research for the key industries and for industries based on knowledge and support the product commercialisation (Hajda et al., 2004). The tools being used are the support technology centres, innovation brokers, mobilisation of researchers (between industry and research), legislative support for the innovative companies and support for firms networking. Technological centres help the businesses to expand and to stimulate innovative and competitive growth. They can be research oriented, facility oriented (e.g. incubators enabling the creation of new firm from research projects) or technology transfer oriented. (Asheim et al., 2003, p120). Innovation brokers aim to identify the needs of the companies. The role has changed from contacting SMEs to providing the assistance and advice for innovative companies, to set the needs and strategy of the company (Asheim et al., 2003, p.129). The mobilisation of researcher enables: employment part time for the company and part time in the research institutions, supporting the company to hire young graduated employees as a transfer of knowledge (Asheim et al., 2003, p.132).

The authors conclude that the tools need to be designed in an interactive way, using all positive externalities, which are difficult to measure in the short term. This requires relations at the firmsø level (client, subcontractors and suppliers), institutional networking (research institutions, services and technological centres, training institutes and chambers of commerce) and relation between public and private actors.

Institutional setting

Even though innovations have positive external effect (e.g. environmental), companies launch and public intervention supports only economically profitable projects. For the allocation of resources, the tool used to assess the project and allocate the resources is based on the estimated profit of the projects. The decisions rely on possible future outcome. The tool therefore involves uncertainty. As a result, there is a risk of two errors - financing of project that fails, and refusing the projects that will be profitable (Peneder, 2008). There might be projects with positive environmental benefit, which is not covering private costs (Czarnitzki, 2002). Concerning the environment, there is a necessity of public intervention, because there is not a market mechanism. The intervention must be done through the institutional regulatory mechanism, to eliminate negative impact (Edquist, 1999). The innovation policies help to overcome the barriers to the innovation and support the ecological technologies (Murphy & Gouldson, 2000).

Educational level policies

Biswas et al., (2005) have defined four areas of policy tools, which were implemented and considered as successful. First area concerns the policies for redesigning the financing for workforce development. This area aims creating new sources of funding, target priority industries, make use of funding responsive to the needs of employers. Used tools: involving the employers and industries in the financial support. The second area concerns strengthening of workforce development and making link with economic development (increase the labour force for innovations and enhance the life sciences and engineering studies). The aim is to provide skilled personnel to the businesses with the focus on selection of the industries. Tools used for reaching the goal: the agencies aligning the economic and workflow development policies, expansion and design of education in order to meet the requirements of the industries. Third area concerns the building the capacities of labour market institutions. Creation of state funding workforce intermediaries bridges the gap between the supply and demand on the labour market. The sector based approach to the workforce development was implemented, which created the partnership among sector representatives, labour and education. The last area concerns the expansion of educational capacity. The aim is to allow access to the education, with the use of student financial aid, distance learning, converting of working experience into the academic degree. Further tools represent the creation of the whole life education system and enhancing the whole life learning.

Conclusion

This section reviewed the literature on public policies and innovation. Public policies are only relevant when solutions for innovation problems are available. For each of factor, there exist a set of public intervention tools, which are being used to increase the innovativeness. Table 42 in annexe gives an overview of the public intervention tools and their impacts.

3.3. Sectoral systems of innovation in Europe

The previous section has reviewed the innovation factors, which are among others creating the differences among the sectors and the public intervention tools impacting these factors. This section aims to review the characteristics of sectoral systems of innovation. Sectoral system provides a very useful unit of analysis for understanding the innovative context.

System of innovations

According the Edquist (2005), the system of innovation is a set of interactions between institutions and organisations involved in searching and exploring, which influence the innovation processes and efforts of the firms. The system of innovation can be applied on different levels; from regional, national to the global. The author argues that more than these geographical levels, the sectoral level is most useful.

Sectoral systems

The sectoral system is providing tool for policy makers to understand the differences and specifics of the sectors (Malerba, 2003). Sectoral innovation system can be defined as a õset of products and agents carrying out market and non market

interaction for the creation, sale and production of productsö (Malerba, 2004, p. 297). The sectoral system can be used for designing the innovation policies (Malerba, 2002). Each sector has different features, organization and dynamics. Different sectoral contexts require different interventions (Malerba, 2003). In the section the diversity of the sectoral systems has been highlighted, which emphasises necessity of different policy measures for different sectors

Typology and characteristics of sectoral systems in Europe

Malerba (2003) uses the typology defined during the project European Sectoral Systems (ESSY). This typology recognises five sectors, which differ in the innovation context: pharmaceuticals, telecommunication and equipment, chemicals, software and engineering. The author has chosen these sectors because they are important for Europe in terms of innovation, competitiveness and growth, and because they are undergoing major transformation.

Pharmaceuticals

Pharmaceuticals as a sectoral innovation system includes big variety of actors: firms, universities, private and public research centres, regulatory authorities and consumers interrelated through different relationships. No single firm can control the research area. Innovation strongly depends on the ability to interact with science and scientific institutions (McKelvey & Orsenigo, 2001). The sector can be characterised by large firms, as well as small firms (Malerba, 2004).

The innovative efforts and lack of the knowledge exchange led to the need of the network among the actors in the sector. The network relations include market transactions, command and control interventions, competition and collaboration. Ability of the firms to use networks is the source of competiveness - projects involving the purchase of knowledge (licence) from the third parties have higher probability of success (McKelvey & Orsenigo, 2001). Innovative capabilities of the sector are dependent on publicly generated knowledge (public funding research), which requires research contracts and long term funding agreements. Smaller firms are farther from the public research using old techniques and hardly adopt new techniques. Larger firms are considered as pioneers of new technologies. The companies require various range of scientific work force; there are therefore strong relations between the companies and the universities (as a source of workforce). University is source of basic research and of property rights (McKelvey & Orsenigo, 2001).

One of the sector specifics is the change knowledge base, new actor in the sector appeared - biotechnology based firms. These became the resource of innovation in the pharmaceutical industry. They are based on the collaboration between the researchers and the professionals (backed with the capital) which resulted in the knowledge of new techniques. The aim of these biotechnology firms is to exploit fundamental knowledge from universities and to transfer that into the knowledge with commercial potential. Publicly generated knowledge is therefore general, which is further developed within these firms in more efficient and more precise way (McKelvey & Orsenigo, 2001). Another specific is the condition of getting access to publicly generated knowledge. Firms have to become active player (not only to use the knowledge, but also to

exchange it), which means to recruit the scientist and publish the knowledge. Incentives (subsidies) for keeping the scientist in the company are provided (McKelvey & Orsenigo, 2001). Last specific is the important role of health system and regulatory institutions (Lacetera & Orsenigo, 2001 in Malerba 2003). The sector is exceptional, that the consumer cannot evaluate the quality of products. The selection of products is done by those who are not paying for that (McKelvey & Orsenigo, 2001). The demand is derived from the health system and regulatory bodies (Malerba 2004). The sector is characterised by strict approval of products. In the sector, there is one agency harmonizing national approaches to product approval in EU countries. Further the legislation is intervening into the pricing (expense reduction which has increased due the increasing purchasing power and ageing of population) McKelvey & Orsenigo, 2001).

Telecommunication

With regard to the telecommunication equipment and services, the main actors are the large companies, as well as smaller specialised companies. Knowledge combination gives the sector the characteristics of high specialisation. In the sector, the innovation is affected by the institutional settings and standards (Malerba, 2004). Large variety of actors can be found. This large variety is explained by the big amount of different suppliers (few large companies, and SMEs), having specific knowledge and competencies. Different sources and relations are therefore required: the firms with the standard setting organisations and research organisations. The demand in the sector is derived from the interaction between the user and producer ó fast changing requirements of users to the standardised services (Malerba 2004).

Due to the fast developing IT and telecommunication, the knowledge and functional differentiation are changing rapidly (Edquist, 1997 in Malerba, 2003). The specific of the sector is development of equipment needed for the telecommunication. The R&D is mostly done by large companies and only small part of R&D is done by the universities and research centres. Public universities are the main source of skilled work force. Firms are providing and financing further education and training. To coordinate the producers, there is an important role of standard setting institutions. In the sector, there is an important role of infrastructure providers. The companies owning the networks are providing the access to the market (Cessaroni et al., 2001).

Chemicals

Concerning the chemicals, the sector is characterised by large firms and small medium innovative firms (Cessaroni et al., 2001).

Knowledge and its creation and exploitation are the main feature of the industry, there is importance of links with the universities and engineering departments (Cessaroni et al., 2001). The chemical companies are dependent on the external technological and scientific knowledge (Malerba 2004). Universities and small firms are elementary for carrying out the basic research. Internal R&Ds of large companies are exploiting the results of the basic research. Inventive capacity of chemical industry depends therefore on the universities and public research institutes. The research effort is mainly public, because the private research waits for the commercial potential. The

large firms are the resource of incremental innovation, because the incremental development is coming from their laboratories (with collaboration with the academic environment or specialised firms). National policies provide education, training, supporting infrastructure. The diffusion of technological knowledge between the firms developing the knowledge and between the firms buying these technologies through the intermediaries (licences) (Cessaroni et al., 2001).

The networks in the sector can be divided into three groups: strategic group including the inter firmsø networks, knowledge group including the network between universities and sector, and usersø needs group including network between producers and users. In the sector, there is necessity to connect the internal R&D and external source of scientific knowledge. The networks are helping the companies to adapt the radical changes (Cessaroni et al., 2001).

The sector is heterogeneous, basic chemicals production can be characterised by low differentiation and focus on costs (process innovation, lower expenditures related to the innovation), while the speciality production is characterised by high differentiation (product innovation, higher expenditures related to the innovation). Specialised production companies tend to enter the alliances more often than basic production companies (Cessaroni et al., 2001).

In the sector institutions are involved in the patent policies (Malerba, 2004). One of the specifics of the sector is the necessity to satisfy strict limits set by the environmental regulations, production of greener products and using less pollutant process technologies. The sector has been considered as responsible for environmental problems. On one hand consumersø behaviour is looking for environmentally safety products, as well as the governments on the other hand is putting stress on the environment. Government are putting regulations and measures in order to eliminate the waste and pollution, these laws are constraint for the manufacturers. Generally, the governments are using two tools: direct based on command and control, and indirect using the economic instruments (taxes, tradable quotas and subsidies). This is pushing the companies to adopt new technologies and products. The public pressure gave birth to the small chemical companies providing environmental technologies and engineering services (Cessaroni et al., 2001).

Software

Software as a sector can be characterised by several large companies as well as small and medium companies. The sector is very dynamic. The innovation system is created by large number of small companies serving for the niche market (Steinmueller, 2004).

Big part of knowledge development is being done in the companies without interest to commercialise, but to support the business of the companies. Radical innovation is done both by small and large firms. Incremental innovation is done by large companies, which are having more international (global) view. Small companies are often focusing on the niche market (seeking for the holes of large companies). User are playing crucial role in the innovation. Universities are generating interesting ideas. While large companies are relying on the ideas from the universities, there is little need

of universities and research institutions for the small companies (Steinmueller, 2004). The author concludes that there is an absence of structured sectoral innovation system. It is important to support the university research by the sector. University research is not compatible with the large long term projects, the results are difficult to generalise.

The sector is represented by fast changing knowledge, which resulted in the networks among the users, developers and the sellers. The demand in the sector is derived from the small user, but newly also by large industrial users (Malerba 2004). In the sector, the product innovation is arising from the interaction between the users and producers, public research institutions (including universities) and the sector and inter firm network (Steinmueller, 2004).

Large companies tend to introduce new products more often. The most common is incremental change ó innovation is driven by new design of the products rather than exploitation of new scientific knowledge (Steinmueller, 2004).

In the sector, the patent policies and the standard institutions have a high involvement (Malerba, 2004). Standard setting mechanism achieves the coordination of the software on the global level (Steinmueller, 2004) and is necessary for diffusion and adoption of large systems (Malerba, 2003).

Engineering

The last defined sector engineering production can be characterised by large amount of SMEs as well as big firms creating big groups (Wengel & Shapira, 2004). The knowledge is highly dependent on skilled personnel with applied technical qualification (rather than academically trained stuff) and on the information from customers (Wengel & Shapira, 2004). Further the information flow among the producers plays an important role (standardisation of components) (Malerba, 2004) The R&D has been decentralised in the sector (Wengel & Shapira, 2004).

The main driver of innovation in the sector is the specialisation of the products and the links among the users and the producer (companies R&D engineers collaborate with the production engineers), and inter firm networks. The importance of collaboration with the universitiesø departments is decreasing. On the contrary the relation of the companies with the users plays a key role and enables the reaction on the market demand. All the companies regardless the size, do their own design (Wengel & Shapira, 2004). Innovation in the sector has been in majority incremental, the R&D has therefore minority role. Radical innovations are rather exceptions in the sector. R&D expenditures are lower compared to other sectors (Wengel & Shapira, 2004).

Another specific of the sector is an increasing role played by the standard setting institutions with respect to safety. Products in the sectors are being standardised in the frame of the regions (countries) (Malerba, 2003). In the sector, there is an effort to support the small companies. Large companies have easier access to the financial resources, and to the work force (can offer higher wages and have closer relations with universities). This is making the large companies dominating and the networks become dependent on the large firms. They are becoming source of knowledge and technologies (Wengel & Shapira, 2004).

Conclusion

This section has provided an integrated overview sectorsø characteristics. Using the factors selected in previous chapter, the differences between the sectors have been found. The literature findings have been summarised up in Table 2.

Table 2 Characteristics of the sectoral systems of innovation

Factor	Pharmaceutics	Software	Telecom	Chemistry	Engineering
Firms size	**Large firms, SMEs**	**Few large firms, dominant**	**Few large firms, dominant SMEs**	**Few large, innovative SMEs**	**Few large firms (groups of SMEs) dominant SMEs**
Degree of innovation	Large-new technologies (radical innovation)	Large firms-incremental innovation		Large firms incremental innovation	In majority incremental innovation
	SMEs- old technologies	Large and SMEs radical innovations (incremental dominant)		Basic chemicals ó low innovative expenditures, process innovation	Low innovation expenditures
		Large firms introducing new product more often		Special production- higher innovative expenditures, product innovation)	
Networks among the actors	Links with universities ó (large firms)	SMEs more links with users (seeking for niche market)	Links with other firms	Links with universities	Strong links with users
	Public funding research (large firms)	links with universities	Links with standard settings institutions	Inter firms links	Inter firms links
	knowledge publishing	Inter firms links	Links with users	Links with users	Decreasing importance of links with universities
	relations: university ó biotechnology firms-companies		Uni.financing (labour)		
Source of knowledge	Universities (basic knowledge)	Internal R&D main resource of knowledge	R&D majority in large companies	Elementary knowledge: universities and SMEs	Companies do the research on their own
	purchase of knowledge (biotechnology firms developing general knowledge from public research)	university is source of ideas for large companies (not that much for SMEs)	R&D minority in SMEs and public research	Exploited knowledge: large companies	users needs=source of knowledge
	to get access to the knowledge, necessity to participate on R&D			Public research inventive knowledge Private R&D only commercial potential	not a strong need of university knowledge
Institutional setting	Demand of national health system	Patent policies	Institutional setting and standards	Environmental regulations	Standard setting institutions (safety)
	Regulations	Standards Institutions	Regulations	Demand determined by šgreen thinkingõ	
	Agency for product approval	Coordination of software on global level			
Educational level	Need of skilled work force from universities	N/A	Universities source of labour	-Universities source of labour	Highly dependent on practically skilled personnel (not dependent on universities)
	employment of scientists				

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3.4. Theoretical framework

In this section the findings from the literature review are synthesised into the theoretical framework. The aim is to answer the fifth sub question what is the theoretical framework based on the findings from the scientific literature? This is intended to be guiding for the data gathering in the empirical part and for the data analysis. The previous sections have summarised five main factors to analyse the innovation system, and how do these factors characterise sectoral systems of innovation. Further the tools of pubic intervention have been introduced. The theoretical framework gives an overview, over how the innovation factors influence concrete sectoral systems, and which policy tools (and their impacts) are important for particular sectors.

Theoretical framework will serve as a guideline for the case study. The aim is to check, whether the same mechanism works also in the observed context. First the interview protocol will be created to study, which tools are impacting particular factors in the current innovations in concrete companies, what is concrete impact of these interventions, and how could be the mechanism adjusted to enhance and facilitate the innovativeness in the companies. At the end the companies will be asked, how could be the innovation subsidy procedure adjusted for the current innovative systems. Next the desk study will be done, to find the causes of current situation. Tables 3-7 summarise, how do the mechanisms work in particular sector.

Table 3 Framework of pharmaceutics

Factor	Specific of the pharma	Policy tools	Intervention impact
Degree of novelty	-Large-new technologies (radical innovation)	-Labour – support of universities	-Enhance of radical innovation in SMEs
	-SMEs- old technologies	-Capital - loans	
		-Governments – IP, encouragement of collaboration	
Networks among the actors	-Links with universities – (large firms)	Subsidies for hiring specialist, Research centres and universities support, Innovation brokers, Mobilisation of researchers, Legislative support, Networking, Technological centres support, Public research support	Decrease the lack of knowledge -Interaction between the private and public sectors -Diffusion of knowledge -Increase and acceleration of the implementation of R&D results -Enforcing the basic research, -Researchers' education -Support the product commercialisation
	-Public funding research (large firms)		
	-Knowledge publishing		
	-relations: university – biotechnology firms- companies		
Source of knowledge	-Universities (basic knowledge)		
	-purchase of knowledge (biotechnology firms developing general knowledge from public research)		
	-to get access to the knowledge, necessity to participate on R&D		
Institutional setting	-Demand of national health system	-Standard settings	-Price regulations
	-Regulations		-Quality standards
	-Agency for product approval		
Educational level	-Need of skilled work force from universities	-Workforce development link with economic development	-Sufficient educational level
	-Employment of scientists	-Capacities of labour market institutions	

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Table 4 Framework of telecommunication

Factor	Specific of the telecom	Policy tools	Intervention impact
Degree of novelty	N/A		
Networks among the actors	-Links with other firms	=R&D subsidies -R&D tax incentives - universities support -Legislative support -Networking support	Decrease the lack of knowledge -Interaction between the private and public sectors -Diffusion of knowledge -Increase and acceleration of the implementation of R&D results -Enforcing the basic research, -Researchers' education -Support the product commercialisation
	-Links with standard settings institutions		
	-Links with users		
	-University financing (labour)		
Source of knowledge	-R&D majority in large companies		
	- R&D minority in SMEs and public research		
Institutional setting	-Institutional setting and standards	-Standard settings	-Price regulations
	-Regulations		-Network infrastructure sup.
Educational level	-Universities source of labour	-Workforce development link with economic	-Sufficient educational level
		-Capacities of labour market institutions	
		-Expansion of educational capacity	

Table 5 Framework of software

Factor	Specific of the software	Policy tools	Intervention impact
Degree of novelty	-Large firms-incremental innovation	-Labour – support of universities	-Enhance of radical innovation in SMEs and large companies
	-Large and SMEs radical innovations (incremental dominant)	-Capital - loans	-enhance the SMEs to introduce new product more often
	-Large firms introducing new product more often	-Governments – IP, encouragement of collaboration	
Networks among the actors	-SMEs more links with users (seeking for niche market)	Research centres and universities support -Innovation brokers -Legislative support -Networking support -Technological centres support -Public research support -Internal R&D support (subsidies)	Decrease the lack of knowledge -Interaction between the private and public sectors, among the firms and users -Diffusion of knowledge among actors -Enforcing the basic research
	-links with universities		
	-Inter firms links		
Source of knowledge	-Internal R&D main resource of knowledge		
	-university is source of ideas for large companies (not that much for SMEs)		
Institutional setting	-Patent policies	-Standard settings	-Coordination of large systems implementation
	-Standards Institutions		
	-Coordination of software on global level		
Educational level	N/A		

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Table 6 Framework of engineering

Factor	Specific of the engineering	Policy tools	Intervention impact
Degree of novelty	-In majority incremental innovation	-R&D subsidies	-enhance the innovation expenditures
	- Low innovation expenditures	-Subsidised loans	-enhance the volume and degree of innovations
		-R&D tax incentives	
		-Labour ó support of universities	
		-Capital - loans	
		-Governments ó IP, encouragement of collaboration	
Networks among the actors	- Strong links with users	Training subsidies - -Mobilisation of researchers -Legislative support -Networking support -Technological centres support -support of links with users and with other firms -R&D subsidies	Decrease the lack of knowledge -effective Interaction between the users and producers -Diffusion of knowledge among these
	-Inter firms links		
	-Decreasing importance of links with universities		
Source of knowledge	-Companies do the research on their own		
	-users needs= source of knowledge		
	-not a strong need of university knowledge		
Institutional setting	-Standard setting institutions (safety)	-standard settings	-coordination of safety requirements
Educational level	-Highly dependent on practically skilled personnel (not dependent on universities)	-Training subsidies	- sufficient volume of practically skilled personnel

Table 7 Framework of chemicals

Factor	Specific of the chemicals	Policy tools	Intervention impact
Degree of novelty	-Large firms incremental innovation	R&D subsidies -Subsidised loans -Grants for new companies -R&D tax incentives -Labour ó support of universities -Capital - loans -Governments ó IP, encouragement of collaboration	-enhancing radical innovation in special production
	-Basic chemicals ó low innovative expenditures, process innovation		-enhance the innovative expenditures
	-Special production-higher innovative expenditures, product innovation)		
Networks among the actors	-Links with universities	Research centres and universities support -Innovation brokers -Mobilisation of researchers -Legislative support -Networking support -Technological centres support -Public research support	Reducing costs for companies -Decrease the lack of knowledge -Interaction between the private and public sectors -Diffusion of knowledge among these -Enforcing the basic research, -Researchersø education infrastructure -Support the product commercialisation
	-Inter firms links		
	-Links with users		
Source of knowledge	-Elementary knowledge: universities and SMEs		
	-Exploited knowledge: large companies		
	-Public research inventive knowledge		
	-Private R&D only commercial potential		
Institutional setting	-Environmental regulations	-command -taxes -tradable quotas -subsidies	-environment regulation (elimination of negative impacts)
	-Demand determined by šgreen thinkingõ		-enhancement of šgreen Technologiesõ
Educational level	-Universities source of labour	Workforce development link with economic development -Capacities of labour market institutions -Expansion of educational capacity	-Sufficient educational level

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4. Case study and analysis

In this chapter, the design of case study and interviews is described. In the first part of the chapter, cross case study design is described, in the second part, the interview protocol is presented and in the last part the case study protocol is elaborated. The aim is to answer the question what is the design of cross case studies and interviews?

4.1. Cross case study design

To choose an appropriate research design, following literature on the research strategy has been reviewed: De Vaus (2001), Verschuren & Doorewaard (2003) and Yin (1994).

Research design selection

The research aims to explore, in depth the innovation system in two sectors of manufacturing industry in the Czech Republic. Before choosing the research strategy it was necessary to make three consecutive decisions. The step concerned the decision to opt for the depth view of the research objective, because the emphasis is put on an intensive and profound research which examines all aspects of a phenomenon. The second decision opts for the qualitative approach to the research objective, because the emphasis is put on the comparing and interpreting the results. In the third step, because the data are gathered in the field (the interviews) and then analysed, it was necessary to determine that the research objective requires the empirical type of the research (Verschuren & Doorewaard, 2005).

For the purposes of this thesis, the case study has been chosen as the research approach, because its characteristics meet the requirements of the research objective. This type of the research gives the researcher an insight into the object restricted in time and space. Case (in this research company) is a unit of analysis about which the understanding is built up and which is informing about the context in which the case exists (de Vaus, 2001). Case study is used, when the investigator does not have possibility to control the events and when the studies phenomenon is contemporary in a real life context (Yin, 1994).

Multiple case study has been chosen, because it provides more insight in the context, is more powerful and convincing than single case study (de Vaus, 2001). The research concerns two sectors of the industry, which means small number of research units is analysed. The research is performed with the small number of research units; it is not therefore possible to make a quantitative analysis but qualitative analysis. The research is not limited by closed questions questionnaires. More labour intensive face to face interviews is used; the research is therefore focused on the depth *(*Verschuren & Doorewaard, 2005).

As the variant of the research strategy the cross case study has been chosen, to make a comparison between the multiple cases. This variant gives an opportunity to study not an individual case. As the sub variant, the hierarchic method has been chosen, because the cases are examined separately independently on each other in the first phase. In the second phase, the results from the first phase has been used to make a cross case analysis of all studied cases (Verschuren & Doorewaard, 2005).

Customising a case study design approach

The design begins with the literature review stage (de Vaus, 2001). The aim of the case study is to see whether the mechanisms found in the literature works in the observed context and to which extent do the literature findings differ from the observed context. The theoretical framework has been developed and concerns the factors describing the innovation system, the public intervention tools being used to support the innovative context and how do the systems of innovation differ across the sectors. Further case selection and data collection protocol has been done. Next the individual case reports and then the cross case conclusion have been done.

The cross case study design

In this section, the comparative case study research design has been described. The research questions defined in the research proposal is: *What are the factors to analyse the innovation system, what are the characteristics of the innovation systems in particular sectors, how can the public policies intervene in the sectoral systems of innovation, what are the characteristics of the Czech innovation system and how does it influence the access to the innovation subsidies, and what are the recommendations for innovations system and for the innovation subsidy programme?*

The question is the starting point of the research. Literature review led to the creation of the theoretical framework.

Case selection

According to De Vaus (2001) there is no exact way of finding typical cases for a case study. In order to make the selection the most appropriate possible the strategic sampling has been done. Strategic sampling is based on choosing cases having particular characteristics (de Vaus, 2001).

For the purposes of the research objective two sectors, chemicals and engineering have been chosen. These two sectors have long tradition as well as the traditional innovation potential (National Innovation Strategy, 2004) that is why they have been chosen for the investigation.

The number of replications depends on desired certainty. õSingle replication tells us something but repeated replication give us more confidence in findingsõ(de Vaus, 2001, p. 238). The aim of the study is to compare two sectors of the industry, means two systems of innovation. In the case when two contexts are different, two or three replications are required (Yin, 1994). To have a higher degree of certainty, four cases in two sectors of industry is appropriate for the research.

It is therefore necessary to select 4 companies operating in each of two observed sectors. The selected companies must meet certain criteria of the representative sample. First criterion is that the company must operate in one of the selected sector. Second criterion is that the companies must be an SME and cannot be member of a large group (for example subsidiary). A third criterion is that the company must have an explicit innovation component. The forth criterion is that the innovation has been realised

maximally 3 years ago. The last criterion is that the companies were not awarded by the innovation subsidy.

Concerning the last criterion, the discussion has been done with the supervisor of the research. Two possibilities were discussed. First option was to interview two companies awarded and two companies not awarded by the innovation subsidies. Second option was to interview only the companies that were not awarded by the innovation subsidies. At the end it was agreed that the option to interview only not awarded companies would be chosen. The reasoning was to avoid just comparison what did the successful companies do in different way than those unsuccessful. Interviewing only the companies that were not awarded by the subsidies enables deeper analysis of the barriers in the innovation management with regard to the observed factors.

Data collection

To obtain in depth qualitative data, several data sources have been used *(*Verschuren & Doorewaard, 2005). For the purpose of this study, the institutional documentations, institutional publications and interviews are used as the information resource. For this research the choice of institutional documentations has been made:

- Documents of Ministry of Industry and Trade (MIT) and Ministry of Education (ME)

- Innovation system documents describing and assessing the efforts and plans of MIT and ME to create the innovative environment for the industry: National Innovation Strategy of the Czech Republic, National Innovation Policies of the Czech Republic for 2005-2010, Strategy for Economic Growth and The White Book of Tertiary Education,

- Text of the innovation subsidy application available on the Ministry of Industry and Trade web pages.

- Interviews with representatives of the companies.

Cross case analysis

To make a cross case conclusion, the within group similarities has been confronted with differences between the groups (de Vaus, 2001). The conclusion has defined, to which extent the two sectoral systems of innovation differ from those found in the literature and which recommendation would be drawn from the individual cases.

Conclusion

In this section, the adequate research design has been described. Based on the research design literature, the cross case study has been chosen as the most appropriate for the purposes of this work, because it allows to make a deep analysis of multiple cases. After deciding on the research design, the case selection has been described. Further the data collection protocol has been defined. After having collecting the data, the cross case analysis has been done. At the end the cross case conclusion has been drawn, which has been summarised in the final report.

4.2. Interview design

The aim of the case study is to answer sub questions 6 - 11. (6) What are the characteristics of the observed sectors compared to the literature findings? (7)What are the criteria for receiving subsidies from the programme Innovation belonging to the Operational Programme Enterprise and Innovation of the Czech Republic? (8)What are the barriers to the subsidy drawing arising from the innovation programme in particular companies? (9)What are the barriers to the subsidy drawing arising from the characteristics of the innovation systems in observed sectors? (10) What are the recommendations made by the representatives of the companies that might contribute to the innovation system improvement? (11) What are the recommendations for the innovation procedure made by the companies representatives and made based on the conclusion from the sectors characteristics?

To answer these research questions, a set of interview questions has been elaborated.

Qualitative interview design

For the purposes of the research, the open interviews with the representatives of the companies independently on each other have been used as the data source. As the representative of the company is considered an employee involved the innovation management in the company, for example the innovation manager.

For the open interviews preparation and data analysis, the factors defined in the theoretical framework have been used. When analysing and comparing the results, the similarities and differences between the practice and the literature findings have emerged. These differences among the sectors and theoretical framework have enabled to define the obstacles of innovation management in terms of subsidy drawing, which have resulted in the recommendations for the future *(*Verschuren & Doorewaard, 2005).

The first group of questions concerns the degree of novelty of the innovations in the particular sector and company. The aim is to obtain the information concerning the degree of novelty of innovations implemented in last 3 years. Else, the companies would specify what are the concrete tools impacting this factor and how do they impact the innovations in their case. It would enable to describe to which extent does the sectoral system of innovation differ from the one found from the literature. At the end they have been asked to make recommendation for changing the public policy tools so that they would positively impact their innovative activities. The questions have been drawn up in Table 8.

Table 8 Degree of innovations question

1. Innovations in the company	
Is the company implementing either process or product innovation?	yes/no
What is the degree of novelty of products/process implemented in the company during last three years:	
Incremental innovation	Yes/no
Radical innovation	
new for the company	Yes/no
new for the market	yes/no
new for the sector	yes/no
new in the country	yes/no
What is the impact of contemporary public intervention (on the innovativeness in your company) concerning the degree of novelty?	specify
What would be in your opinion effective tool to support the innovativeness in the company with regards to degree of novelty?	specify

The second group of questions concerns the sources of knowledge. The companies would specify whether they use their own research or whether they get the knowledge from external sources. In case of external source, the representatives have been asked to specify which external source is being used (they have been given the list of possibilities found in the literature review). It would enable to analyse, whether the Czech reality differs from literature findings. Further they have been asked, what are the current public policy tools impacting the sources of knowledge and how are the tools impacting the company. At the end they have been asked to make recommendation for changing the public policy tools so that they would get easier access to the knowledge. The questions have been drawn up in Table 9.

Table 9 Knowledge source questions

2. Knowledge source	
For the innovative and R&D activities, do you use during last three years:	
internal R&D	yes/no
internal as well as the external R&D	yes/no
external R&D	yes/no
If using the external sources, which one of following (if yes - specify):	
info from the suppliers, info from the customers, info from the competition, universities, other educational	yes/no
institutions, public R&D, private R&D, patent purchase, scientific literature, scientific articles, info from partner companies, from the cluster, from chambers/incubators/organisations/institutions, visit of trade fair, others	specify
Is the adequate knowledge necessary for the innovation implementation accessible?	specify
What is the impact of contemporary public intervention (on the innovativeness in your company) concerning the knowledge source?	Specify
What would be in your opinion effective tool increasing the innovativeness in the company to concerning the knowledge source?	Specify

The third group of questions concerns the links among the actors of the sector. The companies would specify the links to the other actors in the sector. The companies have been given the list of possibilities found in the literature or they have specified other sources. It would enable to analyse, whether the theoretical findings works in practise or whether the theory differs from the real use. Further they have been asked, what are the current public tools impacting these links. At the end they have been asked to make recommendation for changing the public policy tools to facilitate and enhance

the links creation among particular actors of the sector. The questions are to be found in Table 10.

Table 10 Network among the actors questions

3. Network among the actors	
In the frame of the R&D, do you collaborate with following actors during last three years (if yes ó specify):	
public R&D, private R&D, universities, other educational institutions, partner companies , What is the impact of contemporary public intervention (on the innovativeness in your company) concerning the network among the actors?	yes/no
What would be in your opinion effective tool increasing the innovativeness in the company to concerning the networks among the actors?	Specify

The fourth group of questions concerns the educational level in the companies. The representatives have been asked to give the opinion and specify whether the universities are providing the sector with workforce possessing the relevant knowledge for the innovativeness, whether it is difficult to get the skilled work force and whether the companies would need a stronger link with universities to get the access to the qualified labour force. Further they have been asked, what are the current public tools impacting the level of skilled workforce having university degree and how does it impact the company. At the end they have been asked to make recommendation for changing the public policy tools to provide the labour market with needed workforce possessing the relevant innovative knowledge. The questions are summarised up in Table 11.

Table 11 Educational level questions

4. Educational level	
Do you get the skilled workforce from the collaborations with the universities?	Yes/no
Is it difficult to find skilled workforce?	Yes/no
What is your opinion about the educational system:	
Do the universities provide relevant education?	yes/no
Do you need stronger relations with universities in order to get qualified stuff?	yes/no
What is the impact of contemporary public intervention (on the innovativeness in your company) regarding the educational level?	specify
Which public intervention would in your opinion increase the innovativeness in the company with regards the innovative context?	specify

The fifth group of questions concerns the institutional settings that are impacting the innovations in the companies. The aim of the questions is to learn which regulatory policies are being currently used in the sector. Further question would answer how do the current tools impact the innovations in the company. In the last question, the companies have been asked to give an idea, how the public regulations should be changed in order to enhance the innovativeness in the company. The questions are to be found in Table 12.

Table 12 Institutional settings questions

5. Institutional settings	
What are the institutional settings impacting the innovations in the company (standards settings, environmental regulations etc?	specify
What are the impacts of these interventions?	specify
How could be in your opinion the interventions redesigned to facilitate or enhance the innovations in your company?	specify

The last group of questions concerns the barriers to the innovation subsidy programme. The representatives have been asked to give the opinion and specify which of the defined factors the barrier to the innovation subsidy was. In the last question, the companies have been asked about the opinion, how could be the procedure adapted to the current situation of the innovation system. The questions are to be found in Table 13.

Table 13 Innovation subsidy programme questions

6. Innovative subsidy programme	
What was the main barrier to the innovative support with regard to:	
degree of novelty	specify
knowledge source	specify
networks within the sector	specify
educational level	specify
institutional interventions	Specify
Other	specify
How could be in your opinion the innovative support procedure redesigned to facilitate or enhance the access to the financial support?	
degree of novelty	specify
knowledge source	specify
networks within the sector	specify
educational level	specify
institutional interventions	specify
Other	specify

Conclusion

In this section the interview design has been proposed. For the purpose of this work, the qualitative design with open ended questions has been created. The findings from the literature research have been taken into account during the interview design creation.

4.3. Case study protocol

The previous sections have described the steps to be taken and the interview design. This section describes the steps and the interview design implementation.

The empirical research is executed by studying the documents concerning the innovative context and by the interviews with the companiesø representatives involved in the innovation management. The documents are gathered with the help of Czech Invest and with the help of Ministry of Industry and Trade. For making the appointments, the interviewed companies are selected based on 5 criteria mentioned in the previous section.

Further, the implementation of the interview design has been carried out. The interview consists of 6 groups of questions and it is the same for all the interviewed companies, because they have the same characteristics.

Making appointments

For making appointments the snow ball effect has been used. First, one company has been contacted. After explaining the purpose of the research, they have been asked to provide a reference on the same type of company working in the same sector. Based on the references, other companies have been contacted. The first contacts have been done via the phone. The companies had a helpful approach, because it concerned the consultation regarding the diploma thesis.

After establishing the first contacts, the details have been arranged via the email communication. The companies were provided introduction to the context the research and interview questions framework in order to think out the answers. On the contrary the companies have mentioned the confidentiality of some information, related to the innovation subsidy procedure.

The interviews themselves took in average one hour. Except one interview, the representatives were competent to provide the required information. The problem of the unsuccessful interview was that the interviewed person was technician who was not well informed of the innovation as a whole.

Internal and external validity

To reach a reliable result, the design should be internally and externally valid. According to de Vaus (2001), the case studies are lacking in both areas. To reach the internal validity it is essential to have comparable cases. It relies on focusing on several factors and resulting outcome and avoid influence of other factors that are biasing the outcome. The threat is that non observed factors are producing bias. Concerning the external validity, case study does not provide general basis for larger population (de Vaus, 2001).

Conclusion

This sections has emphasises the implementation of the study design and interview design, and how the internal and external validity has been taken into account.

4.4. Research results

This chapter will present the results from the empirical research. In section 4.1 two chosen sectors and eight selected companies have been introduced. In section 4.2 propositions made from the literature findings have been summarised. The aim of the chapter is to answer four sub questions questions. (1) What are the characteristics of the observed sectors compared to the literature findings? The answer is to be found in section 4.3. (2) What are the criteria for receiving subsidies from the programme Innovation belonging to the Operational Programme Enterprise and Innovation of the Czech Republic? (3) What are the barriers to the subsidy drawing arising from the innovation programme in particular companies? (4)What are the barriers arising from

the characteristics of the innovation systems in observed sectors? The answer is to be found in section 4.4.

Cases overview

This section gives an overview of 8 cases that are subject of the research. First the sectors are shortly introduced and next 8 innovative companies are presented.

Observed sectors

Out of 5 major sectors, two have been chosen for the investigation. First the engineering secondly the chemical sectors have been chosen. Both sectors have a long tradition and represent the comparable average number of industrial businesses (engineering 1174 and chemicals 919) with comparable share on the sales (engineering 8.9% and chemicals 10.9 %).[3] Further, both of the sectors can be characterised by few large companies, and innovative SMEs (which had been summarised in Table 4).

The target companies belong into these two sectors. The companies A, B, C and D belong to the engineering and companies E, F, G and H belong to the chemical sector.

The eight interviewed companies

The characteristics of the companies regarding the sector, activity and innovative element have been drawn out in the Table 14.

Table 14 Companies characteristics

Sector	Company	Activity	Innovative element
Engineering	A	Automotive elements production	New production line
Engineering	B	Chimney equipment production and earthmoving machine parts	New engineering for material processing
Engineering	C	Car elements production	Completely new production hall with equipment
Engineering	D	Garden tools production	New production line
Chemicals	E	Production of aerosol products	New production line
Chemicals	F	Cleaners production	New production processes ó new quality standards
Chemicals	G	Car detergents production	New processes to meet the institutional requirements
Chemicals	H	Detergents production	New processes to meet the institutional requirements

4.5. Propositions made based on the literature findings

From the literature framework, several propositions have been done. These will serve as a base for comparison between observed companies and the literature findings.

Degree of novelty:

- Engineering can be characterised by incremental innovations.

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[3] Basic indicators of businesses by CZ-NACE Subsection: official websites of Czech Statistical office [online]. 2008 [cit. 2010-04-04] available on: <http://www.czso.cz/csu/2008edicnplan.nsf/t/68004449F3/$File/8001081201b.pdf>.

- Chemical sector can be characterised by incremental innovations, which are more focused on the product innovations.

- Major tools of public intervention enhancing the volume of innovations and their degree of novelty are: the support of universities, support of loans, patent protections and network encouragement

Institutional settings:

- Engineering sector is regulated by the standards setting institutions which results in safety regulations coordination.

- Chemical sector is regulated by the environmental setting institutions, which results in the environmental protection and implementation of green technologies.

Knowledge:

- Companies operating in engineering do the research on their own with a big contribution of the customers and do not use much knowledge from the universities.

- Companies operating in the chemical sector are using more external knowledge, especially from the universities and public research institutions; this knowledge is further developed within the companies

- Major tools of public intervention targeted to facilitate the access to the knowledge are the R&D subsidies and tax incentives; universities, legislative and networking support which results in decrease of the lack of knowledge

Networks in the sector:

- Companies operating in the engineering have strong links with the customers and other companies, while the links with the universities are limited.

- Companies operating in the chemical sector have links with the universities, customers and other companies

- Main public tools supporting the networking are legislative support mobilisation of researchers between the private and public sector technological support, which results in the cost reduction for companies, decrease in the lack of knowledge, interaction between public and private sector and diffusion of knowledge among the actors.

Educational level:

- Companies operating in the engineering need for their innovativeness labour force with the university degree but more than the degree the practical skills are crucial

- Companies operating in the chemicals use the universities are the main source of labour.

- Major tools of public intervention into the educational level: new forms of the education including the PhD studies and their integration into the private sector; education in the innovation process (R&D laboratories, technology parks, incubators, small R&D companies); creation of the whole life education system and enhancing the whole life learning; increase the labour force for innovations (enhance the life sciences and engineering studies) lead to sufficient educational level.

4.6. Cross case analysis

In this section, the overall findings regarding the eight innovative companies are analysed. The analysis is divided into the sections per factor. In each section the findings from the literature are compared with the answers obtained from the companies. The detail of the answer is to be found in the Annex 1. For each factor, first the proposition is defined based on the literature findings. After presenting the data obtained in the interview, the variance between the proposition and situation in observed companies has been drawn. The explanations of these variances have been found by reading the documents found in the archive of Ministry of Industry and Trade.

Degree of innovation

Interviewed companies were asked on the innovative element in the company in last three years and its degree. The answers have been summarised in the Table 15.

Table 15 Degree and type of innovation answers

Has the company implemented either process or product innovation in last 3 years? What was its degree of novelty?						
		Radical process	Radical product	Incremental process	Incremental product
Engineering	A	+		+	+
	B	+	+		
	C	+	+	+	+
	D	+		+	+
Chemicals	E	+		+	+
	F	+		+	+
	G			+	+
	H			+	+

All companies have implemented product as well as the process innovations in last three years. In 6 companies the implementation resulted in radical process innovation (completely new way of production, mostly new production line) and only in 2 companies in radical product innovation. In 7 companies the incremental process as well as the product innovation has been implemented. By the incremental innovation was meant the adjustment of the product or process. Only company G and H have been implementing only incremental innovations.

The proposition for the engineering is that the sector can be characterised by incremental innovations. All four companies have realised in last three years a radical innovation in the form of purchase or establishment new production lines or machines. In two companies (B and C) it resulted in radical product change, but not new on the

market. In two other companies (A and D) the innovation led to the more efficient production without launching new product. In three of observed companies (A, C and D) the innovation was a reaction on the customersø demands and on the safety standards requirements.

The proposition for the chemical sector is that the sector can be characterised by incremental innovations, which are focused on product innovation. Two observed companies (E and F) have managed a radical change in the process (new production line and new way of processing things) which resulted in the cost decrease, but not in completely new product. All companies have to manage several incremental innovations in order to meet the quality requirements from the customers and the safety institutional settings.

Compared to the proposition, the observed companies have managed more radical innovations. Companies in engineering have easily implemented radical innovation, but the main barrier to manage was the financial resource. While the companies in the chemical sector have to manage high volume of regulatory interventions and it is not feasible for them to implement radical innovation. The observed companies in engineering are characterised by a mixture of the radical and incremental innovations and the companies operating in the chemicals are characterised by the majority of incremental innovations focused on the changes in the product quality.

Radical innovations in engineering might be explained by closer relation with the customers, who are considered as a major driving force of radical innovation. The volume of innovations in observed companies in recent years can be explained by the lack of innovations in the past, by long tradition as well as the traditional innovation potential in observed sectors (National Innovation Strategy, 2004). After 2003 the government joined the Lisbon agreements, the innovation became a priority and the innovation concepts and policies started to be prepared (National Innovation Policy, 2005). There is an increasing number of SMEs, which are interested in innovations and in implementation of new technologies resulting in enlargement of the production (National Innovation Strategy, 2004). The Czech companies had to switch from the comparative advantage based on the cheaper costs (cheaper labour force) to the comparative advantage based on the innovativeness and higher added value (National Innovation Policy, 2005).

In the second part of the question the companies were asked about the tools of public intervention that were enhancing the innovativeness in the company. The results have been summarised in Table 16.

Table 16 Degree of novelty public intervention answers

	company	compatibility with others suppliers	safety requirements(norms)	customers
Which tools of public intervention are impacting the degree of innovation in your company?				
Engineering	A	+		+
	B		+	+
	C		+	+
	D		+	
Chemicals	E		+	+
	F		+	+
	G		+	+
	H		+	

In 7 companies, the only perceived public tools were the directions set by the regulatory and safety institutions. 7 interviewees added that the only actor that was enhancing the innovations were the customers and their demand. In one company the reason for the innovation was the compatibility with the other suppliers.

The proposition is that the major tools enhancing the volume of innovations and their degree of novelty are: the support of universities, support of loans, patent protections and network encouragement. None of the company perceived any mechanism, which would stimulate them to implement radical innovations. There is only innovation subsidy programme but this is targeted only for the innovations that launch new product. The loans are not favourable for the risky project (innovations are considered as risky projects) and are not targeted for projects that do not bring the profit (innovations resulting from institutional settings are not always profitable). In all companies the innovation process was driven by their own needs, by the customers or by the lack of supplier. There are no tools supporting the radical innovations in the companies, or at least of those that would work in practise. On the contrary, the companies perceive public intervention in the incremental innovation. In the observed companies, the regulatory and safety institutional settings are tools stimulating incremental innovation but not enhancing radical innovation.

The explanation has been found in the literature. Basic legal frame and establishing of new regulatory measures and their insufficient interconnection leads to increase of transactional cost related to the institutional setting (Strategy of Economic Growth, 2006). Volume of the risk capital is insufficient which is caused by the low interest from the state in innovations, as well as by the lack of interesting and perspective innovative projects (National Innovation Strategy, 2004). Long term lack of attention focused on the innovations, which changed after 2003 when the government joined the Lisbon agreements, the innovation became a priority and the innovation concepts and policies started to be prepared (National Innovation Policy, 2005).

Institutional settings

In this set of questions, the interviewees were asked about the institutional settings that are intervening into the innovations in their company, and what are the results of these interventions. The answers have been summarised up in Tables 17 and 18.

Table 17 Institutional settings

Sector	Company	Instit. 1	Instit. 2	Instit. 3	Instit. 4	Instit. 5
		What are the institutional regulations impacting the innovations in the company (standards settings, environmental regulations etc?				
Engineering	A	Ministry of Environment (noise reduction, emissions, water cleaners)	ISO			
	B	Technical inspections of the CR	Ministry of Environment			
	C	Czech office for standards, metrology and Testing				
	D	Association of Engineering Technology	Ministry of environment	Work safety		
Chemicals	E	Institute for State Control of Veterinary Biological and Medicines	The National Institute of Public Health	State institute for the Drug Control		
	F	European chemicals agency	The National Institute of Public Health	State institute for the Drug Control	HACCP agency CR	ISO agency
	G	State Labour Inspection Office	Regional Labour Inspectorate	Ministry of Env. (REACH)		
	H	National health institution	State institute for the Drug Control	Ministry of Env. (REACH)		

Table 18 Impacts of institutional settings

Sector	Company	Incremental innovations	Cost increase	Production hindering	Barriers to radical innovation	Seeking for alternative	Lack of profit with regard to the cost	EU criteria versus CR
		What are the impacts of the institutional settings?						
Engineering	A	+	+					
	B	+	+	+				
	C	+	+					
	D	+						
Chemicals	E	+	+		+			+
	F	+	+			+		
	G	+	+		+		+	
	H	+	+				+	

The companies operating in the engineering have been all impacted by the standard settings institutions, by the Ministry of Environment that is regulating the impacts of the companiesø activities on the environment and by the institution that is charged in the safety standards of the products. The companies operating in the chemicals are impacted by the institutions charged in the health and veterinary safety, drug control, by the Ministry of Environment that is controlling the impact of the companiesø activity on the environment and that it influencing the materials that are used for the production. Company E follows the setting defined by the HAACP and ISO, which had been accepted in the frame of the quality improvement.

The proposition is that the engineering is regulated by the standards setting institutions which results in safety regulations coordination. Second proposition is that chemical sector is regulated by the environmental setting institutions, which results in the environmental protection and implementation of green technologies. In all companies the institutional setting is resulting in incremental innovations implementation, which except the company D lead in huge cost increase. In company B, some the institutional settings lead to the production hindering; in companies E and G,

the institutional settings hinder the radical innovations; in companies G and H the institutional settings lead to the investments that do not bring the profit. In company F the regulations make them to seek for the alternatives in the material use, and in company E they are dealing with double regulations, which is too complicated. The companies were complaining about the volume of regulations set by the institution they have to manage. The problem is the double regulations, those set by the Czech institutions, and those set on the EU level. In company E the regulations are in some cases even contradictory, and sometimes a trace of lobby in the regulation settings was perceived. The companies have concluded, that on one hand, these regulations are improving the quality and safety of the products, but on the other hand there is a big volume of regulations (especially those environmentally focused) that are hindering the innovations in the company, because the companies are pushed to spend big amount of money on meeting the criteria that are obligatory to meet. After the EU integration, the environmental protection got to the centre and the companies in the chemicals had to manage a lot of innovations in order to meet stricter criteria at the EU level. Compared to the propositions, observed companies in engineering were except the standard regulations impacted also by the environmental regulations, and the companies in chemical sector were except the environmental setting impacted by the veterinary and health protection, and by the drug control.

In the document National Innovation Policy (2005), the explanation of high volume of institutional settings can be found: innovation policy is meeting the contradictory ideas of particular actors of public administration, concept documentations are lacking the details which results in problem with their realisation; lack of communication among the actors of the public administration as well as among the ministries; absence of institution responsible for innovative environment, there is not an actor which would coordinate the innovation policies and system. Further document, Strategy of Economic Growth (2006) has assessed that the frequent adjustment of basic legal frame and establishing of new regulatory measures and their insufficient interconnection increase the transactional cost related to the institutional setting increase the costs of the companies.

Knowledge source

Companies were asked about the source of knowledge that they use for the innovation implementation. In case of any external knowledge, they were asked to specify which external source they use. The answers are summarised in the Table 19.

Table 19 Knowledge source

Sector	Company	customers	universities	supplier	institutions	competition	trade show	publications	associations
		If using the external sources, which one of following:							
Engineering	A	+	+						
	B			+	+				
	C	+		+	+				
	D	+		+	+				+
Chemicals	E	+		+	+	+	+		
	F	+	+	+	+	+			+
	G	+		+	+	+			+
	H		+	+	+		+	+	

All companies use a mixture of internal and external knowledge. The external knowledge was including the institutional requirements, which had to be included into the innovation. Except the company A, the institutional settings were the major source of knowledge, together with the suppliers of the materials and equipments. The third major source of knowledge (except companies B and H) were the customers that were determining the requirements on the new products. In case of company A the customers were even sharing the costs related to the knowledge development. Only three companies (A, F and H) stated the university as a source of knowledge. Companies E, F and G stated the competition as a source of knowledge; they have observed the quality of competitionøs products and adjusted their production to reach the same quality. Three companies (D, F and G) stated an association operating in the sector as a source of knowledge. Companies E and H were using the knowledge gained at the trade shows, and company H is using knowledge from published results.

The proposition is that companies operating in engineering do the research on their own with a big contribution of the customers and do not use much knowledge from the universities. For three companies, the major sources are the customers, suppliers (which were supplying the production line) and the institutions (which are obligatory). Only company A is using the knowledge from university, they have requested an elaboration a concrete project. Compared to the proposition, in observed companies, except the own R&D there is a big influence of the institutional settings; the companies do not use the knowledge from universities.

The explanation of the situation in observed companies have been found in the documents of MIT. The main partner and source of innovation are the customers which represent 46% of information for innovations, while universities and public research represents only 10%. The weakness of the Czech Republic is that the universities are not integrated in the innovation system (National Innovation Strategy, 2004). As stated in previous section, the volume of legal frame adjustments is increasing and establishment of new regulations is frequent (Strategy for Economic Growth, 2006).

For the chemical sector, the proposition is that the companies are using more external knowledge, especially from the universities and public research institutions; this knowledge is further developed within the companies. Four companies stated supplier as a source of knowledge and all four companies are largely impacted and must manage the knowledge prescribed by the environmental and health protection requirement. Except the company H, the customer is a source of knowledge (driving force). The companies are observing the tendencies of competition. Companies F and H, where the production was not too specific, were using the university as a source of knowledge. In companies E and G the production was too specific and the R&D results from the universities were irrelevant for their production, but they need the results of public research, even if they would have to pay for that. Companies were also using publicly available knowledge gained at the tradeshows, in publications and from the association operating on the market. The characteristics of observed companies is broader compared to proposition: the companies are using the knowledge from the university, but not for all companies the relevant knowledge is available; they are also using the knowledge from suppliers, customers at the same time the knowledge is widely influenced by the institutional setting.

The explanation for the lack of adequate knowledge has been found in several documents. According to Mateju et al., (2009) in the Czech Republic, there is a low contribution of private financial resource on the public research, which does not allow the private sector to intervene into the research design. The authors add that the low demand on the result of public research from companiesø side is firstly caused by the lack of financial resources, but also by the orientation of the companies on the production with lower added value (Mateju et al., 2009). There is a small demand on the results of public R&D, because the companies are trying to survive and they do not seek for the knowledge to implement (National Innovation Strategy, 2004).

Next, the companies were asked, whether the knowledge from the universities is accessible and relevant for them. The answers are summarised in Table 20.

Table 20 Accessibility of adequate knowledge

Is the adequate knowledge necessary for the innovation implementation accessible?		
	Accessible	Not accessible
A, B, C, D, F, H	+	
E, G		+

Companies operating in engineering have no problem with the accessibility to the adequate knowledge. In chemicals, for companies F and H the appropriate knowledge is accessible, while for companies E and G the knowledge is not accessible. Companies E and G said that the universities do not react on their demand of the research (even in the case of the cost sharing), company E has too specific production, and none of the universities has the same specialisation.

In case of companies in engineering, the explanation can be the source of knowledge. As the main sources are the suppliers, customer and institutions; the companies do not have to manage the lack of knowledge necessary for the innovation implementation. The knowledge is accessible, but its purchase is a question of finance. In case of the companies in chemical sector they have to manage the lack of knowledge, because they are more relying on the knowledge generated by the public research. Explanation for the lack of adequate knowledge can be found in the documents published by the Ministry of Industry and Trade.

Mateju et al. (2009) explains the lack of relevancy of public R&D results by the allocation of financial means that are distributed to the small number of universities, without regard on the result and its degree of quality. In order to meet the criteria of õresearch universityõ, the universities produce the results with poorer quality (Mateju et al., 2009). In the National Innovation Strategy (2004) several reason causing the irrelevance knowledge generated by the public R&D have been found: financial support is focused on the basic research which is being granted by the lump sums, and does not motivate to the transfer of technologies; commerce orientation of research employees whose activities are separated from commercial; academic workers in leading position do not posses commercial and communication skills which would enable them to trade the results of the research and seek for the partners in the private sector. Further explanation has been found in the National Innovation Policy (2005): the model that is being used is separating the R&D results from the practice, which results in low number of results used in the practice; lack of agency, which would transfer the knowledge into

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the practice; R&D results and its financing are not innovative oriented. According to Strategy of Economic Growth (2006) the problem the users of the R&D do not participate on the conception creation of the R&D

Interviewees were asked about the current tools of public intervention that facilitate access to innovative knowledge and about their impact on innovativeness. The answers are given in Table 21.

Table 21 Public intervention external knowledge

What are the tools public intervention facilitating the access to the adequate knowledge?		
Engineering	A	university support - sufficient knowledge
	B, C	no impact - purchase from supplier of technology
	D	the R&D subsidy is decreasing the costs, which supports the innovations
Chemicals	E	lump sums for universities - no need to react
	F	state financing of universities - no need to commercialise
	G	support of intermediary - source of knowledge
	H	universities produce knowledge which is shared, does not give the competitive advantage, no profit

The companies B and C do not perceive impact on their management, because they are using the knowledge from the supplier. Company D has obtained a tax incentive on their own R&D and company A that is using the knowledge from the university perceive the support as sufficient, as the university supported from the state budget has elaborated a project for them. Companies operating in chemicals E and F stated that the universities financed by state do not react on the company demand or do not react flexibly because they do not need to become profitable. Company H stated the universities are sharing and publishing the knowledge, which does not give the companies the competitive advantage. Company G has been satisfied by the intermediary agency that is providing the companies with the knowledge.

Companies operating do not need the results of public R&D and their main source is customers and suppliers, who are commercially oriented. They are not therefore impacted by public intervention. Companies in chemicals are more impacted by the public intervention and as a main problem they consider that the universities do not need to generate the results or become profitable. At the moment when the university produced the knowledge, it was published without being commercialised. The companies in chemicals would need stronger public intervention, which would change the result generation at the public R&D institutions.

The proposition is that the major tools targeted to facilitate the access to the knowledge are the R&D subsidies and tax incentives; universities and legislative support which results in decrease of the lack of knowledge. For the companies operating in the chemicals the support of the public R&D does not facilitate the access to the innovative knowledge, because the public research does not need to be profitable. When the results are relevant for the innovation, the knowledge is shared and does not give the companies competitive advantage. In the engineering, one company makes profit of tax incentives on the R&D and one company uses the knowledge generated by the university. The result does not support the proposition. The support of universities fails,

because it is not allocated based on the relevant results; tax incentives on internal R&D and support of intermediary agency work in one observed case.

Networks among the actors

Companies were asked with which actors they collaborate in the frame of the innovative activities. The answers are given in Table 22.

Table 22 Links within the sector

With which of these actors of you collaborate in the frame of your innovation activities?									
Sector	Company	competition	university	customers	suppliers	institutions	associations	chamber	agencies
Engineering	A	+	+	+	+				
	B			+	+	+			
	C		+	+		+			
	D			+	+	+	+		
Chemicals	E		+	+	+	+	+	+	
	F		+	+	+				+
	G			+		+	+		
	H		+	+		+			

All the companies have links with their customers. Except A and F, the companies have links with institutions. The companies A, B, D, E and F have a link with the suppliers, which was in majority based on the supply of production technology. Companies A, C, E, F and H have a link with the university, which was in the frame of the innovative activities. Companies D, E and G have link with an association operating in the sector. Company A has a link with the competition, and based on the answer they are together working on the product development. The other companies have no link with the competition, but they are observing the companies tendencies. Company E has the link with the chamber and company F with the ISO consultancy agency.

The proposition is that the companies in the engineering can be characterised by strong links with the customers and other companies, while the links with the universities are limited. Four companies have the links with the customers who are contributing to the innovations, even sharing the R&D costs. Further the companies have links with the suppliers of the technologies and of the material. Two companies have the link with the institutions, which is considered as obligatory in order to fit into the norms. Only one company has a link with other company, the inter company links lead to the R&D acceleration, but they decrease the competitiveness and can lead to the customers takeover. The same company has a link with the university, which is based on the thesis supervision and provision of the laboratories. The observation result is slightly different from the proposition. In order to meet the standards and safety requirement the companies are also keeping links with the standard setting institutions and associations. This difference can be explained by high volume of institutional settings, which is has been discussed in the results concerning the institutional setting.

As for the chemical sector there is a proposition that the companies have links with the universities, customers and other companies. Four companies have close links with the customers who determine the demand and requirements on the product. Else the companies have links with the institutions (environment, health and veterinary control, safety) which are largely impacting the innovation management. Other most

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common links are with the association that helps them to enforce their interest and deal with the institutional settings. Three observed companies have links with the universities that are focused on the innovativeness (with regard to the labour force there are more links). The universities were not able to carry out the research that was requested by the companies, because it was out of their specialisation. Observed companies have links with the customers, universities, institutions and associations. On the other hand the links with universities are not in all case effective. It can be explained by the characteristics of innovation system in the Czech Republic; the main partner and source of innovation are the customers which represent 46% of information for innovations, while universities and public research represents only 10% (National Innovation Strategy, 2005). The weakness of the Czech Republic is that the universities are not integrated in the innovation system (National Innovation Strategy, 2005). The network in the sector is a weak point of the Czech innovation system, the universities do not contribute to the innovations and they lack the link to the innovative activities (National Innovation Strategy, 2004).

Companies were asked what are the tools of public intervention enhancing the network creation with other actors of the sector, and how does it impact the innovations in the company. The answers have been presented in the Table 23.

Table 23 Public intervention networks

What is the impact of contemporary public intervention on the network creation with other actors in the sector which is related to the innovation activities?	
A, B, D, E	N/A
C	complicated administrative administration for the student mobility
F	support of universities which must collaborate with the firms
G	obligatory collaboration with institutions
H	lack of effort to connect the companies with university

The interviewees in companies A, B, D and E were not able to answer, as they were not aware of the tools of public interventions and they did not perceive them. Company C perceive a barrier between the integration of the students (university and high school) in the sector, which is a result of the complicated administration related to the internships. Company F perceives the impact of universities support, which is being financed from the state budget, which makes them to collaborate with the companies. On the contrary, as the universities are not generating adequate knowledge, the support of the links is not considered as effective. Company G perceives the institutional directives supporting the links between the companies and institutions. Company H perceives the lack of effort to create the link between the companies and the universities.

The proposition is that the main tools supporting the networking are legislative support mobilisation of researchers between the private and public sector technological support, which results in the costs reduction for companies, decrease in the lack of knowledge, interaction between public and private sector and diffusion of knowledge among the actors. There is a difference between the proposition and observed companies. The administration related to the student mobility in the sector is making the link even impossible; universities are financed from the state budget which makes them

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to collaborate with the universities on one hand, but on the other hand as the universities are financed even without the result, it does not make them to make to react on the companiesø needs; as the institutional setting are given by the law, the links with the institutions are obligatory for the companies. The results do not support the proposition. The impacts of public intervention are not considered as effective in observed companies and the links among the actors in the sectors remain a weak point of the innovation system.

According to Mateju et al. (2009) the collaboration of the public and private sector is too complicated thanks cohesion between national policies, public administration and sectors. Author adds that during last years, there was a rise of strategic alliances between the actors in the sector, but they lack the coordination and common target. There is no connector between private and public sphere (agency for technology transfer), which results in communication gap between the public (research) and private sector (users) (National Innovation Strategy, 2004). The public and the private sector meets problem in communication due to the differences in organisation, work style, financing (Strategy for Economic Growth, 2006). There is wrong cooperation on common project which is leading even to the rivalry among the private and public sector. The reason is that there is a lack of horizontal mobility of research workers and the private sector. Contemporary support is focused on the mobility on the international level, but not on the inter-sectoral level (National Innovation Policy, 2005). Further barrier is commerce orientation; academic workers in leading position do not posses commercial and communication skills which would enable them to trade the results of the research and seek for the partners in the private sector (National Innovation Strategy, 2004).

Educational level

Interviewees were asked whether the company get the qualified workforce from the collaboration with a university and whether it is difficult to get the skilled workforce. The answers are presented in Table 24.

Table 24 Links with universities and access to the skilled labour force

Sector		Do you get the skilled workforce from the collaborations with the universities?				Is it difficult to find skilled workforce?	
		Presentation	Thesis	scholarship	Others	Y/N	Specify
Engineering	A	+	+	+		No	Sufficient number of technical faculties
	B	+			High schools	Yes	Contemporary not, but 2 years ago there was a serious problem to find people
	C		+			Yes	Lack of absolvent of technical faculties, they do not want to come to the region, better nowadays
	D		+		Laboratories	Yes	It is difficult to find a skilled workforce with experience
Chemicals	E	+	+			No	It is not difficult to find people with related degree, they must get the experience in the company
	F		+			Yes	Bad infrastructure at the high level education
	G		+			No	-
	H					No	Students have lack of practice

Seven companies had some links with universities in order to get the skilled work force. These are based on the thesis supervision (A, C, D, E, F, G and H), which might lead into the work contract in the future. Companies A, B and E are making the presentation at the faculties in order to aware the students of the company and attract potential employees. Company A is providing the scholarships to student of the last years at their master, which leads to the contract in the future. Company D is providing laboratories to students, which contributes to their R&D and also creates a potential link with the student. Company B is having a link with high schools, in order to get the skilled workforce.

Four companies A, E, G and H, do not find it difficult to get the skilled work force from the universities. The number of technical faculties is sufficient (A); it is not difficult to find a good employee with a sufficient degree, but it takes time to specialise them according to the companies R&D (E); there is enough student with required degree, but the students have enormous lack of practise (H). In company B, concerning the contemporary situation, January 2010, there is not a problem to find a skilled person from the university as well as from the high school. But two years ago, it took more time to hire qualified employee. In three companies (C, D and F), they find difficult to get the skilled work stuff from the universities. There is a lack of graduates from the technical faculties who do not want to move into the region (C); it is difficult to get a skilled person possessing the practical experience, the fresh graduates have no experience (D), and the company feels the lack of educational infrastructure at the high level education (F). Even if the companies do not find difficult to get the skilled workforce, the graduates have a big lack of practise. The companies in engineering have more problems to find the skilled workforce from university, than in the chemical sector.

Next, the companies were asked whether they consider the education provided by the universities as adequate for their innovative activities and whether in their opinion the universities react on the demand of the companies. The answers are shown in Table 25.

Table 25 Relevancy of education

Sector	Company	Y/N	Do the universities provide relevant education? Specify
Engineering	A	Yes	Good knowledge framework, extreme lack of practise
	B	No	Graduates have no specialisation
	C	No	The specialisation of the absolvent does not meet our criteria
	D	No	We are too specialised and the university provide only general knowledge
Chemicals	E	Yes	Students have knowledge, but must learn how to work in our R&D. Other skills ó languages, experience from abroad, other skills
	F	Yes	We are not too specialised, the students from the faculties are possessing sufficient knowledge
	G	Yes	Students have a good background for our production
	H	Yes	For our production, the knowledge background is adequate

Five companies (A, E, F, G and H) consider university education as adequate for the innovations. Students have a good knowledge framework, but extreme lack of practise. Knowledge framework is general, and it takes several months, to profile the

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graduates according to the companiesø needs. But students nowadays possess other skills than related to the fields, for example better language knowledge, experience from abroad, and other skills that are crucial for innovativeness of the company. On the contrary, in three companies (B, C and D) consider the knowledge of graduates as inadequate. Graduates have an extreme lack of practical experience, possess only general knowledge and have no specialisation.

Interviewees were asked whether they would need a stronger links to the universities in order to get the qualified labour force and whether the educational institutions provide additional education. The results are presented in Table 26.

Table 26 Requirement on stronger relations with universities

Do you need stronger relations with universities in order to get qualified stuff?		
Company	Yes / no	Specify
A, E, F, G, H	No	-
B	Yes	Closer collaborations with school, internships
C	Yes	In order to specialise people, we could intervene in their specialisation
D	Yes	The firms should contribute to the creation of the study programmes

Five companies (A, E, F, G, and H) do not need stronger links; they do not consider them as helpful for the situation. Three companies (B, C and D) expect that closer link with the universities would facilitate the access to the skilled labour force, they could improve the specialisation of the graduates, the companies could contribute to the study programs creation and the internships would decrease the critical lack of graduatesø practical knowledge.

The proposition for the companies operating in the engineering is that companies need for their innovativeness labour force with the university degree but more than the degree the practical skills are crucial. Except the company providing the scholarship, companies perceive a considerable lack of graduates from the technical faculties. All companies consider the knowledge framework of graduates as respectable, but with a huge lack of practical skills. For companies B, C and D closer collaboration could improve the situation, especially with regard to the specialisations and practise of graduates, which would positively impact the innovations. Firms could contribute to the creation of study programmes. Observation results support the proposition; the companies have to manage the lack of graduates at technical faculties and at the same time the lack of practical skills.

The proposition for the companies operating in the chemicals is that the universities are the main source of labour. There is a sufficient number of the university degree graduates (from chemical and biologic faculties), but their skills are general and need to specialise in the companies or during the thesis elaboration. The companies perceive lack of high school infrastructure in the sector resulting in the lack of apprentices. On the contrary they do not have much need of apprentices with chemical or biological education. For the internal R&D they have need of master and PhD students. Companies do not consider the stronger links with universities as a solution of the problem. Observation results are in line with the proposition. Companies are getting

skilled workforce from the universities, but these are possessing general knowledge and need to specialise within the companies.

White Book of Tertiary Education elaborated by Mateju et al. (2009), the educational system has been changing since 1989, which was short time compared to other the countries. This system is not able to meet the requirements of the European and global trends. Such an educational system is not able to react flexibly on the market demand and the changes on the market. The author adds that in 1989, the long term political intervention into the educational system finished and the academic liberty has been set up. But it did not remove the deformation in the research system which has been established after Second World War. In this system all the public research has been transferred to the Academy of Sciences. The number of academic workers is not sufficient to ensure the volume and quality of accredited programs on the new faculties and universities. The author adds that in 1989, the long term political intervention into the educational system finished and the academic liberty has been set up. But not remove the deformation in the research system which has been established after Second World War. In this system all the public research has been transferred to the Academy of Sciences. The number of academic workers is not sufficient to ensure the volume and quality of accredited programs on the new faculties and universities. Another problem occurred after 1998 when the law enabled rise of the private universities and the academic workers started giving the courses at several institutions, without working there, which results in poorer quality of educational activities as well n the poorer research activity. At the same time, the requirement on the academic workers (the level of education) excludes the employees with practical experience. The problem is seen in conservative educational methods mixed with the big number of students in the courses results in the lack of feedback, consultation, control and lack of space for the qualification growth of the academic workers. The courses are not led by the specialist from practise without any project approach with the focus on the soft skills.

Companies were asked what the impact of the public intervention on the accessibility of the companies to the labour force is. The answers have been summarised in the Table 27.

Table 27 Public intervention educational level

		What is the impact of contemporary public on the educational level of employees, which is necessary for innovativeness?
Engineering	A	general knowledge ó lack of specialisation, lack of practise
	B	lack of internships
	C	administration to complicated for the practical educations ó lack of internships
	D	lack of practice
Chemicals	E	the universities do not need to be profitable, low flexibility
	F	lack of apprentices
	G	positive impact
	H	Lack of specialisation

Companies A, B, C, D and H perceive lack of public intervention on the suitability of the study programmes, which results in general knowledge frameworks and lack of specialisation and practise, which is a barrier to the innovativeness. For

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company E the universitiesø financing results in low flexibility and competitiveness, which another barrier to the innovativeness. In company F they feel a lack of educational infrastructure at the high school level.

The proposition is that the major tools of public intervention: new forms of the education including the PhD studies and their integration into the private sector; education in the innovation process (R&D laboratories, technology parks, incubators, small R&D companies); creation of the whole life education system and enhancing the whole life learning; increase the labour force for innovations (enhance the life sciences and engineering studies) lead to the to the sufficient educational level. Companies operating in the engineering have to deal with the lack of practise of the fresh graduates. Difference between the propositions is that the public intervention leads to the sufficient educational level, but the fresh graduates suffer from the lack of practice. Companies operating in the chemicals have not a homogenous opinion; the university financing does not push them to be flexible; fresh graduates possess good knowledge and good experience from studies abroad, new skills (e.g. creativity, autonomy), which is very useful for innovativeness. The difference between the propositions is that the public intervention leads to the sufficient level, but fresh graduates need to specialise.

The universities have not learnt how to collaborate with the employers and did not orient on the practical education (Mateju et al, 2009). The author adds that the educational system has been changing since 1989, which was short time compared to other the countries. Major part of the research has been shifted to the universities, which became self-governmental and fully financed from the public sources. According to National Innovation Policy (2005), the problem related to the lack of practise is result of the lack of finance to support the internships, as well as with the social and health insurance. The problem related to the low number of graduates at the technical programs is that many students do not finish their studies because of the wrong material and technical conditions (lack of laboratories, lack of practise) which makes the studies unattractive.

Conclusion

In this section, the literature findings have been compared to the answers obtained in the companies. The analysis of the obtained answers enabled to define what are the characteristics of innovation system, in which the observed companies operate. The propositions that have been defined based on the literature were used to compare whether observations from the companies are in line with the literature findings. In case that the observations were not in line, the explanation has been found. The findings have been summarised up in the Tables 28-32.

Table 28 Comparison results - degre of novelty

Proposition	Observations	Observation in line with proposition?	Explanation
Engineering can be characterised by incremental innovations.	Observed companies in engineering are characterised by a mixture of the radical and incremental innovations.	No	-After 2003 innovation became a priority, innovation concepts and policies started to be prepared -switch from the comparative advantage based on the cheaper costs to the comparative advantage based on the innovativeness and higher added value
Chemical sector can be characterised by incremental innovations, which are more focused on the product innovations.	The companies operating in the chemicals are characterised by the majority of incremental innovations focused on the changes in the product quality.	Yes	-
The major tools enhancing the volume of innovations and their degree of novelty are: the support of universities, support of loans, patent protections and network encouragement	In the observed companies, the regulatory and safety institutional settings are the major tools stimulating the incremental innovations but not enhancing the radical innovations.	No	-legal frame and related measures are insufficiently interconnected -> increase of transactional cost -insufficient risk capital -lack of innovation concepts and policies till 2003

Table 29 Comparison results ó institutional setting

Proposition	Observations	Observation in line with proposition?	Explanation
Engineering is regulated by the standards setting institutions which results in safety regulations coordination.	Observed companies in engineering were except the standard regulations impacted also by the environmental regulations.	No	-double regulations (EU + CR) -> increasing volume of interventions -heterogeneous ideas of particular actors of public administration - weaknesses in concept documentation - lack of communication among the actors - lack of actor coordinating the policies - insufficient connection of actors of public intervention
Chemical sector is regulated by the environmental setting institutions, which results in the environmental protection and implementation of green technologies.	The companies in chemical sector were except the environmental setting impacted by the veterinary and health protection, and by the drug control.	No	

Table 30 Comparison results - knowledge source

Proposition	Observations	Observation in line with proposition?	Explanation
Companies operating in engineering do the research on their own with a big contribution of the customers and do not use much knowledge from the universities.	In observed companies, the customer is major source of knowledge, with a big influence of the institutional settings; the companies do not use the knowledge from universities.	No	-the volume of legal frame adjustments is increasing -> establishment of new regulations is frequent
In chemical sector, the companies are using more external knowledge, especially from the universities and public research institutions; this knowledge is further developed within the companies.	The companies are using the knowledge from the university, but not for all companies the relevant knowledge is available; they are also using the knowledge from suppliers, customers at the same time the knowledge is widely influenced by the institutional setting.	No	-low contribution of private financial resource on the public R&D -> no possibility to intervene into research design -low demand on the public R&D results (lack of financial resources, orientation on lower added value) -companies do not seek for the knowledge to implement
The major tools targeted to facilitate the access to the knowledge are the R&D subsidies and tax incentives; universities, legislative and networking support which results in decrease of the lack of knowledge	The support of universities fails, because it is not allocated based on the relevant results; tax incentives on internal R&D and support of intermediary agency work in one observed case.	No	-financial resources allocated without regard on the result and its degree of quality - focused on the basic research, low commerce orientation of research employees -model that is being used is separating the R&D results from the practice -lack of agency enhancing the knowledge transfer -R&D results and its financing are not innovative oriented -users of the R&D do not participate on the conception creation of the R&D

Table 31 Comparison results ó networks

Proposition	Observations	Observation in line with proposition?	Explanation
The companies in the engineering can be characterised by strong links with the customers and other companies, while the links with the universities are decreasing.	In order to meet the standards and safety requirement the companies are also keeping links with the standard setting institutions and associations.	yes	-
Companies operating in chemical sector have links with the universities, customers and other companies.	Observed companies have links with the customers, universities, institutions and associations.	yes	-
The main tools supporting the networking are legislative support, mobilisation of researchers between the private and public sector technological support, which results in the costs reduction for companies, decrease in the lack of knowledge, interaction between public and private sector and diffusion of knowledge among the actors.	The impacts of public intervention are not considered as effective in observed companies and the links among the actors in the sectors remain a weak point of the innovation system.	no	- complicated collaboration of the public and private sector -strategic alliances between the actors in the sector -lack coordination and common target -lack of intermediary between the private and public sector leads to the communication gap -lack of cooperation on common projects, lack of mobility of worker between private and public sector -lack of commerce orientation of public research workers - differences in organisation between public and private sector

Table 32 Comparison results - educational level

Proposition	Observations	Observation in line with proposition?	Explanation
In engineering the companies need for their innovativeness labour force with the university degree but more than the degree the practical skills are crucial.	Observed companies the companies have to manage the lack of graduates at technical faculties and at the same time the lack of practical skills.	Yes	-
For companies operating in the chemicals the universities are the main source of labour.	The companies are getting skilled workforce from the universities, but these are possessing general knowledge and need to specialise within the companies.	No	-educational system is not able to meet the requirements of the trends and react on the demand of the market -academic liberty -insufficient number of academic workers -the requirement on the academic workers excludes the practical experience -conservative educational methods mixed with the big number of students
The major tools of public intervention: new forms of the education including the PhD studies and their integration into the private sector; education in the innovation process (R&D laboratories, technology parks, incubators, small R&D companies); creation of the whole life education system and enhancing the whole life learning; increase the labour force for innovations (enhance the life sciences and engineering studies) lead to the to the sufficient educational level.	Public intervention leads to the sufficient educational level, but the fresh graduates suffer from the lack of practice and to the lack of specialisation.	No	lack of practical education orientation, lack of finance to support the internships, as well as with the social and health insurance, wrong material and technical conditions -> studies unattractive

4.7. The innovation subsidies in the Czech Republic

This section will describe the innovation subsidy programme in the Czech Republic and aims to answer three sub questions: (1) What are the criteria for receiving subsidies from the programme Innovation belonging to the Operational Programme Enterprise and Innovation of the Czech Republic; (2) What are the barriers to the subsidy drawing arising from the innovation programme in particular companies; and (3) What are the barriers arising from the characteristics of the innovation systems in observed sectors?

Subsidy programme in general

In order to support the innovative efforts in the Czech Republic, the Operational Programme Enterprise and Innovation (OPEI) for the years 2007 ó 2013 has been designed. The program is funded with the support of the European Union and with the contribution of the Czech government. The program is direct financial support for the business plans in the companies belonging to several sectors of the manufacturing industry, including the engineering as well as the chemical production. In order to allocate the resources to the innovative companies, a set of criteria has been designed.

For the purposes of this study, the criteria related to innovative factors chosen in the theoretical framework have been chosen and the next section will describe what the requirements of those criteria are. The programme does not take the sector of activity and its characteristics in consideration.

Based on the information provided by the Czech Invest, which is the agency involved in the allocation of the resources, chosen criteria are crucial for the companies to reach the financial support. The basic criterion is the realisation of activity supported by the programme; product or process innovation.

As a part of the interview, there was a set of questions designed to define the barriers to the innovation subsidies related to the observed factors. Further the companies were asked to make a recommendation for the policy adjustment which would decrease the barriers to the subsidies. Companies did not get the feedback on their unsuccessful application; the information from the respondents is based on their own assessment on the criteria included in the application procedure.

Degree of novelty

To meet the requirement related to the degree of novelty, the OPEI has been designed for the innovative projects that are relevant for the market. The most favoured are these projects that will lead to: opening of new markets, launching of improved products that will enlarge the product portfolio, fill the gap on the market or fill a niche market. The project must bring technically new process or technically improved process. The projects that bring just differentiation or modification of contemporary process or products are not meeting the criteria. The degree of novelty is further assessed with regard to the region; the most favoured are these projects that are new to the world, new to the EU, new to the Central and Eastern Europe, new in the Czech Republic, new for the company (Innovation ó text of the programme, 2009).

The interviewees were asked about their opinion on the barriers to the innovation subsidy with regard to the degree of novelty. The answers have been summarised in Table 33.

Table 33 Barrier to the innovation subsidy and recommendation, degree of novelty

		The barrier to the innovation subsidy:	Recommendation for the procedure:
Engineering	**A, B, C**	-	-
	D	effective production, but not new product	not to take the degree of novelty in consideration, take the economic profit
Chemicals	**E**	completely new production line, economic savings, not big changes on the product	not to assess the degree of novelty, but the economic profit
	F	quality improvement, radical production innovation, not new product	the subsidy should be targeted also project that improve the product quality
	G	only incremental innovations meeting the environmental settings (non economic profit)	support of incremental innovations
	H	only incremental innovations (non economic profit)	Support of incremental innovations

Companies A, B and C have implemented an innovation, which resulted in the new production process and in the launch of new product. In company A, the production line is unique in the Czech Republic and enables highly differentiated production, in company B the innovation results in new way of processing material,

which is due to high cost not unique, but very rare, and company C found a gap on the international market. Companies D, E and F implemented for them radical innovation, which led to higher economic effectiveness, but did not result in implementation of new product. In company F this innovation led to higher quality standards. Companies G and H has implemented incremental innovation that did not result economic profit.

The programme is not targeted for the innovations which do not fill a gap on the market. Based on the information provided by the Czech Invest, if the company does not prepare the business plan introducing an innovation new for the market or that would result in the new product launch, it is excluded from the application process. This can lead to excluding the project that are economically profitable, but do not meet the criteria of the degree of novelty. Further the policy ignores the non economical impacts. The project with positive environmental impacts can be excluded, because they do not bring a radical innovation. Based on the results in the previous section, the companies in engineering can be characterised by the mixture of radical and incremental innovations and the companies in chemical sector can be characterised by the incremental innovations. This criterion can be considered as disadvantageous for the companies operating in the chemical sectors.

Knowledge source

The second criterion includes the source of the knowledge, which is being implemented during the innovation in the company. To meet the requirements, the project must be connected to the R&D activities (results of the R&D, transfer of technologies, patents, purchase of licence). These activities can be of both resources; internal, external or in cooperation with external actor. In the case of using external knowledge, the company must prove and certify the source of knowledge. The companies having own R&D have advantage to those not having own R&D (Innovation ó text of the programme, 2009).).

For the companies operating in the engineering, the customer is the main resource of knowledge. They do not use knowledge generated by the universities. Companies operating in the chemicals use more knowledge generated by universities. This criterion is disadvantageous for the companies operating in the engineering, because the knowledge from the customers might not be connected to the R&D activities.

None of the companies have a problem related to the source of knowledge. All the companies had certified knowledge; either purchased from the suppliers, or they have developed their own knowledge in their internal R&D or based on the inputs from the customers. None of interviewees gave an opinion on the policy adjustment with regard to this criterion.

Networks among the actors

Third criterion concerns the links among particular actors. To meet the criteria, the company should prove the relations with several actors. Firstly, the company must have a relation with some public research institution or university. Second, the company should have a link with the customers (market research). The market research provides at the same time an estimation concerning the demand on the output of the innovative

implementation. The policy requires as much links with the other actors in the sector as possible (Innovation ó text of the programme, 2009).

The representatives were asked, whether there was a barrier related to the links with other actors of the sector (especially with the university and customers) that had hinder the access to the innovation subsidy. The answers have been summarised up in the Table 34.

Table 34 Barrier to the innovation subsidy and recommendation, networks in the sector

	The barrier to the innovation subsidy:	Recommendation for the procedure:
A, C, E, F,	-	-
B	only suppliers and customer	Not to include the criteria into the assessment, the knowledge can be purchased from the supplier, without collaborating with the research institution
D	only suppliers and customer, no links with the public R&D	to exclude this criteria from the assessment, the collaboration with the university does not say about the innovativeness in the company
G	lack of links	not to assess the links within the sector

Companies A, C, E, F and H have a link both with customers, as well as with the universities. Companies B, D and G had only links with the customers and suppliers, and did not have the collaborative links with the universities or with some other public research institution.

Engineering as the sector can be characterised by the limited links with the universities, this criterion can be disadvantageous for the companies operating in the sector. The criterion favours the companies operating in the chemical sector, as the companies have more links with public research and universities.

Institutional setting

Fourth criterion concerns the supporting and regulatory institutions. In order to meet the regulatory criteria, the project must have a positive impact on the environment. The projects that require implementation of new quality or environmental standards are preferred to those without new standards (Innovation ó text of the programme, 2009).

Companies in both sectors were regulated by a high volume of institutional interventions; the projects in the companies had therefore all a positive impact on the environment. Based on the observation, the criterion is not favourable to none of observed sector.

Companies do not consider the quality and environmental standards as a barrier to the subsidies. All the companies have managed several institutional interventions that had been focused on the environmental, health and safety protection and the quality support. All the projects had therefore positive impact in the given areas. Institutional requirements were not considered as a barrier to the innovation subsidies. There were not recommendations how to adjust the policy.

Educational level

The last criterion is concerning the labour force. The share of employees with university degree is being assessed. The advantage is having the company having more than 30% employees with the university degree (Innovation ó text of the programme, 2009).

The representatives were asked whether this criterion is considered as a barrier to the innovation subsidy. The answers have been presented in Table 35.

Table 35 Barrier to the innovation subsidy and recommendation, labor force

	The barrier to the innovation subsidy:	Recommendation for the procedure:
B	lack of MSc at the time of application	release the criteria from the assessment, the employees with the university degree are equal to the employees with the practical experience
A, C, D, E, F, G, H	-	-

Only company B was at the time of application suffering from the lack of employees with the university degree. The source of the problem was the labour market. In engineering the stress is not put on the university degree of the employees, but on the practical skills of the employees. This criterion is therefore disadvantageous for the companies operating in the engineering, who are also dealing with the lack of graduates.

Others

Last question concerned other barriers to the innovation subsidies. The representatives were consequently asked about their recommendation for the policy adjustment. The answers have been summarised up in the Table 36.

Table 36 Barrier to the innovation subsidy and recommendation, others

		The barrier to the innovation subsidy:	Recommendation for the procedure:
Engineering	A	Not known, seems that there was an unknown mistake in the application, lack of policy transparency	make the policy transparent, give the companies the feedback, to enable mistakes elimination in the future
	B	financial health	less stricter financial health assessment
	C	the bank first refused the credit, which caused the delay in the application, the subsidy therefore refused, the loan accepted later on	Change in the procedure, to avoid excluding the project with delayed loan from the game. The project was considered as risky and the credit approval had been delayed. For the project, that estimate economic profit, to change the procedure and not to pay the money by return
	D	Business plan, the company has not uses an intermediary agency, which would make the application for them, seems that there was a mistake in the BP writing; financial health	In the future use the service of an intermediary agency, Less stricter assessment of financial health
Chemicals	E	they were awarded but did not meet the criteria after	The company was awarded by the subsidy, but two years after decided to return it back. Reason: the company did not meet certain criteria of the business plan - the investment did not bring estimated economic profit. It is the question, whether this information was complete, or whether there is something else hidden
	F	procedure to reach the innovation subsidy is complicated and administratively complicated and it is targeted to bigger companies (because of the degree of novelty), the lack of finance and the innovation of lower degree was the barrier to the innovation	the administrative facilitation, adjustment for the SMEs, that have less finance and implement the innovations of lower degree
	G, H	-	-

Except companies G and H, all the companies met other possible barriers to the innovation subsidy. Company A, there was not a feedback on the application procedure, and it is not clear what was the barrier. The application procedure is not transparent, and they cannot learn from the failure for the future applications. Company B, the problem was the financial health of the company, it was not meeting the criteria set by the policy. Company C, the project had been considered as highly risky, and first the bank refused to provide the loan. Based on this, the company was not awarded by the subsidy due to the lack of the capital. Consequently, after second application, the company was provided a credit, but in that call the company could not apply again for the subsidy. The innovation project can be now assessed as profitable. Company D, the problem could be either the financial health of the company, or the business plan quality. The company has not used an intermediary agency that would help them to deal with the application procedure. Company E was first awarded by the innovation subsidy, but two years after the realisation of the project, they have decided to pay the money back to the Ministry of Industry and Trade. They had explained that the project did not meet some criteria estimated in the business plan, and they have therefore decided to return the money back, to avoid the related problems. The interviewee did not specify the details, it is not therefore clear, whether there is something behind. Company F, the barrier was the combination of administrative complication and the lack of necessary capital. The projects are paid in return, which was a problem for the company.

Problems stated in this part of the question cannot be explained by the sector of activity, because they are related either to the administrative complications, or to the lack of financial resources. Concerning the financial resources, the subsidy is allocated to the project (companies) with the sufficient volume of financial resources. This could result in the refuse of project that would be economically profitable, but the companies were lacking the capital. Further the subsidy is allocated to the companies that have sufficient volume of financial resources, who could realise the project even without the financial support.

Conclusion

In this section, the innovation subsidy procedure has been summarised. To meet the requirements the company has to realise the process or product innovation that will lead to the launch of product that will fill a gap on the market and to certify the source of knowledge; the company must have a links to the other actors of the sector, especially with a public research institution and customers. In addition, the project must meet the criteria of the institutional setting and the company must have the high number of the employee with university degree, minimum 30 % of total employees. The procedure does not take into consideration the sector in which the company operates.

In the previous section, the observation and the propositions have been compared. In case of any variation the explanation has been found in the literature. The characteristics of the observed sectors have been made. These have been confronted with the innovation subsidy criteria, and the barriers arising from the innovation systems have been defined. The criterion concerning the degree of novelty is more favourable for the companies operating in the engineering, as they can be characterised by more radical innovations. The criterion concerning the knowledge source is more

favourable for the companies operating in the chemicals, as they are using more knowledge generated by universities (which is certified knowledge) while the companies in the second sector are using more knowledge from customers (which might not be considered as certified knowledge). Concerning the criterion related to the networks among the actors, the procedure is more favourable to the companies in chemicals, because they have except the links with customers also stronger links with universities. Regarding the institutional settings, the procedure is neutral for both sectors, because in both the companies are managing a high volume of institutional interventions. For the last factor, educational level, the procedure is less favourable for the engineering, because the innovativeness in the sector is more dependent on the practical skills of employees than on the university degree, while in the second sector it is more dependent on the university degree of employees.

From the interviews other remarks can be made, which are not related to the observed factors. These cannot be explained by the sector and its characteristics. The support is allocated to the companies with good financial health (where the project would be carried out even without the support); the companies are lacking the feedback on the unsuccessful application; the companies might fail due to a wrong elaboration of the business plan, while the companies that elaborate the business plan via an agency prevail in the competition; the companies have problem with the backward pay off of the financial support which leads to the barrier of the project realisation and the complicated administration which is resulting into the barrier to the subsidy.

5. Conclusion

This research was meant to serve both the policy makers as well as the companies. The objective was to select the factors to analyse the characteristics of innovation system in two particular sectors in the Czech Republic. Next, based on these characteristics, define the barriers to the innovation subsidies and make the recommendation for the innovation subsidy programme and for the innovation system.

In Section 5.1 the conclusion of the research is presented, in section 5.2 the recommendations for the innovations systems and for the innovation subsidy programme are presented and in section 5.3 the project is evaluated in the discussion.

The conclusion has been drawn by answering the central research question:

What are the factors to analyse the innovation system, what are the characteristics of the innovation systems in particular sectors, how can the public policies intervene in the sectoral systems of innovation, what are the characteristics of the Czech innovation system and how does it influence the access to the innovation subsidies, and what are the recommendations for innovations system and for the innovation subsidy programme? To be able to answer this question, 10 sub question have been answered.

In the literature review, 5 factors enabling the analysis of the innovation system have been defined. First factor is the type of innovation (process and product) and the degree of the novelty of the innovation, which is going from incremental to radical

(from update of contemporary product to completely new concept). The second factor is the links among the particular actors creating the network in the sector. Third factor is the institutional intervention impacting the actors of the sector. Fourth factor is the source of knowledge that is crucial for the innovation implementation. The last factor is the educational level of the employees essential for the innovation. These factors enable to analyse the innovation system in particular sectors.

In next section five sectoral systems of innovation have been defined: pharmaceutics, software, telecom, chemicals and engineering. With the use of the factors of analysis (degree of novelty, institutional setting, knowledge source, networks and educational level) the main characteristics of the sectors have been drawn.

Public policies are only relevant when solutions for innovation problems are available. The chapter has defined for each factor a set of tools of public interventions that are being used for the innovation support. First set of tools is targeted to enhance the degree of novelty. Supporting of universities, networking in the sector, devotion of the capital (loans, guarantees, risk capital, subsidies) leads to reducing the companiesø cost and enhance the innovations. Second set of tools is targeted to create institutional framework in which the companies operate. Control, commands, quotas and subsidies have been designed to support positive social and environmental impact of innovations. Third set of tools targets the networks support and facilitates the access to the innovative knowledge. These can be on the firm level (subsidies for hiring specialist, training subsidies, trainings) and on the system level (support of public R&D, mobilisation of researchers, legislative support, technological centres). These resulting in the networking support, interaction between the private and public sector, decrease of the lack of knowledge, diffusion of knowledge, acceleration of the R&D and implementation of its results, enforcing of basic research, support of R&D results commercialisation and identifying the firmsø needs. The last set of tools aims to support the sufficient educational level. These include new forms of education, creation of whole life educational system, and involvement of the private sector on the educational cost sharing, intermediary between the labour market and educational institutions and financial support.

The literature findings served for the literature framework creation, for the preparation of the empirical part and for the qualitative analysis of gathered data. From the framework several propositions for two observed sectors have been drawn.

Before proceeding to the empirical part, the research strategy has been designed. The comparative case study has been chosen as the most appropriate approach for this research, because the case is the unit of analysis providing about the context in which case exist. For the purposes of this research, a company as a case gives an information about the context in which it operates - the innovation system. The research has been carried out with a small number of units; it was therefore possible to make a qualitative analysis. As a variance of the research strategy, cross case analysis has been chosen to make a comparison among the cases. The approach consists of several following steps: case selection, data collection and cross case analysis.

In total 8 companies, 4 operating in engineering and 4 operating in chemicals have been chosen. Before choosing the companies, 5 criteria have been set. At the

beginning one company in each sector has been contacted, which gave the references for other companies. Next, an interview protocol has been elaborated which consisted from set of 6 groups of open ended questions which aimed to describe the characteristics of the innovation system in which the observed companies operate, to describe the barriers to the innovation subsidies and to make a recommendations which could facilitate the innovativeness in the companies and the access to the innovation subsidies. The interviews with innovation managers but also with other representatives have been carried out. The interview design was equal in all companies. After having collected all data, the analysis has been carried out. The results have been compared whether they were in line with the propositions or not. If not, the explanation has been found during the study of the document found in the archives of the Ministry of Industry and Trade.

As the starting point for the analysis, the propositions derived from the literature framework have been used. These have been compared with information obtained in the companies, and the characteristics of the observed sectors have been drawn up, which has served for the analysis of the innovation programme.

Observed companies operating in the engineering can be characterised by the mixture of radical and incremental innovation, while the companies operating in the chemical sector can be characterised by the majority of incremental innovations. In both sector, the only tool of public intervention that is enhancing the innovativeness are the regulatory and safety institutional settings that are stimulating the incremental innovations, but not radical innovations.

As for the institutional settings the companies operating in the engineering were except the standard setting institutions also impacted by the environmental regulations, and the companies operating in the chemicals were except the environmental regulations also impacted by veterinary and health protection and by the drug control.

Concerning the source of knowledge, in the observed companies operating in engineering the customer is major source of knowledge, with a big influence of the institutional settings; the companies do not use the knowledge from universities and the companies operating in the chemicals are using the knowledge from the university, but not for all companies the relevant knowledge is available; they are also using the knowledge from suppliers, customers at the same time the knowledge is widely influenced by the institutional setting. As for the public intervention, observed companies stated that the support of universities fails, because it is not allocated based on the relevant results; tax incentives on internal R&D and support of intermediary agency work in one observed case.

Regarding the networks in the sector In order to meet the standards and safety requirement the companies operating in the engineering are except the customers also keeping links with the standard setting institutions and associations, and do not have a lot of links with universities. The companies operating in the chemicals have links with the customers, universities, institutions and associations. Concerning the impact of public intervention targeted on the networking support, it is not considered as effective in observed companies and the links among the actors in the sectors remain a weak point of the innovation system.

For the last assessed factor educational level, the characteristics of the companies operating in the engineering is that labour force with the university degree is for the innovativeness less important than the practical skills; the companies have to manage the lack of graduates at technical faculties and at the same time the lack of practical skills. As for the companies operating in the chemicals, the universities are the main source of the labour force, but the fresh graduates are possessing general knowledge and need to specialise within the companies. In the observed companies as a consequence of public intervention, there is a sufficient educational level, but the fresh graduates suffer from the lack of practice and specialisation.

All the analysed factors are (among others) the criteria for the allocation of innovation subsidies: the company has to realise the process or product innovation that will lead to the launch of product that will fill a gap on the market; the company has to certify the source of knowledge; the company must have a links to the other actors of the sector; especially with a public research institution and customers; the project must meet the criteria of the institutional setting and the company must have the highest number of the employee with university degree, minimum 30 % of total employees. The procedure does not take in consideration the sector in which the company operates (the policy is common for the whole industry) and its characteristics and it has been designed for the whole manufacturing industry.

From the research results, the barriers to the subsidies encountered in particular companies have been defined. Barriers related to the degree of novelty: the innovation was radical for the company, but it did not result in the new product launch; the innovation was not radical. Concerning the institutional settings and knowledge source, the companies did not perceive this criterion as a barrier. As for the networking, the barrier was that the companies did not have enough links as the criteria require, because these links were not essential for the innovativeness. Last factor, share of employees with university degree resulted in barrier, because of the low share of employees with university degree in the company

The criteria of the subsidy programme have been also confronted with the characteristics of the sectors and the barriers to the innovation subsidy arising from the innovation system have been drawn up. Concerning the degree of novelty the barrier arises for the companies operating in chemicals, because the sector has been characterised by the incremental innovations that do not lead to the launch of new product. As for the knowledge source, the barrier arises for the companies operating in engineering, because the main source of knowledge are the customers, which might not be considered as certified knowledge. With regard to the network in the sector, the barrier arises for the companies operating in the engineering because most of their links is with the customers and they are lacking the links with the public research institutions. Concerning the institutions, the procedure is neutral for both sectors, because in both the companies are managing a high volume of institutional interventions and the barrier therefore does not arise from this criterion. Concerning the last factor, the barrier arises for the engineering, because the innovativeness in the sector is more dependent on the practical skills of employees than on the university degree, while in the second sector it is more depended on the university degree of employees.

Overall conclusion

The research has shown, that the characteristics of the sectors and innovation systems in which the observed companies operate slightly differ from those found in the literature. But from the research implies that even though these slight differences, the sectors differ from each other. It is therefore necessary to focus on the innovation system with regard to the sector. Contemporary the innovation system of the Czech Republic, including the tools of public intervention, does not take the sectors and its characteristics in consideration. From the research implies that there is basically lack of identification of the sectorsø characteristics and its needs, which results in the failure of contemporary designed tools of public intervention.

Further, the research has shown that observed factors are crucial for the innovativeness in the companies, but they do not represent the major barrier to the innovations and consequent barrier to the innovation subsidy. From the research implies that even though the tools of public intervention fail, the companies are able to manage the factor and reach the innovativeness in the company. There are therefore other factors hindering the innovativeness, which cannot be explained by the characteristics of the sector. The major factor hindering the innovations is the financial resource. On one hand, the companies lack own capital, which is related to the cost connected with the innovation implementation understandable, but the companies suffer from the lack of risk capital provided by the innovation system and they lack the guarantee for the loans. Majority of companies encountered a problem with the financial resources at the beginning of their project, even though the projects are now considered as successful and profitable.

From the sectoral differences, several barriers to the innovation subsidy have been defined. The innovation factors serves as criteria for the subsidies allocation; some criteria might be favourable for one sector and the other for the second sector. As the research has not observed all the criteria included in the subsidy policy, it is not therefore possible to make a conclusion for which sector is the policy favourable and other way round. The investigation of the sectoral characteristics would be therefore crucial also for the policy design, because contemporary procedure has been designed for the whole manufacturing industry.

From the interviews other remarks related to the barriers to the innovation subsidy can be made; these are not related to the observed factors and cannot be explained by the sectoral differences. The subsidy is allocated to the companies with good financial health (where the project would be carried out even without the support and where the lack of financial hinders the realisation of profitable project); the companies are lacking the feedback on the unsuccessful application and they cannot therefore avoid the mistakes in the future application, this lack of feedback is resulting in non transparency of the application process; the companies might fail due to a wrong elaboration of the business plan, while the companies that elaborate the business plan via an agency might prevail in the competition (the agencies are more experiences in business plan writing and are able to hide eventual weaknesses of the project, which might result in the realisation of projects with poorer quality); the companies have problem with the backward pay off of the financial support which might lead to the

barrier of the project realisation; complicated administration represents the barrier to the subsidy, because the complicated application supports the mistakes which exclude the projects from the procedure.

The innovations systems as well as the innovation subsidy policy should be therefore adjusted to the characteristics of the sector, but in the first step, the sectoral characteristics needs to be defined.

5.1. Recommendations

The study was investigating how the observed companies are impacted by the innovation system with regard to their innovativeness. Based on the findings 6 groups of recommendations have been drawn up; 5 groups are concerning the innovation system, and 1 group is concerned with the recommendation for the innovation subsidy policy which will be elaborated in separated section. To make recommendations, two research sub questions have been designed: (1) What are the recommendations made by the representatives of the companies that might contribute to the innovation system improvement? (2) What are the recommendations for the innovation procedure made by the companies representatives and made based on the conclusion from the sectors characteristics?

The recommendations have been drawn up based on the opinions of the representatives. Each set of question has been accompanied by the possibility to express the opinion on the possible way how to enhance the innovativeness.

First group concerns the recommendations meant for enhancing the innovations in the companies, and enhancing the higher degree of novelty. The findings have been shown in Table 37.

Table 37 Recommendations degree of novelty

What would be in your opinion effective tool to support the innovations with and enhance the degree of novelty?	
A, B, C, F	credit guarantee
D, G	tax incentives
E	interest rates subsidy
H	incremental innovation subsidies

The main barrier to the innovations (both radical and incremental), is to manage the financial resources. The financial support is the main tool recommended by companies. For the bigger investments, companies A, B, C and F recommended agency involved in the credit guarantee (without regard to the degree of innovation) which would help to manage the lack of trust by the banks. Company E recommended the subsidy which would help to manage the financial load. Concerning the incremental innovations, companies D and G recommended tax incentives especially for environmental issues. Company H recommended subsidy programme, which would support the implementation of incremental innovation.

Contemporary tools are targeted only either on projects that manage the radical innovation resulting in new project launch, or in the case of guarantee they seems to be for less risky projects. This is disadvantageous for the companies that manage the innovations with environmental profits (especially those in chemical sector), the

companies that make the innovations without launching completely new product, even if the profit is estimated as positive and the companies that are managing highly risky projects.

The second group concerns the recommendations meant the facilitations the access to the innovative knowledge. The findings have been summarised up in the Table 38.

Table 38 Recommendations knowledge

		What would be in your opinion effective tool facilitating the access to the innovative knowledge?
Engineering	A	knowledge sharing -acceleration of the R&D
	B	-
	C	Company willing to share the costs on the research, on the contrary the incentives (tax)
	D	design of the projects for the sector
Chemicals	E	financing based on the results and involving the companies in the cost sharing
	F	universities financed based on their flexibility and results
	G	financial support of the market research
	H	universities should become profitable, the basic result should be financed and further developed, not sell out abroad

Company A recommends support of the knowledge sharing, which would accelerate the R&D (on the contrary it would decrease the competitiveness); company C recommends enhancing the public R&D costs sharing which would be on the contrary compensated by the tax incentives; company D recommends design of the research projects focused on the sector needs; companies E, F and H recommend restructuring of the public research financing which would reward the research according to the results and flexibility, not by the lump sums; company G recommends financial support of market research; company H recommends further development of the basic research; financial support of the internal R&D even for the incremental innovations.

Companies in the chemical sector that are more relying on the knowledge produced by the universities are suggesting the change of universities support, which would result in bigger effort to produce an useful knowledge. Companies in engineering would be willing to share the knowledge and contribute to the knowledge development.

Next, the recommendations for the support of the links within have been drawn up. The answers can be seen in Table 39.

Table 39 Recommendations networks

What would be in your opinion effective tool enhancing the network creation in the sector?					
	tool 1	tool 2	tool 3	tool 4	tool 5
C	facilitation of complicated administration for the student mobility				
D	agency that would invite the companies to collaborate and create concrete research projects	concrete research projects	definition of companiesø needs		

E	Interaction with the cluster(thesis)	presentations at the universities	integration of the representatives of the clusters into the public research	workshops support	internships
H	agent that would invite the companies to collaborate	change of financing the universities			
A, B, F, G	-				

In four companies (A, B, F and G) the recommendation has not been made. Companies C and H recommended the legislation adjustments enabling the integration of internships to all levels of education resulting in higher mobility among the sectors. Company D and H recommended an agency, which would invite the companies to the collaboration and contribution R&D. Company E recommended design of a concrete research projects for the sectors; definition of the sector (companies¢) needs in order to define the requirements on the actors; support of the thesis writing in cooperation with the cluster (with the private companies); integration of the cluster representatives into the public research design; workshops support, presentation of the companies and other actors at the universities and the change of university financing which would make them more collaborative.

Next group of recommendations concerns the tools which would facilitate the access to the workforce with sufficient educational level. The findings are presented in Table 40.

Table 40 Recommendations educational level

		Which public intervention would facilitate the access to the workforce with sufficient educational level?		
		tool 1	tool 2	tool3
Engineering	A, B	Facilitation of internships administration, degree based on the number of years of experience		
	C	Better conditions at the technical specialisations ó student support (scholarships), enhancing the student to study technical spec.	Internships ó financial support, administrative support	Agency observing the market/sector needs, intervention into the study system
	D	Intervention of the cluster into the study programs	Internships ó bachelor, master level	
Chemicals	E	Internships support (tax incentives, subsidy of the remuneration)	Elimination of the escape of students into other fields	
	F	Increase of chemical high schools		
	G	Intervention of the chemical association into the chemical educational institutions (contribution of the study programs design)		
	H	Establishment of an agency, that would invite the companies to collaborate in the knowledge creation, design of the common research projects, communicate with the universities on the study programs creation		

Companies A, B, C, D and E recommended change of legislation which would enable and integrate the internships in to all levels of the education (high schools, bachelor programs, master programs); support of the technical facilities at the faculties. Company C recommended student support (scholarships); increase the interest in studies at technical faculties; financial support of the internships (subsidised salaries, tax incentives). Companies C, G and H recommended establishment of an agency observing the market needs, which would negotiate with the Ministry of Education and

universities new programs accreditation and study programs design. Company E recommended elimination of the escape of graduates to other sectors, company F focus on the specialisations at the high schools; company B recommended introduction of possibility to obtain the university degree based on the number of years of experience supplemented with shorter study period.

Companies agreed on the facilitation of the internships implementation, which would help out with the lack of practice, which was stated by the companies as the major barrier in managing the innovativeness in the companies.

Next group of recommendations focused on the innovation system concerns institutional interventions. The answers has been summarised up in Table 41.

Table 41 Recommendations institutional setting

How could be in your opinion the interventions redesigned to facilitate or enhance the innovations in your company?	
A	Tax incentives, subsidies for environmental regulations
B, H, C, F	Subsidies for environmental regulations
D, G, F	Tax incentives for companies meeting criteria
E	Unification of the requirements (EU with CR), double regulations avoiding

Companies A, D, F and G recommended tax incentives for the companies meeting all the regulatory criteria. Companies A, B, C, H and F recommended the subsidies for the costs related to the institutional intervention and their implementation. Company E recommended the unification of EU and CR regulations to avoid double regulations. For all companies, the institutional interventions represent huge increase in the costs, especially for the companies operating in the chemical sector. All companies therefore recommended financial support for the innovations that do not bring the economical profit, but bring environmental profit. An interesting recommendation, which was also mentioned in the previous section, concerns the concept of the regulations, especially with regard to the CR directives and EU directives.

The last recommendation is not based on the answers gained in the companies. Interviews in 8 innovative companies represent really small sample to make a characteristics of the sectors and its innovation system. The recommendation is to make a broader research on bigger sample which would enable the creating of the sectoral characteristics which would result in an effective recommendation of the tools of public interventions that would facilitate the innovativeness in the companies.

The interviewees were asked about the recommendation for the innovation programme adjustment, which would facilitate the reach of subsidies for their company, which is operating in observed innovation system.

First recommendations concern the less strict requirements on degree of novelty, and focus more on the economic and other external impacts (for example the environmental). The second recommendation concerns the support of incremental innovation, which are implemented in order to improve the product quality, or in order to meet the requirements of intervening institutions.

Concerning the source of knowledge and institutional intervention, none of interviewees gave recommendation on the policy adjustment with regard to these criteria. This criterion was not considered as a barrier.

Next recommendation concerns the networking in the sector; all three interviewees have suggested releasing this criterion from the application assessment, because in their opinion the links with the public research institutions do not say much about innovativeness in the company.

As the recommendation for the criterion concerning the labour force, it was suggested to decrease the percentage of the employees with the university degree from 30% and take in consideration the employees that have several years of experience. The opinion is that the innovative skills of employee with practical experience are higher that the skill of employee with university degree without practical experience and that the share of the employee with the university degree does not say about the innovativeness in the company.

Last group of recommendations concerns other criteria, which could in their opinion facilitate the access to the subsidy. Company A recommended making the application more transparent and giving the companies the feedback, so that they could prevent from the same failures in the future. Company B recommended making the financial health assessment less strict, and more focus on the estimation of economic profit, to eliminate the refusal of profitable projects. Company C recommended a special handling to the highly risky projects. In this case the procedure could be different, for example not to pay the money by return, which would eliminate the refusal of profitable projects. Further recommendation would be the possibility to apply in the case when the credit approval has been delayed. Company D recommended less strict assessment of financial health, as the company B. Company E did not give a recommendation. Company F, the criteria should be adjusted for the SMEs that have less finance and implement the innovations of lower degree.

5.2. Discussion

The purpose of the discussion is to make an evaluation of the process and final results of this research. The research process is discussed and then the personal findings are discussed.

First the literature findings have been produced which served as an input for the theoretical framework. The purpose of this chapter was to facilitate the data collection, facilitate the analysis and enable the conclusion drawing. In my opinion, the weak point of the literature review was the characteristics of 5 sectoral innovation systems. I think that I had better to exclude the sectors that have no tradition in the Czech Republic from the literature review, and focus on those that were actually analysed.

With regard to the case selection, there were several criteria, but the most important one was concerning the innovative element in the case (company). Before the interviews, the innovative element was present in all chosen cases. When looking back, in two cases there were only incremental innovations and in other cases the radical innovation took place, but it did not always lead to the launch of new product. In my

opinion, as the degree of innovation was not equal in all companies, the comparison of the cases was hindered. The validity of the research has been therefore decreased. The companies were contacted through snow ball effect. At the beginning one company in each sector has been contacted which has provided the reference to other companies in the sector. The companies were therefore from one region, which could influence the research results. Even though I believe that the research can be a starting point for the investigation of the innovation system which is not focused on the sectors. Literature findings, theoretical framework and interview protocol proposed in the study may serve as a starting point for further research.

Concerning the interview protocol, in my opinion an appropriate interview protocol has been designed that allowed going into detail on the factors of the innovation system. The questionsø details seemed to be suitable for the interviews. This interview protocol could be used for future studies on the sectoral systems of innovation.

During the empirical part, the interviews had been carried out. Than the information have been analysed and compared with the literature findings. When the variation between the observation and the literature occurred, the explanation has been found in documents from the archive of the related ministries. The interviews were easily available. The explanation is that the companies were trying to be helpful to the thesis research. The documents where the explanation of variation between the propositions and observation has been searched documents were also easily accessible because they were concerning the assessment of the innovation system, which is nowadays widely discussed topic. In my opinion the problem with the interviews was that the interviewees were not completely aware of the innovation system. They were aware only of the public intervention and opportunities that were directly impacting the companies, which had hindered a complex analysis of the observed sector. Another factor that could influence the result was an interview with a representative, who was really against the current government, which could make the perceptions more negative.

Some personal experiences will be put forward. First I would like to mention the moment of uncertainty related to the elaborating the research in absence from the university without a possibility to discuss the research regularly. As the discussions were determined by limited number of personal meeting and several skype sessions with my supervisor, it was hindering the research which resulted in the delay in the time framework. Second personal finding is that the carrying of interviews in the companies was an interesting experience. Meeting the professionals was more satisfactory than making the theoretical research and it made a contribution to the research project. Literature findings, the practical part and the contribution of my supervisor enabled to make certain conclusions, which resulted in elaboration of the thesis report.

6. Bibliography

<u>Books and articles:</u>

o Acs, Z. J., Audretsch, D. B.: Innovation and small firms. 2nd printing, 1991. Massachusetts Institute of Technology. ISBN 0-262-01113-1

o Asheim, B.T.: Regional innovation policy for SMEs, 2003. Edward Elgar Publishing. ISBN 1-84376-398-2.

o Ashis, A., Fosfuri, A., Gambardella A.: Markets for technology. The Economics of Innovation and Corporate Strategy, 2001. Massachusetts Institute of Technology. ISBN 0-262-01190-5.

o Bérubé, Ch., Mohnen, P.: Are Firms that Receive R&D Subsidies More Innovative?, 2009. Canadian Journal of Economics, Vol. 42, Issue 1, pp. 206-225

o Biswas R.R., Mills, J., Prince, H.A Handbook of Innovative State Policies: Building skills, Increasing economic vitality, 2005. Jobs For the Future

o Borras, S., Tsagdis, D.: Cluster Policies in Europe: Firms, Institutions and Governance, 2008. Edward Elgar Publishing Ltd. ISBN 978-1-84542-758-0

o Caloghirou,Y., Kastelli, I., Tsakanikas, A.: Internal capabilities and external knowledge sources: complements or substitutes for innovative performance?, 2002. Technovation, Volume 24, Issue 1. January 2004, Pages 20-39.

o Castellaci, F.:Why innovation differs across the sectors in Europe?- Evidence from the CIS-SIEPI database, 2003. TIK Centre, University of Oslo.

o Cervinek, P.: Evropské finan ní systémy 2007, Sborník p ísp vk z mezinárodní v decké konference Brno. Masarykova Universita. ISBN 978-80-210-4319-0

o Cesaroni, F., Gambardella, A., Garcia-Fontes, W., Mariani, M.: The Chemical Sectoral Systém. Fims, markets, instotutions and the processes of knowledge creation and diffusion, 2001. LEM Working Paper Series. Laboratory of Economics and Management SantøAnna School of Advanced Studies.

o Chesbrough, H. W., Appleyard, M.M.: Open innovation and strategy, 2007. California Management Review, vol. 50. No. 1.

o Czarnitzki, D.: The impact of public innovation policies in Eastern Germany: Micro econometric studies at the Łrm level, 2002. Centre for European Economic Research (ZEW)

o Dolezalova, G., Sukup, R., Vojtech, J.: Analýza profesní struktury pracovních sil v eské Republice z pohledu sféry vzd lávání: Vývojové trendy v zam stnanosti v CR období let 1991 afl 2006, 2007. Národní ustav odborného vzd láváni.

o Dosi, G.: Technological paradigma and technological trajectories. Elsevier, 1982. P. 147-162

o Edquist, C.: Systems of Innovations: Technologies, Institutions and Organisations, 2005. 2nd printing. ISBN 1-85567-452-1

o Edquist, C.: Innovation policy ó A Systemic approach, 1999.

o Foss, N.J.: Resources, firms and strategies: a reader in the ressource based perspective,5th printing, 2003. Oxford: University Press. ISBN 0-19-878180-6

o Hujer, R., Dubravko, R.: Evaluating the impacts of subsidies on Innovation activities in Germany,2005. Centre for Economic European Research, Discussion paper no. 05-43.

o Keizer, J.A., Dijkstra, L., Halman, and J.I.M.: Explaining innovative efforts of SMEs: An exploratory survey among SMEs in the mechanical and electrical engineering sector in The Netherlands, 2000. Elsevier Science.

o Malerba, F.: Sectoral systems and Innovation and Technology policy, 2003. Cespri ó Bocconi University. Revista Brasileira de Inovacao, vol 2, number 2. July/December 2003. P. 329 ó 375.

o Malerba, F.: Sectoral Systems of Innovation: Concepts, Issues and Analyses of Six Major Sectors in Europe, 2004. Cambridge: Cambridge University Press. ISBN 0-521-83321-3

o Maurseth, P.B., Verspagen B.: Knowledge spillovers in Europe: A patent citations analysis, 2002. Scandinavian Journal of Economics 104(4), 531-545.

o Mateju, P., Jezek, F., Munich, D., Polechova, P., Slovak, J., Strakova, J., Vaclavik, D., Weidnerova, S., Zrzavy, J.: White Book of the Tertiary Education, 2009. Ministry of Education, Youth and Sports, 2009.

o McKelvey, M., Orsenigo, L.,: Pharmaceuticals as a Sectoral Innovation Systém, 2001. Chalmers University and University of Brescia. Working paper for the Project European Sectoral Systém of Innovatio.

o Murphy, J., Gouldson, A.: Environmental policy and industrial innovation: integrating environment and economy through ecological modernisation. Geoforum, Volume 31, issue 1. February 2000, Pages 33-44

o Myskova, R.: Vliv lidského faktoru na výkonnost podniku, p 75-79. Univerzita Pardubice. Ustav Ekonomie

o Mytelka, L. K.: Competition, innovation and innovativeness in developing countries, 1999. OECD. ISBN 92-64-17091-X

o Narula, R., Hagedoorn, J.: Innovation through alliances: moving towards international partnerships and contractual agreements, 1999. Technovation, Volume 19, 1999, Pages 284 - 294

o Nauwelaeres, C., Wintjes, R.: SME policy and the Regional Dimension of Innovation :Towards a New Paradigm for Innovation Policy ?, 2000.

o OøConnor, G.C.: Market L earning and Radical Innovation: A Cross Case Comparison of Eight Radical Innovation projects, 1998. Journal of Product Innovation Management 1998, volume 15, 151-166, Elsevier Science Inc.

o Peneder, M.: The problem of private under-investment in innovation: A policy mind map. Technovation, Volume 28, 2008, Pages 518-530

o Porter, M.E., van der Linde, C.: Green and Competitive: Ending the Stalemate, 1999. Journal of Business Administratin and Policy Analysis.

o Steinmueller, W. E.: The European Software Sectoral System of Innovation, 2004.

o Tellis, G.J., Prabhu, C.P., Chandy, E.K.: Radical Innovation Across Nations: The Preeminence of Corporate Culture, 2009. Journal of Marketing

o Tidd, J., Bessant, J.R., Pavitt, K.: Managing innovation: integrating technological, market and organizational change. 3rd edition, 2005. Chichester [etc.]: Wiley. ISBN 0470093269

o Todtling, F., Kaufmann, A.: Innovation systems in Regions of Europe ó A Comparative Perspective, 1998. Institute for Urban and Regional Studies University of Economics and Business Administration Vienna

o Tvrdon, M.: Regulation of the labour market in the Czech republic, 2006. Working paper nr16/2006. Research centre for Competitiveness of Czech Economy. ISSN 1801-4496

o Verschuren ,P., Doorewaard, H.: Designing Research Project. 2nd edition, 2005. Utrecht: Lemma Publisher. ISBN 90-5189-707-3

o Wengel, J., Shapira, P.: Engineering: the remaking of a traditional sectoral innovation system. Published in Sectoral systems of innovation: Concepts, Issues and Analyses of Six Major Sectors in Europe. Franco Malerba, Cambridge University Press, UK, 2004. p. 243-286

o The Innovation Index: Measuring the UKøs investment in innovation and its effects, 2009. Index report November, 2009. NESTA

Websites:

- Basic indicators of businesses by CZ-NACE Subsection: official websites of Czech Statistical office [online]. 2008 [cit. 2009-09-07] available on: <http://www.czso.cz/csu/2008edicnplan.nsf/t/68004449F3/$File/8001081201b.pdf> .

- Jaroslav Jasanský, National Innovation Strategy of the Czech Republic: official websites of Ministry of Industry and Trade of the Czech Republic [online]. 2006-01-23 [cit. 2009-09-01]. Available on: <http://www.mpo.cz/dokument11662.html>.

- National Innovation Strategy of the Czech Republic: official websites of Ministry of Industry and Trade of the Czech Republic [online]. 2004 [cit. 2009-09-08]. Available on: <http://download.mpo.cz/get/27431/28899/315171/priloha001.doc>.

- Small medium enterprise definition: official websites of CzechInvest [online]. 2009-09-15 [cit. 2009-09-15]. Available on: < http://www.czechinvest.org/definice-msp>.g/definice-msp> .

- National Innovation Policies of the Czech Republic for 2005-2010: official websites of Ministry of Industry and Trade of the Czech Republic [online]. [cit. 2010-03-25] Available on: <http://www.mpo.cz/dokument4415.html>

- Strategy for Economic Growth: official websites of the Czech Research [online]. [cit. 2010-3-25). Available on: < www.vyzkum.cz/Priloha.aspx?idpriloha=13718>

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7. Supplements

Table 42 Public intervention tools and their impacts

Factor	Policy Tools	Impact
Degree of novelty	-Labour ó support of universities -Capital - loans -Governments ó IP, encouragement of collaboration -R&D subsidies, Subsidised loans, Grants for the companies, R&D tax incentives	-Not successful tool, the innovation more dependent on the firm culture, Reducing costs for companies
Networks among the actors **Source of knowledge**	**Firm level** Subsidies for hiring specialist, Training subsidies, Innovation management training and advice **System level** Research centres and universities support, Innovation brokers, Mobilisation of researchers, Legislative support, Networking support, Technological centres support, Public research support	-Decrease the lack of knowledge -Interaction between the private and public sectors -Interactions among the actors -Diffusion of knowledge among the actors -Increase and acceleration of the implementation of R&D results -Enforcing the basic research, -Researchersø education infrastructure -Support the product commercialisation -Identifying firms needs
Institutional setting	- Command, Control -taxes -tradable quotas -subsidies	-Support of positive social impact -Threat of hindering the projects because of the environmental reasons -Support of environmental projects -environment regulation (elimination of negative impacts) -enhancement of šgreen technologiesõ

Educational level	-new forms of the education including the PhD studies and their integration into the private sector -creation of the whole life education system and enhancing the whole life learning -increase the labour force for innovations (enhance the life sciences and engineering studies) -involving the employers and industries in the financial support -intermediaries bridges the gap between the supply and demand on the labour market -financial aid, distance learning, converting of working experience into the academic degree	-Sufficient educational level

Table 43 Degree of novelty answers

	Is the company implementing either process or product innovation?
A	product/process
B	product/process
C	product/process
D	product/process
E	product/process
F	product/process
G	product/process
H	product/process
	What is the degree of novelty of products/process implemented in the company during last three years:
A	"2 years ago the company has purchased the production line (which represented huge investment), which is considered as unique in the Czech republic, and rare in Europe. Since that time the company is investing in smaller innovations that are focused on meeting the changing requirements of the products. These small investments are considered as incremental.
B	"The innovation was determined by the lack of supplier for necessary element for the production. In last three years the company has invested into the new machinery, which enables better processing (cutting) of the materials necessary for the further production. This innovation is considered as radical, because it enabled completely new way of processing the material. The machinery is new for the company, and it is rare in the Czech republic, due to the high costs. Since that time the company has not been investing into the further innovations.
C	"The innovation implemented was not renewal of contemporary facility, but it was opening of completely new production of the car wires and components. The production is considered new for the company, but it is not considered as exceptional in the Czech Republic. The same production is in other companies, but we have found a demand on the German market. Since that time there were several additional innovative element required, in order to meet the standards and assure the compatibility.
D	"Concerning the innovation, it is combination of both. The innovation determined by firstly our needs (needs of our customers) and secondly by the state intervention. When implementing the Innovation it was determined by the need to decrease the costs, therefore replacing the old production line by a new production one, which enabled faster and more effective production of the same products. The innovation is new for the company, but it is not new in the Czech republic. For us it represented the decrease in costs, but did not result in launching new product on the market. The number of people has increased to minimum, and the output is higher. Since that time only 2 small incremental innovations, in order to meet the safety standards (garden machins).
E	"The innovations for us are determined by the life cycle of the product. The radical innovation in the history of the company is very rare. It is more the combination of both. The technology innovation is extremely expensive. Last radical innovation was concerning the new production line, which wills last 15 years. There are therefore just partial changes/modifications (incremental innovation) in order to modify the product proprieties (price, quality)and to meet the safety requirements se by the intervening institutions (will be mentioned in the section institutions).
F	"It is hard to determine the degree of innovation we have implemented. It is more or less the combination on both. We have implemented a production line, which enabled new way of doing the same product, with certain level of qualities, to meet the requirements of quality certificate. The process innovation has been considered as radical but the outcome innovation is not radical. The purpose of the innovation was ISO label. Since that time, only investments into the innovations related to the safety requirements were realised. As we are producing the cosmetics and dental hygienic, most of the innovations concerned safety standards.
G	"Last 3 years the, the innovation has been determined only by meeting the requirements. We have not implemented any changes,

	which would represent some radical change in the way of doing, or in the production effectiveness. The company has been investing only in the incremental innovations in order to meet the security requirements from the customers (which started to be very sensitive about the quality), as well as from the responsible institutions.
H	"Recently, the company has been investing only into the small/incremental innovations. All these are related to the institutional requirements: National health requirements. At this time, we are preparing a project, which would represent new line and enabled firstly the decrease in labour costs, but secondly enable the production of different products. But he related costs are too high, it is therefore necessary wait 2 or 3 years.
	What is the impact of contemporary public intervention (on the innovativeness in your company) concerning the degree of novelty?
A	"The new production opening was determined purely by the business potential ad by the customers' demand, not by any intervention. The only tools, which are pushing us to make changes, are the customerøs requirements and the standardisation, as we are supplying the components, it must be compatible with other producers. Further the innovations are enhanced by the ISO standards. Further the environment protection makes us to implement the innovations.
B	"Our innovation is not determined by the directions from the government, or by any effort. The investment into the cutting line, was driven by the demand and by the lack of supplier.
C	"The changes in the production processes are all based on the customers and our needs. The intervention from outside comes when the change in norms occurs. At that moment we have to establish the steps, to fit into the norms.
D	"We do not feel the effort to support the radical innovations in the company, but whether is an intervention to support the innovations taking the safety requirements in consideration. By the legislation, and by the norms setting, the incremental innovations are supported. As mentioned before, 2 incremental innovations have been done since the opening of new production, and these were done to meet the safety criteria. Ministry of environment, Work safety
E	"We do not perceive any effort, which would enhance us to increase the degree of novelty of implemented innovations. The government is trying to look like supporting, but in fact it is more contradictory. By the state interventions, the company must innovate even what is not necessary. Sometimes it feels lobbying (for example direction to store the products in slightly different packaging, which requires an innovation of the packaging machine"
F	"Regarding the novelty of the innovations, there is not a tool which would be impacting the company and enhancing to the higher innovativeness. On the contrary, the safety requirements are making us to make small incremental innovations.
G	"Actually we do not know about the tools supporting the radical innovation. Our production and therefore innovations are determined by the demand from our customers. They do not expect completely new products, but just improving of contemporary products. There are public interventions on the safety requirement, set by the institutions, but also by the customers. On the contrary there are not tools which would support us in meeting given criteria.
H	"The only effort we feel is that the legislations implementation of quality standards (it concerns the product modifications, product quality). The problem is that there are criteria set by the EU directives, but also the criteria set by the Czech legislation, which are not in all cases necessary.
	What would be in your opinion effective tool to support the innovativeness in the company with regards to degree of novelty?
A	"Of course that our main problem was financing. The investment was big and there is long return period. In the case of such project, the state should come up with a tool, which would enable the companies to reach a credit in the banks. There should a national agency which would be working like a guarantee for the credits for the projects with high degree of uncertainty, which is the case of the radical innovations.
B	Even though the business plan was promising the new product, it was too risky for the bank, and we met the problem to find a creditor. It caused a delay, and some state guarantee would be helpful
C	"Before the opening of the new production, we met a certain problems with the financing. The investment was considered as risky for the bank, because there is already the same production in the CR and the problem with the credit occurred, which delayed the project. As a helpful tool would be state guarantee for the project, which would eliminate the delays with the credit.
D	"Last 2 innovations were related to the safety norms, which are connected with certain investment which were not expected. It is clear, that the administration cannot cover all the costs related to the implementation of these changes. But to facilitate, or enhance, certain remits would be supporting. Concretely tax incentives or allowances. Innovation programmes specialised on the sector
E	"As I said, the new production line which was purchased represented a huge investment. This investment was financed partially by own resources, and partially by the loan. It would be helpful, if there would be any subsidy of the interest rates or some financial contribution. As mentioned, some (not all) of the safety requirements seem to me as a lobby, and do not make much sense to me. We would safe lots of money on these non sense requirements. The legislative requirements are extremely increasing costs, which negatively impacts the innovations.
F	With regard to the incremental innovation, the effective tools would be an increase in the skilled workforce, concerning the radical innovations, the financial support for example from the regional administration. The problem of radical innovations is the estimation of results which are not clear, but in order to get the financial support, the administration wants the result estimation. The effective tools would be a credit guarantee for new projects.
G	"With regard to the costs related to the innovations implementation and the volume of requirements set by the institutions, incentives would be a tool which would support the company. For example the tax incentives, which would ease the companies of the financial charge. Some of the innovations are related to the environment protection, the tax incentive would be therefore adequate.
H	"As mentioned, there are subsidies supporting innovative projects, but these are designed only for the projects that bring completely new product to the market. It would help, if there would be therefore some subsidies for the innovations related to the safety requirements. Contemporary subsidies are designed for launching new product or technologies, but not for institutional requirements.

Table 44 Institutional settings answers

	What are the institutional regulations impacting the innovations in the company (standards settings, environmental regulations etc?
A	As mentioned the environmental protections requirements (noise reduction, emissions, water cleaners), ISO requirements
B	Technical inspections of the Czech Republic, Ministry of Environment
C	Czech office for standards, metrology and Testing - interventions regarding the technical normalisation and implementation the norms resulting from EU membership
D	Association of Engineering Technology, Ministry of environment, Work safety - this is an obligatory collaboration to fit into the norms, very close collaboration with the customers (they are driving force), collaboration with the Associations of gardener
E	The National Institute of Public Health, Institute for State Control of Veterinary Biological and Medicines, State institute for the Drug Control
F	European chemicals agency - intervention about the use of chemicals, The National Institute of Public Health, State institute for the Drug Control, HACCP agency CR, ISO 9001:2000 consultation agency
G	State Labour Inspection Office (setting the labour safety requirements), Regional Labour Inspectorate, Ministry of Environment (REACH) control the authorisation of chemical products,
H	National health institution, State institute for the Drug Control, Ministry of environment (REACH)
	What are the impacts of these interventions?
A	they make us to implement new innovations to meet the criteria, which is increasing the costs (on the contrary for some of the requirements - emission decrease, there is direct financial support)
B	The implementation of new machine enabled us to meet some requirements (noise reduction, aluminium release) so there was not a necessity to implement additional innovations since the purchase of the cutting machinery. But normally these interventions are increasing costs, and sometimes even hindering the production
C	For us the impact is, that we must implement the moves in order to fit into the norms. As the main problem, are the huge costs?
D	Modification of the technological processes with regard to the norms
E	On the long time basis we are collaborating with institutions which are obligatory for us to get the certifications and registration, but on the contrary it is expensive for the company to meet their requirements. These institutions are barrier for the innovations. Another problem is the necessity to implement EU requirements and at the same time to implement additional Czech requirements. This is sometimes non sense
F	ECH is determining the chemicals that cannot be used - we must seek for the alternatives. ISO implementation were very costly, and required several changes. The main impact is huge increase in costs.
G	Their intervention is resulting in certain volume of innovation, which are given by the law and they do not bring the profit, and delay more radical innovations, exaggerated volume of safety requirements which requires the innovations that do not bring too much profit for us, but are costly. There are several tools designed to support the innovations, but these are not designed for the unprofitable innovations, that are just meeting the safety criteria. Contemporary impact delays our innovativeness
H	These interventions lead to the big number of innovations that lead to the quality improvement. Sometimes it seems that these are even non sense (some of them), which is for us money wasting and does not lead to the profit
	How could be in your opinion the interventions redesigned to facilitate or enhance the innovations in your company?
A	The financial support is provided only to some environmental requirement, but not to all of them. It would be helpful to get the support (at least in the form of tax incentives, or subsidies) even for the rest of the regulations, because they are extremely expensive.
B	subsidy program even for the innovations based on the environmental requirements
C	Financial support of the innovations related to the interventions.
D	decreased tax rate for the companies that are meeting the criteria
E	To unify the regulations, to prepare a set of regulations, to avoid meeting double regulations.
F	Direct financial support for the implementation of the quality standards, tax incentives
G	tax incentives for the innovations focused on the environment protection,
H	they sould be subsidised, or financial supported

Table 45 Knowledge source answers

	For the innovative and R&D activities, do you use during last three years:
A	internal and external R&D
B	external and partially internal R&D
C	external R&D
D	internal R&D
E	Internal R&D external R&D
F	external R&D
G	internal and external R&D
H	internal and external R&D
	If using the external sources, which one of following (if yes - specify):
A	source of knowledge from the customers- their needs are the basis for the knowledge development, collaboration with the high schools and universities (project support)
B	Supplier - purchase of the technology for cutting the material. We do not have any collaboration with the university and other educational institutions. Concerning the product development, it is being done internally. Environmental and standards institutions
C	Supplier - the supplier has provided us with the complete technology, customers - as mentioned we have found a space on the foreign market, and therefore w have adjusted the production to their needs. We do not use the results of public R&D. Czech office for standards, metrology and Testing.
D	supplier of the production line, customer (external firm for marketing), Association of Engineering technology, Czech office for standards, metrology and Testing (source of information to meet the norms), incubators and technology centres are not yet effective
E	customers, based on their requirements the internal research develops the required knowledge, competition-effort to observe what is the competitions doing cheaper in different quality, trade shows, suppliers-the suppliers are presenting the qualities of their products which might contribute to the development of new process, The National Institute of Public Health, Institute for State Control of Veterinary Biological and Medicines, State institute for the Drug Control
F	University-three times we have ordered a project, customers - the source of information about the market demand, the product qualities and requirements are determined by the users, suppliers - if the supplier changes the qualities of the products, it enables us to change the quality as well, other companies - we are trying to trace their trends (the price policies, the quality development), European chemicals agency The National Institute of Public Health, State institute for the Drug Control, CR, ISO 9001:2000 consultation agency
G	institutions, Association of the Chemical industry (legislative and technical info), Czech association of detergent producers customers (define the innovations in the terms products improvements), competition (we are watching what are they doing), suppliers, customers
H	as the source of knowledge for dealing with the safety and quality, we use the directives which are sometimes clear enough, or we used the directives to develop the process change, that would meet the criteria, regional university (when we need, we contact them to elaborate a study) further we use the knowledge from the publications, trade shows, suppliers
	Is the appropriate knowledge necessary for the innovation implementation accessible?
A	yes
B	yes, but it is expensive
C	As I said, the complete technology was purchased from the suppliers. It was therefore easily accessible, but it was very expensive
D	the knowledge is developed by ourselves, and we have no problem with developing the technology to meet the requirements
E	no, we have contacted universities with a special request and they did not accept the proposition to develop the required knowledge for us
F	The problem is that the universities are very slow, they have a very inflexible time framework
G	yes
H	yes
	Do you consider the knowledge generated by these actors as adequate for your company?
A	yes, and if not the universities react on our demand (project elaborated in the thesis)
B	we have purchased the technology which was made-to-measure for us, so it is perfectly compliant with our needs
C	yes
D	None of public R&D institutions develops knowledge related to our production
E	the knowledge developed by the public research are not relevant for us, our products are too specific
F	Well, our production is not specific, there are more companies operating in the same field, that means that the demand was high and the universities have focused on our specialisation
G	no
H	yes, and if not, we contact the university with special request

	What is the impact of contemporary public intervention (on the innovativeness in your company) concerning the knowledge source?
A	the state is supporting the universities and educational institutions, and we have a good collaboration with them, so for our innovativeness it has positive outcome
B	as we have purchased the machinery from a supplier, we do not perceive any impact of public intervention
C	we are not impacted
D	At this moment we have got the subsidy for the R&D which decreases the costs on the R&D group.
E	the public R&D is being supported by lumps sums, which does not push them to react on the demand from the companies side
F	The universities are financed by the state and they do not need to be profitable, therefore commercialise their products.
G	the association are financed by the state, they provide us the background and information
H	the universities are financed by the state, and they generate the knowledge, on the contrary we use the knowledge from the publications, which is shared
	What would be in your opinion effective tool increasing the innovativeness in the company to concerning the knowledge source?
A	support of the knowledge sharing, which would lead in competitiveness decrease, but on the contrary it would accelerate the R&D
B	no idea
C	In the case we have a need of an extra knowledge, we would contact university with a proposition (in the form of study project, diploma thesis/internship) to work up a project. We are willing to share the costs, but by the return, tax incentives would be a tool
D	specialised projects for the sector
E	In my opinion it would be productive, if the universities and public R&D in general would be financed based on the results. The companies would be willing to contribute to the research (financially).
F	If the universities would be financed based on the flexibility and based on the results they perform, the knowledge development would become more effective.
G	the financial support for the market research
H	1) univ. and other public research should be more oriented toward the commercialisation there are lot of findings which are easily shared, 2)or there are basic findings which are sold abroad where there are further developed and lead to the profit over there and does not bring profit to local companies

Table 46 Network among actors answers

	In the frame of the R&D, do you collaborate with following actors during last three years (if yes ó specify):
A	other companies - there is a trend not to collaborate at all, the collaboration with other companies is sometimes resulting in the customers take over, together with other companies the solutions and steps to be taken are found with the university (thesis supervision and they provide us external laboratories in the case of needs, but it must be paid), very important are the relations with the customer (they are even willing to share the R&D costs to get the good quality product/component), relations with the suppliers
B	we have quite close collaborations with our customers, because we are together working on the product development, and we are adjusting the production based on their needs. Further we collaborate with the suppliers, because they are determining our production. Technical Inspection of the Czech Republic
C	Regional university, thesis supervision, but not the internships. Confederation of industry of the CR (definition of the common realisations of the EU requirements, customers
D	Association of Engineering Technology, Ministry of environment, Work safety - this is an obligatory collaboration to fit into the norms, very close collaboration with the customers (they are driving force), collaboration with the Associations
E	we are collaborating with the customers (via the research agency) we are seeking for the customers need, further we are the member of different associations (for example we are member of aerosol association) and together we are seeking the solutions and steps to be taken when trying to change the legislation. Further we are collaborating with the chamber. We do not collaborate with universities in order to get the knowledge, because as mentioned we are too specific for them, and they do not need to become profitable. Next the relations with the suppliers, they provide us with the information about the products which determines the innovations. We never purchase the IP, we develop our own.
F	University (people from our R&D provide the lectures at the faculty, further we provide the thesis supervision), customers, suppliers, ISO 9001:2000 consultation agency
G	State Labour Inspection Office, Regional Labour Inspectorate, Ministry of Environment (REACH) , Association of the Chemical indusrtry,Czech association of detergent producers - these collaborations are obligatory in order to meet th requirements, collaboration with the customers is the source of innovation with regard to the product differentiation
H	with the institutions we are collaborating on the level of meeting the criteria, we collaborate a lot with the customers which are determining the product qualities, university
	What is the impact of contemporary public intervention (on the innovativeness in your company) concerning the network among the actors
A	I do not know about this
B	we do not perceive any
C	We wanted to establish a relation with the regional university. The aim is not to get the knowledge, but to specialise the students with a possible contracts. contemporary there is a complicated administration related with the collaboration with the schools, it is administratively even impossible to have a relation in the forms of internships and projects
D	no, I do not know about it
E	we do not see any support of the relations among the actors and if there are, it is just money vesting
F	All the relations with mentioned actors are from our own initiative, there is not a public intervention. Only that the universities are supported from the state budget, it makes them obligatory to collaborate with us.
G	concerning these state institutions, the collaboration is obligatory for us, because we are obliged to meet the safety requirement, regarding the collaboration with the customers, there is not any public intervention, while the relation with the customers bring us the profit, the association financed by the state and associate the chemical companies in their efforts to modify the legislation, or regulate the volume of requirements, and provide kind of knowledge
H	there is only interventions in innovations regarding the safety, but there is not enough effort to connect for example the companies with the universities, which would be positive for the innovations
	What would be in your opinion effective tool increasing the innovativeness in the company to concerning the networks among the actors?
A	does not know
B	with those we need we have good relations
C	Facilitations of the complicated administration, which would support the internships and the specialisation of students/apprentices
D	1) intermediate agency which would actively contact the companies and invite them into collaborations with the public R&D and which would 2)come up with the concrete project. The aim of the agency would be also to 3)define the sectors needs.
E	1) to change the legislation about the university education and implement the internships, support of the diploma thesis writing in collaborations wit the cluster, 2) to support the option of the chair groups to collaborate with the companies 3)change the legislation and integrate the representatives of the clusters into the board of the directors of the universities and other research institutions, 4) support of the workshops 5)support of the lectures (people from the cluster) at the universities
F	No idea
G	no idea
H	1) change of the system of financing the universities, if the universities would have to become profitable, they would start to collaborate with the private sector much more I guess, 2) there should be an agent, which would invite the companies to collaborate with other actors

Table 47 Educational level answers

	Do you get the skilled workforce from the collaborations with the universities?

A	yes, we are presenting the company at the faculties, we are doing the thesis supervision. We are also attracting student (we provide them scholarship during their studies) in order to establish a contract in the future
B	with collaboration with both, the universities as well as the high schools
C	Yes, we would like to have more internship, but it is rarely possible. We are therefore doing the thesis supervision
D	I collaborate with the technical faculty of agricultural university (we are supervising the thesis, and provide the students our laboratory to carry out the research), based on this we establish future collaboration
E	yes, we make a presentations at the universities, we are presenting our company and opportunities to write the thesis
F	yes, we are trying to attract the student already during their studies (thesis supervision)
G	not collaboration, but we are providing the advices for the student thesis (eventually supervision) which is mostly resulting in future collaboration
H	no
	Is it difficult to find skilled workforce?
A	it is not, there are sufficient number of the machinery faculties and specialisations
B	contemporary there is no problem, but two year ago, there was a huge lack of the skilled workforce, especially those with the university degree
C	It is, there is a lack of absolvent of technical faculties, and they do not want to come to our region. It is slightly better nowadays, but couple of years ago, it was really difficult to find right people.
D	it is difficult to find skilled workforce with experience
E	it is not difficult to find people having required degree of education in the related field (masters from the chemical faculty and biological faculty)
F	With regard to the high school absolvent, there is a bad infrastructure - huge lack of apprentices. Concerning the university absolvent, the situation is better; we do not need such a big number of employees with the university degree.
G	no
H	It is not, but the students lack the practice. At least concerning the university absolvent, they have lack of practice. The high schooløs student have more practice
	Do the universities provide relevant education?
A	The knowledge obtained at the universities is quite good, but there is an enormous lack of practise. The student are possessing good theoretical knowledge, but there is a lack of practise. The universities are providing good theoretical framework, but the students specialise by the practise
B	for us, both universities and high school provide lab or force with inadequate knowledge, the graduates do not have our specialisation, they have only theoretical skills, but they are absolutely lacking the practical skills
C	That is the problem, as mentioned, there is lack of people, and if we find some, the have no specialisation which would meet our requirements. It takes time, to specialise them.
D	no, we are too specialised and the university provides the students only general knowledge
E	These people are having general overview, but on the contrary they must learn a lot to be able to work in our R&D. At the same time, we can change the evolution in the the knowledge, contemporary absolvent are better equipped with the languages, they have experiences from abroad, they are more self-confident, which is producing positive externalities for us, when developing the knowledge within our R&D.
F	As I said, we do not have highly different specialisation, the student from the faculty have a good knowledge, which is deepened during the thesis elaboration.
G	yes, for our production, the students get good background
H	For us yes
	Do you need stronger relations with universities in order to get qualified stuff?
A	no
B	we would appreciate closer collaboration with schools, we would appreciate the possibility of the internships
C	We would need to have stronger relationships in order to specialise people. In the study program, there is no space for the further specialisations. The study programmes are not flexible.
D	should be stronger, firms should contribute to the design of the study programs
E	we are already having the collaboration with the universities, students are writing the thesis with our collaboration with an opportunity to work for us in the future (in the case of both side satisfaction)
F	The relations are ok now.
G	no
H	no
	What is the impact of contemporary public intervention (on the innovativeness in your company) regarding the educational level?
A	the state is supporting the high schools and the universities, and the student have solid knowledge, but it takes time to specialise them
B	there is a complicated administration with the practise, we wanted to open internship vacancies both for university student as well as high school student, but the administration was too complicated and made it impossible
C	the main problem is, that the public intervention (or more administrative setting) does not allow us to specialise the student before obtaining the diploma. If we get the fresh graduate, it takes time to specialise him. If there would be space for the

	practical education even of the university students, it would shorten the period.
D	lack of experience with the new employees
E	It is similar as in the question about the knowledge. The universities do not have to be profitable, and they rarely react on the market demand.
F	We are lacking the apprentices. The universities are providing sufficient number of graduates.
G	we are not lacking the labour force, so the impact is positive
H	The impact is, that if we hire a fresh graduate, it takes time before he get the experience. On the contrary nowadays student are well equipped with other skills than the knowledge related to the chemicals. They are more competitive, creative, they have experience from abroad which brings of course innovative ideas.
	Which public intervention would in your opinion increase the innovativeness in the company with regards the educational level?
A	very useful tool would be establishment of the internships (for both universities as well as the high schools) which would shorten the period of the employees specialisation
B	to facilitate the internships administration,
C	1) Improvement of the study condition at the technical specialisations - improvement of technical conditions, support the students (scholarships), necessity to increase the interest to study the technical faculties. 2) Further the support of the internship - financial support, administrative support. 3) Establishment of an agency, which would observe the market needs. This agency would collaborate with the ministry of education for example, and they would make a change of the contemporary system (accreditation of new specialisations) or make the system more flexible
D	Firms (clusters) should contribute to the design of the study programs, there should be an obligatory internship (at least 3 months) on both levels of the university studies (bachelor, master)
E	The Czech system of education should be restructuralised. As mentioned there should be support of the internships (tax incentives, or subsidy of the internship remuneration) . Further the state should eliminate the escape of the people to other fields.
F	Increase the number of chemical high schools.
G	I think that the Chemical association could more investigate the weak of the chemical education and start negotiate with the universities and high schools, and should contribute to the study programs design
H	

Table 48 Barriers to the subsidies answers

What was the main barrier to the innovative support with regard to:						
	Degree of novelty	Institutions	Knowledge source	Networks in the sector	Educational level	Other
A	0	**0**	0	**0**	0	**they do not know, seems that there was an unknown mistake in the application, lack of policy transparency**
B	0	**0**	0	**only suppliers and customer**	lack of MSc at the time of application	**financial health**
C	0	**0**	0	**0**	0	**the bank first refused the credit, which caused the delay in the application, the subsidy therefore refused, the loan accepted later on**
D	effective production, but not new product	**0**	0	**only suppliers and customer, we do not have the links with the public R&D**	0	**business plan**
E	completely new production line, economic savings, not big changes on the product	**0**	0	**0**	0	**they were awarded but did not meet the criteria after**
F	quality improvement, radical production innovation, not product	**0**	0	**0**	0	**procedure to reach the innovation subsidy is complicated and byrocratic, and it is targeted to bigger companies (because of the degree of novelty), the lack of finance and the innovation of lower degree was the barrier to the innovation**
G	nly incremental innovations, resulting in non economic profit (environemental)	**0**	0	**lack of links**	0	**0**
H	only incremental innovations	**0**	0	**0**	0	**financial health**

How could be in your opinion the innovative support procedure redesigned to facilitate or enhance the access to the financial support?				
	Degree of novelty	**Institutions**	Educational level	**Other**
A	0	**0**	0	**make the policy transparent, give the companies the feedback, to enable mistakes elimination in the future**
B	0	the criteria assess the relations with the public R&D, which we do not have, the knowledge is purchased from the supplier	release the criteria from the assessment, the employees with the university degree are equal to the employees with the practical experience	less stricter financial health assessment
C	0	**0**	0	**Change in the procedure, to avoid excluding the project with delayed loan from the game. The project was considered as risky and the credit approval had been delayed. For the project, that estimate economic profit, to change the procedure and not to pay the money back.**
D	not to take the degree of novelty in consideration, take the economic profit	**to exclude this criteria from the assessment, the fact that we do not have collaboration with the university does not say about the innovativeness**	0	**We have not use an intermediary agency, which would make the application for us, next time we will do so. In my opinion, the companies, that have used this intermediary were successful, because they wrote a good business plan for them**

E	not to assess the degree of novelty, but the economic profit	**0**	0	The company was awarded by the subsidy, but two years after decided to return it back. the company did not meet certin criteria of the business plan. Investment did not bring estimated economic profit. It is the question, whether this information was complete, or whether there is something else hidden.
F	the subsidy should be designed also project that improve the product quality,	**0**	0	the administrative facilitation
G	support of incremental innovations	not to assess the links within the sector	0	0
H	to support also incremental innovations	**0**	0	0