

Open Method of Co-ordination (OMC)

3% Action Plan

Report of the CREST Working Group on

Industry-Led Competence Centres –
Aligning academic / public research
with Enterprise and industry needs

December 2008

Final Report submitted to CREST

Table of Contents

1. Preface	2
2. Executive Summary	3
3. Introduction – Consideration of Terms of Reference/Definitions	4
4. Broad Policy Background & Characteristics	6
4.1. The Broad Context for Competence Centres	6
4.2. Competence Centres as Collaboration Mechanisms	7
4.3. Characteristics of Competence Centres	11
4.4. Benefits of Participation	12
5. Existing Situation in Europe	13
5.1. General Trends	13
5.2. Existing Situation in Europe	15
6. Governance	16
6.1. Leadership & Management	16
6.2. Role of Funding Organisations	18
6.3. Structures - Advisory Boards and Committees	19
6.4. Indicators of Governance	20
7. Metrics / indicators of Performance	21
8. Financing IPR and Sustainability	25
9. Training/Mobility	27
10. Conclusions and Recommendations	29
10.1. Encouraging Best Practice in the operation of Industry-Led Competence Centres	29
10.2. Adding Value to Member State Investment in Industry-Led Competence Centres through Enhanced Co-operation and Co-ordination at the European Level	31
Annex	34
Annex 1 – Members of the Working Group	34
Annex 2 – Mandate of the Working Group	36

1. Preface

In December 2007 CREST agreed to the establishment of a Working Group on the theme "Industry-Led Competence Centres – aligning academic / public research with the enterprise and industry needs". The group was chaired by Dr Martin Lyes, Enterprise Ireland and the Rapporteur was Mr Martin Hussey, also of Enterprise Ireland.

In considering its terms of reference, the Working Group agreed a work programme which consisted:

A number of meetings of the Group which focussed on the specific issues of governance, funding, training and mobility, and IPR and metrics as required in its terms of reference. The Group met on 21st February 2008 and considered its terms of reference, the work plan for the year and the definitions. The second meeting took place in Dublin on the 7th April 2008. These meetings took the form of seminars where experts presented views and information on their experiences. These were followed by break out sessions which allowed Working Group members, together with the experts to discuss the topic under consideration. Presentations were made by experts from Ireland and from Austria on governance and from Ireland and Sweden on aspects of training and mobility. The third meeting took place on 27th May 2008 and heard presentations from Technopolis Consultants on metrics for Industry-Led Competence Centres and measuring impact, as well as a presentation and discussion from the Institute for Prospective Technological Studies on concepts and approaches to Centres. Finally IWT from Belgium, which is the organisation responsible for the management of the Compera EraNet, gave a report on the findings of a recent workshop on sustainable funding. The final meeting took place on 25th September 2008 to consider the draft final report.

The Working Group also commissioned a presentation and report from an independent expert, Dr Patries Boekholt of the consultancy Technopolis. Technopolis has been responsible for a range of evaluations of Competence Centre programmes especially in Nordic countries and it was felt that their experience and expertise would be extremely valuable to the Working Group.

A request for assistance was made to the European Commission's Institute for Prospective Technological Studies (IPTS) at the Joint Research Centre (JRC) to produce a report on the economic background to the investment by Member States in Competence Centres. This provided a broad policy framework for the deliberations of the Group.

A survey was made of Member States to attempt to understand the variety of types of Centre, the investment made and a variety of operational aspects and to set some benchmark of the state of play of Centres across Europe. The level of response from countries was not sufficient to make definitive statements about these issues, but the data obtained was considered with information available through the Compera

network, allowing some comments to be made on levels of funding and the broad investment being made.

The Working Group would like to express its gratitude to Dr Patries Boekholt of Technopolis for her presentation and report and also Dimitris Kyriakou of the IPTS for a very valuable input to the work of the Group. During the course of the work the Chairman and Secretary had the opportunity to benefit from discussions with representative from the Compera network. This is an EraNet, supported by the European Commission and has the objective of creating a forum for the exchange of good practice in the management of Industry-Led Competence Centres.

The Working Group was ably supported by Ms Maud Skäringer and Ms Sylvia Jahn of the European Commission.

2. Executive Summary

In December 2007, CREST mandated a Working Group to collect and present Member States approaches to the key aspects of establishing and the functioning of Industry-Led Competence Centres. The Working Group was requested to develop recommendations on the best practice approaches, especially in the following key areas; -

1. Priority setting and establishment of programmes and agendas that are truly Industry-Led, particularly research agendas.
2. Funding models for Competence Centres and the related IPR, value for money and sustainability issues.
3. Governance structures to ensure the continued engagement of the key stakeholders.
4. Training and researcher mobility to and from Competence Centres, including industry based researchers.
5. Opportunities for co-ordination of activities between the Competence Centres of Member States.
6. Performance management and metrics which encourage the desired strategic impacts.

In order to address these issues the Working Group met formally on four occasions during 2008, and had the benefit of additional inputs from IPTS, Seville, a number of experts in fields relating to the operation of Industry-Led Competence Centres who presented to the various Working Group meetings, and Technopolis Consultants. A survey of Member States activities in the area of Industry-Led Competence Centres was carried out and supplemented by information from the Compera EraNet.

The Working Group discussed in detail their experiences in the establishment and management of Industry-Led Competence Centres and related funding programmes. Through these discussions the Working Group agreed a number of aspects of best practice in the establishment and operation of Industry-Led Competence Centres and also in the related area of the management of funding and support programmes by Member States for Industry-Led Competence Centres.

The working Group then formulated this report, which consists of consensus opinion of best practice aspects for Member States to consider in establishing and operating Industry-Led Competence Centres, and also the following recommendations; -

1. Encouraging Best Practice in the operation of Industry-Led Competence Centres: - It is recommended that Member States bring this report to the attention of the relevant bodies in order to allow for discussion on the adoption of aspects of best practice into programmes supporting Industry-Led Competence Centres.
2. Adding Value to Member States investments in Industry-Led Competence Centres through enhanced co-operation: - It is recommended that CREST and the Commission give further attention to ILCCs and their coordination across Europe. As a first step, an investigation aimed at teasing out some of the operational issues associated with introducing a mechanism to co-ordinate ILCCs could be considered. This investigation could address the level of demand for cross-border activities, its potential impact on the European Research Area, how it should be co-ordinated and which organisation is best placed to achieve co-ordination of Industry Led Competence Centre activity across Member States. For this purpose, interested Member States could propose an OMC-NET project or the Commission may consider a study.

3. Introduction – Consideration of Terms of Reference/Definitions

The Working Group (WG) considered its Terms of Reference including the key issues set out, namely Priority setting, Funding Models, Governance Structures, Researcher Mobility, Co-ordination across Member States and Metrics and Impacts. The mandate of the Working Group is attached at Annex 2.

The WG also clarified and agreed a number of definitions as follows; -

Industry-Led

In terms of 'Industry-Led' it was decided to consider the spectrum of Competence Centre leadership and to arrive at a common definition from analysis of the spectrum. It was concluded that Member States had established different forms of Competence Centre with a common intention that they all be Industry-Led in the sense that their impact was to be felt directly through their impact on innovation and (economic) value creation.

Stakeholders

The stakeholders in Competence Centres were defined as being the members of the Public Private Partnership that usually form Competence Centres. The partners directly involved in the operation of a Centre are:

- private enterprises

- research performing organisations
- public service organisations such as hospitals

Government Departments and their Agencies play an important role in setting the agenda and providing a major part of financing for the activities of the Centres.

The effective operation of the Centre depends upon the balance of the views and expectations of stakeholders and it is the effective balancing of these factors which defines a successful Centre.

The Working Group definition of Industry-Led Competence Centres was agreed as follows; -

- They are engaged in collaborative research, typically focussed on medium/long term issues.
- The research is conducted on areas of direct industrial relevance,
- The areas of research are focused on gaining competence in areas of technology or innovation which are relevant to the industry stakeholders.
- They are formal organisations, which have a long term but typically finite duration.

To bring greater clarity to the discussion the following attributes of Centres were agreed. Competence Centres:

- are long term collaborative entities harnessing the expertise of publicly funded research performers with strong industry leadership
- are research Centres with a degree of autonomy, physical focus and possessing a critical mass of researchers.
- engage in market-relevant research through close engagement with industry in the development of their research agendas.
- engage in a range of activities with industrial relevance such as strategic research, researcher training and the transfer of knowledge and intellectual property.
- typically they do not carry out extensive contract research but focus on truly collaborative strategic research
- address a market failure in the RTDI landscape whereby the risks associated with the longer term nature of strategic research carried out cannot be addressed by individual companies.
- build over time a core competence in the Centre in the area of technology focus of the members/partners.
- achieve impacts over time in terms of increased industrial activity by the training and transfer of researchers and commercialisation of IP.
- develop strong linkages between researchers and industry defined in a Centre agreement setting out the expectations of the partners and the commitment expected from them, e.g. time spent engaging in collaborative activities in the Centre.
- They also act as a bridgehead for international collaboration through such mechanisms as the Framework Programme.

4. Broad Policy Background & Characteristics

4.1. The Broad Context for Competence Centres

Recent economic challenges have shown that globalisation is an important feature of European economies and one which will become more intense in future. This is creating new competitive pressures on industry and is driving the need for greater product and process differentiation. As the Communication from the Commission on a broad based innovation strategy suggests:

“Europe’s citizens are concerned by important issues ranging from climate change and the depletion of non-renewable resources to demographic change and emerging security needs, which call for collective action...These legitimate concerns, must be turned into an opportunity to enhance Europe’s global economic competitiveness.”

This European imperative has become an increasingly pressing need for Member States as innovation has become a crucial factor in this situation. The speed of development in the adaptation of new products and technologies is increasingly seen as a decisive factor in ensuring the international competitiveness of both firms and countries. Equally, Member States are increasingly required to provide more effective and cheaper public services and to show how innovation can lead to better societal benefits such as improved health services.

One of the ways forward which has been a continuing response is to foster linkages between the science base and business communities. By joining forces and creating critical mass in R&D, existing gaps in the implementation of new products and new processes can be enhanced and overall competitiveness improved. The introduction of open innovation models by many companies has led to a new willingness on the part of industry to engage in the collaborative process. Inevitably this will mean the creation of more alliances and joint ventures; more spin-offs based on developed technology; and more contracts between industry, universities and national research laboratories.

There are well established arguments for public funding for research which becomes stronger the further distant from the market the research. These arguments for public funding involve positive externalities i.e. spill-overs from research, which cannot be fully appropriated by any individual firm financing it, and which raise the base of knowledge. This under-appropriation leads to low R&D spend by companies and an overall lower level of research activity than would be desirable from the viewpoint of the country as a whole. Although the reverse holds true for applied research situated clearly downstream – i.e. it can be appropriated and fully funded by individual firms, for their own benefit – there are still many intermediate shades of grey between purely ‘basic’ and purely ‘applied’ research.

Competence Centres are investments by Member States made to encourage greater efficiency in the interaction between researchers, industry, and the public sector, in research topics that promote economic growth by their direct relevance to industry agendas. They can be considered as public-private partnerships, aimed at enabling research which might not otherwise take place, and facilitate better interaction with industry towards producing tangible economic benefits. By working in collaboration companies can be exposed to longer term, strategic research which would otherwise be too costly for them to support individually. Centres also create an environment where companies can come together in a non-competitive manner to develop new business relationships and to learn from one another in an effective way. Experience has shown that even in Centres where the technology developed is free e.g. Open Source software, there are still benefits to company participation through early access, proximity to sources of expertise, and the availability of skills to assist the translation of research results into commercial reality.

A core weakness in any country's innovation system is the gap between the research outputs of the funded academic system and its 'translation' into market results of value to the business community which has the ability to fully realise the value of any intellectual property which arises. This barrier can prevent Governments from getting a return both in economic and broadly societal terms from the significant levels of research expenditure in the public research system. A central issue here is the lack of a "needs driven" research culture in the science system which introduces a responsibility upon Universities and other actors to accept this economic role as one which is legitimate and important. It also requires a professional interface to be present between the science system and industry to ensure that there is clarity of expectation on each side and that agreements are executed in a speedy and professional manner. As a result the traditional view that scientific results will naturally flow to industry via spinouts, licences or people is largely unrealised.

In a Competence Centre researchers from different academic disciplines and departments work together. The thematic areas of a Centre are developed jointly by academic researchers, industrialists and in many cases also public actors. Innovative research groups are created working on projects across disciplinary boundaries with issues that are both relevant for the industrial partners and scientifically challenging. By this collaboration between researchers synergies and added value are possible. This is significantly different from the way academics normally organise their research activities.

4.2. Competence Centres as Collaboration Mechanisms

There is no ideal type of Competence Centre, and the organisational set up, mandate, size and resources of Competence Centres vary considerably and therefore there is no one single blueprint that can be designed to assess their impact or define their effective operation.

A wide range of structures has been used across Europe and beyond. Typical ILCC programmes include¹:

- Kplus, Kind and Knet in Austria
- Engineering Research Centres in the USA
- Cooperative Research Centres in Australia
- KKK Centres in Hungary
- Networks of Centres of Excellence in Canada
- Competence Centres in Sweden
- Top Technological Institutes in the Netherlands

The variation in models is in part due to the fact that different Member States have elaborated their own approach to Centres and in some cases these models have been revised over time to address changing policy objectives. The deliberations of the Working Group showed that while the Centre approach is well established across Europe there remains an appetite to learn from the experience of other authorities and to adapt the broad mechanism to changing economic environments.

Even given the rich diversity of form, it is still possible to distinguish a number of existing types of Competence Centre. Some are strongly based in academia but have industry on their Boards, such as the Swedish Competence Centres and the Austrian K+ Centres. A key objective in these cases is to achieve critical mass and to change the behaviour of universities to encourage greater openness to collaborate with industry. Virtual Centres also exist, combining different competences in existing organisations e.g. some Dutch Leading Technological Institutes. Here the approach was to develop multi-disciplinary approaches in areas of importance for industry. Finally there is a community of dedicated 'physical' Centres such as IMEC in Belgium, or the Dutch Telematics Institute which aim to get real depth in expertise and facilities as a core support to the development of industry sectors.

The focus of the Working Group was on exchanging experience of making such Centres work in terms of the interaction between research providers, colleges and companies and to identifying what best practice measure would help in making them more responsive to industry needs.

All Centres aim to address issues of value to both ends of the academic-industry link. They encourage firms to undertake more radical kinds of innovation than normal, based on more fundamental understanding of the technologies with which they work. They also aim to re-focus some of the activities in the knowledge infrastructure (universities plus research institutes) towards inter-disciplinary problem areas of importance to industry. Centres work primarily with established firms that have some capability to absorb technology and can play a role in making the knowledge infrastructure attractive for multinational companies with R&D facilities or mobile R&D.

¹ See for a comparative review of competence centres: Erik Arnold, Jasper Deuten, Jan-Frens van Giessel, An international review of Competence centre programmes, 2004.

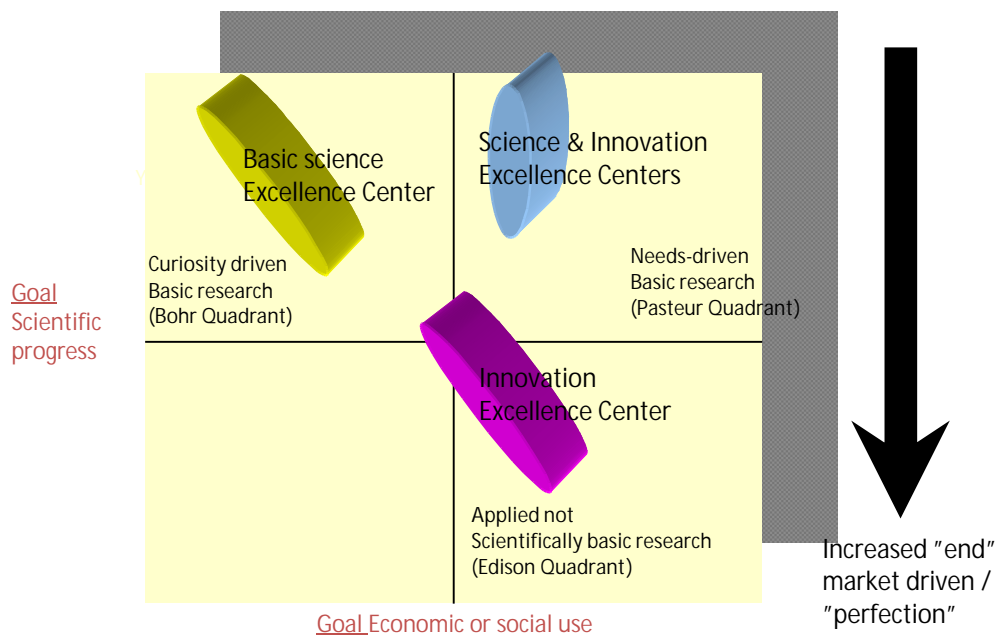
Usually the focus of Centre programmes is on the building of skills and expertise in a particular area to create an effect within that country. Companies located outside the country may in many cases be invited to participate where there is a strategic value in their participation, for example as part of a value chain. New technology-based firms which may include spin-offs will also appear as partners of the Centres.

Other key features include:

- Competitor companies are rarely present within the same Centre. Where this happens, they tend to tackle different topics within the Centre, or to handle questions of common interest far from product development, such as how to tackle environmental requirements and develop a common technological basis.
- Centres normally include a significant proportion of PhD education, training PhDs who are more exposed to and interested in working with industrial problems than traditional PhD candidates and who are more quickly and easily absorbed into industrial companies
- Member States operate different Competence Centre programmes, depending on what type of public-private partnership instruments is most appropriate. For example, industrial clusters with low absorptive capacity need different mechanisms for cooperating with collaborative research Centres than clusters with high absorptive capacity.
- Centres work with a cluster of industrial partners, whose activities share a common 'knowledge base'. They build networks and communities of knowledge with value that goes beyond R&D.
- Many programmes have been set up in the expectation that industry will take over the funding role of the state when the public financing ends. While thirteen of the NSF Engineering Research Centres have been able to carry on without core funding after their NSF grants ran out, there is little evidence to suggest that Centres can continue to exist without public support. The issue for Competence Centre management becomes one of effective monitoring and evaluation to ensure that the expenditure by a Member State is providing value for money.
- There appears to be a trend towards the inclusion of non-technological aspects such as service issues, especially where these have a direct impact on the provision of public services such as the health services.

A discussion on the positioning of Centres supported by the Working Group members on the Stokes Quadrant which is illustrated in Figure 1 below suggests a tension between academic and industrial outcomes, which depends upon such variables as the sector involved, the technology focus and the R&D "sophistication" of the participating companies. The diagram gives a broad delineation between different types of Centres, but of course in reality a number of Centres do operate across such boundaries.

Figure 1 Positioning and the dynamic of Competence Centres is crucial to understand the type of impact and time perspective we should expect



Source Donald Stokes, *Pasteur's Quadrant: Basic Science and Technological Innovation*, Washington DC: Brookings, 1997

While the higher industry focus type of Centre can have a higher immediate impact by solving short term problems or developing close to market technologies their long term impact is likely to be smaller. This was one of the findings of an evaluation of the Dutch Leading Technology Top-Institutes. A policy question is also whether these more applied Centres are justified in receiving the high levels of public support which such Centres usually receive. There is also the danger that these would then compete with other applied technology Centres or even private technical service companies.

Thus the context in which Centres operate largely determine the expected impacts. Some questions and issues that have to be looked at to understand the potential input relate to the academic, the business and the policy context in which a Centre operates. For instance a Centre, established in a domain which has hardly any R&D efforts on the side of the business sector - so having no significant industrial counterparts capable of setting a clear research agenda - will have a much more academically oriented research programming and most likely position itself more towards the Bohr Quadrant. The result is that the impacts are more likely on the academic front rather than on the business case of the industrial partners.

Competence Centres are public-private research Centres of excellence that connect industry to research performing organisations in a sophisticated way so as to increase the generation and availability of new, industrially relevant knowledge which is a crucial pillar of any State's innovative potential. Companies need to employ new technologies

effectively to ensure a competitive advantage, to boost innovative potential, to reduce costs and to bring new products and services to the market. While an increased investment in in-company R&D can go some way to promoting this end, the pace of change and economies of scale make it increasingly necessary for firms to collaborate and to source innovative solutions externally.

Competence Centres programmes provide Member States with a cohesive, strategic and focused approach to market-led applied research and R&D. The strength of this model is its flexibility and capacity to focus on commercially significant technologies of future relevance. The industry/academia duality of this approach allows for institutions' research agendas to be mapped precisely to industry needs, thus increasing the possibility of the generation, and successful exploitation, of new knowledge.

4.3. Characteristics of Competence Centres

Each successful Competence Centre has a set of central characteristics which allow for the efficient and effecting running of a Centre and are thus important tenets when considering the economic rationale for funding Centres.

The flexibility of the Competence Centre model allows for adaptability to suit the needs of the industrial and academic partners. As such, few Centres exhibit identical characteristics however the following are broadly agreed as being core operational descriptors:

- Research and training programs focussed explicitly on industry future needs under the direction of an Industry-Led board and appropriate management who have significant experience of industry.
- A very strong focus/ethos of generating and assisting industry in exploiting new knowledge as their primary objectives
- Significant scale of researchers/principal investigators with further numbers of postgraduate research students both in-house and in associated institutions over the range of disciplines required to deliver on the problem focussed research agenda.
- A multidisciplinary research team covering the range of disciplines required to deliver on the problem focussed research agenda.
- A research agenda which is directly relevant to the future needs of the industrial partners – more medium term market focused than technology driven, as witnessed by the clear commitment of the industry partners.
- Close location / relationship with high quality research groups yet independent from Institutional management structures, possibly to the extent of becoming a separate legal entity.
- Formal governance structures, led by a strong, high profile industry Chairman and a balanced and experienced board, supplemented where appropriate with a scientific advisory board

- A funding model which enables the Centre to maximise the commercial potential of the IP which it is managing rather than being restricted to a small number of companies.

The focus of Competence Centres in the generation of a large supply of research-trained people, who are already used to working for the business community and who are highly sought-after by industry should not be underestimated. This can result in an impressive infusion of industry focused research professionals into a research system that is currently lacking in this critical perspective and can be a strong driver of systemic shift in the culture of collaboration both in industry and in the public research system.

4.4. Benefits of Participation

Too often the majority of actions related to supporting innovation involving industry, research performers and State funding are considered on a short term basis. While this is an obvious reaction to the pressure of change in market requirements this situation is at variance with the need to develop the stability in performance which can only come from having the capability to recognise the emergence of market and technology trends and have the ability to change to meet them. With regard to the business community, Competence Centres promote stronger R&D capabilities by fostering longer co-operations founded on a commitment to a four to five year strategically important research initiative. Academic members similarly, can benefit from the longer term, stable collaborative partnership with key industry partners who have high research ambitions rather than the current system of predominantly short term and often ad hoc co-operative engagements.

Competence Centres can be of particular benefit to smaller States' innovation systems. Centres of such scale can form quite an obvious presence of industry-academia collaboration and research excellence in a smaller innovation landscape. While the Centre's R&D focus can be problem centred or technology centred its overriding and decisive R&D mission can enhance the international visibility of the Centre through scientific and technical recognition and in so doing lend additional credence to the innovation system that spawned it.

This can increase the profile of a country or region as a location for high technology business and as a potential partner in the international research environment. The addition of overseas companies as industrial partners in the Centre can also serve to further embed these firms into the economic environment at a time of increasing global competition for foreign direct investment.

The use of Competence Centres as a policy instrument can also provide a solution to smaller Innovation systems which frequently suffer from a need to form a critical mass in research areas where they have existing or nascent industrial and academic competence.

These positive benefits are, of course, significant to larger States but in the context of a smaller state they allow the initiative to “punch” well above the “weight” of the investment.

The established Competence Centre model throughout Europe is based on a public co-financing funding arrangement. The significant levels of State commitment are complimented by considerable private contributions from the Industry partners. Such industry investment can be characterised by:

- Highly skilled and experienced managerial presence in the Competence Centre’s governing structures
- Skilled and experienced sharing of staff between the partner companies and the Centre
- Invaluable contributions in terms of industrially related “know how”
- Direct cash funding
- Various other in-kind contributions

From the Industry perspective ILCC Programmes ensure a continuum which reduces the risk associated with research initiatives, particularly those of scale and medium to long term duration. In particular Competence Centres address a market failure in higher risk medium and longer term research provision, where companies individually cannot justify engaging in this type of activity, but collectively and with State funding and academic excellence in support, they can engage and complete the full profile of R&D activity required for longer term sustainability.

The model also fits coherently with an increasing drive towards interdisciplinary initiatives in the Third Level sector as many Competence Centres (depending on the specific research focus) support an interdisciplinary approach to their research agenda.

5. Existing Situation in Europe

5.1. General Trends

The Working Group considered the term “Industry-Led” in the context of its work and agreed that a large variety of approaches had been taken by different Member States but all had the same objective to address medium to long term R&D issues facing industry by building long term strategic relationships with research performers. It also became clear that many Programmes developed to support such Centres were themselves changing and adapting to new economic circumstances. Differences are emerging in the level of industrial contribution for example which reflect the maturity of programmes and the strong relationships which have been developed between the partners. It was decided to take an open and inclusive approach to the definition, to learn from different approaches and to recognise the continuing adaptation of programmes.

Discussions at the Working Group demonstrated that significant investments have been made by Member States and that there is a continuing debate across Europe on how best to achieve the industrial development benefits associated with this spend. For example, Ireland, which is in the process of setting up its first Centres has taken an approach of driving the process using industry consortia which are asked to define their needs and to subsequently seek collaboration from research performers.

In contrast the Netherlands has funded Centres since 1996, with a funding mix of 50% State, 25% Industry and 25% University. The programme has evolved over time and some Centres are expected to be self-sufficient. The current model is set in a broader innovation strategy context in order to obtain better value for money and a broader transfer of knowledge. Also Austria has extensive experience in this area with many Centres funded through previous programmes. The latest programme is expected to fund 5 large scale internationally recognised Centres, 23 Competence Centres similar to the original programme and some 20 less formal collaborative research initiatives involving industry.

Estonia has 5 Centres established, these are Industry-Led but with a large degree of Researcher involvement in the proposal formulation stage. Hungary has a mix of Academic-led and Industry-Led programmes, but is moving to an approach which will encourage the development of Centres as separate legal entity, with a strong focus on industry-led components. In other Member States actions were being taken to create appropriate bridging initiatives between the academic and industrial worlds.

Trends can be identified in the evolution of Competence Centre Programmes across Europe which reflects:

- learning by the funding agencies and Government involved of how Science – Industry collaboration actually works and how programmes can be operated that maximise the interaction,
- a clearer understanding of the benefits of collaboration by companies and a willingness to participate in significant strategic relationships with Research Performers.
- An increasing openness by some Research Performers to accept and economic role as part of their mission
- a preparedness by Member States to commit significant funding to this area
- Innovation systems characterised by open innovation has been shown to be successful. Companies understand that innovation may be stimulated by active interaction with creative groups outside the company rather than relying on traditional closed in-house R&D.

Many of the first Centres were initially academic led due to the fact that response to such initiatives is relatively straightforward for academics and also industry demand is difficult to quantify and maintain. Having gained confidence in these early stages, many Centres and Funding organisations are moving towards demanding stronger industry empowerment.

A further trend is the move away from virtual Centres, where a number of research groups are brought together to collaborate with industry towards a model where physical, independent structures are created. Relationships with other research providers outside of this Centre are still sustained but they are more being considered as a supportive network brought in as appropriate by the Centre to satisfy industry needs.

On average across Europe each individual Centre receives funding from public agencies of 1-3 €M per annum and have a total budget that is more than double when the contributions from research institutions and industrial partners are included. They are typically funded for 5-10 years. Given that most Member States now have Competence Centres of some type, the level of investment in Europe clearly is significant.

State support varies (all MS are acutely aware of EU State Aids and ensure that their programmes comply) but is typically of the order of 65% in gross terms, with some MS setting sustainability targets for Industry-Led Competence Centres at the end of their funding period.

5.2. Existing Situation in Europe

The Working Group conducted a survey of its members to attempt to determine the extent of investment made by Member States. Discussions were also held with Compera management to refine the results arising from the survey.

As a result of the survey and Compera data collection, the overall level of state support for Competence Centres Programmes can be estimated. Amongst ten responding countries a €260M investment per annum was depicted. The typical programme duration for these countries is 4-7 years, indicating an investment of well over €1Bn in these countries alone. It is not possible to make a definitive statement on the overall investment on the European level, which would be an interesting project, but it is clear that they represent a very significant commitment.

In terms of the technological area of focus of Competence Centres a simple analysis of the data is presented in the table below, mapping to the main EU Framework themes. This picture masks the complexity of Competence Centres programmes in terms of their focus. Many individual Centres have multiple thematic areas under this framework and most would map to at least two areas. This shows that the Competence Centres tend not to reflect the traditional technology areas that may be expected but to reflect the multidisciplinary of approach required by meeting industrial market need.

Thematic Area	% Activity	Thematic Area	% Activity
	No. of Centres		No. of Centres
Life Sciences	15.6	Information Technology	11.8
Chemistry	4.3	Nanotechnology	7.8
Materials	13.7	Agriculture and Food	3.8
Environment	7.6	Transport	6.3
Production Technologies	12.2	Socio-economic sciences	2.1
Services	8.4	Other	6.3

Data from working group survey and Compera

6. Governance

During its deliberations the Working Group agreed that one of the key aspects of a successful Competence Centre is an effective governance system. The following points emerged from discussions and the survey.

6.1. Leadership & Management

As has been mentioned before, the form of Centre is variable across Europe and the model of governance has to be sufficiently flexible to allow it to change with circumstances. Nevertheless there are some lessons that stand out.

Leadership is perhaps the central element in the successful operation of a Competence Centre. In this context the two key functions are the Director and the Chairperson of the Board. The Director must be an individual who understands both academic and industrial environments and appreciates the complexity associated with bridging these two spheres which often have widely different timescales, expectations and cultures. S/he must also have domain expertise to maintain credibility among the partners. If a Centre chooses to pursue a strictly industry relevant work programme there is a risk that the best researchers will not get involved. Equally if the research activities are determined by academics only there is a risk that industry partners would find this approach less relevant for their business needs. Balancing these competing demands is the major challenge facing the Director and the Board.

In some Centres the role of Director is split between a scientific director and a business manager, as a response to the demanding nature of the role. This overcomes the problem experienced, for example, in the Swedish competences Centres programme by some Centre managers with strong academic backgrounds, who found that they lost momentum in their research careers. In this way an academic director can use his/her

experience of working with a Competence Centre in a positive way which can enhance his/her career.

Directors obviously need to be perceived as good leaders and managers, and this has consequences for the kinds of personalities and experience that are appropriate for the job. Depending on the origins of the Centre application, Directors come from both academic and industrial backgrounds. The key issue is that the Director in a truly Industry-Led Centre will need to spend significant time with the industry partners to ensure their active participation and will therefore need a background and personality which will be familiar and acceptable to a community of company R&D managers.

This means also that the Director must be supported by a governance structure that balances academic and industrial power in the Centre and which also delegates authority adequately to the Director.

The role of Chairperson the Board is one which is critical in drawing in and maintaining the interest of companies. A major danger for Competence Centres is that they continue in existence but become less and less relevant for industry. The Chairperson is in a position to understand the pressures facing companies and work with the Director to reflect those pressures in a responsive work programme. The Chairperson should also ensure that the Centre has a clear focus and medium to long term vision of what research topics are important and the results that are needed to maintain momentum in the Centre. S/he should come from an industrial background if possible and should bring with them the profile and experience to reinforce the profile of the Centre and to ensure that the highest quality individuals are brought on to the Board, which should include members from industry and the research institutions.

The breakdown of membership of Boards varies considerably across the Centres funded by Member States represented on the Working Group, which reflects the stage of development of Centres, the direction of the Centre Programmes, as well as the industry sector and technologies involved. It has been clear from discussions, however, that a strong industry voice is necessary and the view was taken that the board should have an industrial majority. Methods of achieving satisfactory research programmes with true inter-company collaboration are a focus along the value chain in a sector or for a technological focus that spans sectors. As the research focus will change, new partners may be required and should be accommodated (both Industry and Research Provider).

The Group felt that the Board should represent the partnership, and should have periodic elections to ensure this representation and to maintain a dynamic involvement of the partners. Compulsory rotation is an option in most cases but not necessarily a requirement. The participants in the Board need to be the right people at the appropriate level in the companies and research performers, and other company/provider participants also should be appropriate to the activities involved (e.g. project sub-groups, IP committee etc). The Board should continually review the Research Agenda and adapt it to the market needs.

In this context, the Board should be 'tolerant' of research failures as the nature of strategic research means that this will occur. The Board should monitor the collaborative nature of the research being carried out and beware of slipping into 'contract research' modes.

The group recommended that the Board itself be well versed in IPR, and that a sub-committee of IPR professionals be utilised. The structure should be such that IPR considerations encourage new members, foster new ideas and maintain dynamic collaboration over inter-member competition. IPR policies need to be clear. There is a necessity to have a clear process for agreement, review and development of the research programme. It is clearly the Chairpersons job to ensure alignment of the college / research performers and industry ambitions for the Centre at a strategic level.

The key learning point is that a successful Centre needs both a strong Director and a committed Chairperson.

As discussed previously the technological and industrial settings in which Centres operate have big impact on the governance model of a Centre. It influences the 'time-to-market' pressures of the companies involved (e.g. the longer term science based developments in the pharmaceutical industry compared to the faster turn-round pressures in the ICT industry), the presence of R&D capable companies in a country, the role companies can and want to take in the medium to long term research programming, and therefore also the positioning within the Pasteur's Quadrant. National programmes supporting Centres therefore should – within certain policy boundaries - remain flexible in prescribing organisation models, and structures as the composition of stakeholders will have a large influence on what works and does not work in a particular area. There also needs to be sufficient 'absorptive capacity' on the side of industry to capture the benefits of Centres' work.

6.2. Role of Funding Organisations

Funding organisations have responsibilities associated with the provision of money and a duty to ensure high quality performance and best value for money. Clear deliverables need to be set to ensure compliance; although different agencies are aware that it takes time to establish a Centre and there is a concern that strict milestone performance indicators should not be set too early in the Centre's operation as they take a considerable time to become established and fully operational. This does not mean that clear performance metrics are not essential to the operation of Centres or the effective evaluation of progress of funding programmes.

The role of a funding organisation should be:

- Establishing a accepted policy context for a Competence Centre programme
- Setting out clear conditions for support and application procedures

- Management of an independent evaluation of applications for support
- Formulate performance metrics and be in charge of an on-going monitoring of progress
- Ensuring that the Centre maintains a longer term, strategic view
- Regular Centre reviews to determine which should continue / close in the context of their performance with respect to given criteria
- Independent programme evaluation to inform discussions on whether the entire Centre programme is achieving its aims

As a major stakeholder the role of the funding organisation should typically constitute the running of external evaluations, ensuring that a longer term, strategic view is taken, independently evaluating new funding projects and the review of quarterly metrics.

The frequency, nature and expectations of external evaluations need to be clearly stated from the outset, and the Centre must be prepared to act upon recommendations made or face possible cessation of funding. A suggested structure was discussed involving evaluations at approximately 2-3 year intervals. The primary evaluation would focus on issues relating to the establishment of the Centre and a demonstration of its potential, an interim evaluation to focus on the scientific outputs and transfers to member companies and a final evaluation to focus on the wider impact.

6.3. Structures - Advisory Boards and Committees

The group recommended that Centres should have Scientific Advisory Committees, which would aim to ensure quality of science, to provide a platform to brainstorm ideas and help to formulate longer term strategies in the context of future industrial trends.

The advisability of establishing Centres as separate legal entities was considered. On the positive side it was felt to be the most appropriate structure for an Industry-Led initiative, as Competence Centres need to be clearly separate from the parent organisations of the stakeholders, drawing on the expertise available but being sufficiently independent not to get drawn directly into an academic environment. On the negative side a less formal structure would make closure easier if that was necessary and it might allow for better integration into the research provider.

The experience of a number of members of the Working Group suggested that there be good use made of sub groups to engage managers throughout the industry partners and avoid a situation where all dealings pass through a single senior manager. This can lead to a situation where the flow of knowledge can be restricted and problems develop which could have been diffused quickly had all parties had better communication.

Research Providers and industry need to form the Centre (contractually) and it is recommended that funding agencies have observer status (as a 'maximum') in the governing board. However, consideration also needs to be given to the state of development and level of integration with a Host

Research Provider, and in some cases the separate legal entity may not be the optimum approach.

Given the central importance of the Centre research programme, the process by which it is formulated is critical and simple industrial participation in Advisory Boards is not necessarily sufficient to ensure relevance. Their exact role in setting the Research Agenda e.g. topics, the duration of projects, whether to consider only joint projects or small consortia should be clarified and made transparent. The Group was convinced that for a good level of industry commitment it is essential for the right person at the right level, Board, management committee, project group, etc to be committed and to participate actively.

Finally, considerations included the challenge of engaging new companies, in particular SMEs. This can be addressed through research project portfolio management and IPR agreements that are flexible and open to this behaviour. The Centre should preferably have a physical location rather than a virtual entity. A mix of large and small companies is recommended.

6.4. Indicators of Governance

From the experience of the members of the Group, the following emerged as indicators of strong and weak governance.

Of good governance:

- Free and flexible mobility of staff, research performer and industry.
- Regular transfer of technology through formal and informal means.
- Flexible ways of interaction driven by the needs of the industry.
- Recognition by the researcher/research-performing institution that the Centre is a significant and important activity as demonstrated by the involvement of senior staff.
- Openness to new members.

Of weak governance:

- Conflict at Board and other Committees, including conflicts of interest.
- A "Closed Shop" approach to new members, where the membership conditions dissuade companies from seeking to join
- A work programme too close to market, alienating academic researchers.
- Lack of a Centre identity and a consequential lack of status either in industry or in research performers.
- Low interest by industry, poor representation or attendance at meetings.
- Low motivation of good academics to participate in Centre.

These indicators give some insight into the development of Centres and can help Programme managers to see more subtle signals of performance.

7. Metrics / indicators of Performance

As part of its deliberations the Working Group established that the ILCC metrics and associated impacts of ILCC Programmes were complex and closely dependent on the strategic aims of the national support programmes, the maturity of the Centres and also on the technological focus of the programmes and Centres within the programmes.

The 'Time to Impact' of an ILCC is dependant on the conditions set by the national funding programme, which sets the broad operational parameters, such as the level of contribution from industry. This is also influenced by the market sector involved, the absorptive capacity of the industry involved, the level of true collaboration possible and on the size, technology focus and scale of the companies involved. It is therefore very difficult to have generic metrics and generic assessments of impact in terms of both time and expectations of value.

The type of impact also depends on the policy context. For example, if the intention of an ILCC Programme is to drive change in University behaviour the type of metrics and indicators used must align with the policy aim (a top-down or mandatory type approach to metrics in this instance). This presents a problem in terms of the 'lifetime' of a policy aim as these may be shorter term than the time to impact of a particular ILCC or the programme which supports it. Typically impact in the context of ILCCs requires a relatively long time to develop (some of the members of the Working Group suggested as a crude estimate 7 to 10 years) and therefore sustained ILCC programme and policy support is a requirement. Academic knowledge outputs as metrics also require time to show impacts such as citations and can be very difficult to attribute proportionally to the impact achieved.

Equally, a piece of technology may be developed by a Centre and transferred to a group of companies, but that technology may have arisen over years of research effort, sponsored by a range of sources. Thus there are many different 'actors' in knowledge outputs and assessing the individual effect of each actor on an output is extremely difficult. Consideration should be given at the earliest stages of programmes to establishing the baseline, and to monitor and measure the activities which lead to knowledge outputs in the future. Metrics in this case would include licences, spin off enterprise, training programmes, industry staff enrolled on post graduate courses, joint publications, joint patents.

Personnel transfers are usually considered as outputs rather than impacts and need to be closely monitored in time. For instance 'spin-out' activities from Research Collaborations are often somewhat removed from the researcher activity in the Centre, whereby researchers often move to industry for a period prior to using the benefit of both research and industry experience to establish a new venture. Metrics include the number of students associated with the Centre moving to employment in the business sector involved, time spent by industry staff in the Centre, time secondments of staff from the Centre into industry.

Networking indicators are useful in showing the dynamics of interaction and it is important to consider the metrics that measure and report ILCC activities (as a measure of the level of effort and to establish a timeframe for the cause). Metrics here include numbers of networking events, briefing sessions, newsletters, number of informal contacts between partners and so on.

Management metrics are important in establishing the quality of leadership in ILCC activities. These give early stage information on the likely success or otherwise of the Centres and can be used as indicators to improve or correct performance over time. Metrics differ with the stage of development of the Centre from early stage metrics such as development and agreement on a strategic plan, to cover the challenges of managing a mature Centre such as budget targets, overall performance metrics for the Centre, time spent with industry members, etc.

In terms of economic impacts, such as the attraction of Foreign Direct Investment and business eco-system development, the people generating these activities often are at some remove from the initial ILCC interaction and evidence to support such impacts is therefore difficult to attribute. There are many reasons why a foreign company may decide to locate a factory or an R&D unit in a certain place, e.g. tax breaks, availability of infrastructure, availability of skilled staff etc., and within this context a ILCC may have a significant role but one that is hard to disentangle from the other inducements.

It is important to recognise that some Centres focus their energies on creating innovation in public sector services such as service delivery, business processes etc., and here the metrics must be developed accordingly such as response times, customer feedback, effectiveness etc.

Lessons from existing practice on metrics and impacts of ILCC emerged as follows; -

- Impact was seen as being easier to relate or attribute to physical Centres compared to virtual initiatives. In virtual initiatives the interaction between the companies and the Centre can be confused with a range of other interactions rather than directly with the Centre. A physical Centre channels interaction in a more intensive manner and the responsibility for managing and controlling that interaction tends to reside with a single individual.
- Management metrics are important, particularly at the early stages and should cover business performance, IPR management and research stakeholder engagement. This can be unusual in a research environment but common in business and reflects the earlier discussion on the competencies required by a Centre Director.
- The contributions of stakeholders, particularly the in-kind (non-cash) contribution of companies and researchers is important and needs to be measured. This is partly dealt with through proper

management of the Centre, and again is easier to establish with physical Centres. The group noted that the behaviours and motivation for participating in an ILCC shift over time as the programmes funding the Centres mature and change themselves, and metrics may need to alter to reflect this.

- In a given programme the early stages are about the challenges of establishment, developing strong management commitment and the creation of effective networking activities.
 - In the mid term the Centres tend to be engaged in the producing relevant research outputs, proactively arranging knowledge transfers and ensuring that commercialisation takes place.
 - In the final stages Centres tend to be strongly engaged in reformulation, issues of sustainability and possibly a refocus of activities with a view towards the impact on the wider community. The roles and expectations of the partners therefore change as time goes on. As the relationships between the research and industrial partners become closer it is important that care be taken to avoid driving the work of the Centre too close to the market. In such cases this could lead to competition with the private sector.
- A baseline study of the relevant eco-system is good practice and should be carried out at the outset in order to measure the effects. This means looking at the existing level of collaboration by the partner companies, the collaboration with industry by the research groups etc. This will give an indication of the enhancement of linkages over a period of time. Often in this regard international benchmarking is not really relevant as the effect of an initiative really depends on the relative strengths and weaknesses present in the starting situation.
 - A key behaviour to monitor and avoid was the ILCC becoming a 'Projects Hotel' or an entity that draws down funding from national or international sources to commission projects across the research system, as this does not build up competence within the ILCC.
 - In terms of the metrics used by different Member States there is a mix of bottom up metrics provided voluntarily by the ILCCs in their submissions, and prescribed metrics imposed by the funding organisations. Good practice suggests that there should not be too many individual indicators (typically 10 to 15 are used), and they may need to shift in time as the Centres mature. Bottom up metrics and indicators are particularly useful in Centres which self assess and manage themselves in a businesslike fashion, as they allow for early intervention in areas of weakness. Top down metrics are usually a requirement set around the strategic aims of the ILCC programmes. There is a mix of practice in collection of indicator

data, with individual Centres providing reports, and Agency internal and external evaluations. Better managed Centres collect their own data and use it as management information to run their operations.

- The Working Group felt that as best practice, 'in-kind' contributions should be company researcher time spent working in the ILCC. These have the highest influence on ILCC behaviours and training outputs.
- The technology and market focus of ILCCs have large effects on impacts, and therefore flexible approaches are required by funding organisations in order to achieve the best value for money. Centres in ICT will have to contend with faster moving technologies but less pressure on intellectual property considerations whereas Centres in Biotechnology need to have long terms commitments and very clear and strong IPR policies.
- The time to achieve impact is normally long, and it is a mistake for funding organisations to try to drive for early impact as this will affect the research quality in favour of direct service and training provision. Research quality metrics should be set and monitored in order to control this behaviour.
- In terms of the balance of company types interacting in ILCCs the best results are achieved with a mix of SMEs and large companies.
- While other technology transfer and company support activities can be carried out, this can cause loss of focus on core activities, so such behaviours need to be carefully considered. Metrics and evaluations should take account of this behaviour, however it can be of benefit in terms of interaction with wider groups of companies and can help to foster ILCC growth over time (a marketing type model).
- Where it is necessary to terminate State funding to a Competence Centre it was recommended that the metrics and indicators would be of very high importance in confirming the basis of such a decision.

The Compera Eranet has carried out a process to identify the most commonly used indicators throughout its partners' programmes. The following indicators are suggested;-

Research Outputs:

- Number and Volume/Value of R&D Projects
- Number of participating Partners particularly company partners
- Researcher Training initiatives in the Centre
- Publications produced
- Number of Graduate students trained

Commercial Outputs:

- Number of Spin-out / Spin-off companies (some also use a 'spin-in' model)
- Number of newly created jobs (could also include employment protection)
- Number of Patents / Trademarks – measurable IP generation
- Mobility of Staff (between partners)
- Level of involvement of Companies in Projects (active, cash, in-kind)
- Identification of Spin-out / Spin-off Opportunities (a measure of effort)
- Increase of R&D expenditure in Enterprises

One should bear in mind that the commercial outputs normally will appear at a much later stage than the research outputs. This is even more so for the Centres with a scientific profile.

8. Financing, IPR and Sustainability

The Working Group agreed to include the aspect of Intellectual Property Rights considerations and State Aids into this part of the discussion.

The Group felt that some core State funding will always be required to sustain ILCC operations, if they were to continue to operate in the research environment. Where financial self-sufficiency was a requirement, the ILCC behaviour tends to become dominated by short term, high return activities and in essence spins itself out as a commercial activity (contract research, consultancy, training, testing etc) rather than continuing with medium/long term research.

It is important to recognise that sustainability can be couched in terms of broader value to the economy rather than pure monetary input to the Centre itself. This is particularly relevant where a Centre is involved in the innovative development of public services, such as the health system. An approach would need to be developed to consider a form of valuation to the local economy of the ILCC outputs over time. The Working Group felt that this should be done "ex ante" in the evaluation of proposed ILCC initiatives and there is some work ongoing in UK and EI which could be used as a basis for furthering this point.

The 'natural' life of a Competence Centre is on average found to be 10 years. After this period of time it should either re-focus on newer research and technology areas or it should established spin out type activities to sustain itself with further State ILCC supports.

Careful consideration needs to be given to the provision of capital and infrastructural finance as the ILCC may eventually cease operations. Many programmes operated by Member States do not include capital support but do recognise the research performers' contribution to the funding in the regulations governing the programme. Reversion of ownership of

infrastructural assets to the benefit of the research performer should be considered and provided for in funding agreements.

Careful consideration is also required as to the 'ownership' of ILCC IPR at then closure of operations and mechanisms should be built in to ensure that this is properly managed. Reversion of ownership of IPR assets to the benefit of the State should be considered and provided for in funding agreements. IPR arrangements such as licences with associated maintenance contracts must take cognisance of this situation.

In terms of IPR it may be necessary for the ILCC to have some shared IP, but it can also have in some cases specific bilateral activities with associated IP in order to engage companies and meet their needs. This activity requires professional IP management, and requires the agreement of IPR frameworks across the industry partners and rules in advance of funding. The use of Centre IP as background for other projects is recommended to drive collaboration in the longer term.

Financing levels and IPR best practice are interlinked and come under the influence of EU State Aids. ILCCs tend to operate on the level of multi-lateral collaborative activities, where the research outcome is of some risk and in such cases individual companies do not have a 'need' to own the IPR, but may need to get access to it. The benefit to them is in agenda setting and awareness of IP outcomes and access to ownership can be provided to companies at a point in time, for a suitable market consideration compatible with State Aids. If the Centre owns the IP and releases it to partner companies at a fair market rate determined through an independent process, the issue of State Aids does not arise as there is no distortion of the market.

Practices appear to vary across Europe in this regard, although time and resources meant that it was an issue which the Working Group only dealt with superficially.

Due to the long term nature of ILCC initiatives, there is a danger that lack of competition leading to declining performance levels. Over time complacent behaviours can set in, and guaranteed funding allows for a less dynamic mindset for ILCC management. Structures and financing should be arranged to mitigate this risk. Member States need to commit to evaluation of ILCCs and closure of failing Centres, and to commit to new calls for Centres over a period of time. One suggestion was that individual ILCCs should not be sustainable per se, rather the programme for funding them should be long term and have regular evaluation and renewal or regeneration of ILCCs.

Setting the correct Research Agenda is very important in maintaining the correct type of research behaviour (collaborative, multi-lateral, strategic research). Research Agenda setting for true collaboration is a difficult process and requires significant time, effort and analysis. The type of behaviour required by the ILCC in its activities will be dependant on the Research Agenda and its review and renewal process. Defining projects tends to lead to bilateral contract research, defining programmes tends to

rely on collaboration and medium term focus, and defining academic themes tends to drive a 'research institute' behaviour.

A suitable mixed approach is recommended, where projects have formal rules for collaboration, programmes must be open to new members (with review process to select projects on the programme) and academic themes have a funding dependency on industrial engagement. Tensions can arise through the domination of large companies in setting agendas, and also through engagement of international partners. Mechanisms to ensure true collaboration need to be considered.

Therefore the determination of a clear exit strategy for funding of an ILCC at the outset of the programme is recommended particularly as the lifetime of a Centre may exceed that of any sponsoring government.

A suitable mixed approach to Research Agenda is recommended, where projects have formal rules for collaboration, programmes must be open to new members, and academic themes have a funding dependency on industrial engagement.

9. Training/Mobility

The Working Group discussed the key issues involved in setting industry informed research agendas and the effects that this has in researcher training and mobility in ILCC initiatives.

Clarity is necessary on what skills are required out of the collaboration by the relevant stakeholders, and the full range expected of an ILCC programme can be quite large, requiring significant investment in acquiring those skills through training, experience and networking. PhD/Masters training may be a requirement of the State, and will be useful to industry participants in that these are internationally recognised formal training qualifications and are generally transferable between Member States. However, industrial partners in ILCC initiatives will also place emphasis on collaboration skills, communication skills, and other business skills. These may not be part of a traditional post graduate programme, but PhD students in a Centre should receive training in these areas as well.

Each Centre will have its relevant technology / knowledge domain which will also bring specific skill sets requirements. Indeed it may be the role of the ILCC to provide this training through its activities. In particular, consideration should be given to the environment for research management training, which is an emerging area especially for companies that are adopting an open innovation methodology. Industry-Led Competence Centres have a particular advantage here, in that they bring high quality research performers from the academic world together with industry practitioners, to the benefit of both.

There is an expectation in industry that the skilled people produced through ILCC initiatives will be of high quality and quickly absorbable into an industrial environment. In order for this to be effective transfer /

placement mechanisms are often required. Structured programmes may prove more beneficial to the trainees as the correct balance or mix of skills is difficult to obtain with traditional 'apprenticeship' style fourth level (Lisbon levels 9 and 10) qualifications.

Without doubt high levels of trust are required between stakeholders, although this is a metric of success which can be very difficult to measure. It is often easier to see a situation where there is a lack of trust, demonstrated by industry members not attending meetings, membership fees not being paid etc. As ILCC initiatives are relatively new the people being trained through engagement with them may perceive this option as risky in terms of career development. Centres need to develop a reputation for professionalism, relevance and delivery and are uniquely placed to develop strong interaction based on skills development.

Mobility as a transfer mechanism is at the very core of the philosophy of Centres and should be included in structured training schemes at undergraduate, post-graduate and post-doctoral level. Placement with industry and/or ILCC is a most effective method.

Joint specification of Masters and PhD projects by industry and University is becoming more popular as it appeals to the student in that it enhances job prospects; the company in getting access to appropriate skills and the research provider in that there is extra relevance to the training. In particular where an apprenticeship type degree is being pursued this is an effective method of mitigating the risk of diverging goals between academic excellence on one hand and industrial relevance on the other.

Emerging ILCC initiatives should not neglect development opportunities for academic supervisors and consideration should be given to systems of exchange of experience for principal investigators, Directors and even Boards to help them recognise how other Competence Centres work and to understand how they themselves should operate.

Each Centre is challenged to develop its own courses and course delivery techniques which are relevant to their thematic area and company needs. This must reflect the technology domain specific requirements of each initiative. Training can be used as a metric for ILCC activities.

Finally, the Group felt that the management of Competence Centres would have useful views on the structure of PhD formation, which is a subject of debate. The particular experience of working with industry provides an excellent insight into the environment in which the new post graduate is to operate as well as the constraints faced by Universities in providing a challenging process and environment.

10. Conclusions and Recommendations

10.1. Encouraging Best Practice in the operation of Industry-Led Competence Centres

The terms of reference for the Working Group require that it consider Best Practice in the operation of Industry-Led Competence Centres as well as reflecting on the issues that need to be considered by Member States when faced with operating Programmes in support of such Centres. The text below discusses these points, drawn from valuable and open discussion within the Working Group and enhanced by expert input. It is clear however, that a number of Member States are at an early stage in the development of Centres in their own countries and profited from participating in the debate. It also became clear that some member States which have a history of support for Centres are reflecting on the changing economic circumstances facing them and are considering how the existing Centres should be developed to address future needs.

It is recommended that Member States give consideration to the adoption of the Best Practice approaches recommended through this report for the Management of Industry-Led Competence Centres, which are summarised in the following key areas; -

Governance is a key aspect and the best practice is to adopt a governance model that reflects the policy context and enables the Centres to develop performance indicators and metrics that reflect the policy context and strategic goals of the programme.

Leadership of Industry-Led Competence Centres is key and responsibility resides with the Centre Director and the Chairperson of the Board. The active engagement of the academic and industry partners in true collaborations requires excellent leadership and management skills and Centres should be empowered to employ suitable candidates for these roles. The Board should be composed so as to reflect the partnerships and should evolve over time to reflect the changing nature of the partnership. Research Agendas should be agreed by the Board, but continuously reviewed to reflect progress or change both scientifically and commercially.

It is good practice to have an international scientific advisory committee to ensure the quality of research and to assist in the formulation of longer term strategic research agendas. Intellectual Property management is a key feature of Industry-Led Competence Centres and therefore it is recommended that a suitably qualified IP sub-committee should also be part of the structure of a Centre.

Metrics and Performance Indicators are clearly of fundamental importance to Member States, and there are several best practice recommendations to be considered. Again these need to be set to reflect the strategic goals of the programme and its policy context.

Well managed Competence Centres will employ a range of their own performance indicators, an approach which is to be encouraged as best practice. These bottom-up indicators can be supplemented by fundamental indicators of performance which reflect the strategic goals and policy of the National Programme which is supporting the Centre. A concise set of indicators should be agreed between stakeholders at the outset, which can be reviewed over time.

As Industry-Led Competence Centres evolve and adapt to changing circumstances, the best practice metrics must also evolve. At the early stages management performance indicators are more appropriate, moving to research quality, training and commercialisation performance in the medium term. Impacts such as spin-outs, the attraction of foreign direct investment etc can only be measured in the longer term. Furthermore, the timing between early, medium and long term varies with the technology focus of the Centres e.g. ICT will be significantly faster than Biotechnology. Therefore, metrics need to be set on a Centre by Centre basis and regularly reviewed.

As best practice, metrics should reflect the collaborative contributions of the academic and industry partners. This should include the cash and in-kind contributions (particularly researcher time dedicated to collaborative projects), research quality outputs, training of personnel and commercial outputs to partner companies and the wider industrial sector.

Funding Agencies of the Member States should regularly review and revise the performance indicators and metrics in conjunction with the Centre management. Continued State funding should be clearly contingent on performance and the indicators and metrics chosen should reflect any views on Centre performance. International expert evaluation is recommended as best practice for Centres on an approximate time-scale of 2-3 year intervals.

Financing and Sustainability are clearly key areas for Member States to consider in obtaining the best return for public investments. Key considerations are value for money, the broad context of longer term impacts, and the interrelationship between IPR and financing and EU State Aids.

As best practice it is recommended that Member States should avoid prescribing self-financing status over time on Industry-Led Competence Centres, as this will tend to drive their activities too close to market and so undermining long term collaboration with the research community. The typical lifetime of a Competence Centre was found to be 10 years, and therefore consideration needs to be given to Centre closure (who owns IP after closure, capital/infrastructure ownership provision, staff issues etc). These aspects need to be designed into the programme from

the outset. Competence Centres programmes can however, be sustained over longer periods, allowing for new and reformulated initiatives to be supported as they arise.

It is recommended that Centres employ mechanisms for research agenda setting that are truly collaborative and which avoid 'bilateral' projects. It has been found that openness to new members and to a range of types and sizes of companies helps this process, whereas 'closed' systems tend to allow IP issues to dominate. This can cause tensions where a small community of member companies can have a disproportionate influence of the work of the Centre. On the other hand, definition by the academic partners only leads to 'research institute' behaviours and eventual loss of interest from industry.

Training and Mobility of Researchers is one of the most frequently cited key aspects of Industry-Led Competence Centres, and occurs as a natural consequence of the close relationship between research providers and companies. Typically Competence Centres focus on the training of post graduate researchers as opposed to undergraduate programmes, but they may have an influence on them over time.

As best practice it was agreed that the regular and sustained involvement of industry based researchers in Centre activities enhanced the nature of the training for all researchers involved. In order to attract the best talent from the academic side of the partnership, Centres need to maintain their focus on research excellence. Traditional 'apprenticeship' fourth level degrees may not be appropriate in the environment where a research agenda is expected to change and to responsive to industry needs and therefore consideration should be given to structured programmes, which have shorter term projects and placements as the norm.

Mobility of researchers greatly is enhanced by periods spent in Industry-Led Competence Centres, as time spent working in collaboration allows for the exchange of ideas, experiences and responsive working relationships to form. Furthermore Centres are an excellent training ground for research programme managers, allowing for an additional career path for researchers.

It is recommended that member states bring this report to the attention of relevant authorities to allow a debate to take place on the incorporation of aspects of best practice into programmes that are aimed at supporting Industry-Led Competence Centres now or in the future.

10.2. Adding Value to Member State Investment in Industry-Led Competence Centres through Enhanced Co-operation and Co-ordination at the European Level

The Working Group recognised the existing significant investment that has been made by Member States in Industry-Led Competence Centres, and felt that there was scope for the development of better co-ordination

across the community of Centres. There are benefits above and beyond these national priorities which can arise from better European level action:

- Some countries are in the process of developing programmes to support ILCC and would benefit from a quick learning process, drawing upon the lessons of countries more experienced in the area
- The collective knowledge and experience of ILCC Programme managers could be a valuable resource to the Commission in its deliberations not only on cluster development but also such issues as State Aid rules, where the operation of Centres needs to balance support for the research environment and the commercial exploitation of results
- The position of ILCC Director has been shown to be central to the Centres success and this position is one which demands specific skills and experience. A European wide process of best practice would be very supportive in allowing Directors across a range of Centres to meet, discuss common issues and work together to define possible joint development activities
- The Centres are well placed to act as powerful advocates for European collaboration through such mechanisms as the Framework Programme, capitalising on the existence of groups of companies associated with the Centres. These companies would also have experience of collaboration and openness to Expert with other actors. While some Centres already act as facilitators for FP7 applications, there are other opportunities which could be exploited, such as schemes supporting the mobility of research staff, industry participants, such as is supported through Marie Curie, and support for exploratory visits to prepare for collaboration, such as is available through the EU SME action and so on.

An enhanced level of facilitation and collaboration across Europe would bring benefits to the management of ILCC support programmes, to the management of individual Centres and to their industry and public sector collaborators. This approach reflects the fact that in many ways the benefits to the participants of involvement in a Competence Centre mirrors that of participation in a cluster. In both cases groups of firms and institutions are located near to each other and work together to develop a sufficient scale to develop specialist skills and resources which are of value to them all on a non-competitive basis. In both cases there is a particular value in the breaking down of science – industry barriers and in seeking to create a smoother transfer of technology and knowledge to the productive sector for economic impact. Industry-Led Competence Centres are a good example of how the cluster concept can be further developed in a structured context.

This recommendation is also coherent with the recent debates which have led to the development of the Ljubljana Process. This Process articulates a conviction that more cooperation and synergy are needed to improve research in order to create a globally competitive Europe able of competing with the likes of the US and Japan, as well as the rising powers of India and China. Better co-ordination of research investments is an important strand of this approach.

Better co-ordination of Competence Centres in Europe will also lead to new opportunities through the use of Competence Centres in the development of Joint Programming approaches, giving an important platform to Member States for value adding activities.

It is recommended that CREST and the Commission should give further attention to ILCCs and their coordination across Europe. As a first step, an investigation aimed at teasing out some of the operational issues associated with introducing a mechanism to co-ordinate ILCCs could be considered. This investigation should have terms of reference that includes aspects such as:

- The level of interest among existing Competence Centres in working within a co-ordination framework
- The impacts and benefits that such a framework might make to the European Research Area
- The modalities by which co-ordination may take place and how effective co-ordination can be brought about
- Suggestions for which existing organisation may be prepared to accept the co-ordination role.

For this purpose, interested Member States could propose an OMC-NET project or the Commission may consider a study. As appropriate, CREST should be informed and consulted on the results of such work for further consideration and action.

Annex

Annex 1 – Members of the Working Group

Country	Name	Name of represented body
Austria	Ingrid Fleischhacker	Austrian Research Promotion Agency
Austria	Otto Starzer	Austrian Research Promotion Agency
Belgium	Corien Struijk	Institute for the Promotion of Innovation by Science and Technology in Flanders
Belgium	Tania De Roeck	Institute for the Promotion of Innovation by Science and Technology in Flanders
Estonia	Kaie Nurmik	Ministry of Economic Affairs and Communication
Finland	Pentti Vourinen	Ministry of Economy and Employment
Finland	Pirjo Kutinlahti	Ministry of Economy and Employment
France	Denis Huguenin	Agence Nationale de la Recherche
Germany	Walter Moenig	Ministry of Education and Research
Greece	Aliki Pappa	Ministry of Development
Greece	Vassilis Zaspalis	Centre of Research and Technology Hellas (CERTH), Chemical Process Engineering Research Institute (CPERI)
Hungary	Ilona Vass	National Office for Research and Technology
Hungary	Laszlo Csonka	Innovation Research Centre
Hungary	Oliver Szarvas	National Office for Research and Technology
Ireland	Aidan Hodson	Office of Science, Technology and Innovation
Ireland	Helen Nugent	Office of Science, Technology and Innovation
Ireland	Martin Hussey	Enterprise Ireland
Ireland	Martin Lyes	Enterprise Ireland
Italy	Guglielmo M. Tino	National Institute for Nuclear Physics
Lithuania	Birute Mikulskiene	Ministry of Education and Science
Lithuania	Neringa Kranauskiene	Ministry of Education and Science
Luxembourg	Léon Diederich	Ministry of Research
Netherlands	Lisette Janse	SenterNovem
Netherlands	Michiel Ottolander	Ministry of Economic Affairs
Norway	Dag Kavlie	Research Council of Norway

Poland	Andrzej H. Jasinski	Warsaw University
Portugal	José Bonfim	Foundation for Science and Technology
Romania	George Bala	Ministry of Education, Research and Youth
Spain	Paloma Perez	Ministry of Industry, Tourism and Commerce
Spain	Rodolfo Piedra	Centre for the Development of Industrial Technology
Sweden	Mattias Lundberg	Swedish Governmental Agency for Innovation Systems
Switzerland	Paul E. Zinsli	State Secretariat for Education and Research
Turkey	Hüseyin Güler	Scientific and Technological Research Council of Turkey
Turkey	Huseyin Metin	Scientific and Technological Research Council of Turkey

Mandate of CREST Working Group

“Industry-Led Competence Centres – Aligning academic/public research with enterprise and industry needs”

Background

The Lisbon agenda is aimed at making Europe more competitive and innovative on the world stage. The relaunch of the Lisbon strategy committed the Member States to undertake a series of new measures to achieve the ambitious targets adopted in 2000. In particular the Barcelona European Council concluded that Europe as a whole should aim to reach a target of spending 3% of GDP on R&D by 2010 with two thirds of that spend to come from industry. The building of technological and applied research and development capability to support the development of high-value products and services is key in this regard.

Industry-Led Competence Centres are being introduced in a number of member states as a mechanism for aligning academic/other public research with enterprise and industry needs. These Centres are often located on or near university campuses and are characterized by having medium to long term agendas (or technology programmes) strongly informed by enterprise needs. The Centre's activities are shaped by company engagement at both the strategic and operational levels. Research programmes underpin other industry-academia linkages such as personnel mobility, training and access to specialized equipment. The overall objectives are to develop a critical mass competence in particular science and technology areas relevant to particular enterprises and/or sectors and associated human capital development including the training of highly qualified researchers suitable for subsequent recruitment by industry.

There is considerable scope at Community level for member states to engage in mutual learning around various aspects of the design and implementation of such Centres. This topic would build on earlier work in previous cycles (e.g. reform of public research institutions, IPR and research etc.). While it could draw on guidelines developed in earlier OMC studies, it is put forward as a focused piece of work on this new type of instrument which appears to be of interest to a number of member states.

Objectives of the Working Group

The broad objectives of the working Group will be to collect and present MS' approaches to the various key aspects of the setting up and functioning of Competence Centres with a view to developing recommendations on the good approaches to be taken.

Key areas to be considered and addressed include: -

1. Mechanisms for priority setting and programme definition to ensure that agendas and programmes are truly enterprise-led including: -
 - Technological competences which the Centre intends to develop must be clearly set out
 - Research programme prioritised in line with financial model
 - Detail processes to develop, review and build upon competences over time
2. Development of sustainable funding models for Competence Centres including: -
 - Funding model to drive sustainable collaboration between the Centre and industry with industry as the leader of the collaboration
 - Funding model to encourage increasing numbers of companies to engage with the Centre
 - Funding model to address IPR
 - Value for money to be a key concern
3. Governance structures to ensure appropriate involvement of enterprise and other stakeholders including: -
 - Aspects of self-governing and independence focusing on strategic and applied research and the legal entity needed to achieve this
 - Development of people with skills relevant to enterprise
 - Independence of the Board
 - Membership of the Centre and participation of non-members in the research programme
4. Mechanisms for ensuring researcher mobility to and from such Centres including: -
 - Opportunities for placement of researchers at member companies
 - In-kind contribution by enterprise to Centre through placement of company personnel

5. Opportunities for coordination of activity across groups of member states with regard to Competence Centres including:-
 - Opportunities for cross-border sharing of technological competences both at researcher and company level

6. Design of performance management systems to encourage desired impacts including:-
 - Metrics to be applied with Centre management
 - Quality of research to be of international significance driven by the metrics

Work Plan and Deliverables

It is proposed that the work of the group would commence in Jan/Feb 2008. Details of work plan would be developed by the working group. It is envisaged that a report outlining MS' approaches to the various key aspects of the setting up and functioning of Competence Centres together with guidelines on good approaches to be taken would be completed by September 2008.