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REGIONS OF KNOWLEDGE 2**

**MIRIAD:
Managing and Infusing Research Investment
And Development**

Project Participants

Partic. Role	Partic. no.	Participant name	Participant short name	Country	Date enter project	Date exit project
CO	1	University of Sheffield Management School	USFD	UK	1	24
CR	2	South East European Research Centre	SEERC	Greece	1	24
CR	3	Chamber of Commerce University Istanbul	ITICU	Turkey	1	24
CR	4	University of National and World Economy Sofia	UNWE	Bulgaria	1	24

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1. Introduction

This report constitutes deliverable 5.1 of the MIRIAD project. The report comprises analysis of data obtained from structured interviews and focus groups across the MIRIAD regions. The MIRIAD project partners used a method of a structured interview to gather relevant data on knowledge supply and organised focus groups in order to obtain further information.

The structured questionnaire was designed by the coordinators - who lead this workpackage - and which was approved by the consortium. The questionnaire was divided into 3 sections: Knowledge Assets, Knowledge Transfer and Barriers and Future support. A copy of the questionnaire is enclosed in the Appendix of the report (in general, interviewees were asked to respond to questions on a scale of 1 to 9). The key aim of the questionnaire was to gain an understanding of how the knowledge generating and transfer supporting organisations in particular region can help improve the performance of firms in the region. We were particularly interested in how the knowledge creation institutions operate in the region where they are based.

The individual reports provide an overview of knowledge creation, knowledge sources, knowledge transfer to firms and barriers and policy issues that need addressing across four regions from the perspective of knowledge suppliers and transfer institutions.

The deliverable consists of the following:

- Benchmarking Regional Knowledge Supply and Transfer in Yorkshire and Humberside
- Benchmarking Regional Knowledge Supply and Transfer in Central Macedonia and Thrace
- Benchmarking Regional Knowledge Supply and Transfer in Thrace Turkey
- Benchmarking Regional Knowledge Supply and Transfer in South and East Bulgaria

2. Benchmarking Regional Knowledge Supply and Transfer in Yorkshire and Humberside

The section presents the analysis of the knowledge supply in the Yorkshire and Humberside region. In our respective region we have targeted a variety of higher education institutions, which earlier deliverables have shown to be the key knowledge generating institutions within the region. Data was gathered by a method of a structured interview and a focus group organised to gather further information from knowledge transfer organisations. Interviews were undertaken with representatives of the knowledge transfer offices from eight of the higher education institutions in the regions, which covers all the leading research-based universities in the region. The representatives were able to systematically respond on behalf of the range of the knowledge transfer initiatives they are coordinating with their institution. These representatives were also invited to attend a more open focus group, along with representatives of the individual HEI-based initiatives. The questionnaire was divided into 3 sections: Knowledge Assets, Knowledge Transfer and Barriers and Future Support. The aim of the conducted interviews was to gain an understanding of how the knowledge generating and transfer supporting organisations in Yorkshire and Humberside can improve the competitiveness of firms in the region.

The analyses of the data are divided into three sections:

- Section 1 focuses on questions around knowledge assets, knowledge creation and knowledge sources.
- Section 2 examines the data on knowledge transfer to external resources within and outside of the region and interaction with businesses.
- Section 3 focuses on barriers that hamper knowledge transfer and policy issues that need addressing.

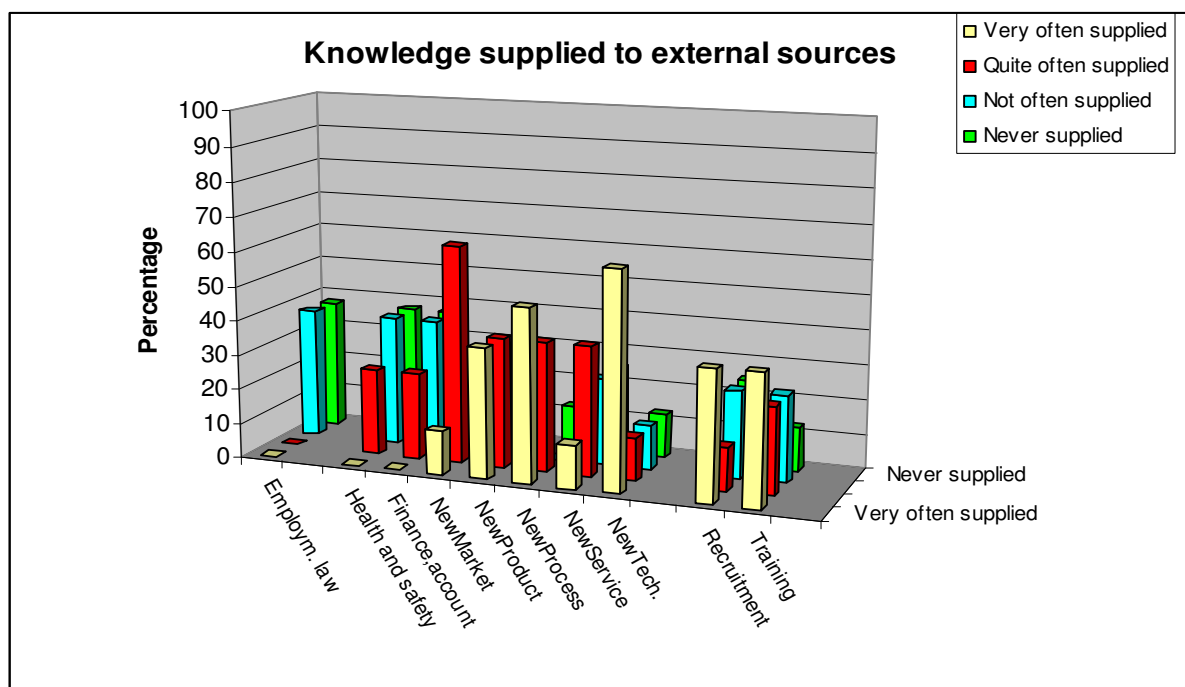
The higher education institutions in the Yorkshire and Humber are organised in a more formal organisational constitution within the region. The Yorkshire and Humber region has the White Rose Consortium and the Yorkshire and the Humber association, and they both represent different facets of higher education regional relationship. The White Rose Consortium was set up between the three most research-intensive universities University of Sheffield, York and Leeds.

2.1. Knowledge Assets

This section focuses on data analysis of knowledge assets and intellectual capital that resides within higher education institutions in the Yorkshire and Humberside region. The data in this section are divided into five groups: Types of Knowledge, Intellectual Assets, Importance of Academic Disciplines in knowledge creation process, and Sources of Knowledge and Human Resources.

We have tried to map out how often the intellectual capital and other recorded resources available within the organisation are supplied to the sources outside the institution. Table 2.1 presents the data on various types of knowledge, which are supplied to the external organisations. From the frequencies obtained it is evident that new technology is the most frequent knowledge supplied to the external stakeholders (62.5%) together with new process developments (50%). This is followed by the new product development and then by recruitment/skilled labour and training, with 37.5% for each category. Knowledge on new market developments is supplied quite often (62.8%), and this is followed by IT and business support knowledge (57.1%).

Interestingly, knowledge on employment law, health and safety advice, finance and accounting is not often supplied to the external sources. Procurement is the only type of knowledge, which is never supplied to external bodies.



According to the focus group discussion for many SMEs undertaking training and/or accessing support with universities is the most valuable form of knowledge transfer and major source of information on new ideas, equipment, products and processes.

Table 2.1 – Types of knowledge supplied to external sources

	Very often supplied	Quite often supplied	Not often supplied	Never supplied
Employment law	0.0	25.0	37.5	37.5
Health and safety advice	0.0	25.0	37.5	37.5
Finance, accounting and auditing	0.0	25.0	37.5	37.5
New Market development	12.5	62.8	12.5	12.5
New Product development	37.5	37.5	12.5	12.5
New Process development	50.0	37.5	0.0	12.5
New Service development	12.5	37.5	25.0	25.0
New Technology	62.5	12.5	12.5	12.5
Recruitment or Skilled Labour	37.5	12.5	25.0	25.0
Training	37.5	25.0	25.0	12.5
Procurement of inputs	0.0	0.0	71.4	28.6
IT development/support	14.3	57.1	28.6	0.0
General business support	25.0	57.1	0.0	12.5

Table 2.2 presents data on institutions' intellectual assets, their importance and effectiveness in relation to knowledge transfer. The outcomes highlight the fact that three types of assets (market knowledge, training programmes and website) are more important than effective, and therefore not utilised effectively in regards to knowledge transfer. Specifically the training programmes are very important for institutions but the percentage difference (22.83%) highlights the fact that they not efficient and presumably do not meet the requirements of the external sources. Two of the assets process manuals and copyrights are more effective than important, suggesting that they are utilised more efficiently than it is necessary for the organisation. Patents and IT facilities are equally important as effective suggesting that they are utilised effectively.

Table 2.2 – Intellectual Assets

	Importance	Effectiveness	Percentage Difference
Patents filed	5.38	5.38	0.00
Copyrights held	4.25	4.38	-3.06
Market knowledge	6.00	5.63	6.17
Process manuals	3.25	3.71	-14.15
Training programmes	6.00	4.63	22.83
Website	4.88	4.25	12.91
IT facilities	5.00	5.00	0.00

Table 2.3 – Importance of Disciplines for Knowledge Creation

	Importance
Biological sciences	6.50
Medicine and dentistry	4.88
Computer science and information systems	6.75
Engineering technology	7.50
Mathematical sciences	5.75
Business and administrative (e.g. logistics)	6.25
Physical sciences	5.88
Agriculture	2.75
Architecture, building & planning	5.13
Other	Humanities, criminology, animal and plant sciences

Table 2.3 documents that the academic disciplines are of a high importance for knowledge creation within each institution. In total, 7 out of 9 academic disciplines were given importance higher than 5. The highest importance is given to engineering & technology with an average score of 7.50, this is followed by computer science

(average score 6.75), biological sciences (average score 6.50) and business & administration with average score of 6.25. Agriculture is the least important amongst other disciplines with respect to knowledge creation. Within the other disciplines, a high importance was given to humanities (but this relates to the research focus of the particular institution), criminology, animal and plant sciences.

Table 2.4 maps out the sources of knowledge for the research institutions. The obtained scores document that knowledge is more often sourced within the Yorkshire and Humberside region rather than outside the region, with the exception for large private sector firms, which are based outside the region and spread out across the country. Not surprisingly the universities within the region, as well as outside, are the most frequent institutions for sourcing and obtaining knowledge (average score 8.33). This is followed by professional networks within the region (with a score of 7.17) and the public sector organisations (with a score of 7.14). The high score highlights the fact that the knowledge creation institutions source knowledge within their own or closely related sectors. The relatively low score of SMEs (5.67 & 5.83) and large private companies (5.67) emphasises the fact that they are not considered to be an important knowledge source for the higher education institutions neither within the region nor outside. Universities also source knowledge ‘worldwide’ from all the listed stakeholders. Interestingly, small private firms in the US are an important source of knowledge for higher education. Other significant sources are international organisations within the EU and universities located in the North-West part of the UK.

Table 2.4 – Sources of Knowledge

	Within the Region	Outside the Region
Small private sector firms	5.67	4.50
Medium sized private sector firms	5.83	5.00
Large private sector firms	5.67	6.50
Public sector organisations, such as government business support agencies	7.14	5.00
Private sector organisations, such as private training or research providers, and consultants	5.29	3.50
Universities or other higher education institutes	8.33	7.00
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	7.17	4.00
International Organisations/Donors	2.67	6.33

In relation to the capacity to create and transfer knowledge in the area of Human Resources, Table 2.5 highlights a similar pattern to the D4.2 results, where a majority of the assets are more important than effective. Staff and employee's competences, problem solving capacity, employee's skills and experiences and their project management skills seem to be of a higher importance than actually what their employee's possess. However, 6 out of 12 assets (management commitment, employee's strategic skills, employee's leadership skills, mentoring skills, teaching skills, knowledge of specific markets) are more effective than necessary for the competitiveness, suggesting also that employee's possess higher qualifications or skills than needed. The high percentage difference of management commitment (-49.91) highlights the fact that the asset is far more effective than necessary for the institution. Only staff employee consulting skills seem to be used effectively.

Table 2.5 – Human Resources

	Importance	Effectiveness	Percentage Difference
Staff/Employee skills	8.57	8.14	5.02
Staff/Employee competences	8.71	8.00	8.15
Staff/employee experience	8.57	8.29	3.27
Staff/Employee problem solving capacity	8.71	8.29	4.82
Staff/employee teaching skills	7.71	8.14	-5.58
Staff/employee knowledge of specific markets	7.43	7.71	-3.77
Staff/employee consulting skills	7.29	7.29	0.00
Staff/employee strategic skills	6.57	7.43	-13.09
Staff/employee leadership skills	6.43	7.00	-8.86
Staff/employee development skills	7.29	7.00	3.98
Staff/employee project management skills	8.29	7.71	7.00
Staff/employee mentoring skills	6.43	6.86	-6.69
Management commitment	5.43	8.14	-49.91

2.1.1 Summary

The results obtained in this section highlight the fact that higher education institutions frequently supply a wide range of knowledge to external sources, however new technology and new processes development are most frequent types of knowledge supplied to external stakeholders. More specific knowledge such as employment law, health and safety advice, finance and accounting is not often supplied and procurement is never supplied onto external bodies which suggest that these areas should be improved. Higher education institutions in Yorkshire and Humberside rate knowledge in the scientific disciplines far higher than the SMEs sector, giving a high score to engineering and technology, computer science, biological sciences. Higher education institutions seem to source knowledge within their own sector or public sectors rather than sourcing it from SMEs. There is a scope for improvement and bridging the gap between SMEs and higher education. From the focus group session it became apparent that the Knowledge RICH initiatives (discussed in Work package 2) could act as a facilitator in this process.

2.2. Knowledge Transfer

The second section of this report focuses on knowledge transfer from the knowledge generating institutions onto other stakeholders within the Yorkshire and Humberside region and interactions with business orientated organisations.

Table 2.6 documents the importance and effectiveness of routines and practices with regards to the institutional capacity to transfer knowledge to firms within the research region. Data shows that e-library subscriptions (a score of 4.86), as well as communication with beneficiaries (6.38) and other service providers (6.13) are important practices but less effective and need to be improved in the future. The data documents that three of these practices process manuals, training materials and customer project materials are more effective than important suggesting that they are not utilised efficiently to gain the maximum value. Forums for solving problems are utilised effectively as their importance and effectiveness is rated equally high, suggesting that they engage efficiently with the business world.

Table 2.6 – Practices and Routines

	Importance	Effectiveness	Percentage Difference
Process manuals	3.88	5.29	-36.34
Training materials	5.71	6.14	-7.53
Customer project materials	6.00	6.17	-2.83
Library	5.00	4.86	2.80
e-library subscription	4.86	4.43	8.85
Forums for solving problems	5.38	5.38	0.00
Communication with beneficiaries	6.38	6.13	3.92
Communication with other service providers	6.13	5.63	8.16

The finding from Table 2.7 highlights the fact that external relations are of a high importance, however none of the factors is used effectively to maximise the value. The high scores across the categories document that universities emphasise the importance of external relations, however the percentage difference across the categories suggests that universities need to focus on improving their effectiveness. The most important factors are the client's satisfaction together with relationships with beneficiaries and collaboration with other providers, with an average score of 8.88.

Table 2.8 highlights the fact that the scientific disciplines are again highly rated in relation of knowledge transfer to external organisations. Within the listed disciplines engineering and technology are the most important disciplines of knowledge transfer (with an average score of 7.25), followed by the computer science (a score of 6.63) and business and administration (a score of 6.0). Within the other disciplines a high importance was given to humanities (but again this relates to the focus of the particular institution), criminology, animal and plant sciences.

Table 2.7 – External Relations

	Importance	Effectiveness	Percentage Difference
Reputation of your organisation	8.75	7.38	15.56
Presentation of your services	8.75	7.25	17.14
Knowledge of your organisation's role(s)	8.75	7.75	11.43
Satisfaction of client/customer/partner	8.88	7.50	15.54
Responsiveness to beneficiary demands	8.50	7.25	14.71
Relationships with your beneficiaries	8.88	7.50	15.54
Relationships with other providers	8.75	7.25	17.14
Collaboration with business to innovate	8.63	7.75	10.20
Collaboration with other providers to innovate	8.88	7.50	15.54

Table 2.8 – Importance of academic disciplines for knowledge transfer

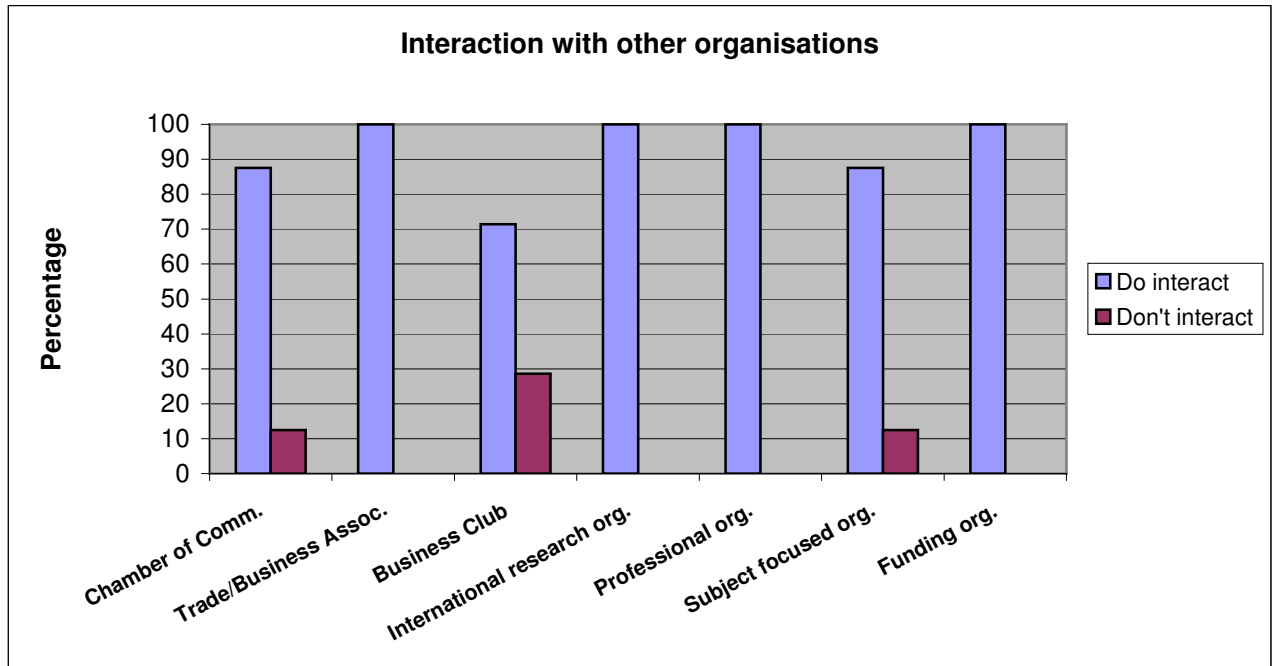
	Importance
Biological sciences	5.88
Medicine and dentistry	5.00
Computer science and information systems	6.63
Engineering technology	7.25
Mathematical sciences	5.13
Business and administrative (e.g. logistics)	6.00
Physical sciences	5.63
Agriculture	2.86
Architecture, building & planning	5.38
Others	Humanities, criminology, animal and plant sciences

With regards to knowledge transfer to different stakeholders within and outside the region, Table 2.9 documents that knowledge is very often transferred to small and medium private sector firms within the region, with an average score of 8.14. This is followed by the higher education sector (a score of 7.25), large private firms (6.86) and then by public sector organisations (6.25) within the research region. Interestingly, knowledge is quite often transferred to SMEs and to large private companies outside of the region (scores 7.25 & 6.50). The findings suggest that there are high levels of interaction with respect to knowledge transfer between the higher education sector and other stakeholders not only within the region but also outside the region. The higher education institutions supply knowledge also worldwide to all the listed stakeholders, to small private sector firms in the USA, to international organisations within the EU and to universities located in the North-West part of the UK.

Table 2.9 – Knowledge Transfer Supply

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	8.14	7.25
Medium sized private sector firms (50- 249 employees)	8.14	6.5
Large private sector firms (250+ employees)	6.86	7.25
Public sector organisations, such as government business support agencies	6.25	4.75
Private sector organisations, such as private training or research providers, and consultants	5.50	4.25
Universities or other higher education institutes	7.5	6.75
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	6.12	3.67
International Organisations/Donors	4.00	5.67

Table 2.10 documents a very high level of interaction between the higher education sector and other business organisations and networks. The higher education institutions interact mainly with trade or business associations, international research organisations, professional and funding organisations (100%). However, they seem to interact slightly less with Chambers of Commerce and Business Clubs or subject focused organisations. The evidence suggests that collaboration in regards to knowledge transfer is evolving through business orientated networks and other intermediaries within the region.

**Table 2.10 – Interaction with other stakeholders (%)**

	Yes	No
Chamber of Commerce	87.5	12.5
Trade or Business Association	100.0	0.0
Business Club	71.4	28.6
International research organisations	100.0	0.0
Professional organisations	100.0	0.0
Subject focused organisations	87.5	12.5
Funding organisations	100.0	0.0

In relation to the importance of interaction, from Table 2.11 it is clear that higher education institutions mainly focus on developing contacts with firms (a score of 8.75) and on knowledge sharing with other business orientated organisations/networks (8.63). Knowledge sharing and founding common grounds form the basis for developing collaboration across the sectors. Developing trust between research providers and companies (a score of 8.63) seem to be very important for universities. This finding, where all aspects of interaction were given a high score, suggests that higher education sector plays a very active role in developing relationships and forming collaboration with different business stakeholders.

Table 2.11 – Importance of Interaction

	Importance
Developing contacts with firms	8.75
Developing other service provider contacts	7.36
Improving university-business relations	7.86
Sharing knowledge with other members	8.63
Developing trust between research providers and companies	8.63

2.2.1. Summary

Higher education institutions need to focus on improving external relations and gaining higher efficiency across all the factors. The findings highlight the fact that the communication needs to improve as it is not as effective as it ought to be. Some of the practices such as process manuals, training materials and customer project materials are more effective than important, therefore not utilised efficiently. Knowledge is often supplied to SMEs and large private companies within the region as well as outside of the region. The universities seem to interact with various business organisations and developing the contact with firms seems to be of a high importance. With regards to knowledge transfer there is relatively high interaction between higher education institutions and other stakeholders.

2.3. Barriers and Future Support

This section of the report examines the data on barriers that hamper knowledge transfer from the creators to the external stakeholders within the region. It also examines the policy areas which need further addressing.

From Table 2.12 it is apparent that the higher education sector faces three significant barriers concerning knowledge transfer. The main barrier is a lack of the financial resources available for knowledge transfer (a score of 6.38), which is closely followed by a lack of time (a score of 5.88) that the higher education institutions can devote to this activity. The third barrier is a lack of demand from local firms (score of 5.63), which suggests that more needs to be done on business side to stimulate the demand. Clearly there is not enough interest from businesses in knowledge that is created by the higher education sector and not fully utilising the opportunities for knowledge transfer. The remaining barriers do not seem to be a large obstacle for knowledge transfer as their average score is below 5. The knowledge creation institutions seem to have relevant management acumen and skills and receive enough support from the public sector. They are able to identify the opportunities for collaboration and do not

face major difficulties when undertaking market research. The relatively low score of a lack of contacts with the business world (2.25) suggests that the interaction between both sectors is happening, however knowledge transfer does not seem to be very successful.

Table 2.12 – Barriers to knowledge transfer

	Importance
Lack of demand from local firms	5.63
Lack of time to contribute to such activities	5.88
Lack of finance/budget to reach many firms	6.38
Lack of management acumen and skills	3.75
Lack of support from the public sector (based on your experiences)	3.67
Difficulties in undertaking market research to identify opportunities for collaboration	4.86
Lack of contacts in the business world	2.25

Table 2.13 documents that firms/organisations within the region do not have access to relevant networks with respect to knowledge acquirement. Access to suitable finances and relevant collaborators are significant barriers for firms and hamper their competitiveness. Interestingly, firms do not seem have an access to the relevant collaborators within the region which suggests that the firms are either not aware about the knowledge creation institutions or relevant knowledge is not created in the region. In essence, demand and the supply do not seem to meet.

Table 2.13 – Barriers to knowledge creation faced by firms

	Importance
Access to relevant networks	6.00
Access to relevant collaborators	5.57
Inapplicability of knowledge created by others in region (e.g. universities, other companies or existing networks)	4.28
Quality or applicability of available business support or advice	4.29
Access to suitable finance	5.86
Access to skilled labour	5.43
Access to suitable training	4.86
Access to suitable equipment or plant	4.50

When looking into the policy issues (Table 2.14) the results suggest that the focus for policy makers should be on creating access and opportunities for training and workforce development (75%). 62.5% of respondents suggest that there is a need of creating an improved system of business support and making finances available to companies for R&D as well as improving infrastructure of the firms and all these issues need to be addressed by relevant policy. 57.1% of respondents felt that foreign direct investment (FDI) needs to be attracted in order to stimulate better supply and demand for knowledge and this should form a core policy issue. Creating better networks that link companies with universities and other R&D performing organisations should be of a high focus and receive a high priority on the policy agenda.

Table 2.14 – Future policy directions

	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy
Creating an improved system of business support and advice	12.5	62.5	25.0
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities	0.0	62.5	37.5
Creating more access to training and workforce development opportunities	12.5	75.0	12.5
Support companies in entering and accessing new markets	25.0	50.0	25.0
Create better networks that link companies with universities and other R&D performing organisations	25.0	25.0	50.0
Make improvements to the physical infrastructure allowing companies to locate in better equipped premises	25.0	62.5	12.5
Provide more support to companies to improve their supply-chains and logistical needs	50.0	16.7	33.3
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment	28.6	14.3	57.1
Stimulate the creation of new start-up companies	28.6	28.6	42.9

2.3.1. Summary

Universities in Yorkshire and the Humber need to focus on stimulating the demand from the business community, however the local firms also need to be stimulated to acquire knowledge from universities. More financial resources and human capital needs to be allocated to knowledge transfer activities in the higher education sector. FDI needs to be attracted in order to stimulate better supply and demand for knowledge and it should be a priority for the regional policy.

2.4. Conclusions

The key conclusions from this part of the project are:

- Higher education institutions source knowledge within their own sector or public sector rather than sourcing it from SMEs, therefore the focus should be on developing and improving contacts with business world and bridging the gap between private and higher education sector. Intermediaries in the region such as Knowledge RICH could act as a facilitator in this process and assist in facilitating dissemination of best practices.
- There are significant barriers to knowledge transfer such as access to suitable finances and relevant collaborators, which hampers the competitiveness of companies in the region. The demand for knowledge by firms and the supply of knowledge do not seem to meet. Collaboration between higher education and private sectors needs to improve and knowledge supply should be more tailored to the needs of firms in the region.
- The findings from the focus group suggest that the links between support agencies such as Business Link and higher education need to improve in the future. Universities are keen to improve this relationship and consider it important for knowledge transfer.
- External relationships are very important for universities but are not as effective as they should be, therefore the focus should be on how to improve the efficiency in this area.
- More financial resources and human capital needs to be allocated to knowledge transfer activities in the higher education sector. The local firms need to be stimulated to acquire knowledge from universities. Even though that there is a high level of interaction between higher education and business sector a lack of demand from the private sector still persists.
- Foreign direct investment (FDI) needs to be attracted in order to stimulate better supply and demand for knowledge and it should be a priority for the regional policy.
- Further work needs to be done to ensure that knowledge transfer is fully considered and integrated by the business support infrastructure (this will form part of the strategy recommendations).

3. Benchmarking Regional Knowledge Supply and Transfer in Central Macedonia and East Macedonia Thrace

This section presents the results for the Central Macedonia and East Macedonia-Thrace region in Greece. In total, twenty interviews (more interviews were necessary in this region than, for example, Yorkshire and the Humber, as the institutions do not generally possess 'umbrella' knowledge transfer offices), along with a focus group, were undertaken with Universities, Research Laboratories and Research Centres in the region, gathering data on knowledge assets, knowledge flows and interaction with relevant organisations and regional business.

The data analysis is divided into three sections. The first section examines data on knowledge stock within the organisations and their competitiveness in order to benchmark the importance and effectiveness of various factors. The second section analyses data on knowledge transfer in order to assess how knowledge is transferred by the research organisations to the regional economy. The third section examines the barriers faced by the organisations in terms of transferring knowledge to firms in the region and their perceptions of barriers faced by firms with respect to acquiring or creating knowledge. Finally, their opinion about what should form the core policy for the development of R&D in the region is examined and final conclusions are drawn.

3.1 Knowledge Assets

This section presents data on the knowledge stock of the universities and research organisations and its importance as well as effective use for overall competitiveness. The data are divided into five broad groups, Knowledge Type, Intellectual Assets, Disciplines that are significant for knowledge creation within the organisation, Organisation's sources of knowledge and Human Resources.

In terms of Knowledge Type, Table 3.1 shows that not all of knowledge types are supplied with similar degrees of frequency by most organisations. 'Training' is most frequent supplied with 45% followed by 'IT development/support' with 40% and 'New Technology' with 35%. However, General business support (40%), 'New Product development' (35%) and 'Recruitment or Skilled Labour' (30%) are also important knowledge types since they quite often supplied. It is worth noting that knowledge types, which are more market oriented like 'Finance accounting', 'Employment law', 'Market development' and others are amongst the least frequently supplied.

Table 3.1- Types of knowledge supplied to external sources

	Very often supplied	Quite often supplied	Not often supplied	Never supplied
Employment law	5%	5%	35%	55%
Health and safety advice	10%	15%	35%	40%
Finance, accounting and auditing	0%	30%	30%	40%
New Market development	0%	20%	40%	40%
New Product development	10%	35%	30%	25%
New Process development	25%	15%	40%	20%
New Service development	15%	25%	40%	20%
New Technology	35%	40%	20%	5%
Recruitment or Skilled Labour	5%	30%	15%	50%
Training	45%	30%	15%	10%
Procurement of inputs	0%	10%	35%	55%
IT development/support	40%	15%	10%	35%
General business support	5%	40%	30%	25%

Table 3.2 presents data on the organisations' intellectual assets in relation to competitiveness. 'Website', 'IT facilities', 'Market knowledge' and 'Training programmes' are rated as the most important, scoring between 6.6 and 7.2. Further, organisations rely quite significantly on 'Website' and 'IT facilities' to generate competitive advantages and seem to be relative effective in implementing these strategies, particularly regarding their website. Interestingly, typical intellectual assets such as patents and copyrights rank lowest in terms of importance, reflecting the limited orientation of research performers to market needs and knowledge commercialisation a fact that has also been confirmed by national data and consultations that took place under deliverable 2.2.

Table 3.2 - Intellectual Assets

	Importance	Effectiveness	Percentage Difference
Patents filed	5.1	3.15	38.23%
Copyrights held	5.7	4.35	26.68%
Market knowledge	6.65	5.55	16.54%
Process manuals	6.05	5.25	13.2%
Training programmes	6.6	5.95	9.84%
Website	7.2	6.55	9.02%
IT facilities	7.05	6.35	9.29%

Table 3.3 - Importance of disciplines for knowledge creation

	Importance
Biological sciences	4.35
Medicine and dentistry	4.1
Computer science and information systems	7.55
Engineering technology	5.7
Mathematical sciences	4.7
Business and administrative (e.g. logistics)	5.75
Physical sciences	3.95
Agriculture	3.95
Architecture, building & planning	3.5
Other (please state)	<ul style="list-style-type: none"> • Tourism • Transport • Employment, Health and Safety • Psychology

Table 3.3 highlights the fact that in terms of the importance of disciplines for knowledge creation ‘Computer science and information systems’, ‘Business and administrative’ and ‘Engineering technology’ are rated as the most important. As expected, all other disciplines scored quite low given their more specialised nature. It should be noted that regional higher education institutions provide all the above mentioned types of knowledge.

Table 3.4 shows that the most important sources of knowledge for research performers in Central Macedonia & East Macedonia/Thrace are located both inside and outside the region. However, the key sources of knowledge seem to reside within the community of research performers especially universities or other higher education institutes both within and outside the region. This is followed by ‘International organisations’ and ‘Public sector organisations’ while the corporate sector ranks quite low. As far as the locations of sources of knowledge from outside the region are concern, the capital city of Athens dominates together with EU countries and to a lesser extent the USA and the broader Balkan region.

Table 3.4 – Sources of Knowledge

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	4.2	3.21
Medium sized private sector firms (50- 249 employees)	3.85	3.43
Large private sector firms (250+ employees)	3.65	3.78
Public sector organisations, such as government business support agencies	5.05	4.5
Private sector organisations, such as private training or research providers, and consultants	4.95	3.69
Universities or other higher education institutes	6.55	7.21
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	4.4	4.23
International Organisations/Donors	5.7	5.31

In terms of Human Resources, Table 3.5 shows that all human resource factors are of a great importance for competitiveness. However, ‘Staff/employee skills’, ‘Competencies’, ‘Problem Solving Capacity’, ‘Management Skills and Commitment’ were found to have the highest rating in terms of importance all scoring above 7. Staff/employee Strategic and Consulting Skills ranked the lowest.

The general rating of “effectiveness” is lower compared to the factor of ‘importance’ with a percentage difference ranging from 10.07% to 21.97%. Hence, although the importance of human resource factors might be very high, organisations do not seem to be able to utilise them to an equal degree of effectiveness. This is particularly so for the case of ‘Staff/employee leadership skills’ and ‘Staff/employee knowledge of specific markets’. These results are consistent with those derived on other aspects of the knowledge stock and reflect the limited orientation of research performers to the real economy and the corporate sector as well as the low degree of knowledge commercialisation.

Table 3.5 – Human Resources

	Importance	Effectiveness	Percentage Difference
Staff/Employee skills	7.70	6.75	12.33%
Staff/Employee competences	7.45	6.45	13.42%
Staff/employee experience	6.95	6.05	12.95%
Staff/Employee problem solving capacity	7.55	6.40	15.23%
Staff/employee teaching skills	6.95	6.25	10.07%
Staff/employee knowledge of specific markets	7.00	5.55	20.71%
Staff/employee consulting skills	6.45	5.50	14.73%
Staff/employee strategic skills	6.40	5.10	20.31%
Staff/employee leadership skills	6.60	5.15	21.97%
Staff/employee development skills	7.00	5.78	17.43%
Staff/employee project management skills	7.40	5.80	21.62%
Staff/employee mentoring skills	7.00	5.85	17.02%
Management commitment	7.25	6.35	12.41%

3.1.1 Summary

The fact that the more market oriented knowledge types are the ones that are least supplied is characteristic of the limited focus of research performers on market needs. This is also displayed by the limited importance of patents/copyrights as key intellectual assets reflecting further the limited degree of knowledge commercialisation.

These findings are further highlighted in the fact that the corporate sector ranks quite low as a knowledge source for research performers. Further, the self-contained nature of the community of research performers is confirmed by the fact that the predominant knowledge source lies within their own community both at home and abroad. Finally, the fact that the importance of human resources ranks consistently higher than their effectiveness displays their overall under-utilisation.

3.2 Knowledge Transfer

This section analyses knowledge transfer by presetting data on ‘Practices and routines’, ‘Importance of knowledge transfer by discipline’, ‘External relations’, ‘Knowledge transfer beneficiaries’ and ‘Membership networks’.

Table 3.6 shows that ‘e-library subscription’ and ‘Library’ are the most important Practices/Routines followed by ‘Communication with other service providers’. ‘Customer project materials’ and ‘Process manuals’ rank the lowest in terms of importance. The high ranking of ‘Communication with other service providers’ combined with the low rank of ‘Customer project materials’ underline the inward looking nature of the research performers community possibly at the expense of engaging with the external business environment. Finally, the relatively high importance of ‘Forums for solving problems’ could display the realisation, by research performers of the need to engage more intensively with the real economy, however, this practice remains the least effectively used (Percentage Difference 15.25%).

Table 3.6 - Practices and Routines

Practices and Routines	Importance	Effectiveness	Percentage Difference
Process manuals	5.70	4.90	14.03%
Training materials	6.10	5.55	9.92%
Customer project materials	5.18	4.42	14.67%
Library	6.55	5.60	14.50%
e-library subscription	6.75	6.10	9.62%
Forums for solving problems	5.90	5.00	15.25%
Communication with beneficiaries	5.90	5.20	11.86%
Communication with other service providers	6.35	6.15	3.14%

Again all “practices and routines” factors, with the exception of communication with other service providers, rank with higher importance than effectiveness, i.e. the

research performers are not able to use them as efficiently as it is necessary to boost competitiveness.

Table 3.7 shows that ‘Responsiveness to beneficiary demands’ and ‘Reputation of your organisation’ are the most important external relations followed by ‘Collaboration with other providers to innovate’. ‘Relationships with your beneficiaries’ and ‘Presentation of your services’ rank the lowest in terms of importance. Again all ‘external relations’ factors rank with higher importance than effectiveness, i.e. the research performers is not able to use them as efficiently as they would like to. These results seem to reinforce the conclusions derived under practices and routines as research performers are less interested in building long-term relations with beneficiaries and promoting their services in an organised fashion.

Table 3.7 - External Relations

External Relations	Importance	Effectiveness	Percentage Difference
Reputation if your organisation	7.15	6.70	6.29
Presentation of your services	6.65	5.80	12.78
Knowledge of your organisation’s role(s)	7.20	6.20	13.90
Satisfaction of client/customer/partner	6.75	6.05	10.37
Responsiveness to beneficiary demands	7.25	5.95	17.93
Relationships with your beneficiaries	6.50	5.90	9.23
Relationships with other providers	6.90	6.45	6.52
Collaborations with business to innovate	6.75	5.70	15.55
Collaboration with other providers to innovate	7.00	5.90	15.71

Table 3.8 highlights the fact that in terms of knowledge transfer ‘Computer science and information systems’, ‘Business and administrative’ and ‘engineering technology’ are rated as the most important. This is in line with the fact that these are also knowledge types that are supplied with a high significance. As expected, all other disciplines scored quite low given their more specialised nature. It should be noted that regional higher education institutes do provide all the above-mentioned types of knowledge.

Table 3.8 - Importance of disciplines for knowledge transfer

	Importance
Biological sciences	3.80
Medicine and dentistry	3.85
Computer science & information systems	7.80
Engineering technology	5.85
Mathematical sciences	4.35
Business and administrative (e.g. logistics)	5.85
Physical sciences	3.65
Agriculture	3.70
Architecture, building & planning	3.00
Other (please state)	Tourism, Transport, Employment Health and Safety, Psychology

Table 3.9 shows that the most important beneficiaries of knowledge transferred from research performers in Central Macedonia & East Macedonia/Thrace are significantly located both inside and outside the region. The key beneficiaries of knowledge transfer by regional research performers are universities and other higher education institutions both within and outside the region followed by public sector organisations within the region and private sector research providers. The role of the corporate sector especially SMEs rank much lower as a beneficiary of knowledge transfer.

As far as the locations of sources of knowledge from outside the region are concerned, the capital city of Athens dominates together with EU countries and to a lesser extent the USA and the broader Balkan region. The high importance of international organisations and higher educational institutes from outside the region reflects the participation of regional research performers in international projects like the Framework Programme while the regional public sector organizations seem to be the most important clients/beneficiaries within the region. In all instances, the corporate sector ranks significantly lower as a client/beneficiary.

Table 3.9 – Knowledge Transfer Supply

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	4.21	3.23
Medium sized private sector firms (50- 249 employees)	4.50	3.50
Large private sector firms (250+ employees)	4.05	3.86
Public sector organisations, such as government business support agencies	5.50	4.86
Private sector organisations, such as private training or research providers, and consultants	5.25	3.69
Universities or other higher education institutes	5.50	6.43
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	4.80	4.78
International Organisations/Donors	3.60	5.07

Regarding external relations (Table 3.10), it is observed that generally research performers appear to be highly connected especially with ‘International research organisations’ as well as ‘Subject focused organisations’, ‘Funding organisations’, and ‘Professional organisations’. On the other hand, ‘Chambers of Commerce’, ‘Trade or business associations’ and ‘Business Clubs’ rank less importantly. The predominance of ‘International research organisations’ in external relations displays the great benefit that regional research performers have acquired in terms of international exposure through their participation in European Projects (mostly Framework Programmes).

Table 3.10 – Interaction with other stakeholders

	Yes	No
Chamber of Commerce	55%	45%
Trade or Business Association	50%	50%
Business Club	25%	75%
International research organisations	100%	0%
Professional organisations	80%	20%
Subject focused organisations	85%	15%
Funding organisations	80%	20%

Table 3.11 - Importance of interaction

	Importance
Developing contacts with firms	7.45
Developing other service provider contacts	7.50
Improving university-business relations	8.20
Sharing knowledge with other members	8.05
Developing trust between research providers and companies	8.00

Table 3.11 shows that all outcomes of interaction with other organisations are highly significant. The highest importance is attached to ‘Improving university-business relations’ and ‘Sharing knowledge with other members’ followed by ‘Developing trust between research providers and companies’. These results show that, at least over the recent past, regional research performers have been making significant strides in engaging with the real economy and the corporate sector by utilising the interaction with other organisations particularly as a result of their involvement in international research projects.

3.2.1 Summary

The less efficient use of ‘practices and routines’ and the predominance of other research performers and public sector organisations as beneficiaries of ‘knowledge transfer’ contrasted with the limited amount of knowledge transfers to the corporate sector reflect the limited degree of knowledge commercialisation and the high dependence of research performers on public sector projects. However, increasing networking relationships primarily achieved through cooperation with international organisations and research performers outside the region have significantly increased the international exposure of regional research organisations.

Further, the high importance attached to ‘university-business relations’ shows that regional research performers are conscious of the need to improve knowledge commercialisation and address more effectively the needs of the real economy. The increasing participation of regional research performers in European projects especially in the Framework Programmes has proved vital in improving the overall outlook.

3.3 Barriers and Future Support

This section examines data on barriers to knowledge transfer, barriers to knowledge acquisition by firms and future policy directions.

Table 3.12 suggests that the most important barrier faced by research performers in the process of transferring knowledge is a lack of contacts in the business world (9.3). This is followed by a lack of finance/budget to reach many firms (7.6). The least importance is given to a lack of time to contribute to such activities (6.0) as well as a lack of management acumen and skills (5.9). It is important to note that a lack of demand from local firms which also ranks significantly might on the one hand suggest a low degree of sophistication of the regional business sector and on the other the limited efforts of regional research performers to engage with regional businesses and possibly the limited relevance of their skills.

Table 3.12 – Barriers to knowledge transfer

	Importance
Lack of demand from local firms	6.8
Lack of time to contribute to such activities	6.0
Lack of finance/budget to reach many firms	7.6
Lack of management acumen and skills	5.9
Lack of support from the public sector (based on your experiences)	6.8
Difficulties in undertaking market research to identify opportunities for collaboration	6.4
Lack of contacts in the business world	9.3
Other (please state)	Legal Framework

Finally, an important aspect often cited by research organisations (under other barriers) is the legal framework. This reflects the inappropriateness of the legal framework surrounding the community of research performers and especially higher education institutes, particularly as regards their ability to commercialise knowledge and acquire funds that are explicitly earmarked for research purposes or furthermore the creation of company spin-offs. These issues have been highlighted by research performers during earlier consultations and analysis undertaken by deliverable 2.2.

Table 3.13 looks at the perception of research performers regarding the most important barriers faced by firms in the region with respect to acquiring or creating knowledge. In this respect the most important barrier is the 'Access to suitable finance' (7.5) followed by the 'Inapplicability of knowledge created by others in the region, i.e. universities, other companies or existing networks (6.8). Another factor of importance is 'Access to skilled labour' (6.3) which relates to the applicability and quality of the overall education and training system as was highlighted in the analysis under the deliverable 2.1. This factor also ranked high in the SMEs scoracard when concerning the barriers to knowledge under (Deliverable 4.2). Finally, the least important factor is the 'Access to suitable equipment or plant' (5.5).

It is interesting to note that overall the same results were obtained by the answers of regional SMEs regarding their barriers to knowledge creation in our survey that was reported under deliverable 4.2. Further, of particular significance is the fact that research performers clearly recognise the relative inapplicability of knowledge that they create for regional SMEs, even though this might be partly due to the limited sophistication of regional SMEs that might also explain the low demand for R&D services.

Table 3.13 – Barriers to knowledge creation faced by firms

	Importance
Access to relevant networks	6.00
Access to relevant collaborators	6.25
Inapplicability of knowledge created by others in region (e.g. universities, other companies or existing networks)	6.80
Quality or applicability of available business support or advice	6.10
Access to suitable finance	7.50
Access to skilled labour	6.30
Access to suitable training	5.90
Access to suitable equipment or plant	5.55

In terms of future policy directions (Table 3.14), it appears that research performers believe that ‘Creating better networks that link companies with universities and other R&D performing organisations’ together with ‘Making more R&D finance available to companies enabling them to become involved further in R&D and knowledge related activities’ should form the core policy issues.

Significant importance is also attached to the creation of start up companies, an attraction of a high value foreign investment and an improved system of business support and advice. This result shows the increasing awareness of research performers in the need to address corporate requirements through stronger links between companies and R&D performing organizations.

Comparing the above results with those derived from answers of SMEs regarding future policy directions it is a positive fact that SMEs also recognise that the ‘creation of better networks that link companies with R&D performers’ should form a core policy component. Further, in addition to ‘making more finance available for corporate R&D’ which ranks highly for both communities, the need to ‘stimulate the creation of start-up companies’ and ‘creating an improved system of business support and advice’ are also the issues that both the community of SMEs and research performers agreed that they should form core policy issues.

The almost identical preferences of both communities even in terms of ranking the relative importance of each factor that should form the set of core policy issues is of a vital importance in achieving consensus in policy formulation and maximise co-operation in order to promote the regional R&D. These findings indicate that there is much potential to improve on the results of other regional research (including the earlier findings of deliverable 2.2) where it is found that corporate sector and research performers place much lesser emphasis on synergies between them or even perceive each other with a relative degree of suspicion.

Table 3.14– Future policy directions

	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy
Creating an improved system of business support and advice	5%	40%	55%
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities	0%	25%	75%
Creating more access to training and workforce development opportunities	0%	50%	50%
Support companies in entering and accessing new markets	15%	35%	50%
Create better networks that link companies with universities and other R&D performing organisations	0%	5%	95%
Make improvements to the physical infrastructure allowing companies to locate in better equipped premises	10%	50%	40%
Provide more support to companies to improve their supply-chains and logistical needs	25%	50%	25%
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment	5%	40%	55%
Stimulate the creation of new start-up companies	15%	25%	60%

3.3.1 Summary

Regarding the barriers faced by research performers for R&D transfer a lack of contact with the business world, lack of finance and the legal framework surrounding the functioning of R&D organizations seem to be most significant. The limited R&D demand by the corporate sector is also an important factor partly reflecting a lack of corporate sophistication and partly a limited applicability of knowledge created by R&D performers and their limited commercial orientation. However, research performers recognise that policies aiming to address the need for closer links with the corporate sector should form a core policy regarding the future policy directions. The fact that the survey results for both SMEs (deliverable 4.2) and research performers show a striking resemblance in their perception of which issues should form the core policy is of a particular significance.

3.4 Conclusions

The major weaknesses of the research performing community are its self-contained nature, its over-dependence on public sector projects and finance and the resulting lack of focus on the needs of the real economy and the corporate sector both in terms of knowledge applicability as well as developing long-term relations with the corporate sector and explicitly aiming to boost knowledge commercialisation.

The strengths of the community of research performers seem to lie in their improving overall outlook especially in terms of building an international network of relations with other research organisations and in their recognition of the need to engage more intensively with the corporate sector. These improvements are to a great extent linked to the participation in international projects, particularly within the auspices of successive EU Framework Programmes. Further the research community recognises the need to make the supplied knowledge more applicable to the requirements of the economy and notes the need to change the legal framework regulating research by making it friendlier to knowledge commercialisation.

Significant opportunities arise from a better utilisation of existing resources, particularly human capital. However, most opportunities would arise from a greater focus on triple helix interaction particularly by bringing the corporate sector and research performers in closer interaction considering that both communities have explicitly recognised the need to do so and would both like to see this issue forming a core policy focus.

A major threat arises from the limited availability of financial resources dedicated to R&D regarding both the corporate sector and research performing organisations. This risk could be intensified if the public sector does not in practice herald R&D a national priority and hence continue to delay the necessary reforms in the legal framework, the promotion of the triple helix interaction by policy makers and the prioritisation of R&D in terms of financial resources.

4. Benchmarking Regional Knowledge Supply and Transfer in Thrace Turkey and Istanbul

This section presents the results for Thrace Turkey and Istanbul. These results were obtained through interviews, along with a focus group, with twenty-two research centres in the region, gathering data on knowledge assets, knowledge flows and interaction with the business organisations. The targeted centres are based in the most advanced Universities of Turkey as ITU, Bosphorus, Sabanci, but also included private sector research and development centres mainly owned by the largest industrial organisations in Turkey as Arçelik, Vestel, Eczacıbaşı.

The data analysis is divided into three sections. The first section examines data on knowledge creation and acquisition by research centres and intellectual assets in order to benchmark the importance and effectiveness of various values. The second section examines the extent of collaboration with other institutes and transfer of knowledge to SMEs. The third section examines opinions on business support policies and research issues. The last section of the report summarises the main conclusions.

4.1 Knowledge Assets

This section presents data on the knowledge stock of research centres and their importance and effectiveness for the overall success of the regional R&D Potential. The gathered data are divided into five broad groups, Knowledge Potential, Intellectual Assets, Knowledge Creation, Knowledge Sourcing and Knowledge Creation.

Table 4.1 shows the percentage of responses in the determined fields of knowledge supply. It is observed that training is very often supplied to external sources. Yet, knowledge is also often supplied in the area of a new service development. On the other hand, IT development and support is not often supplied knowledge to external firms and knowledge in the field of employment law is never supplied.

It is also observed by the figures that a majority of the responders are in technical fields, since knowledge does not seem to be supplied in the area of finance, health and safety, new market development or recruitment of skilled labour. It is also noticed that the research centres are focused into very detailed disciplines, such as research on earthquakes.

Table 4.1 – Types of Knowledge Supplied to External Sources (%)

	Very often supplied	Quite often supplied	Not often supplied	Never supplied
Employment law	0.00	9.09	13.64	77.27
Health and safety advice	4.55	9.09	18.18	68.18
Finance, accounting and auditing	9.09	4.55	13.64	72.73
New Market development	4.55	9.09	27.27	59.09
New Product development	27.27	13.64	31.82	27.27
New Process development	18.18	18.18	31.82	31.82
New Service development	9.09	31.82	22.73	36.36
New Technology	27.27	27.27	31.82	13.64
Recruitment or Skilled Labour	0.00	18.18	18.18	63.64
Training	45.45	27.27	22.73	4.55
Procurement of inputs	0.00	18.18	27.27	54.55
IT development/support	4.55	18.18	40.91	36.36
General business support	9.09	18.18	22.73	50.00

Table 4.2 presents data on the intellectual assets of the research centres in relation to competitiveness. Training programmes are rated with the highest importance of 7.00 and website, IT facilities follow with 6.36 and 6.23. Interestingly, typical intellectual assets such as patents, Copyrights, trademarks and trade secrets rank lowest in terms of importance. The centres instead rely on technology with Websites and IT infrastructure to generate competitive advantages.

Table 4.2 – Intellectual Assets

	Importance	Effectiveness	Percentage difference
Patents filed	4.73	3.14	33.65
Copyrights held	5.36	4.50	16.10
Market knowledge	4.91	3.91	20.37
Process manuals	4.95	3.82	22.94
Training programmes	7.00	6.68	4.55
Website	6.36	5.82	8.57
IT facilities	6.23	5.82	6.57

The lowest effectiveness compared with the importance is seen in the assets such as patents, which reflects the difficulty and high cost of taking global patents. There is more than 20% difference in effectiveness in market knowledge and process manuals yet less than 10% difference for the three fields of highest importance. This might lead to the conclusion that if the research centre believes in the importance of an intellectual asset they also consider themselves to be more capable of making it effective.

Table 4.3 – Importance of disciplines for knowledge creation

	Importance
Biological sciences	2.36
Medicine and dentistry	1.36
Computer science and information systems	4.86
Engineering technology	5.55
Mathematical sciences	3.45
Business and administrative (e.g. logistics)	3.91
Physical sciences	3.23
Agriculture	2.14
Architecture, building & planning	2.91
Other (please state)	5.50

In Table 4.3 the rates on significance of knowledge creation of academic disciplines are shown. Engineering technology seems to be the most significant field, while medicine and dentistry seem to gain the lowest significance. Other disciplines rated as high as engineering are the specific scientific fields like nano-technology, bio-genetics, material sciences, which are not specified in the list. The interviews highlighted the fact that knowledge is accumulated and created in engineering technology fields, rather than basic scientific fields or medical fields.

From Table 4.4 it is evident that the research institutions seem to obtain knowledge from other universities or higher education institutions either within or outside the region with the highest score of 6.95 and 5.14. Professional networks and focus groups (that are mentioned under the section ‘others’) follow with a score of 5.86 and 5.67. It seems that they have some intermediate level of knowledge exchange with the private industry in the region but the least sourced is training or consulting institutes. The highest percentage difference between the knowledge sources within and outside the region is the public sector organisations, suggesting that they hardly get in contact with the public sector outside the region.

Table 4.4 – Sources of Knowledge

	Within the Region	Outside the Region	Percentage difference
Small private sector firms (1-49 employees)	3.91	2.48	36.66
Medium sized private sector firms (50- 249 employees)	4.86	2.67	45.17
Large private sector firms (250+ employees)	4.95	3.10	37.53
Public sector organisations. Such as government business support agencies	4.05	1.95	51.74
Private sector organisations such as private training or research providers and consultants	3.36	1.95	41.96
Universities or other higher education institutes	6.95	5.14	26.14
Professional networks (e.g. chambers of commerce. Trade or business associations. Business clubs or other professional networks).	5.86	2.86	51.27
International Organisations/Donors	4.91	4.41	10.19
Other (please state)	5.67	3.67	35.29

Table 4.5 highlights the fact that human resources factors are important as well as effective in knowledge creation process of the research institutes. We can see higher rates in this table, presenting the importance of all the human resource factors. It is observed that problem solving capacity, general skills and mentoring are chosen to be the most important factors for knowledge creation. Though all the factors are rated to

have more than an average importance, market knowledge is rated lower than the others.

Table 4.5 – Human Resources

	Importance	Effectiveness	Percentage difference
Staff/Employee skills	8.29	7.62	8.05
Staff/Employee competences	8.10	7.33	9.41
Staff/employee experience	8.05	7.27	9.60
Staff/Employee problem solving capacity	8.33	7.57	9.14
Staff/Employee teaching skills	7.86	7.45	5.18
Staff/Employee knowledge of specific markets	6.10	5.86	3.91
Staff/Employee consulting skills	7.67	7.29	4.97
Staff/Employee strategic skills	7.57	6.81	10.06
Staff/Employee leadership skills	7.57	7.00	7.55
Staff/Employee development skills	7.71	7.24	6.17
Staff/Employee project management skills	7.76	7.52	3.07
Staff/Employee mentoring skills	8.23	7.86	4.42
Management commitment	7.80	7.35	5.77

The lowest effectiveness is obtained by strategic skills with more than 10% difference of the importance. The project management skills are on the contrary found very effective. From these results we could conclude that project based skills are more effective than the managerial skills. This is in accordance with the SME responses.

4.1.1 Summary

The data suggests that the most important knowledge competence within the research institutes are in the field of engineering and technical fields and the institution very often collaborate with other higher education institutions. Intellectual assets are mainly focused on training. Human resources are competence effective in specific markets and training. This proves that most of the research centres reside within the universities and even the private sector research centres work with a similar culture, since most of the researchers come from the academia.

In general, there is a gap between the level of importance and the level of effectiveness for all the factors. The fact that this difference is positive in all questions suggests that the firms are not able to perform as efficiently as they would like to.

4.2 Knowledge Transfer

This section presents data on knowledge transfer from research institutes to businesses and firms in the region. Table 4.6 highlights the importance and effectiveness of the practice and routines in relation to knowledge transfer. All categories are rated just above the average though training materials are given the highest importance. Communication with the beneficiaries follows with a small difference, however it seems more effective than the training materials.

Table 4.6 – Practice and Routines

	Importance	Effectiveness	Percentage difference
Process manuals	5.00	4.09	18.18
Training materials	6.82	5.86	14.00
Customer project materials	6.36	5.73	10.00
Library	5.59	5.05	9.76
e-library subscription	6.00	5.05	15.91
Forums for solving problems	6.18	4.82	22.06
Communication with beneficiaries	6.64	6.09	8.22
Communication with other service providers	5.33	5.00	6.25

A majority of the practices and routines in knowledge transfer seem to have more than 10% difference between importance and effectiveness with the biggest difference of 22.06% in forums for solving problems. This shows that unlike the industrial companies research institutes are not capable of performing the practices that are important for them.

The importance of external relations in creating and transferring knowledge seems to be focused on the organisational reputation similar to SMEs outcomes. As it is highlighted in Table 4.7 all factors are given more than average importance. However, reputations followed by presentation of the services score above 8.

Table 4.7 – External Relations

	Importance	Effectiveness	Percentage difference
Reputation of your organisation	8.32	8.09	2.73
Presentation of your services	8.23	7.32	11.05
Knowledge of your organisation's role(s)	8.09	6.64	17.98
Satisfaction of client/customer/partner	8.00	7.41	7.39
Responsiveness to beneficiary demands	8.00	7.14	10.80
Relationships with your beneficiaries	7.95	7.27	8.57
Relationships with other providers	7.68	7.14	7.10
Collaboration with business to innovate	8.05	6.73	16.38
Collaboration with other providers to innovate	7.86	6.73	14.45

It is also emphasised that the industrial firms to which knowledge is transferred do not have knowledge of the research organisation's role because this factor shows the biggest percentage difference between the importance and the effectiveness (17.98%). It is also noticed that collaboration with business to innovate shows very low effectiveness resulting in more than a 15% difference between importance and effectiveness.

The importance of academic disciplines for knowledge transfer is summarised in Table 4.8. Engineering technology is given the highest score of 6.73 and computer science and information systems follow with a score of 5.55. Other disciplines seem to be rated higher, however from the focus group it appears that these fields are significant for specific institutions i.e. technologies or material sciences. Medical disciplines scored amongst the disciplines very low, with the lowest importance of 1.5.

Table 4.8 – Importance of disciplines for knowledge transfer

	Importance
Biological sciences	2.14
Medicine and dentistry	1.50
Computer science and information systems	5.55
Engineering technology	6.73
Mathematical sciences	4.23
Business and administrative (e.g. logistics)	4.27
Physical sciences	3.64
Agriculture	2.14
Architecture, building & planning	2.68
Other (please state)	7.40

Knowledge created in the interviewed organisations is transferred to the other universities or higher education organisations within or outside the region as shown in Table 4.9. Professional networks and medium sized private companies follow with grades higher than average. Similar to knowledge sources, knowledge transfer to private training and consulting firms outside the region obtained the lowest score. It is also interesting to see that the knowledge transfer to international organisations within or outside the regions is much higher than knowledge transfer to small or large private companies and public sector organisations. The results can be representation of the career conscious researchers and due to the general performance evaluation rules. The difference between knowledge transfer within the region and outside the region is in favour of the firms within the region.

Table 4.9 – Knowledge Transfer Supply

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	4.86	3.55
Medium sized private sector firms (50- 249 employees)	5.50	3.05
Large private sector firms (250+ employees)	4.95	3.64
Public sector organisations, such as government business support agencies	4.59	2.95
Private sector organisations, such as private training or research providers, and consultants	4.05	2.82
Universities or other higher education institutes	7.27	5.73
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	6.23	4.41
International Organisations/Donors	5.23	4.77
Other (please state)	4.50	1.00

Table 4.10 – Interaction with other Stakeholders (in %)

	Yes	No
Chamber of Commerce	45.45	54.55
Trade or Business Association	59.09	40.91
Business Club	36.36	63.64
International research organisations	86.36	13.64
Professional organisations	81.82	18.18
Subject focused organisations	77.27	22.73
Funding organisations	45.45	54.55

Table 4.10 highlights the interaction of responding organisations with other stakeholders. In total, 86.4% of them interact with the international research organisations, whereas 63.6% do not interact with the business clubs at all. The fact that engineers are obliged to be a member of a professional organisation is reflected in table where 81.8% respondents interact with professional organisations and 77.3% interact with the subject focused organisations. The low interaction with business could be attributed to the performance factors because the current system favours international projects and publishing rather than the local projects.

The interactions are recognised to be important to improve university–business relations as shown in Table 4.11 with an average score of 8.3. Developing trust between research providers and companies and sharing knowledge with other members follow with a score of 7.3 and 7.1. Although the remaining interactions are rated above average, i.e. developing contacts with other service provider, they do not seem to be favoured.

Table 4.11 – Importance in Interactions

	Importance
Developing contacts with firms	6.86
Developing contacts with other service providers	6.32
Improving university-business relations	8.32
Sharing knowledge with other members	7.14
Developing trust between research providers and companies	7.27

4.2.1. Summary

In this section the data highlights the fact that the research community in Thrace-Turkey seem to source and transfer knowledge mainly from and to other universities and researchers both within and outside the region. Although the aim of the interactions is stated as improvement of the university-business relations, it does not seem to be effective. The training materials and communication with the beneficiaries seem to have the biggest importance in generating knowledge transfer. The fields of knowledge are focused on engineering. During the process of knowledge transfer, the reputation of the organisation and presentation of the services seem to be of a concern. It is noticeable that innovation is not shown as a goal.

4.3 Barriers and Future Support

This section examines data on the barriers to innovation faced by the researchers and the policy actions the research organisations that they would like to see implemented across the region. Table 4.12 suggests that the two biggest barriers are a lack of demand from the local firms and a lack of support from the public sector. This is followed by a lack of contacts with businesses. The reason is mainly the unwillingness of the public and business organisations to share and support the research topics or to share data.

Table 4.12 – Barriers to knowledge transfer

	Importance
Lack of demand from local firms	5.80
Lack of time to contribute to such activities	4.75
Lack of finance/budget to reach many firms	4.95
Lack of management acumen and skills	4.60
Lack of support from the public sector (based on your experiences)	5.70
Difficulties in undertaking market research to identify opportunities for collaboration	4.63
Lack of contacts in the business world	5.59
Other (please state)	1.00

The research organisations believe that a lack of finance is the biggest barrier for competitiveness and access to the skilled labour. This is highlighted in Table 4.13 where access to the relevant networks is not considered to be a concern. The observations of the researchers seem to match with the declarations of SMEs given in D.4.2.

Table 4.13 – Barriers to Knowledge Supply faced by Firms

	Importance
Access to relevant networks	4.22
Access to relevant collaborators	4.83
Inapplicability of knowledge created by others in region (e.g. universities, other companies or existing networks)	4.56
Quality or applicability of available business support or advice	4.58
Access to suitable finance	6.11
Access to skilled labour	5.65
Access to suitable training	4.63
Access to suitable equipment or plant	4.37

In terms of future policy directions 77.3% of the research organisations believe that the companies should be financially supported in the area of research and knowledge development, 68.2% of the respondents believe that providing more access to training and creating better networks with the universities need to form the core policies. More than 50% of respondents found improvement of business support, physical infrastructure and supply chain development in need of addressing. Support of entrepreneurship is also highlighted among the core policy issues by more than 50% of the respondents.

Table 4.14 – Future Policy Directions

	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy	Percentage of NA
Creating an improved system of business support and advice	9.09	63.64	13.64	13.64
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities	0.00	9.09	77.27	13.64
Creating more access to training and workforce development opportunities	0.00	27.27	68.18	4.55
Support companies in entering and accessing new markets	4.55	27.27	45.45	22.73
Create better networks that link companies with universities and other R&D performing organisations	0.00	22.73	68.18	9.09
Make improvements to the physical infrastructure allowing companies to locate in better equipped premises	13.64	50.00	18.18	18.18
Provide more support to companies to improve their supply-chains and logistical needs	13.64	50.00	13.64	22.73
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment	4.55	31.82	45.45	18.18
Stimulate the creation of new start-up companies	0.00	22.73	59.09	18.18

4.3.1. Summary

Priorities for future policy are mainly making finance available for firms to expand R&D and knowledge related activities, supporting companies entering new markets and creating opportunities for work force development in addition to networking with universities. It is observed that the future policies are suggested in relation to the major policy makers, since both TUBITAK and KOSGEB have representative organisations in on university campuses.

4.4. Conclusions

The main conclusions drawn from this work are that all the variables scored higher in the importance rather than in its effectiveness. Since the researchers interviewed clearly understood the difference of importance and effectiveness, it can be explained that the research organisations are not given the opportunity to put the important factors in effect for knowledge creation and transfer. The public universities are not given enough resources to enable the necessities, but it is a surprise that it is also true for the private sector.

The sources of knowledge, which are important to researchers, appear to be other universities and research centres both within and outside the region as well as the international organisations. This pattern is repeated with respect to collaboration.

The interaction between the universities and the business world is considered important not only for knowledge transfer but also for the improvement of the industrial companies. However, this is not necessarily seen as the source of innovation since the reputation of the organisation and presentation of the role of researchers are seen as the most important factors for knowledge transfer.

Engineering is seen as the most important field of knowledge supply, which is mainly realised through training practices. Although researchers believe the access for skilled workers is one of the major barriers for the competence of the industrial companies, they wait for the demand to be generated rather than making an effort to introduce their services.

The suggestions for the future policies are clear guidelines in terms of building better ways of accessing financial and knowledge resources. It appears that there is a need to redesign the performance factors for the researchers to allow more business interaction so that more resource can be created to improve effectiveness of the research organisations.

5. **Benchmarking Regional Knowledge Supply and Transfer in South and East Bulgaria**

The aim of this regional report is to gather data from the key knowledge generating organisations in South-East Bulgaria on different types of knowledge, R&D which they currently undertake and the existing modes of knowledge transfer and barriers hindering such transfer. The report summarises the results from structured interviews with twenty key knowledge supply actors in the region and from a focus group, which was organised as a networking event. Participants of the event were representatives of the higher education and the other research oriented institutions. The sample of the interviews included universities, various institutes of Bulgarian Academy of Science and research oriented NGOs. Further to the interviews, the UNWE project team organized a focus group. The main goal of this meeting was to identify what kind of knowledge universities and other research institutions create, the R&D they currently undertake, and the existing modes of transfer and barriers hindering such transfer. The focus group was composed of participants from the key knowledge supply actors such as universities (13 participants), Bulgarian Academy of Science institutes (3 participants) and research oriented NGO (1 participant). The invited participants represented a variety of fields of R&D related knowledge and covered practically the whole MIRIAD defined Bulgarian region.

The interaction with knowledge supply actors was aimed at:

- exploring types of knowledge that is generated by these institutions and applicability of such knowledge and its transfer to SMEs;
- understanding how knowledge is currently transferred from the research to the SME community;
- identifying and understanding how knowledge creating institutions and intermediaries can be involved and in the future enhance knowledge transfer and infusion activities;
- gaining an understanding of the issues that the research community is facing when they are trying to engage with the SME community in regards to knowledge transfer and supply.

The report is structured as follows: The first section focused on knowledge assets that the interviewed institutions possess and analysis of their importance and effectiveness. The second section summarises the results concerned with knowledge transfer. It focuses on practices and routines, importance and effectiveness of the external relations, the major disciplines and recipients, as well as collaboration with some organizations. The third section highlights the main barriers, which the supply organizations and firms are facing in the processes of knowledge transfer and the future support that is needed to improve the knowledge supply and knowledge transfer. The conclusions related to fundamental issues discussed in the report are briefly summarised at the end of the report.

5.1. Knowledge Assets

This section contains a description of knowledge assets that interviewed institutions possess and analysis of their importance and effectiveness. Knowledge for the project purposes is classified in 13 groups (employment law; health and safety advices; finance, accounting and auditing; development of new markets, new products, new processes, and new services; new technologies; recruitment or skilled labour; training; procurement of inputs; IT development; general business support).

According to data reported in Table 5.1, training is the type of knowledge that is very often or often supplied to other stakeholders, followed by recruitment of skilled labour, general business support and IT development. Completely different situation is in the area of health and safety advice, which is never supplied by more than half of the respondents. Advice on employment law, procurement of inputs, development of new markets, products, processes, services, and technologies are the types of knowledge that is never or not often supplied. Recruitment or skilled labour is the only type of knowledge, which is not very often supplied or never supplied. Data from Table 5.1 confirms the conclusions drawn from the previous workpackages that two types knowledge are currently created and transferred in Bulgarian regions which is training and business support. The significance of applied and technical research especially is rather low.

Table 5.1 – Types of Knowledge supplied to external sources

	Very often supplied	Quite often supplied	Not often supplied	Never supplied
Employment law	5	15	35	45
Health and safety advice	0	20	25	55
Finance, accounting & auditing	25	25	25	25
New Market development	10	20	30	40
New Product development	10	20	30	40
New Process development	10	10	35	45
New Service development	10	20	30	40
New Technology	5	10	45	40
Recruitment or Skilled Labour	40	5	10	45
Training	75	25	0	0
Procurement of inputs	0	10	45	45
IT development/support	30	30	20	20
General business support	30	45	25	0

Table 5.2 shows that the most important intellectual assets that are supplied are training programmes, websites and market knowledge with average scores of 8.07, 7.56 and 6.75 respectively. At the same time the importance of typical intellectual assets as patents and copyrights is ranked as the lowest (2.63 and 3.44). Processes manuals and IT facilities appear to be of an equal importance for the knowledge supply organizations with an average score of 5.38. Six of seven intellectual assets are rated more important than effective. The only exception is IT facilities but the percentage difference between the importance and effectiveness is only -4.65%. Compared to other intellectual assets, i.e. training programmes, website and market knowledge, which are also used in the most efficient way, is documented by lower scores of their importance. The biggest percentage differences between importance and effectiveness are related to copyrights held and patents. The percentage difference for training programs is only 3.35%, which means that their significance for the organization is almost the same as the efficiency of their use.

Table 5.2 – Intellectual Assets

	Importance	Effectiveness	Percentage Difference
Patents filed	2.63	2.37	9.89
Copyrights held	3.44	3.06	11.05
Market knowledge	6.75	6.25	7.41
Process manuals	5.38	5.00	7.06
Training programmes	8.07	7.8	3.35
Website	7.56	7.0	7.41
IT facilities	5.38	5.63	-4.65

Table 5.3 suggests that business and administration (e.g. logistics), and computer science and information systems are considered to be the most significant disciplines with average scores of 7.25 and 6.13 respectively. The rest of disciplines are not rated highly, and the lowest score of 1.75 is given to architecture, building & planning. Almost all of the respondents under the section ‘other disciplines’ added different fields of social sciences, with the average score of 4.43, which is higher than in other disciplines, such as engineering technology and other fields of natural sciences. This can be explained by the fact that the majority of the interviewed universities and most of the Bulgarian universities as a whole supply knowledge in the field of social sciences.

Table 5.3 – Importance of academic disciplines for knowledge creation

	Importance
Biological sciences	2.56
Medicine and dentistry	2.13
Computer science and information systems	6.13
Engineering technology	3.50
Mathematical sciences	5.13
Business and administrative (e.g. logistics)	7.25
Physical sciences	3.44
Agriculture	2.13
Architecture, building & planning	1.75
Other	4.43

Table 5. 4 – Sources of knowledge

	Within the region	Outside the region
Small private sector firms (1-49 employees)	4.60	3.86
Medium sized private sector firms (50- 249 employees)	4.67	4.21
Large private sector firms (250+ employees)	4.53	4.50
Public sector organisations, Such as government business support agencies	4.73	3.79
Private sector organisations, such as private training or research providers, and consultants	4.13	3.93
Universities or other higher education institutes	7.40	7.36
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	5.73	4.64
International Organisations/Donors	4.33	5.00

In terms of sources of knowledge, the highest rated source within and outside the region are “universities or other higher education institutes” with an average score of 7.4 (Table 5.4). They are distributed almost equally within and outside the region. All other sources of knowledge, except the “other”, have a medium frequency of usage with average scores of 4.7 and 4.3 within and outside the region. Firms and

organizations from private sector and professional networks are definitely more important sources of knowledge within the region rather than outside the region. Not surprisingly international organizations are the only high important source of knowledge outside the region with an average score of 5.00. The basic locations of the outside sources are grouped into two main groups. The first group consists of the district centres located outside the MIRIAD region such as Veliko Tarnovo, Rousse, Pleven, Swishtov, Vratza, Vidin, and Montana. The second group includes locations outside the country and especially the EU countries.

In terms of human resources, Table 5.5 highlights the fact that the employees' teaching skills, employees' competences and employees' consultancy skills are the most important factors affecting the organization's competitiveness. The different kinds of human resources obtained similar scores. In spite of this finding, the management commitment is ranked relatively low. This indicates that the contribution of employee's skills and competences to the competitiveness of the organisation are higher than the management commitment. Meanwhile all scores (except the effectiveness of employees teaching skills) are below 7, which lead to the conclusion that they are not perceived as being especially significant for the organization's competitiveness.

Table 5.5 – Human resources and competitiveness

	Importance	Effectiveness	Percentage Difference
Staff/Employee skills	6.27	6.20	1.12
Staff/Employee competences	6.67	6.87	-3.00
Staff/employee experience	5.87	5.73	2.39
Staff/Employee problem solving capacity	6.20	5.93	4.35
Staff/employee teaching skills	6.73	7.20	-7.00
Staff/employee knowledge of specific markets	5.27	5.00	5.12
Staff/employee consulting skills	6.53	6.67	-2.14
Staff/employee strategic skills	6.33	6.6	-4.27
Staff/employee leadership skills	5.73	6.33	-10.48
Staff/employee development skills	6.00	6.20	-3.33
Staff/employee project management skills	5.33	5.80	-8.82
Staff/employee mentoring skills	5.40	5.47	-1.30
Management commitment	5.47	5.67	-3.66

The results obtained show that the prevailing part of the human resources (9 of the 13) is more effective than important. Regarding the percentage differences between these two categories, they are the biggest in the cases of employee's leadership skills and

employee's project management skills, which document that they are used in a more efficient way rather than they are more crucial for organizations' competitiveness.

5.1.1. Summary

The data in this section indicates that training is the most significant type of knowledge supplied by respondents. Training programs scored higher than the other knowledge assets, most of which are accepted to be more important than effective. Business and administration gained a leading position among the other disciplines, followed by computer science and information systems. The other fields are ranked relatively low. The main sources of knowledge are universities or other higher education institutes, and the most crucial source outside of the region is international organizations. Prevailing human resources are generally considered to be of higher importance than being effective. The highest score in the area of human resource was given to the employee's teaching skills.

5.2. Knowledge Transfer

This section contains empirical analysis of the practices and routines and the main kinds of external relations of the knowledge transfer organisations. The focus is on their importance and effectiveness for the competitiveness of the respondents.

Table 5.6 suggests that training materials are the most important and the most effective practices and routines, affecting the organizations' capabilities to transfer knowledge to business. The average values of 8.07 and 7.64 are high which documents that this significance occurs both in relative and in absolute terms. The second ranked item is library, whereas the lowest score is given to the customer project materials. The importance of all "practices and routines" is higher than their effectiveness, i.e. knowledge transfer organizations are not able to use them as efficiently as it is necessary in order to be competitive. The difference between importance and effectiveness of 10.11% for the process manuals is the highest, whereas the difference for solving problems forums is only 1%.

Table 5.6 – Practices and Routines

	Importance	Effectiveness	Percentage difference
Process manuals	5.64	5.07	10.11
Training materials	8.07	7.64	5.33
Customer project materials	4.36	4.07	6.65
Library	7.57	7.14	5.68
e-library subscription	5.00	4.71	5.80
Forums for solving problems	6.57	6.5	1.07
Communication with beneficiaries	6.64	6.00	9.64
Communication with other service providers	5.14	5.07	1.36

When considering the external relations of the knowledge transfer organizations, the following major characteristics could be outlined: In comparison to other external relations, the reputation of knowledge transfer organisations appears to be the decisive factor in terms of importance and effectiveness with average scores of 8.43 and 7.57. The next three positions on the scale were obtained by information on an organisation's roles, presentation of their services, and the level of client satisfaction. Interestingly the relatively low scores were obtained in the area of relationships and collaborations with business and other providers, which suggest that they are less significant in the knowledge transfer process.

Similarly to the previous table, all forms of external relations are rated as more important than being effective, and again these forms are more important for the knowledge creation organisation than they are being efficient in regard to the knowledge transfer. The percentage difference between the levels of importance and effectiveness varies from 3.96% (satisfaction of clients) to 10.2% (reputation of the organization).

Table 5.7 – External Relations

	Importance	Effectiveness	Percentage difference
Reputation of your organisation	8.43	7.57	10.2
Presentation of your services	7.36	6.93	5.84
Knowledge of your organisation's role(s)	7.79	7.14	8.34
Satisfaction of client/customer/partner	7.07	6.79	3.96
Responsiveness to beneficiary demands	6.71	6.36	5.22
Relationships with your beneficiaries	5.71	5.36	6.13
Relationships with other providers	5.86	5.29	9.73
Collaboration with business to innovate	6.00	5.50	8.33
Collaboration with other providers to innovate	4.86	4.57	5.97

Regarding the importance of scientific disciplines in relation to knowledge transfer, Table 5.8 shows that they are ranked in very similar way as the results in Table 5.3. The obtained scores for a majority of disciplines are in this case higher, which denotes that they are of higher significance and contribute to knowledge transfer. The data in Table 5.8 confirms the inference, drawing from knowledge supply analysis, that the scientific disciplines are not rated highly, except business and administration and computer sciences.

Table 5.8 – Importance of disciplines for knowledge transfer

	Importance
Biological sciences	3.36
Medicine and dentistry	2.93
Computer science and information systems	6.64
Engineering technology	4.14
Mathematical sciences	5.79
Business and administrative (e.g. logistics)	7.14
Physical sciences	3.93
Agriculture	3.14
Architecture, building & planning	2.71
Other (please state)	5.00

Table 5.9 presents the results concerning knowledge transfer to the different stakeholders. It highlights the fact that the recipients of primary importance are universities and other higher education institutes, public sector organisations, private sector organisations, and professional networks. The scores for all types of private firms are much lower, and this fact can be interpreted as an unfavourable in respect to the innovation capabilities and competitiveness of the firms.

The knowledge transfer recipients are located mostly inside the region. Thus, the average scores for the agents outside are very low in absolute and in relative terms, due to the broad definition of the Bulgarian region for the project purposes, which has more than ¾ of all Bulgarian universities and other research centres. Similarly to the results, presented in Table 5.4, the main outside knowledge transfer destinations are the district centres of the excluded planning regions, as well as the EU countries.

Table 5.9 – Knowledge Transfer Supply

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	4.93	3.57
Medium sized private sector firms (50- 249 employees)	4.86	3.43
Large private sector firms (250+ employees)	4.57	3.07
Public sector organisations, such as government business support agencies	6.00	2.71
Private sector organisations, such as private training or research providers, and consultants	5.71	3.00
Universities or other higher education institutes	7.36	5.36
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	5.57	3.00
International Organisations/Donors	4.71	4.29
Other	1.57	1.43

Table 5.10 provides information on various partners to knowledge transfer organizations. All the listed partner organizations appear to be of a high importance. 100% of the respondents interact with international research institutions, 92.9% with professional organizations, and 85.7% with the subject focused organisations and funding organizations. These data can be perceived as evidence that a relatively big part of interactions relates to fundamental research, having little to do with the applications to SMEs.

Table 5.10 – Interactions with other stakeholders (in %)

	Yes	No
Chamber of Commerce	57.1	42.9
Trade or Business Association	78.6	21.4
Business Club	64.3	35.7
International research organisations	100.0	0.0
Professional organisations	92.9	7.1
Subject focused organisations	85.7	14.3
Funding organisations	85.7	14.3

The importance of interaction for knowledge transfer is outlined in Table 5.11. The most important aspect seems to be improving university-business relations with an average score of 7.64. The second and third positions were obtained by sharing knowledge with other members and developing contacts with firms rated with 6.93 and 6.07, whereas the score of the developing trust between research providers and companies is the lowest. The obtained results suggest that interaction at institutional level is rather high but the real collaboration with the firms is actually not happening.

Table 5.11 – Importance of Interactions

	Importance
Developing contacts with firms	6.07
Developing other service provider contacts	5.57
Improving university-business relations	7.64
Sharing knowledge with other members	6.93
Developing trust between research providers and companies	5.36

5.2.1. Summary

Training materials are the most important practices and routines in regards to knowledge transfer. The knowledge transfer organizations are not able to use these practices and routines as efficiently as it is necessary to remain competitive. Among the external relations of the knowledge transfer organisations, the decisive factor is the reputation of the organisation, whereas the scores for the relationships and collaborations with business and other providers are relatively low. All forms of external relations are assumed to be of a higher importance, compared to their effectiveness. Scientific disciplines in knowledge transfer process are ranked almost the same way as in the knowledge creation process, and overall they are not rated highly. The most important recipients of knowledge transfer are universities and other higher education institutes, public sector organisations, private sector organisations, and professional networks, however the scores for all types of private firms are lower. The interaction with business and professional organizations are of a high importance for knowledge transfer. The most important interaction seems to be improving university-business relations, whereas the effect on developing trust between research providers and companies is rated relatively low.

5.3. Barriers and Future Support

These section analyses two types of barriers to knowledge transfer: barriers concerning knowledge transfer to firms, and barriers to acquiring or creating knowledge in the organisations which need to maintain or improve their

competitiveness. It also highlights the areas of policy interventions that could help companies to acquire and develop knowledge needed for improving their performance.

Table 5.12 suggests that over 50% of barriers to knowledge transfer are rated below 5 and consequently are not classified as significant. The most important barrier faced by knowledge transfer organizations is a lack of support from the public sector with an average score of 6.38, followed closely by a lack of finance/budget to reach many firms and a lack of demand from local firms with a score of 6.06 and 5.63 respectively. It should be pointed out that none of the barriers (except the item “other”) is ranked below 4, which means that these barriers are not significant. These data are indicative and suggests that public sector interventions are necessary in regards to the knowledge supply process. In this case it is necessary to take into consideration the fact that a majority of the research institutions are still state-owned and subsidised, and therefore rely on the public support more than on knowledge transfer activities initiating by themselves.

Table 5.12 – Barriers to knowledge transfer

	Importance
Lack of demand from local firms	5.63
Lack of time to contribute to such activities	4.56
Lack of finance/budget to reach many firms	6.06
Lack of management acumen and skills	4.88
Lack of support from the public sector	6.38
Difficulties in undertaking market research to identify opportunities for collaboration	4.81
Lack of contacts in the business world	4.25
Other	2.5

In terms of barriers faced by firms, Table 5.13 shows that the two most important barriers are the access to suitable finance and the access to skilled labour, with average scores of 6.94 and 6.56 respectively. The relatively high scores of the access to suitable finance and the access to skilled labour highlight the financial problems of most of Bulgarian firms, which suffer from the adverse demographic trends and the “brain drain” processes.

Table 5.13 – Barriers to knowledge creation faced by firms

	Importance
Access to relevant networks	4.81
Access to relevant collaborators	4.81
Inapplicability of knowledge created by others in region (e.g. universities, other companies or existing networks)	4.25
Quality or applicability of available business support or advice	5.44
Access to suitable finance	6.94
Access to skilled labour	6.56
Access to suitable training	5.31
Access to suitable equipment or plant	4.63

The priority for future policy should be a focus on creating better networks that link companies with universities and other R&D performing organisations. The high percentage (70%) suggests that it should form the core policy. The other areas that seem to be of a high importance are the improvements to the physical infrastructure (55%), closely followed by creating more access to training and workforce development opportunities (50%). From the obtained data it becomes apparent that the universities and other research centres do not think that making finances available to firms or providing more support to companies to improve their supply-chains should form the core future policy.

Table 5.14 – Future Policy Directions

	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy
Creating an improved system of business support and advice	0	60	40
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities	15	60	25
Creating more access to training and workforce development opportunities	0	50	50
Support companies in entering and accessing new markets	20	50	30
Create better networks that link companies with universities and other R&D performing organisations	5	25	70
Make improvements to the physical infrastructure allowing companies to locate in better equipped premises	5	40	55
Provide more support to companies to improve their supply-chains and logistical needs	20	65	15
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment	0	65	35
Stimulate the creation of new start-up companies	5	55	40
Other	10	45	45

5.3.1. Summary

The biggest barrier faced by knowledge transfer organizations is a lack of support from the public sector, followed closely by the lack of finance/budget to reach many firms, and a lack of demand from the local firms. Regarding the barriers faced by firms, the two most important are the access to suitable finance and the access to skilled labour. The core future policy should focus on creating better networks that link companies with universities and other R&D performing organisations.

5.4. Conclusions

The conducted analysis of the knowledge supply and transfer in the region of South and East Bulgaria allows us to draw the following conclusions:

Firstly, knowledge supply and transfer is clearly dominated by training activities and training programmes, suggesting that training is the most important knowledge type and consequently the crucial intellectual asset in the region. The relatively low scores of the other knowledge types and assets demonstrate that universities are focusing mainly on education and do not pay sufficient attention to research activities. They provide training in almost all fields of the science, which explains why the respondents from different universities rank the different disciplines in a specific way.

Secondly, the traditional research institutions carry out significant research work in the area of fundamental sciences, whereas the applied research is of a secondary importance. Most of these institutions pointed out that teaching skills, competence and consulting skills are the most important in the human resources field. In the area of external relations reputation is considered to be of a high importance for knowledge suppliers, whereas the responsiveness to beneficiary demands, relationships with beneficiaries and other providers and collaboration with business and other providers to innovate are considered to be less significant.

Thirdly, the main knowledge recipients are universities and other higher education institutes, however, private sector firms are rated to be of less importance. The research institutions closely interact with major business and professional institutions, however the interaction is happening mainly on the institutional level and the actual interaction and collaboration with the firms is lacking.

Fourthly, for knowledge suppliers a lack of public support is the main barrier to knowledge transfer, whereas for firms the main barriers are a lack of financing and access to skilled labour. In spite of the fact that firms are facing financial problems, the research institutions do not think that making more finance available to companies should form the core policy issues that needs to be addressed.

Fifthly, the participants of the focus group showed an interest in project developments and its future outcomes. Some of them expressed their willingness to take part in the preparation or in the discussion of the regional strategy on Research and Development that will be prepared under the project. The participants suggested that the focus group should continue acting as a networking event that will be of common interests for all represented organizations.

6. Conclusions

On the basis of the data analysis conducted across four MIRIAD regions we can draw conclusions highlighting similarities and differences between the regions. The common outcomes drawn from this work is the fact that all the variables scored higher in the importance than in its effectiveness across the Balkan regions.

Knowledge Assets

- Across the Balkan region the knowledge supply is dominated by training activities whereas in Yorkshire and Humberside new technology and new processes development are the most frequent types of knowledge supplied to the external stakeholders. However, more specific knowledge such as employment law, finance and accounting, health and safety advice is not very often or never supplied across all four regions and the same applies to knowledge on procurement inputs, which is never supplied.
- The importance of academic disciplines for knowledge creation and knowledge transfer is rated higher in Yorkshire and Humberside than in the Balkan regions. The dominated disciplines are engineering technology (in Yorkshire and Humberside and Thrace Turkey) and computer science and information systems in Central Macedonia -Thrace, Greece. Interestingly, in South-East Bulgaria business and administrations are the most important disciplines followed closely by computer science.
- In all MIRIAD regions the higher education institutions source knowledge within their own sector i.e. universities, research institutions or public sector rather than sourcing it from SMEs or private sector. International organisations play an important role for higher education across the regions. The higher education institutions need to focus on bridging the gap between private and higher education sector.

Knowledge transfer

- Across the Balkan regions is apparent that higher education institutions are of a self-contained nature and are characterised by and over dependence on public sector finance. They do not focus on the needs of the economy or the corporate sector both in terms of knowledge applicability or developing long-term relations with this sector.
- There is a gap between the supply of knowledge and the demand for knowledge. The supplied knowledge needs to be more applicable to the requirements of the economy and be commercialised. In countries such as Greece the current legal framework hamper the process.
- Common outcomes for all regions are in the area of external relations, where the importance of all factors is higher than their efficiency. Higher education institutions should focus on how to improve the efficiency in these areas.

- Significant opportunities arise from the better utilisation of existing resources, particularly human capital.
- More financial resources and human capital needs to be allocated to knowledge transfer activities in the higher education sector.
- In spite of the fact that there are interactions between higher education and business sector across the regions a lack of demand from the private sector still persists.
- Collaboration between higher education and the private sector needs to improve and knowledge supply should be more tailored to the needs of firms across all the regions.
- The main knowledge recipients across the Balkan regions are universities and other higher education institutes, with private sectors firms rated to be of less importance. In Yorkshire and the Humber knowledge is supplied to SMEs and large private firms as well as universities and public sector.
- The research institutions closely interact with major business and professional institutions, however the interaction is happening mainly on the institutional level and the actual collaboration with the firms is lacking.

Barriers

- There are significant barriers to knowledge transfer across the regions often due to the lack of access to suitable finances and relevant collaborators.
- Foreign direct investment needs to be attracted in order to stimulate a better supply and demand for knowledge, and it should be a priority for regional policy in Yorkshire and Humberside.
- In the Balkan regions, knowledge suppliers lack public support, whereas for firms the main barriers are a lack of finance resources and access to skilled labour.
- There is an urgent need to bring the corporate sector and research performers into closer interaction forms of interaction with each other.

APPENDIX

Knowledge Supply Interview Questionnaire

The key aim of the interview is to gain an understanding of how the knowledge generating and transfer supporting organisations in our region can help improve the performance of firms in the region. In order to achieve this, it is necessary to gather some information on your organisation and its operation. All the information given will remain confidential and will only be used in an aggregated form along with information supplied to us by similar organisations.

We are particularly interested in how your organisation operates in the region in which it is based.

We are also very interested in how and where the knowledge your organisation generates and processes is transferred. **Knowledge is defined as broadly consisting of research and development, ideas, expertise, and other information that is, or potentially can be, used to make the operation of an organisation more effective.**

For a number of questions we ask you to rate the importance and effectiveness of various factors for creating and transferring knowledge. In this case, please consider the following:

- Importance – how necessary a factor is for transferring knowledge from your organisation to the business community in your region.
- Effectiveness – relates to how efficiently your organisation transfers knowledge to the business community in your region.

Knowledge Assets

1. What type(s) of knowledge does your organisation supply to external sources?

Knowledge Type	Very often supplied	Quite often supplied	Not often supplied	Never supplied
Employment law				
Health and safety advice				
Finance, accounting and auditing				
New Market development				
New Product development				
New Process development				
New Service development				
New Technology				
Recruitment or Skilled Labour				
Training				
Procurement of inputs				
IT development/support				
General business support				

2. On a 1 – 9 scale, please rate the importance (where 1 is of no importance and 9 is extremely important) and effectiveness (where 1 is completely ineffective and 9 is extremely effective) of the following to your organisation’s capability to create and transfer knowledge to firms in your region?

Intellectual Assets	Importance	Effectiveness
Patents filed		
Copyrights held		
Market knowledge		
Process manuals		
Training programmes		
Website		
IT facilities		

3. On a 1 – 9 scale, please rate which disciplines are significant for knowledge creation within your organisation (where 1 is of no significance and 9 is extremely significant).

Biological sciences	
Medicine and dentistry	
Computer science and information systems	
Engineering technology	
Mathematical sciences	
Business and administrative (e.g. logistics)	
Physical sciences	
Agriculture	
Architecture, building & planning	
Other (please state)	

4. On a 1 – 9 scale (where 1 is never and 9 is very often) how often does your organisation **source and obtain** knowledge from the following?

	Within the Region	Outside the Region	If Outside Region, Please State Main Locations
Small private sector firms (1-49 employees)			
Medium sized private sector firms (50- 249 employees)			
Large private sector firms (250+ employees)			
Public sector organisations, such as government business support agencies			
Private sector organisations, such as private training or research providers, and consultants			
Universities or other higher education institutes			
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).			
International Organisations/Donors			
Other (please state)			

5. On a 1 – 9 scale, please rate the importance (where 1 is of no importance and 9 is extremely important) and effectiveness (where 1 is completely ineffective and 9 is extremely effective) of the following to your organisation’s capability to create and transfer knowledge to firms in your region?

Human Resources	Importance	Effectiveness
Staff/Employee skills		
Staff/Employee competences		
Staff/employee experience		
Staff/Employee problem solving capacity		
Staff/employee teaching skills		
Staff/employee knowledge of specific markets		
Staff/employee consulting skills		
Staff/employee strategic skills		
Staff/employee leadership skills		
Staff/employee development skills		
Staff/employee project management skills		
Staff/employee mentoring skills		
Management commitment		

Knowledge Transfer

6. On a 1 – 9 scale, please rate the importance (where 1 is of no importance and 9 is extremely important) and effectiveness (where 1 is completely ineffective and 9 is extremely effective) of the following to your organisation’s capability to transfer knowledge to firms in your region?

Practices and Routines	Importance	Effectiveness
Process manuals		
Training materials		
Customer project materials		
Library		
e-library subscription		
Forums for solving problems		
Communication with beneficiaries		
Communication with other service providers		

7. On a 1 – 9 scale, please rate the importance (where 1 is of no importance and 9 is extremely important) and effectiveness (where 1 is completely ineffective and 9 is extremely effective) of the following your organisation’s capability to create and transfer knowledge to firms in your region?

External Relations	Importance	Effectiveness
Reputation of your organisation		
Presentation of your services		
Knowledge of your organisation’s role(s)		
Satisfaction of client/customer/partner		
Responsiveness to beneficiary demands		
Relationships with your beneficiaries		
Relationships with other providers		
Collaboration with business to innovate		
Collaboration with other providers to innovate		

8. On a 1 – 9 scale, please rate which disciplines are the most significant for knowledge transfer **from** your organisation (where 1 is of no significance and 9 is extremely significant)

Biological sciences	
Medicine and dentistry	
Computer science and information systems	
Engineering technology	
Mathematical sciences	
Business and administrative (e.g. logistics)	
Physical sciences	
Agriculture	
Architecture, building & planning	
Other (please state)	

9. On a 1 – 9 scale (where 1 is never and 9 very often) how often does your organisation **transfer knowledge to** the following?

	Within the Region	Outside the Region	If Outside Region, Please State Main Locations
Small private sector firms (1-49 employees)			
Medium sized private sector firms (50- 249 employees)			
Large private sector firms (250+ employees)			
Public sector organisations, such as government business support agencies			
Private sector organisations, such as private training or research providers, and consultants			
Universities or other higher education institutes			
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).			
International Organisations/Donors			
Other (please state)			

10. Does your organisation interact with any of the following?

	Yes	No
Chamber of Commerce		
Trade or Business Association		
Business Club		
International research organisations		
Professional organisations		
Subject focused organisations		
Funding organisations		

11. If you answered yes to any of the above, on a 1 – 9 scale (where 1 is of no importance and 9 is extremely important), how important is this interaction for the following:

	Importance
Developing contacts with firms	
Developing other service provider contacts	
Improving university-business relations	
Sharing knowledge with other members	
Developing trust between research providers and companies	

Barriers and Future Support

12. On a 1 – 9 scale (where 1 is not significant and is 9 extremely significant), please rate the significance of the barriers faced by your organisation in terms of transferring knowledge to firms in the region:

	Barrier
Lack of demand from local firms	
Lack of time to contribute to such activities	
Lack of finance/budget to reach many firms	
Lack of management acumen and skills	
Lack of support from the public sector (based on your experiences)	
Difficulties in undertaking market research to identify opportunities for collaboration	
Lack of contacts in the business world	
Other (please state)	

13. On a 1 – 9 scale (where 1 is not important and is 9 extremely important), please rate the importance of the barriers faced by firms in your region with respect to acquiring or creating the knowledge they require to maintain or improve competitiveness:

	Barrier
Access to relevant networks	
Access to relevant collaborators	
Inapplicability of knowledge created by others in region (e.g. universities, other companies or existing networks)	
Quality or applicability of available business support or advice	
Access to suitable finance	
Access to skilled labour	
Access to suitable training	
Access to suitable equipment or plant	

14. Where should policymakers most focus and concentrate their resources so as to help companies in your region better acquire and develop the research and development, ideas, expertise, and other information required to improve their performance?

Policy Area	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy
Creating an improved system of business support and advice			
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities			
Creating more access to training and workforce development opportunities			
Support companies in entering and accessing new markets			
Create better networks that link companies with universities and other R&D performing organisations			
Make improvements to the physical infrastructure allowing companies to locate in better equipped premises			
Provide more support to companies to improve their supply-chains and logistical needs			
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment			
Stimulate the creation of new start-up companies			
Other (please state)			

Name of respondent	
Position	
Name of Organisation	