

Expert Group on the future of Networks of Excellence

Final Report

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Executive Summary

In this Final Report, achievements of NoEs are reviewed without aspiring to perform a full and detailed assessment of individual NoEs. A particular focus is directed towards the issues of ‘critical mass’ and ‘integration’. The expert group discusses the special nature of the ‘intermediate collective research goods’ NoEs are producing as well as the structural aspect of NoEs originally supposed to form a new intra-European layer of durable virtual research organisations. In that context, the group also considers the roles of NoEs for national research institutions, such as universities and research organisations.

In the expert group’s view, the objectives of the NoE scheme were ambiguous and the scheme was successful to a limited extent only regarding the general objective of developing integrated and sustainable ‘virtual centres of excellence’. However, the NoE ‘experiment’ is seen as valuable and important because it showed that in such organisational setting valuable collective goods can be produced that would not result from other arrangements. Some NoEs have even come close to achieving the originally defined objectives.

Therefore, based on the review of the FP6 NoE scheme, the expert group proposes renewed funding opportunities for a very limited number of NoEs that are successfully moving towards achieving the objectives of the NoE scheme. Furthermore the Commission is invited to consider appropriate existing funding schemes for supporting valuable activities developed by other NoEs.

Based on the review of the serious problems both in the conceptual phase and – as a consequence – also during implementation the expert group recommends to discontinue the NoE scheme.

For the future, a revised concept is proposed: ‘Joint Research Initiatives (JRIs)’ oriented towards long-term (academic) research of ‘slender’ alliances between universities and research organisations. The objective of Joint Research Initiatives should be the creation of ‘virtual institutes’ of a manageable size of about 3 to 7 partners. The science-led JRIs are seen as potential ERA instruments complementary to the industry-led Joint Technology Initiatives (JTIs). In addition, they are proposed to become the institutional complement to the individual researchers funded through the ‘Ideas’ specific programme and the European Research Council.

Furthermore, the expert group recommends that the Commission develops the JRI concept in close interaction and consultation with stakeholders at member states level and from universities and research organisations. In addition, the Commission is invited to organise an internal process in the Commission services utilizing the experience from the implementation of FP6 NoE scheme and ensuring a coherent understanding of the new JRI scheme.

Finally, the expert group sees the necessity that the development of the ERA instruments is closely followed and monitored. In the ERA Green Paper ambitious goals are proposed that have been further developed during the follow up consultations and in the recent Communications by the Commission. The expert group is convinced that these goals will be difficult to reach without the provisions of appropriate intermediate collective research goods. The concept of ‘Joint Research Initiative’ is proposed to serve that purpose.

1. Tasks of the NoE Expert Group, working methods and reporting

1.1 Tasks and Mandate

The mandate of the group is to provide recommendations on how to optimise the objectives, modalities and implementation of Networks of Excellence under the Framework Programme in view of enhancing their contribution to the European Research Area, in light of past experiences of networks and lessons learnt so far.

It is therefore based on two main axes, namely to

- a) To reach common views on the organisation and functioning of existing Networks of Excellence (NoE) in line with what the legislator intended in their regard, and
- b) To consider options for continued activities to strengthen the integration of research resources and capacities at European level based on experiences gained with ongoing NoE and in the light of the renewed perspectives of the European Research Area (ERA).

The group is NOT asked to look into the quality and the scientific performance of the existing NoE, which is essentially a case-by-case situation dealt with through external reviews which are already in place.

Issues to be addressed by the expert group include:

- a) Are the FP6 NoE a true-to-type materialisation of what they were intended to be? What is the effective contribution that the current NoE (can) make to any durable integration of research resources and capacities thus bringing the ERA to its full potentials?
- b) What could be the role for NoE in the new context of the ERA green paper, in consideration of other initiatives equally designed to structure the ERA, such as ERA-NETs and Art.169 initiatives for national research programmes implemented jointly, or European Technology Platforms, the JTIs, the KICs of the EIT?
- c) In light of the possible role of NoE within the European Research Area and their experience so far, how could the objectives for NoE and the modalities for their funding through the Framework Programme be adapted?
- d) Is there a general case for contemplating in the EU framework programme(s) to provide more sustained support (from the framework programme and from other sources) for successful projects designed to produce structural effects (for NoE, but also infrastructures and other large projects more generally)?

1.2 Working method

Applying a combination of collective and individual work punctuated by working meetings, the expert group analysed existing evidence and met selected coordinators, Commission services and stakeholders, in order to prepare all necessary material for discussing the key issues and for drawing its conclusions.

At the mid-term of its work, the expert group presented an interim report to the European Commission services with a main focus on possible short-term measures and recommendations for the Work Programme 2009. In its final report, the group formulates and suggests concrete recommendations also for the long-term, and detail these recommendations including all relevant background analysis and findings of the expert group.

The expert group took the following approach:

- Analysis of existing evidence (e.g. basic legal and other documents on the Framework Programme and NoEs, 2004 Evaluation of the effectiveness of the new instruments, overall analysis of Annual Review Reports of existing NoE, theme-related overviews provided by operational Commission services, short summary reports from some thematic priorities, publications on NoE, etc.).
- Interviews/ Meetings with some selected coordinators of ongoing NoE;
- Interviews/ Meetings with stakeholders (Commission, Research Organisations);
- In-depth group discussions on the basis of the analysis of existing evidence and the interviews, leading to the Interim Report;
- Further interviews with stakeholders;
- Questionnaire survey of Research Councils and Research Organisations and a synthesis of the comments received;
- In-depth discussions on the basis of the accumulated information;
- Delivering the commonly agreed Final Report by the end of September 2008.

Meeting schedule and list of interviews are presented in the Annex.

1.3 Reporting

Following the Terms of Reference of the EG, an interim report had to be mature enough to draw already conclusions for the drafting of the 2009 FP Work Programmes. Thus, this interim report included preliminary findings on the development of the NoE concept and the state of development at beginning of 2008. The report was based on interim results of the expert group's work in progress, proposed only possible short-term measures and outlined possible recommendations or options for WP 2009. Several aspects of the possible roles NoE in the European Research Area were considered and proposals were made for some adaptations of objectives and modalities. By definition, the Interim Report was of a preliminary nature only building on the findings of the expert group at mid-term of the exercise, was supposed for internal Commission use only and was not published or disseminated otherwise.

This Final Report presents in Chapter 2 some general reflections on the overarching issue of 'integration' of research activities. Chapter 3 is devoted to an analysis of the implementation of Networks of Excellence in FP6. In Chapter 4 the expert group presents its broad conclusions, before presenting in Chapter 5 concrete recommendations for the future. These are put in Chapter 6 in the broader context of the various initiatives towards the European Research Area. The final Chapter 7 provides a short summary of the main findings and the key recommendations.

1.4 Acknowledgements

The expert group expresses its appreciation of the excellent support provided by the European Commission services, especially unit A3 DG RTD, but also of the preparedness for very open discussions of all interviewed persons as listed in the Annex. Special thanks go also to the respondents to the survey.

2. Reflections on 'integration' of research activities

The European Research Area and European integration in research

The intention of this chapter is to put the basic assumptions of the European Research Area and NoE concept in the overall context of structural aspects and characteristics of the organisation of the research fabric.

'Fragmentation' and deficits regarding 'critical mass' were identified as major problems of research in Europe and were core motivations of the European Commission when launching the European Research Area initiative. NoEs and 'integration' of the participating organisations into 'virtual centres of excellence' were defined as a promising remedy.

The creation of 'virtual centres of excellence' means in fact introducing a new layer of intra-European research organisations. Such 'virtual centres of excellence' engage research teams from national research institutions – mainly universities and research organisations - in new modes of long-term cooperation in research and education beyond the traditional and now well established modes such as e.g. collaborative projects, thematic networks, research training networks or coordination actions.

Critical mass of a research unit

An argument, among a few others, which was presented for promoting the concept of NoEs was the alleged necessity of creating a 'critical mass' in many research areas in which Europe was supposed to be lagging behind the USA or Japan. EU RTD policy is not the only political frame where 'critical mass' is discussed and policies are developed to overcome perceived problems and deficits.

Defining a critical mass in research is not an easy task (it is certainly variable from discipline to discipline). The report of the ERA Rationales Expert Group has addressed this issue: "... *to be sub-critical means that the effort in a particular field or sub-field lacks resources, equipment or a sufficient number of researchers to achieve a desired goal*"¹. It contends that below a certain "critical" size (5-8 persons as permanent staff excluding post-doc and PhD students) scientific productivity or efficiency is low. Although the empirical evidence is mixed this view is also supported by the presentations and discussion in the frame of a recent conference addressing this issue² and also selected reports point in that direction³.

A minimum size is necessary in order to:

- Be able to share tasks between researchers,
- provide opportunities for creative and productive exchange of views,
- give to PhD students the capacity of interacting with different researchers, etc.

¹ L. Georghiou, et al.: "Challenging Europe's Research: Rationales for the European Research area (ERA)": Report of the ERA Expert Group. European Commission, Directorate-General for Research, EUR 23326 EN, Brussels, 2008, pp. 12 ff.

² "Damaging Fragmentation or Healthy Diversity? The Contribution of Economies of Scale to European Research", Conference, London Chamber of Commerce, 20 June 2008 (see especially the contributions of B. Martin and L. Georghiou)

³ N. von Tunzelmann, M. Ranga, B. Martin, A. Geuna: 'The Effects of Size on Research Performance: a SPRU Review.', SPRU, University of Sussex at Brighton, June 2003

'Maintaining Research Excellence and Volume', A report for the Higher Education Funding Councils or England, Scotland and Wales and for Universities UK. Evidence Ltd., Centre of Economic Performance, LSE and PREST/CASR, University of Manchester

'Uncritical Mass. Can research data test the concept that bigger units produce better research?' A report of Evidence Ltd. Prepared for the Department for Innovation, Universities and Skills, April 2008

However, there are of course disciplines where these limits are far lower or higher (mathematics and particle physics being two different extremes). This size can be considered as corresponding to a 'basic research unit' imbedded into a 'laboratory', 'institute' or 'university department', etc. in which interactive and productive relations and cooperation can be entertained through common projects or programmes (frequently with pluri-disciplinary approaches as for example chemists, metallurgists, physicists in a materials science laboratory), seminars, courses, etc.

Thus, the basic level of achieving and ensuring 'critical mass' is the level of the research unit. And that is very much an issue and a responsibility of institutional management and national research policies.

Integration within an institution

To be embedded into a larger structure (an institute for example) is often necessary in order to share common costly scientific equipments (high resolution NMR spectrometer or DNA sequencing machines for example). It is also an advantage as it facilitates the development of joint projects by using complementary methods, involving the perspectives of different disciplines and through the sharing of a common pool of knowledge which allows thus broadening the research front. Organizing research training at the graduate or post-graduate level is also easier in larger structures.

A large structure is, in principle, 'integrated' as its basic units share a common roadmap and a budget, while some mobility of personnel is taking place over the years (it can also be a kind of loose federation of small individual laboratories). A large institute (5 to 10 units) is, in general, the frame which renders possible this kind of research organization which exists in every country whatever its size. Europe has a fair number of those institutes since a long time and many European scientific institutions have been able to provide means to constitute those 'quanta' of critical mass which are productive and successful⁴

Integration within an institute or large laboratory has thus several advantages:

- sharing common or complementary views in a thematic area (nano-materials, physical oceanography, proteomics, combustion, for example) for jointly addressing a rather broad spectrum of issues (this supposes the existence of a rather stable 'paradigm'...);
- allowing interdisciplinary approaches through cooperation between specialists of neighbouring disciplines - using a common pool of costly equipment for which exchanging views and experience about their performance and limits is important and valuable;
- bringing together a pool of specialists of different disciplines to organize high-level research training (or training of technicians from companies or public services).

In addition, also the fact has to be stressed that the existence of an integrated structure with several units has an advantage for cooperation with industry: companies (or public services) will find in an institute or department a pool of knowledge and know-how which can help them addressing scientific issues which they consider as 'strategic' for the development of new processes or products. Transfer of knowledge to industry is very often performed through former PhD students of an institute or academic department who are recruited by companies.

⁴ One might observe that productive groups as, for example mentioning Nobel Prizes winners, Alex Muller's and Binning's groups who discovered HT superconductivity and atomic force microscopy in IBM Zurich, Cl.Cohen-Tannoudji's atomic physics group in ENS Paris, and J-M.Lehn's laboratory in chemistry in Strasbourg are or were rather small units in larger structures. Similar observation can be done through the reading of papers published in *Nature* or *Science* which for most of them originate from small 'units'.

Operating with a critical mass at institutional level can be realized in most cases at a local level (a campus of a university or of a national research institute) as it represents the basic ‘metabolism’ of research activities. This holds especially when it comes to addressing problems that call for interdisciplinarity. There, the question arises how institutions are organised to support and facilitate cooperation across different disciplines which means departmental boundaries. Such facilitation of cooperation – not necessarily tight integration - might increase the productivity of the research system by encouraging interaction and synergies, interdisciplinary approaches both in training and research, etc.

These considerations show also that the core issue for achieving ‘critical mass’ at the institutional and supra-institutional level is the combination of complementary competences, capabilities, resources and infrastructures, rather than putting together more of the same.

‘Integration’ at institutional level cannot be a central argument to support a mechanism as NoEs. Experience shows, however, also that researchers tend contacting and cooperating with the best possible colleagues in their field wherever they are located and there is not necessarily a priority given to contacts within an institution. That means that the issue relevant for the present review is trans-national ‘integration’ in research and research based education. Modern communication technologies have very much supported and enhanced that tendency. Therefore, there are good reasons for considering arrangements and structures that support communication, coordination and cooperation beyond local boundaries.

Moving beyond local level cooperation and integration

Researchers are encouraged to find synergies through delocalized cooperation and “virtual” integration with objectives such as:

- undertaking complementary approaches on joint projects
- pooling complementary research equipment;
- building data banks (with a common effort to standardize data collection, organize their storage and treatment)
- organize high level training with a fair diversity of specialists.

Integration can be realized in view of reaching all or a limited number of these objectives and it can be achieved either at the national level or at the European level. Achieving some degree of integration is the objective of research policies through a limited number of means: mostly networks and joint projects (several countries in Europe like Austria⁵ and Switzerland⁶ have developed such a policy, Canada apparently has also a dynamic networking policy and, of course, the EC has initiated a similar policy since the launch of the ERA policy and the NoE scheme in FP6).

Evolving new structures at national level

It is interesting to note that new patterns of integrated or integrative institutional alliances or federations between universities and also research organisations etc. are evolving at national level in different member states. It is also interesting to emphasise that some of these initiatives were rather not initiated because of government policies but were by the involved institutions because of obviously perceived needs and their expected benefits. It will be important to follow the further development of these initiatives and monitor them carefully in order to learn from their experience.

⁵ Austrian Science Fund (FWF), National Research Networks (NFN) , see: <http://www.fwf.ac.at/en/projects/nfn.html>

⁶ Swiss national science Foundation, National Centres of Competence in Research (NCCR); see: <http://www.snf.ch/E/targetedresearch/centres/Pages/default.aspx>

Following the strategy of the Scottish Funding Council (SFC), Scottish universities have joined their forces forming for example the ‘Scottish Universities Physics Alliance (SUPA)’⁷. Similar structures have been created in life sciences (SULSA), in geosciences, environment and society (SAGES) as well as in informatics and computer science (SICSA). These alliances intend especially at

- pooling equipment,
- providing a basis for undertaking joint projects and collecting funds, and
- developing and following a common policy for recruiting students and professors.

This kind of integration within a rather homogeneous territory with a focus on specific fields seems to be rather strong. A similar approach is followed by the Central European Institute of Technology (CEITEC)⁸ in Brno, Czech Republic that will combine the resources and capabilities of four universities, several institutes of the Academy of sciences of the Czech Republic as well as other research institutes in areas such as life sciences and material sciences in the Brno region.

However, there are also examples of higher level institutional alliances:

- The Karlsruhe Institute of Technology (KIT)⁹ represents the merger of the Universität Karlsruhe with the Forschungszentrum Karlsruhe. Both partners are joining their forces in KIT in order to achieve an unprecedented quality of cooperation. With roundabout 8000 employees and an annual budget of about 700 million Euros, KIT has the potential of becoming a leading institution in selected science disciplines in the world.
- The three leading universities of technology in the Netherlands, Delft University of Technology, Eindhoven University of Technology and the University of Twente have joined forces in the 3TU.Federation¹⁰. This federation maximizes innovation by combining and concentrating the strengths of all three universities in research, education and knowledge transfer. The universities have formed joint centres of excellence and centres of competence and are offering joint master programmes. They are also developing initiatives for joint business operations of the three institutions.

Why going European?

As has been said before already, researchers and research units tend to find, eventually, through cooperation with external units the complementary knowledge and technical know-how as well as capabilities and resources which they need to undertake their scientific programme in case it would be lacking in an ‘integrated’ institute. This cooperation has become necessary at least in two cases:

- the importance of accessing to large or medium size and diversified equipment which are more often costly;
- areas of science in which the constitution and use of large data bank and the access to distributed data sets is a requisite for research operations.

In both cases building-up networks at national or European level is a practical means which is presently well recognized (e.g. the Descartes prize for European collaborative research has thus been awarded, in 2008, to the laboratories of the EPICA project working together on paleoclimates in Antarctica) .

⁷ See: <http://www.supa.ac.uk>

⁸ <http://www.ceitec.eu/>

⁹ <http://www.kit.edu/fzk/idcplg?IdcService=KIT&lang=en>

¹⁰ <http://www.3tu.nl/en/>

However, as most of European countries can probably undertake 'virtual' integration at national level, what are the advantages of 'going European'? There are at least three:

- by definition a greater 'intellectual' diversity within a larger pool of talents and competence which represents certainly an asset to address scientific issues with complementary points of views;
- a far larger basis for collecting data in some areas (for example in genetics, environmental or social sciences) and thus avoiding national biases (this argument is not valid of course if you wish to study the genetics of Iceland population!);
- a capacity of gathering high level competence for the training of scientists (at the master or the PhD level) in programmes which would be attractive for non-European scientists (the existence of centres of excellence for graduate studies is probably one of the great strengths of the American academic system).

One could also add, cynically, that cooperation at the European level between academics on research projects is rather devoid of competition or rivalries for their careers which, for the time being, are local or national (rivalries are certainly much more stronger at national level). However, as the above examples might show things might be gradually changing.

The networking and cooperation tradition of European RTD policies and programmes is a competitive advantage e.g. compared to the USA that are mostly oriented towards promoting individual researchers and their competition¹¹. Cooperation is very productive and networking supports creativity. At the same time, keeping an appropriate mix of cooperation and competition is important. That means that integrative arrangements have to ensure that appropriate quality assurance measures are provided for such as competitive project selection based on peer review. In addition, individual researcher will for instance continue there disciplinary work competing with their community while also cooperating interdisciplinary or complementary settings.

Such approaches certainly mean enrichment and contribute to fruitful diversity of the European research 'eco-system'. Thus, arrangements like NoEs and other research alliances bear the potential to be important components of European research policy and a strong asset compared to competing regions around the world.

Integration is probably unnecessary (and may be probably avoided) when there is no consensus or a well accepted paradigm in a research area. In this case competition is much more necessary than cooperation in order to avoid artificial scientific consensus (for example in areas as stem cells research, black matter in astrophysics, etc.).

To be integrated or not and how?

For the time being, with the exception of a limited number of research areas (high energy physics with CERN, space science with ESA, partially infrared astronomy with ESO, JRC in nuclear energy and a few other domains, EMBL, ITER in the future with its satellite laboratories, the ECMW in meteorology in Reading) there are no real fully integrated European laboratories (meaning a total harmonisation and uniformity of programming, staffing, etc.). The EU member states are certainly wishing to keep a national basis for research (in order to dispose of a training force at the frontier of science, to have an access to scientific expertise for various purposes) and will not favour a "strong" scientific integration (with some thematic exceptions as energy and health, one may hope...).

¹¹ Traditionally, NSF is funding principal investigators, which, however, has also a catalytic role in academic science as for example in engineering science.

One reason for national governments' eventual reluctance to integrate their research institutions with others is the role of research in higher education. Without the former there will be no latter. The pan-European integration of research is certainly valuable from the point of research leading possibly to scientific breakthroughs, eventually new inventions, and innovation to economic strength. However, considering integration the fundamental role of research as a means for science-based higher education (at all levels) and training of future generations must be taken into account. Therefore, in order to overcome such obstacles initiatives towards integration have to follow an approach combining high level research with education and training.

Organizing a "mild" or "virtual" durable integration with a European dimension has a limited but clear number of advantages as it has catalytic effects both at national and European levels; utilizing complementary expertise for joint research, high level training (in master and PhD programmes in close association with research groups), sharing data bases and infrastructures are probably the most important.

Training within a master or PhD programme (under the condition that students from various EU countries, and from outside Europe, spend at least two semesters together in the same university following the same programme, which is apparently the case for a few NoEs) involving a truly European and may be international faculty is certainly the most valuable long term investment for Europe as it will induce a "European spirit" among future researchers (there is the same effect with scientists who use to work with European colleagues at CERN and may be in other facilities).

Summing up, the expert group considers that in the future (also beyond FP7) a EU scheme based on the NoE experience would keep a sense if it would aim at achieving integration through a durable partnership ('virtual institute' with or without a legal status) with well defined core objectives which have to be identified beforehand and with a well defined programme with main lines to be agreed upon:

- combining complementary expertise and methodologies in a joint research agenda;
- pooling sophisticated equipment dedicated to a specific research area with common rules and practices for access;
- building through cooperation data bases as research tools;
- organizing high level trans-national training for research.

It has to be emphasised that training should be in all cases one of the compulsory objectives of integrating initiatives and structures as it represents the most challenging effort. Research projects would be performed "à la carte" and would naturally support those objectives (for the present NoE research projects are undertaken in most of the networks but mostly with in-house funding sources) but with specific sources of funding.

It is fair to consider that in most cases durable integration needs a strong governance and would be achieved only with a hard core of a limited number of institutions (3-5-7). Data banks might be an exception as the integration of data from many European sources might make sense, for example in genetics and social sciences.

Having in mind for example the above Scottish, Dutch and other examples, one might also remark that integration may be more easily to be accomplished at the regional scale (neighbouring states as countries around the Baltic, the Rhine valley including Switzerland, Northern Italy with Austria and the S-E of France, Central Europe, etc.). However, the IT infrastructure for video conferences is very advanced so that 'virtual' discussions and interactions are becoming more and more attractive. In addition, in ten years from now, a network of rapid railways will exist within a great part of Europe which will render easier daily contact between scientists (much more than in the USA).

The concept of ‘integration’ would deserve still more reflection and research. In the expert group’s view the present approach starting from perceived deficits of ‘fragmentation’ and lack of ‘critical mass’ might be replaced by approaches focusing on opportunities of utilising the potential of combining distributed complementary competencies and resources including infrastructures. The advantages are not in combining more of the same but creating synergies between different capabilities, specialities and potentialities located at different places in Europe. In this regard, the expert group supports also the findings of the ERA Rationales expert group¹². Different scientific areas will have different requirements. For example, in social sciences the combination and joint use of distributed national or regional data sets will be important for comparative research. Health research will need different patient groups and also distributed data sources.

¹² L. Georghiou, et al.: “Challenging Europe’s Research: Rationales for the European Research area (ERA)”: Report of the ERA Expert Group. European Commission, Directorate-General for Research, EUR 23326 EN, Brussels, 2008

3. Networks of Excellence in FP6

3.1 Quantitative aspects ¹³

In FP6, the part of the programme comparable to ‘Collaborative research’ in FP7 was implemented through integrated projects, specific targeted projects, networks of excellence, coordination actions, and specific support actions. Table 1 shows the relative importance of the different instruments¹⁴ in terms of numbers of contracts/projects, participations and EU financial contributions. Taking into account that the total amount spent for all FP6 activities was about EUR 16 678 mio by the reference date, this shows that the instruments for collaborative research form the most important part of activities in terms of finances.

Table 1: ‘Collaborative research’ in FP6

FP6 Projects ‘Collaborative Research’	Contracts		Participations		EU financial contribution	
	Number	%	Number	%	EUR	%
Integrated Projects and Specific Targeted Research Projects	2.979	59,54	39.132	65,63	11.140.779.760	79,96
Networks of Excellence	171	3,42	5.153	8,64	1.262.017.551	9,06
Coordination Actions	486	9,71	7.123	11,95	581.142.962	4,17
Specific Support Actions	1.367	27,32	8.218	13,78	948.551.797	6,81
Total ‘Collaborative research’	5.003	100,00	59.626	100,00	13.932.492.070	100,00

Data: European Commission, Reference Date: 26/11/2007

Out of a total of 74.460 participations in FP6, 59.626 are devoted to the activities encompassed in ‘collaborative research’ out of which 5.153 participations are related to 171 FP6 signed NoE contracts, with a total Community contribution¹⁵ to all participants of around 1,2 billion euro.

Table 2 provides a more detailed quantitative overview of the NoE scheme as it has materialized in FP6.

More than half of the 5.153 participations to FP6 NoE, i.e. 2.898 (56%) are from Higher Education Establishments, whereas 1.476 (29%) participations are from research centres. The situation is similar in terms of the % share of EC funding. Industrial participation, in the strict meaning of the term, amounts to 391 entities (7,6%) with 4% share of the EC funding. However, as the overview shows the share of industry participation differs between thematic priorities. It is highest in EURATOM (15,6%), interestingly enough followed by Climate Change and Ecosystems (10,9%). NoEs in Information Society Technologies attracted 8,7% of industrial partners, Life Sciences and Aeronautics 7,9% and 7,2% respectively, and in NoEs in the area of Food Quality and Safety only 3% of the partners came from industry.

With a share of 34,5% the uptake of the NoE scheme was strongest in Information Society Technologies thematic priority followed by Life Sciences with 22,2 %.

The average number of partners in NoEs was 30. Taking into account the problems related to the management of networks with large numbers of partners this indicates already one of the

¹³ The data provided by the Commission services are based on the status of data collection from November 2007.

¹⁴ In FP7 called ‘funding schemes’

¹⁵ Please note that the figures related to EU contributions refer to commitments and not payments

Table 2: Networks of Excellence in FP6: Quantitative overview

FP6 NoEs	1. Life sciences, genomics and biotechnology for health	2. Information society technologies	3. Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices	4. Aeronautics and space	5. Food quality and safety	6. Sustainable development, global change and ecosystems	7. Citizens and governance in a knowledge-based society	Euratom	Specific measures in support of international cooperation	Total
NoEs										
Number of NoEs	38	59	22	3	12	19	14	3	1	171
% of total number of FP6 NoEs	22,22	34,50	12,87	1,75	7,02	11,11	8,19	1,75	0,58	100,00
Participations										
Total Number of all participations:	1.115	2.017	431	51	332	626	472	90	19	5.153
Average number of participations:	29	34	20	17	28	33	34	30	19	30
The largest number of participants:	116	95	36	24	52	66	56	53	19	116
The smallest number of participations:	12	11	11	13	13	9	9	10	19	9
Types of organisations (activity)										
Higher Education	620	1.267	245	15	140	248	330	26	7	2.898
Research Centre	301	423	143	28	136	270	124	42	9	1.476
Industry	88	176	31	4	10	68	0	14	0	391
Other	97	147	11	3	43	37	16	8	3	365
Undefined	9	4	1	1	3	3	2	0	0	23
EU Contribution (euro)										
Total EU contribution for NoEs	374.391.783	315.618.821	157.221.743	20.422.000	160.083.765	141.725.439	61.942.000	17.632.000	12.980.000	1.262.017.551
% of total EU contribution for FP6 NoEs	29,67	25,01	12,46	1,62	12,68	11,23	4,91	1,40	1,03	100,00
Average total EU contribution to projects:	9.852.415	5.349.472	7.146.443	6.807.333	13.340.314	7.459.234	4.424.429	5.877.333	12.980.000	7.380.220
Highest total EU contribution to projects:	15.500.000	9.900.000	12.479.743	7.500.000	17.263.765	14.300.000	5.500.000	6.352.000	12.980.000	17.263.765
Lowest total EU contribution to projects:	4.400.000	1.500.000	4.400.000	6.000.000	11.000.000	2.000.000	3.400.000	5.000.000	12.980.000	1.500.000
Project Duration (running months)										
Average project duration:	58	43	52	56	60	55	55	52	60	51
Longest project duration:	60	60	60	60	72	72	60	60	60	72
Shortest project duration:	48	18	48	48	48	36	48	48	60	18

deficits of the implementation of the scheme in FP6. The minimum number of partners was 9 which shows that even the smallest NoE had a partnership somehow above a size found reasonable by the expert group.

Looking at the funding and considering the large numbers of partners involved in NoEs shows that even in the NoEs with the highest financial EU contribution the funding by partner was rather low indicating that also the NoE would not play a substantial role in the overall frame of partners' activities.

The average duration of NoE contracts was 51 months, which means less than 5 years. As the interviews and other information collected by the expert group showed this timeframe is seen as too short for achieving 'integration' – even if it were intended by the NoEs.

Table 3: Participation in NoE by country groups or countries

Country groups, Countries	Participations	
	Number	%
MEMBER STATES – OLD (EU15)	4.257	82,61
MEMBER STATES - NEW	400	7,76
ASSOCIATED COUNTRIES	376	7,30
INCO-RUSSIA&NIS	25	0,49
EU-JRC	16	0,31
INCO-WESTERNBALKAN	14	0,27
INCO-ASIA	12	0,23
US	12	0,23
INCO-MEDITERRANEAN	9	0,17
INCO-ACP-AFRICAN	9	0,17
INCO-LATINAMERICA	9	0,17
CA	6	0,12
AU	4	0,08
JP	1	0,02
KR	1	0,02
NZ	1	0,02
TW	1	0,02
Total	5.153	100,00
Total Third countries	104	2,02

Table 3 summarizes the participations by groups of countries. It is interesting to compare the participation in NoEs with the participation in FP6 as a whole. 7,76% of NoE partners come from the new member states, which is remarkably lower than the total participation of researchers from the new member states in FP6, which is over 12%. The participation of associated countries in NoE (7,30%) is above the general participation from these countries in FP6, which accounts for 6,5%. Total third country participation is 5,2% in FP6, whereas in NoE only 2,2% of the partners come from third countries. 25% of the 104 third country participations come from industrialised countries with US in the lead, followed by Canada and Australia.

Regarding the involvement of organisations from new member states in NoEs or future other integrative arrangements utilising synergies between the Framework Programme and Structural Funds should be considered. The involvement of organisations from Third Countries is an issue to be addressed in connection with the future discussions on the forthcoming Communication on a strategic European framework for international S&T cooperation.

3.2 Achievements regarding original intentions and contributions towards durable integration

A great variety of NoE

The expert group has identified a great variety of NoEs across the different thematic fields regarding their partnership, objectives and activities. There are also great variations and differences regarding the materialisation of the original intentions of the NoE instrument. Due to this variety also the perspectives and modalities towards durable integration differ substantially between existing NoEs.

Based on the information available to the expert group through interviews with some coordinators, an analysis of the homepages of the FP6 NoEs, information from NoE reviews and results of workshops on NoEs, a distinction can be made between different categories of NoEs regarding their advancement towards the original objectives:

- NoEs that defined and implement a Joint Programme of Activities (JPA) in accordance with the objectives of the NoE instrument combining in a balanced way joint research, developing and sharing of joint infrastructures, specific targeted activities towards integration of research activities and structures, and initiatives towards spreading of excellence. Some of them have developed successfully towards institutional integration for instance as Durable Integration Structures (DIS)¹⁶ with good prospects for sustainability;
- NoEs that developed integrated research and training activities in different partnerships between participating organisations with some changes towards closer institutional cooperation but with too little time available for developing ‘durable integration’;
- NoEs that developed coherent approaches towards scientific and other research based services with different development stages regarding integration;
- NoEs that implemented a small outsourced research programme and are concerting the small projects funded under the JPA working more or less like in Thematic Networks as they were known in FP5;
- NoEs that supported small collaborative research projects of their members with little coordination of the projects and without any consequences to their institutional structure.

From the overview that the expert group was able to achieve it seems that only a minority of NoEs have moved convincingly towards durable integration with perspectives to longer-term survival beyond the ending of EU funding. In that context, the expert group is fully aware of the fact that the issue of ‘integration’ cannot be restricted to the organisational aspect of e.g. creating a legal entity and is more complex.

Achievements of NoEs

This chapter summarizes findings of the expert group on achievements of NoEs and presents them in a structured way as a basis for further considerations on shaping possible integrative structures in the European Research Area. The role of NoEs or other appropriate structures in the context of the spectrum of ERA schemes and initiatives designed for supporting the creation of the European Research Area will be discussed in more detail in chapter 6.

¹⁶ See some examples in A. F. de Baas and J.L. Vallés: Networks of Excellence- Key for the future of EU research: Success stories in the Materials domain. European Commission, Directorate-General for Research, Industrial Technologies, Unit G3 ‘Value-added Material’. EUR 23128. 2007

According to the original ideas and objectives, NoEs can be seen as ‘incubators’ for excellence or emerging excellence and for exploratory activities towards new scientific issues; they can provide a test bed for new ideas or for the emergence of new scientific fields. Where NoEs succeeded to move towards creating excellent new ‘virtual’ European research institutions they can be seen as complementary to the ‘Ideas’ Specific Programme promoting excellent individual researchers.

Activities and ‘products’ of NoEs

Successful NoEs were able to develop a balanced spectrum of joint activities and building/producing what may be called ‘intermediate collective research goods’ that are not research results but activities promoting and supporting research:

1. Developing joint programmes for research activities towards a common research agenda (in many cases a consolidation of existing cooperation);
 - Collaborative research projects in many cases of an interdisciplinary and/or exploratory nature paving the way also for new complementary partnerships, new ideas, and for developing new fields and innovative approaches;
 - Combining different, complementary fields and disciplines while at the same time letting the involved disciplinary areas also develop in their separate domains in a competitive way;
 - Fostering excellence by internal and external competition and quality assurance;
 - Developing, sharing and validating common working methods;
 - Ensuring critical mass for addressing ambitious complex challenges such as e.g. quality assurance in genetic testing, malaria research, or research on new diseases;
 - Providing opportunities for comparative cross-national studies;
 - Addressing issues with a real European added value (for instance in the health theme) and playing the ‘research branch’ of a European agency.
2. Pooling scientific equipment, joint use and/or development of (intermediate) research infrastructures:
 - Establishing common methodologies for the use of complex experimental facilities;
 - Jointly agreed approaches for data collection and treatment; production of joint data sets;
 - Developing joint databases, platforms, testbeds, etc.
3. Providing a favourable environment for young researchers:
 - Developing the human resource base for science and research in Europe and developing the new generation of European researchers by creating networks of young and advanced professionals and scientists through early stage participation in joint research and training activities;
 - Advanced researchers providing guidance for career development of young scientists who may benefit also from the meritocracy aspect of NoEs;
 - Supporting researcher mobility between partner centres and facilitating access to the best research equipment in Europe;
 - Improving the opportunities for joining into EU projects and other trans-national activities, thus providing international exposure at an early stage;

- Improving possibilities for publishing in top international journals, eventually together with world class scientists.
4. Offering transnational integrated advanced education and training activities
 - Offering joint Bologna master and PhD programmes;
 - Organising European summer schools and training courses;
 - Such joint programmes assembling the best expertise available in Europe may also create European added value by attracting participants from all around the world. There are cases where new partners from the USA or Japan want to join in, or send their PhDs.
 5. Ensuring a science policy interface, including societal involvement and public awareness
 - Communicating with science policy stakeholders;
 - Developing platforms for user involvement;
 - Organising outreach to the public and providing joint information tools, e.g. common web portal, newsletters.
 6. Supporting European and international visibility and competitiveness
 - Assembling critical mass for joining international initiatives or organisations and representing Europe ‘with one voice’.

Some NoEs have also moved towards closer institutional relations or have even succeeded to establish a formalised joint durable integrated structure (DIS) based on a common legal arrangement e.g. ‘Association internationale sans but lucratif’ (AI SBL) or ‘European Economic Interest Groupings’ (EEIG).

It has to be emphasised that a balanced spectrum of such activities would be an ideal model but is not necessarily reflected by the overall reality of all the present NoEs. However, the activities of many NoEs cover several of the above activities.

3.3 Difficulties encountered in implementing Networks of Excellence in FP6

The challenges of integration: different interpretations, different perceptions, different approaches

From the start of FP6, the NoE concept was defined ambiguously and was also promoted differently by Commission services across the directorates of the research family. In Annex 3 an overview of policy and programme background of the NoE scheme is given. Views on rationale and objectives as well as on requested achievements of NoEs are still varied across different thematic priorities and across different NoEs, i.e. across the Commission services and across the research community.

Despite of possible other internal considerations in the Commission the main messages as perceived by the research community indicated the need for including rather large numbers of partners in NoEs. Therefore, especially the NoEs of the ‘first wave’ comprise large numbers of research teams although, in general, throughout the research community there were many doubts regarding the possibility of integration and mutual specialisation of such large groupings. In addition, in many parts of the Commission there was (and still is) a strong focus on structural/organisational aspects of integration especially on the progress towards legal integration without a clear vision of its objectives and its implications for the long term.

In many cases, the NoE scheme is not seen as an initiative for organisational development and the support for the creation of new structures for coordinated and collaborative R&D and for spreading of excellence (training) in Europe. NoE partners very often interpret the NoE

instrument rather as Thematic Networks or re-enforced Coordination Actions known from FP5¹⁷ i.e. loosely coupled groupings providing in a flexible self-organised way financial resources for small scale research projects and other activities - very often of an exploratory nature. Thus, NoEs are interpreted as kind of small outsourced research programme leading for instance to NoEs that are just clusters of small research projects each with a limited number of partners that are – if at all – only loosely connected in the network but certainly not leading to any form of structural integration.

From the point of view of the original intentions, the main objective of the NoE instrument is integration. In contrast, most NoEs' emphasis is on science and research activities only and not on measures aiming at organisational change towards organisational integration. One root of the problems might be hidden in the fact that the NoEs were called 'networks' and that term has been used with a different meaning in previous Framework Programmes.

Certainly, 'durable integration' is the most challenging issue related to the NoE concept which is also clearly reflected in different interpretations of that aspect followed by different NoEs:

- Quite a few NoEs interpret research cooperation including some alignment of concepts, methods, standards and also coordination already as 'integration' – this is for instance particularly true for the NoEs in the IST thematic priority;
- However, some others strive in addition towards structural change and organisational integration being defined in contractual arrangements and even leading to new joint legal entities as required by the original objective of the NoE scheme.

The NoE concept foresees a balanced combination of both aspects in the Joint Programme of Activities (JPA). In most cases that is not being achieved or not even aimed at. In most cases researchers focused on the research activities, whereas scientific officers of the Commission put the focus in project monitoring also on the organisational (administrative) integration, sometimes despite progress in scientific integration. This led to difficult and fruitless discussions and in fact waste of valuable time both of scientific officers and researchers and finally to frustration on both sides.

The expert group has identified achieving 'durable integration' and creating joint organisational arrangements and structures under the conditions defined for the NoE instrument in FP6 as the major problems for achieving the core objectives of NoEs.

Choice of research areas for NoEs

Since NoEs are aimed at fighting against 'fragmentation' of existing research capacities, the topics should be identified carefully and based on a detailed analysis focusing on:

- The level of fragmentation of the thematic area considered;
- The effect of this fragmentation on the competitiveness at international level in that area;
- The envisaged outcome on European scientific excellence and more efficient use of resources.

Although 'fragmentation' was one of the main reasons for establishing the NoE scheme only in exceptional this aspect has been addressed explicitly and thoroughly in work programmes, calls for proposals and consequently in applications. In quite a few cases, networks of excellence and integrated projects were even offered as two equally possible options for proposals.

¹⁷ See e.g. <http://www.cordis.lu/growth/src/proj-fp5.htm>

NoEs as legal entities - Ex-ante contractual commitments to integration

‘Integration’ is spelled out in contracts with the EC and has been decided before partners started to work; it caused problems that creating a legal structure mentioned as an example became contractual obligation which led to problems of assessment. The fixed ex ante commitment of NoEs towards durable integration into a joint legal structure was a problem and presented a burden for the NoEs.

Involvement of the parent institutions of NoE partners

The reluctance of universities or research organisations is in many cases the major barrier to integration. They are very often not prepared letting eventually their best departments or units become members of other durable (legal) structures¹⁸. During the introduction of the NoE concept there was no general in-depth discussion with universities and research organisations on this organisational innovation and the consequences for research institutions in Europe.

Integrated Projects are instruments of collaborative research involving researchers for a limited time. In Networks of Excellence, also the chief executives of the participating teams’ host organisations should be involved in addition to researchers from the start because the objective is organisational integration with other partner organisations. Institutional change and integration has to be decided by the top management of the institutions. However, in most cases, the institutional level was only formally involved in proposal preparation and probably not made sufficiently aware of the long-term consequences of participating in NoE.¹⁹

The NoE concept bears also the potential/risk/danger for creating conflicting situations of European integration vs. local ‘disintegration’:

- Groups entering into NoEs are integrated in universities and RPOs;
- Integration at European level has to be achieved in harmony with local ties and commitments;
- Attenuating ties to parent institutions by creating an administrative or legal structure that is separate from parent institution clearly cuts off groups from their lifelines which becomes especially problematic when parent institutions were not sufficiently involved in the development of NoEs;
- NoE groups are important components of their parent organisations and attenuating these ties is prejudicial to the rest of the institution, e.g. if ‘NoE group’ follows different educational or transfer policy.

It is a major issue that benefits for universities or research centres from agreeing that departments join NoE are not sufficiently clear and have yet to be identified. As a consequence, the lack of institutional support from universities or research organisations hosting NoE partners is not surprising.

For the time being, only the intergovernmental research organisations, such as for instance CERN, ESA, ESO, ESRF, ILL etc. are organised on the basis of trans-national agreements. Thus, creating new durable trans-national ‘virtual centres of excellence’ in the context of the NoE scheme would mean a step change in the organization of European research. This constitutes a real and important challenge which can only be met with the full commitment of universities and national research organisations (as Max Planck, CNRS, CNR, CSIC, etc.), which would have to contribute to the long term funding of these new centres.

¹⁸ Also, in the discussions on the concept of the European Institute of Technology and Innovation this attitude became very obvious.

¹⁹ See above NoE workshop from March 2006

Number of partners, quality of the partnership

For many NoEs the large numbers of partners is a major challenge and presented a natural problem for network management in general and for institutional integration in particular. Successful integration or mergers are probably possible only with a manageable number of partners, where in general the number of three or five to seven partners seems reasonable as recommended also in the FP7 Guide for Applicants.

Larger partnerships should be formed only in exceptional duly justified cases on the basis of well argued special requirements of the chosen area of activities. It is well understood that one size doesn't fit all: there may be thematic areas where larger consortia are necessary and appropriate and others, where 5 to 7 partners or even less are the appropriate size. However, a high level of awareness has to be created on the difficulties that arise when networks are too large. When evaluating such exceptional cases, special attention should be paid to the proposed organisational structure and to the planned management approaches towards durable integration. There might also be a need for explicitly ensuring that the appropriate expert advice is available supporting the integration process.

The partnerships are often also very uneven regarding scientific quality of the partners and their motivation and commitment to long-term perspectives of durable integration. In many cases, there is a 'core/periphery problem' with a core team of partners that has a long history of working together and with newcomers that are not sufficiently integrated in the NoE activities. There should be clear and commonly agreed added value of the involvement of partners – both for the partners and for the whole network. Partners should share a well defined common interest in the development of such a new common structure. There are problems with partners that are taken on board only because of (perceived) requirements regarding size of the network or also because of other political and not research driven reasons following (perceived) political appeal related for instance to cohesion issues.

Marginal involvement regarding resources and activities

Contrary to original intentions, the work related to NoE is in most cases only a minor part of participants' activities:

- EU contribution for individual partners is small money compared to the requested major organisational change;
- The research activities involved in the NoE may be only a fraction of the overall research activities of the involved research entity or team, which is in contrast to the original ideas of *"involving some or, where appropriate, all of the research capacities and activities of the participants in the relevant area to attain a critical mass of expertise and European added value"*²⁰.

Finally, one must say that there may also be a diversity of interests of participants. Therefore, durable integration will be possible only with a rather limited number of partners.

Barriers for 'mutual specialisation'

Main barriers for 'mutual specialisation' are:

- Lack of awareness that according to the integration objective of NoEs there is a need for mutual specialisation, re-focusing and coordination in the network with regard to the priority research activities of the partners in order to avoid duplication, to ensure concentration on specific strengths and to optimise complementarities;

²⁰ See decision on FP6

- Moving senior researchers faces the well-known problems of researcher mobility in Europe;
- Moving major equipment and installations is difficult or impossible due to institutional regulations.

Duration of the NoE contract and the EC funding

Most NoEs see the 4-5 years duration of the NoE contract as too short for substantial and sustainable integration. Integration can be achieved through a long-term process of communication and interaction, coordination and cooperation. As a yardstick one could use that it takes *“2 to 3 successive projects with sharing of personnel and equipment, building cohesion and experiencing mutual benefit thus becoming real partners, building mutual trust and appreciation, common working modalities, and finally a true sense of belonging together. ... Thus, time for building a true research partnership would be 6 to 9 years (assuming project duration of some 3 years).”*²¹ Due to the (at least implicit) FP6 requirement to build large networks the partnerships consisted in most cases not only of partners who have worked together in projects already but involved also sometimes a significant numbers of new partners. This is a further reason why the 5 year period foreseen for the NoEs to build ‘virtual centres of excellence’ was in many cases too short for true integration even provided that partners are committed to moving in that direction and when the willingness for integration was present.

Participation of industry and SMEs

The expert group came to the conclusion that cooperation with industry should not be an important requirement for NoEs and the “virtual” integration process for several reasons:

- large companies have now a fair knowledge of the European (and global) research system and they have their own cooperation strategy with well established academic research groups (for example EADS has identified the 3 or 4 European laboratories with which it wishes to have a long time cooperation to develop composite materials);
- in general, for industry the objectives of the NoE scheme were not defined clear enough;
- the objective of ‘durable integration’ is not attractive for industry that is following the concept of ‘open innovation’;
- becoming part of a large consortium becomes very difficult with regard to legal and intellectual property issues;
- also the financial aspect of NoEs is not attractive for industry because only a fraction of research is covered by the EC contribution.

SME tend to prefer local regional cooperation close to their production facilities. In addition, long-term contractual commitment is also a problem for SMEs because they would need more flexible arrangements according to their changing needs.

However, industry could play an important role in advisory boards following and supporting the strategic development and the results of NoEs where appropriate. In addition, industry involvement would also be valuable in training activities.

The involvement of industry in NoE is certainly a point for further in-depth considerations. During the discussions of the expert group on industry involvement gradually the idea emerged that the outcome of FP6 regarding the fact that industry mostly did not join the NoE scheme should be taken seriously and used as a basis for sharpening the instrument.

²¹ Quoted from one of the responses to the survey of research funding organisations and research organisations

The ERA instruments comprise now the industry led European Technology Platforms and the Joint Technology Initiatives. Therefore, one conclusion of the FP6 NoE experience might be that it would be useful to develop an instrument supporting long-term strategic research alliances between universities and research organisations complementing industry led European Technology Platforms and Joint Technology Initiatives.

Management of networks and of organisational change

There are still problems related to the implementation and follow up of NoEs. There is a variety of approaches towards the management of NoEs by the consortia and towards the follow-up by scientific and financial officers in the Commission. There is a need to further develop clear indicators for assessing (progress towards) sustainable integration. Progress should be assessed on the basis of well defined activities and deliverables. According to information from several NoE coordinators, specific problems of financial management are caused by frequent fluctuation of financial officers.

Researchers interpret the reporting requirements as being applied as a value in themselves. Therefore, they are not well accepted by researchers; they just see this as administrative burden. However, this can be interpreted as a sign of still existing deficits in the research management culture. Adequate reporting should be a purposeful tool for (scientific and administrative) monitoring and assessing progress both in the integration process and the research performance; thus, reporting should serve the objectives of the scheme. The expert group recommends that the reporting requirements should be reviewed, streamlined and readjusted to the objectives if necessary – and possible.

In many cases, the management of the large partnerships led to administrative overload.

NoEs are initiatives for organisational development and structural change involving integration of partners of different organisational bases and legal status. As a consequence, they are faced with challenging problems known also from mergers in industry. The characteristics of research systems and the distributed nature of NoE partnerships make merging processes probably even more complex. However, in many NoEs, there seems to be a lack of expertise, capabilities and skills of management of large networks as well as in organisational development and management of institutional change. That is also a reason for the main emphasis on research activities because reorganisation is not an attractive activity for researchers.

There may be problems of having researchers in the driving seat for such tasks. For young active researchers coordinating NoE could certainly be problematic for their future scientific career, because their scientific productivity might suffer from the heavy task of managing a NoE. In some cases it was positive that coordinators were experienced researchers at the end of their careers. However, the problem remains that the appropriate professional expertise, capabilities and skills for managing complex processes of organisational change were mostly not available in NoEs.

4. Key lessons learned from the FP6 NoE experience

4.1 NoEs are producing collective goods important for the development of ERA

In most cases, NoE yielded intermediate scientific products that would not qualify as scientific outputs as such but would benefit European science especially young scientific fields where disadvantage of fragmentation/dispersed and badly connected capacities is/are a special problem. Thus, the specific spectrum of activities of NoEs may improve future capability to capitalise from new ideas and concepts. The expert group is convinced that European integration in research and the further development of the European Research Area cannot be achieved without such intermediate collective research goods.

It has to be emphasised that networks of excellence are not created for producing research results *per se*. NoEs produce *some* research as a result of the collaboration among members. It can be said that research in NoE is not the ultimate goal, but an instrumental goal. Research is needed (and, indeed, is necessary) in order to realize the overall goal, i.e. research integration. Thus, the overall activity of NoE can better be understood by assuming that the goods they are producing are not final products (such as research results), but mainly intermediate goods, i.e. goods that facilitate the production of research, increasing its productivity and/or accelerating discoveries.

Main collective goods produced by NoE are:

- Shared use of equipment;
- Joint production of data sets²²;
- Definitions, measurement protocols, procedures and quality assurance;
- Standards, definitions of specifications related to products or technologies;
- Long term research agenda; research results;
- New curricula for research training;
- Societal involvement: user involvement, patient association, support for public policies, public awareness.

Being produced by a closed collection of actors, initially for themselves, these instrumental goods can be defined collective, not public goods. The degree to which these goods will be made available to the overall scientific community is an open question that will have differentiated responses.

These intermediate collective goods are considered by scientists themselves as of high importance for the ultimate goal, i.e. producing research results and contribute to address various social issues through the use of new knowledge. There are different reasons in different scientific areas why these intermediate and collective goods created by integrative institutional arrangements like NoEs are considered so important by scientists.

In some areas, information and data are collected with different methodologies and instruments and often by different institutions creating a strong need for complementarity and coordination. In other areas, issues and disciplines that were previously separated are getting closer and cooperation as well as vertical integration across disciplines are mandated by the dynamics of sciences.

Another feature of new sciences is the blurring of established boundaries between science and engineering creating new and unprecedented opportunities for complementarity between science and engineering that translate also into relations between academia and industry. A

²² In several areas data have a European dimension (in genetics for example) and must be collected according to a common European methodology.

strong argument for collective action is also overcoming uncertainty on measurement in emerging sciences at an early stage of development. Finally, new sciences such as life sciences or nano-materials require instrumentation utilizing intermediate levels of energy compared to particle accelerators or other large instruments that can be acquired by many individual labs creating some need to increase the rate of utilization.

Finally, the intermediate collective goods are produced cooperatively, with an intentionally coordinated effort. There is a need to organize new forms of complementarity. It is questionable, whether it would be possible to produce the same goods in other ways, perhaps in a hierarchical or centralized way, or rather through the fully decentralized and independent activity of scientists competing against each other in the pursuit of discoveries.

4.2 Need to safeguard the achievements of NoEs and to learn from the FP6 experience

Despite the problems rooted in ambiguous definitions of the NoE instruments many NoEs have initiated and maintained valuable coordination measures and cooperative activities. These do not simply reproduce existing research collaborations, but extend much beyond in terms of size and scope to encompass and structure or restructure whole fields and to create new spaces for research.

Although the policy goal of ‘durable (organisational) integration’ has been achieved only by a limited number of NoEs the spectrum of activities performed by many NoEs is useful and beneficial and supports the ERA objectives. While some of the individual activities could possibly be covered also by other funding schemes under the Framework Programme none of them covers the finalisation and integration of these activities into a coherent strategy for structuring ERA at present.

NoEs are producing intermediate collective goods and despite the rather low funding scientists engage in such activities because they consider these ‘products’ as of high importance for the ultimate goal, i.e. producing research results and contributing to address various social issues through the use of new knowledge.

As a consequence, it will be important to safeguard the positive achievements of the NoEs that have been reached despite the problematic starting and developing conditions. The challenge will be to stabilize the NoE strategy towards durable integration and coordinate it with other funding schemes.

This policy fine-tuning must recognize the following points:

- integration activities such as the ones realized by (successful) NoEs are valuable and unique, whereas they do not overlap completely with activities in any of the existing instruments and should be pursued also in future calls;
- policies for integration are by definition transitional, in the sense that their ultimate goal is to support scientific communities in reaching self-sustaining integration in a reasonable timeframe and not to fund coordination activities forever;
- integration is a complex task that has different meanings in different fields, may require a long time horizon, and may be subject to unexpected and unforeseeable obstacles. Therefore, it is not a wise policy to impose in every case the same time schedule or the same type of integration model.

As a consequence, allowing an extension to a subset of existing excellent NoEs will be useful to help their integration path in a realistic way. Such an extension would also be justified because NoEs should not be penalised for deficits in the launch and implementation of the NoE instrument in FP6.

Based on the lessons learned from the NoE experience a refined instrument for developing transnational integrated structures for collaborative research should be offered in the future.

4.3 Refining the objectives of existing NoEs and the modalities for EC funding

From the point of view of the expert group the objectives of the NoE instrument as defined by FP7 need not be changed in general but they need to be clarified. In particular, the concept of integration needs to be reappraised and calls for some further effort for developing a commonly accepted interpretation both within the Commission services and in the European research community. The NoE scheme has been designed for targeting institutional integration towards ‘virtual centres of excellence’. Therefore, integrative arrangements like NoEs have to provide a space conducive to integration consisting of a balanced set of integrative activities for creating intermediate collective goods and of supporting organisational measures towards a reasonable level of integration. Other useful coordinated and cooperative activities should be funded by other funding schemes like coordination and support actions.

The expert group supports the advice provided in the Guide for Applicants for the first FP7 calls for proposals regarding a size of NoEs of three to seven as a reasonable number of partners.

The expert group points out that a spectrum of different options for organisational integration modes or new structures from loose coupling to strict arrangements, agreements and legal entities should be considered when defining the requirements of a future calls - both for the extension of a limited number of existing NoEs and the launch of a new refined scheme:

- Continuous long-term cooperation based on contractual arrangement, Memorandum of Understanding, Consortium Agreement, statutes, etc. for mutual sharing of e.g. facilities, equipment and infrastructures, databases, platforms, test-beds, software, methods and for collaboration in advanced education and training activities;
- Use of existing legal structures to join in (e.g. scientific society or association; European agency);
- ‘Association internationale sans but lucratif’ (AISBL) according to Belgian law;
- European Economic Interest Grouping (EEIG);
- Joint legal status, legal entity (some NoE may go for legal structure: in that case some partners will drop out because of barriers, some will leave because they have become less interested, others will leave because they were never active)

NoE coordinators welcome that in FP7 the funding model is based on real costs of NoE coordination and activities (e.g. training, joint data bases, joint infrastructures) compared to the FP6 funding formula. Thus, there is no need for change of the present funding modality.

There is a need to further develop clear indicators for assessing (progress towards) sustainable integration. Progress should be assessed on the basis of the implementation of a balanced spectrum of integrative activities as well as the targeted development of structural provisions supporting integration.

Reporting requirements should be designed as a purposeful tool for monitoring and assessing progress in the integration process; thus, reporting should serve the objectives of the scheme. The expert group recommends that the reporting requirements should be reviewed, streamlined and readjusted to the objectives wherever possible.

4.4 Need for a “buy in” from various actors to support sustainable support

Considering the information gained and assessed the expert group has identified a spectrum of possibilities and sources for sustainable support the present NoEs:

- EU financial contribution for specific activities under FP7;
- Participation fees and income from training activities, services, etc.;
- National and European agencies;
- National funding institutions and ERA-NETs;
- Public authorities;
- Industry.

There are NoEs that have developed an approach to manage a portfolio of funding from different sources. Thus, there are convincing examples where NoEs found ways and means laying the ground for their sustainable development beyond the termination of the EU contract and thus the funding from the EU. However, many NoEs seem to find it difficult to follow such a path leading to ‘patchwork’ or ‘jig-saw’ funding for covering the costs of the NoE.

Although EU financial contribution per partner is small many NoE participants see it as being essential as an added value of and incentive for future participation and collaboration.

There are some convincing examples of NoEs where financial support from institutions paying participation fees and also income from training activities and services have been organised as funding mode to support sustainability of the NoEs. However, there seem to be many cases where that doesn’t work either because the partnership is too small or institutions are under financial pressure and/or are not willing for long-term financial commitments. They see NoE as a public good: it is good to have it, but there is no willingness to contribute to sustainable funding.

Another possibility would be to involve national agencies or European Agencies (e.g. EFSA²³). However, there is the problem that this would possibly work for some themes and some countries only but not as a general solution.

So far, there is a lack of ‘buy in’ from national and other European funding organisations for continued support of NoEs. In most cases, national or other funding organisations were not involved in the development of the NoE concept and in the creation of NoEs. Nevertheless, several of them agreed bringing their financial support. Therefore, the expert group has performed a short survey in order to gather information on the position of funding organisations towards the future of NoE. There were no clear signs of a general preparedness towards financial contribution to NoEs.

The possible links or synergies between NoE and ERA-NETs are an area for further consideration. NoEs could provide input into the identification of thematic priorities for ERA-NETs and the development of new programmes or the definition of the focus of joint calls. ERA-NETs could form an appropriate funding source for NoE coordination and activities. This approach should be explored further. In that context, also the possibility of coordinated calls between ERA-NETs and FP7 combining national and Community funds should be explored. This could be an interesting option specifically suited for the financial support of NoEs.

²³ EFSA: European Food Safety Agency

Industrial involvement in NoE is low. From the beginning of FP6, NoE were interpreted as targeting mainly universities and research organisations. Industry saw problems regarding IPR issues in the frame of networks with large numbers of partners and low funding per researcher. In general, the position of industry towards NoE was characterised by hesitation to long-term institutional integration. Therefore, only in just a very few NoEs there are industrial partners that might contribute to future approaches towards public-private partnerships in the long-term.

Summing up, so far, there are NoEs that claim to have good chances organising their sustainability beyond the ending of the EC funding. However, for many NoEs the priority solution seems to be EU funding. Therefore, it has to be avoided that one will face the same problematic situation after e.g. two or three additional years. That means that when a new funding round for existing NoEs would be considered a highly competitive and selective procedure has to be developed where only NoEs with a realistic potential for sustainability will be able to succeed.

4.5 A change in the EU RTD funding ‘philosophy’?

In its considerations the expert group has concentrated on an analysis and review of the NoE scheme. The question of future NoE funding has to be embedded in the wider context of the future development of the spectrum of ERA instruments and the potential role of integrative structures. Offering a new opportunity for competitive funding for NoEs would not only mean the development of new institutional structures for research in Europe but also present a major general change in the Community’s policies regarding research funding. So far, project funding was based mainly on the assessment of the objectives and future deliverables of a project. Offering a re-newed funding round for excellent NoEs would mean that in evaluations also past performance would have a certain weight. However, in the expert group’s opinion this is a reasonable innovation that can be implemented within the frame of the present rules for participation where possibly only a minor re-formulation of the evaluation criteria would be necessary. Such an approach would certainly be meaningful also in activities related to research infrastructures.

Within the limits of its mandate and the available resources, the expert group could not engage into in-depth discussions of the whole issue of the EU RTD funding ‘philosophy’. This would call for general reflections on the future role of ‘integrated’ structures including infrastructures in the European RTD policy (objectives, funding, and relationships with national organisations). As a very general conclusion it can be said that opportunities for renewed funding of successful activities, e.g. infrastructure projects or others might be provided in exceptional duly justified cases. The rules for participation and the evaluation criteria might be slightly adapted to provide sufficient flexibility for such an approach.

More considerations on possible substantial changes or extensions of EU RTD funding approaches were not seen necessary for the present review of the FP6 NoE scheme. In addition, more broad and in-depth deliberations on this special issue would have gone beyond the possibilities and resources that the expert group had in the frame of the present exercise.

5. The way ahead

5.1 Support for existing NoEs that are advanced towards integration

From the interviews and the study of the available other information and documentation the expert group acknowledges that there are cases of beneficial activities and also achievements regarding the general objectives of NoE towards durable integration and mutual specialisation. Some of the NoEs are well under way and will reach the defined objectives. Others are far advanced and might benefit from an opportunity to compete for funding in order to complete their activities towards integration.

Normally, contracts under EU RTD Framework Programmes are for a certain limited duration. Most NoE have a 5-years contract. When they have achieved their objectives, it is difficult to argue for continuation of funding. When they didn't achieve their objectives there is little or no reason for further funding.

However, following its mandate, the expert group identified the NoE instrument or funding scheme as a special case where in a limited number of duly justified cases there might be a need for providing opportunities for additional funding for a limited additional period on a competitive basis. No justification has been found for a 'closed cycle' funding for all or even a majority of NoE.

The further funding opportunity should be rather exceptional and should be limited to cases of NoEs that can show high level of institutional commitment and also convincing past achievements as well as future plans towards durable integration within a period of two or maximum three years. This would to a certain extent also be compatible with the original plans providing Community financial support for NoEs for a maximum of seven years²⁴. In addition, it would be in accordance with arguments that integration needs 7-8 years, especially when partners are involved that don't build on a cooperation history.

This recommendation applies to the best NoE that have performed excellently, that show convincing commitment (including commitment of the parent institution) to integrate and are advanced towards that goal already but time was too short. For instance, newly emerging (interdisciplinary) fields may have special needs for more time for their establishment and integration. Special considerations might also be necessary for some excellent but very large NoEs.

The expert group proposes that the Commission considers the following recommendations:

1. There are well performing NoEs that will have some funds left at the end of their project duration. In such cases, a first pragmatic option is the extension of the contract for 1 year without additional funding (amendment of the contract).
2. With regard to a new funding round for excellent NoEs the expert group proposes that the following two options are considered:
 - A Call for Support Actions for 2 years for funding of the NoE secretariat and management ('glue' to keep partnership together), and for potentially funding of additional expertise for assistance on shaping the integration process and legal or contractual framework. In addition a limited yearly budget per partner might be provided for some activities such as training, databases or organising the joint use of research infrastructures; or

²⁴ See FP6 decision

- A Call for coordination actions for developing an advanced joint agenda for integration including professional support for the integration process.

The procedure should be highly competitive and selective, for the Call for Proposal and for the evaluation clear requirements should be defined such as e.g.:

- Integration at the level of fields not topics;
- Coherent rigour across the themes in implementation according to the defined objectives and requirements.
- Where necessary, the number of partners should be reduced to a manageable size;
- The clear commitment, agreement and – where appropriate - active involvement of the top management of the national parent institutions of partners should be obligatory; that means that membership should only comprise partners that have the support for integration from the top management of their institution; that would also mean ‘cleaning up’ of partnerships and possibly letting committed newcomers join the NoE;
- It should be ensured that no ‘alibi’ partners are involved; care should be taken looking for excellence, emerging excellence and talent wherever it is;
- Allow different forms of membership: full members that want to move towards durable integration and associated members that will join in only for certain activities;
- Also splitting of large NoEs in reasonable smaller groupings that would be manageable should be considered;
- Critical mass of partners’ research resources have to be involved;
- A convincing concept for integration or strategic alliance with clearly defined added value, complementarity of the partnership, appropriate management arrangements and ‘business plan’ should be requested;
- Substantial activities and track record to attract funding also from other sources including commitments for external funding beyond the EU funding;
- Convincing expertise, capabilities and skills for managing organisational development and change should be available.

5.2 Safeguarding specific integrated activities of existing NoEs

There is also the necessity to consider how some of the useful activities of other NoEs can be supported by appropriate Community or national means. Therefore, the Commission services are invited to consider how the Coordination/Support Action funding scheme could be used in a way that successful and attractive integrated activities of NoE that will not achieve the objective of durable institutional integration have a perspective for future funding. In addition, owners and managers of national programmes and especially ERA-NETs should explore possibilities of sustained support for specific NoEs activities.

5.3 ‘Joint Research Initiatives (JRIs)’ as a concept to replace NoEs

Considering the ambiguities and difficulties encountered when starting and implementing the NoE instrument in FP6 the expert group recommends to launch no new call for NoEs in the present form and to discontinue the NoE funding scheme in the present form. However, the expert group considers that the further development of the European Research Area will require well designed integrative initiatives capable to produce intermediate collective research goods.

Based on these considerations, the expert group recommends that in the future the NoE instrument be replaced by a new concept with the working title ‘**Joint Research Initiatives (JRIs)**’. Joint Research Initiatives are proposed to be science-led and oriented towards long-term (academic) research of slender alliances between universities and research organisations

mainly. The concept is intended to be complementary to the industry led Joint Technology Initiatives. Furthermore, being oriented towards supporting alliances of research oriented institutions the JRI concept would also complement the activities under the 'Ideas' specific programme that are targeting individual scientists. The clear objective of Joint Research Initiatives should be the creation of 'virtual institutes' of a manageable size of about 3 to 7 partners.

The expert group is convinced that for a successful development of the JRI concept intensive communication, consultation and a close concertation with the member states, national funding organisations as well as universities and research organisations will be necessary in order to arrive at a common understanding and agreement on the objectives and details. As a basis for further discussions the expert group presents first ideas on the possible concept and the profile of a Joint Research Initiative.

The JRI scheme could be implemented in two tracks:

- Mainly a 'bottom up' track, and
- a 'top down' track of very limited extent that is supporting selected strategic research of European importance e.g. supporting grand European challenges.

Joint Research Initiatives should have the following characteristics:

- Identify proactively the need of selected research areas for such alliances, i.e. issues with a clear European dimension and added value and areas where the distributed nature of the research community and the lack of critical mass of complementary resources and capacities is a problem;
- Core requirements are ambition and commitment of the research groups and the top management of their parent institutions towards the objective to form a 'virtual institute' and getting involved in joint long-term research planning and activities;
- The size of the partnership should be 3 to 7 partners²⁵;
- Duration: 7 to 9 years; opportunities for a stepwise development of JRIs and 'virtual institutes' should be explored;
- Required spectrum of activities such as:
 - Joint Research Programme comprising collaborative research supporting integration;
 - Sharing of equipment, development of new common research infrastructure;
 - Joint production of datasets;
 - Career development of 'a new breed' of European researchers acquainted with working in a genuinely trans-national environment;
 - Attracting researchers world-wide;
 - Joint education and training programmes: joint PhD schools, European summer schools advertised world wide, training courses at the frontier of science;
 - Outreach to stakeholders and the general public;
- Financial resources should be provided for
 - targeted concertation and integration activities;
 - research including mobility researchers with clear requirements for quality assurance (competition, peer review, project monitoring and concertation);

²⁵ Since one size might not fit all: the request for a very limited number of partners has to be emphasised; however, the size of the consortium should be open and flexible in a certain well defined but rather restricted 'band width' as appropriate to the requirements of different themes while at the same time not compromising the ultimate goal of integration and the manageability of the JRI. In some areas broad cooperation and strategic alliances might be essential, e.g. in geographically distributed research problem areas such as marine sciences or in highly interdisciplinary areas where distributed complementary expertise has necessarily be involved.

- the joint use of research infrastructure respectively the development of new common infrastructure;
- state of the art video-conferencing equipment.

For the financing of JRI, options for joint funding from Community and national funds should be discussed also in the frame of future ‘Joint Programming’ activities.

An important type of collective good to be actively produced will be the discussion, negotiation, definition of the **long term research agenda**. In some cases this will take the form of a detailed roadmap, in others it might be less detailed but still a structured vision of the commonly agreed perspectives of research. Shaping the research agenda is considered especially important in young fields or disciplines, in which scientists may disagree on the most promising research directions. Another role played by the research agenda is towards the Commission and national governments and funding organisations. An agreement on the long term vision and roadmap may become an authoritative contribution to the design of research programmes and funding. However, in a situation of complete absence of scientific consensus i.e. no agreement on a ‘paradigm’ an integrated structure will probably not be justified.

A main issue for the development of the new concept is the need for more in-depth consideration of the ways in which **research infrastructures** are constituted by scientific communities.

- First of all, many important infrastructures are immaterial; this is shown also by the NoE experience.
- Second, in many important cases there is a long process to be undertaken before embarking into a large infrastructure. This process involves steps of exchange, validation, harmonization, standardization and quality certification of experimental data, as well as definition of legitimate procedures and standard operational rules (SOP). This preparation process may be complex.
- Third, the size of efficient infrastructures is not necessarily large in coverage or financial terms, but usually must be large in terms of countries covered. In many cases, in fact, such infrastructures are not general purpose, but rather narrowly defined at the level of scientific field or sub-field. In a classical definition of infrastructures drawn from big science or large bio-databases, these would not be considered legitimate candidates. But these really build up the infrastructure for ERA and for future competitiveness of European science.
- Fourth, the construction of these infrastructures requires significant (and parallel) research work. It is not separable from research. This must be recognized in the financial schemes for infrastructures. From this perspective, it seems natural that successful NoEs and future JRIs that have established the conditions for such infrastructures should find their way into the DG Research new policy for research infrastructures, and that this policy should explicitly acknowledge the work done.

Finally, substantial resources should be devoted to **training and mobility** of researchers for developing research skills in scientific fields that are newly created or very young. The distinctive approach should be one of preparing the skills for future researchers in fields in which existing Master or PhD courses at university level or even at national level would lack the critical mass bringing together in the same training programme professors who will present different approaches and methodologies and transfer newly created knowledge to young generations. In this perspective this activity will be immensely valuable to accelerate the flow of knowledge from frontiers of research to the future generation of researchers. This will become a European asset and will be attractive also for non-European researchers

This activity must be viewed in the light of the problem, recently investigated in the economics of science, of how much time does the institutional scientific system (universities, established disciplines) take for building new curricula in emerging fields. Evidence from a few studies (e.g. bioinformatics, nano-sciences and technologies) suggest that European countries lag behind US in terms of responsiveness, rapidity and flexibility. Therefore these activities are addressing one of the critical bottlenecks in building the ERA.

If this is true, it is important that in the future self-sustainable integration stage, policies for mobility and training at DG Research explicitly take this work into consideration. This amounts to say that in these cases it should also be recognized that integrated cooperative research is needed as a preparation for these initiatives, because they do not simply collect existing teaching materials but build on top of new knowledge generated in laboratories. This underlines the need for such integrative structures like the successful NoEs or the future JRIs.

Supporting measures

In order to pave the way towards a future implementation of the JRI concept, the following two groups of supporting measures are recommended:

For the *design phase* of a JRI scheme the following measures are proposed:

- Given the critical issue represented by the commitment of national institutions to the whole process of integration the Commission services are invited to discuss the new JRI scheme with member states representatives, national funding organisations, and leaders of universities and of research organisations in order to investigate with them the nature, possibilities, etc. of their long-term engagement in this new intra-European initiatives. The involvement of the national stakeholder groups will be essential regarding shaping the scheme so that also added value for the host institutions is ensured.

It will be important to consider in more depth the challenges of organisational change from the ‘network’ concept to institutionalisation in ‘virtual centres of excellence’ or ‘strategic alliances’. Networks are very good for supporting creativity and the emergence of new ideas whereas they might be less efficient regarding the production of scientific results. Also communication in networks might differ from communication in structures like ‘virtual centres of excellence’ or strategic alliances;

- At the same time, it is recommended to organise an internal process in the Commission services to arrive at a common and coherent understanding and interpretation of the JRI scheme.

For a future *implementation phase* it is recommended:

- Ensuring careful briefing of the evaluators regarding the objectives of the new funding scheme;
- Organising hearings for JRIs proposed to be retained for funding and ensure participation of the top management of the parent institutions of the participating groups;
- Providing a ‘coaching for integration’ during the negotiation phase and the finalisation of the technical annex of the contract and, if necessary, ensure that the appropriate competence for shaping an integration process is available during implementation either in the partnership or through involving outside expert advice.

Commitment towards integration can be shown by a structured combination and a balanced spectrum of activities such as:

- Efficient governance structure and steering provisions as well as centralised, joint decision making based on the full support of the top management of the host institutions of the partners;

- Convincing Joint Programme of Activities (JPA) ensuring integration through joint research;
- Well organised implementation of the JPA: project identification and development (eventually via Calls for Proposals), project evaluation, selection, monitoring, concertation; internal competition; quality assurance;
- Joint or jointly used infrastructures and shared facilities based on contractual arrangements;
- Established joint long-term training programmes (e.g. joint doctoral school, summer schools);
- A structured approach towards outreach to stakeholders and the general public.

These are first ideas on the concept of Joint Research Initiatives. The expert group presents them as basis for discussions between the European Commission and stakeholders from member states authorities and universities and research organisations.

6. A favourable environment for European research – the spectrum of ERA instruments

The possible role of NoEs and the new JRIs in the new context of the ERA Green Paper and in the spectrum of instruments that has evolved since the start of FP6 (ERA-NET, Art. 169, ETP, JTI, EIT/KIC) has been shortly reviewed by the expert group. This short chapter focuses on the future roles of NoEs and JRIs in the context of ERA instruments and on further issues identified as important for the future development of ERA.

European Technology Platforms (ETPs) and Joint Research Initiatives (JTIs)

In some cases, successful NoEs have undertaken a long term effort of discussing and defining future research agenda. This is a difficult task in fast moving fields, in which discoveries are made almost daily, and the agenda of research priorities shifts very rapidly. For the possible new **Joint Research Initiatives (JRIs)** developing joint mid- and long-term research agendas will be a core important requirement.

This activity is somewhat similar to the one experimented in **European Technological Platforms (ETPs)** and, of course, also in **the Joint Technology Initiatives (JTIs)**, although these initiatives cover very large technological disciplines or collections of fields, while NoEs are usually defined at the level of fields or sub-fields. In addition, ETPs and JTIs involve a higher level of strategizing, insofar as they are considered somewhat instrumental to the definition of future research actions with industrial relevance, while NoEs are more scientifically driven and JRIs are supposed to be clearly oriented towards long-term scientific research.

It is important that the connection between these two worlds is considered and that the complementarity between the two schemes is ensured. In addition, also ways and means should be found that the important work done in some NoEs is capitalized on (is utilized). This should not be wasted but find its own way of synergistic cooperation or communication and interaction with existing and future ETPs and possibly also Joint Technology Initiatives (JTI).

For the future, the JRIs should form important elements of the European research fabric safeguarding the future long-term knowledge base of the European research Area also forming an institutional complement both to the Joint technology Initiatives and the activities of the European Research Council and the 'Ideas' specific programme.

ERA-NETs, ERA-NETplus, etc. and the future roles of national funding agencies

When discussing the perspectives of successful FP6 NoEs and the development of future Joint Research Initiatives (JRIs) as new integrating structures not only the opportunities provided by FP7 and future Framework programmes have to be considered but also the role of the national funding organisations comes in the focus.

Policies of future cooperation between funding agencies in the **ERA-NET** and **ERA-NET Plus** scheme and in future '**Joint Programming**' actions, should explicitly consider the developments of the FP6 NoE scheme and proposed for the future JRIs. This means that future funding schemes by national agencies wishing to collaborate at supranational scale should be open to interact with these structures in the definition of research agendas, as well as when considering the possibility of financially contributing to the sustainability of these new intra-European initiatives.

The experiences with the FP6 NoEs and with the ERA-NET scheme and the related challenges call also for in-depth considerations of major elements of the European research funding system and its role in the further process of European integration in research.

The national funding agencies are the backbone of research promotion in Europe and have a core role to play in shaping the future of the European Research Area. At present, the national funding systems are more separated and disconnected than the research communities in Europe. Talking about integration of European research there is certainly an urgent need for discussing the appropriate future organisation and structuring of a true European research promotion system supporting the further development of the European Research Area. Of course, the needs of national innovation systems and the balance between competition, coordination and cooperation have to be recognised. However, the emergence of the multi-layered European research system calls also for a discussion of the appropriate governance structures of the European research funding system.

This said, there is certainly an important challenge of developing a joint framework for cooperation of funding organisations and the development of intra-European programmes under variable geometry arrangements. Needless to say, this will be one of the major challenges of the 'Ljubljana process'.

The creation of the **European Research Council (ERC)** and the FP7 'Ideas' specific programme was a most important step. The most important aspect of the ERC is the promotion of all European competition of individual scientists. However, at moment the ERC is just one additional research funding track and there is a need for clarifying the roles and the division of tasks between the ERC and the national funding organisations²⁶.

If funding takes place mainly at national level, and national agencies do not value European integration activities as such, there is the risk that in the end the costs for integration are not supported by anybody, so that the overall integration effort goes back to a voluntaristic, and therefore weak, approach.

NoE/KICs

The relation between the newly proposed JRI scheme and the emerging activities and structures under the initiative towards the establishment of the **European Institute for Technology and Innovation (EIT)** were a special issue for the expert group. The existing successful NoEs that have a substantial industrial involvement should follow the evolution of the Knowledge and Innovation Communities (KIC) concept and might consider those new structures as a development perspective. It has to be ensured that in the design of the KIC scheme overlaps or duplication of the NoE and the JRI concept are avoided. It will be important that the KIC scheme finds its clear position and specific profile in the spectrum of the ERA instruments where complementarity and synergies should be most relevant guiding principles.

A need for careful monitoring of the development of ERA instruments

Since the launch of the ERA concept in the year 2000, the spectrum of European RTD funding schemes has changed substantially and has led to a quite complex system. There is a clear need that in the future both the developments of the individual schemes and the overall portfolio or system are carefully monitored and reviewed as well as fine-tuned as appropriate.

²⁶ See also the presentation of P. Laredo at the London conference on 'critical mass' (footnote 2 of this report)

7. Conclusions and summary of recommendations

Originally, NoEs were designed to address the dispersed situation of certain areas of research in Europe, to assemble critical mass of complementary resources and capacities and to avoid duplication through moving towards 'durable integration' and creating 'virtual centres of excellence'. Accordingly, a new layer of supra-European research structures would be formed.

The FP6 NoE scheme was an important experiment. It showed that in such organisational settings certain intermediate collective research goods are produced that would not result from other arrangements. The related new spectra of activities are neither supported by the traditional EU projects and support or coordination actions nor by national organisations.

However, in the expert group's view, the NoE scheme was successful to a rather limited extent only especially with regard to its general objective of developing integrated and sustainable 'virtual centres of excellence'.

On the basis of this analysis, the expert group has agreed on the following seven key recommendations:

1. Some existing NoEs have come close to achieving the originally defined objectives. The Commission is invited to launch a competitive call where these NoEs get an opportunity for gaining support for moving further towards integration.
2. For the continuation of useful activities initiated by NoEs, traditional funding schemes like Coordination and Support Actions should be utilized.
3. The expert group recommends that the NoE scheme should not be continued in the present form and no calls for new NoE should be launched.
4. For the future, the expert group recommends to launch a revised scheme: 'Joint Research Initiatives (JRIs)' oriented towards long-term (academic) research of 'slender' alliances between universities and research organisations. The science led JRIs are seen as ERA instruments complementary to the industry led Joint Technology Initiatives. In addition, they are conceived as the institutional complement to the individual researchers funded by the European Research Council and 'Ideas' specific programme.
5. Given the critical issue represented by the commitment of national institutions to the whole process of integration the expert group suggests to the Commission to engage into a 'concertation' with member states, universities and national research institutions as well as national funding organisations in order to investigate with them the nature, possibilities, etc., of their long term engagement in Joint Research Initiatives (JRIs) as virtually integrated organisational structures.
6. In parallel, an internal effort should be organised in the Commission in order to utilize the important experiences of scientific officers gained from the FP6 NoE scheme and to ensure a common understanding of the JRI concept and its relations to other the other ERA instruments.
7. The Commission is invited to continuously monitor the further development of the system of ERA instruments.

The ambitious goals proposed in the ERA Green Paper and further developed during the follow up consultations and in the recent Communications will be difficult to reach without the provision of appropriate intermediate collective research goods. The proposed concept of Joint Research Initiatives is intended to be a contribution towards achieving these objectives.

ANNEXES

Annex 1: Meeting and reporting schedule of the Expert Group

Annex 2: List of interviews

Annex 3: The evolution of the NoE concept: A short review on the policy and programme background (short summary see Chapter 4)

ANNEX 1 Meeting and reporting schedule of the Expert Group:

Preliminary meeting	19 December 2007
Preliminary meeting	16 January 2008
Preliminary meeting	13-14 February 2008
1 st Working meeting	07 March 2008
Intermediate report	31 March 2008
2 nd Working meeting	23 April 2008
3rd Working meeting	10 June 2008
Draft final report	31 July 2008
Consolidated final report	30 September 2008

ANNEX 2 List of Interviews

Interviews 16 January 2008:

- Interview 1: Ebba BARANY (RTD-E3)
- Interview 2: Pierre MATHY (RTD-I4)
- Interview 3: Jacques REMACLE (RTD-F4)
- Interview 4: John SMITH (European University Association)

Interviews 13-14 February 2008:

- Interview 5: Bruno LE DANTEC (INRIA), NoE COREGRID (*The European Research Network on Foundations, Software Infrastructures and Applications for large scale distributed, GRID and Peer-to-Peer Technologies*)
- Interview 6: Fotis KAFATOS (Imperial College, President of ERC), NoE BioMalPar (*FP6 Malaria Initiative*)
- Interview 7: Jean-Jacques CASSIMAN (KU Leuven), NoE EuroGentest (*Harmonizing genetic testing across Europe*)
- Interview 8: Anne DE BAAS (RTD-G3)
- Interview 9: André JESTIN (AFSSA - French Agency for Food Safety), NoE MED-VET-NET (*Network for prevention and control of zoonoses and food borne diseases*)
- Interview 10: Michel ANDRÉ (RTD-ADV01, Advisor responsible for research policy issues)
- Interview 11: Vladimir MALY (Helmholtz Association, Brussels Office)
- Interview 12: Giulia AMADUCCI (RTD-L2)
- Interview 13: Beatrice CODA (RTD-K2)
- Interview 14: Jean Marie CASTELAIN (EAC-DG.TF1)

Interview 07 March 2008:

- Interview 15: Ingemar PONGRATZ (Karolinska Institute, SE), NoE CASCADE (*Chemicals as contaminants in the food chain*), (videoconference)

Interviews 23 April 2008

- Interview 16: Lucia RECALDE LANGARICA (EAC-DG.TF1)
- Interview 17: Wolfgang WITTKE (RTD-B1)
- Interview 18: Matteo BONIFACIO (BEPA)
- Interview 19: Jan Van Den BIESEN (Philips Research, VP Public R&D Programs), (videoconference)

ANNEX 3 The evolution of the NoE concept: A short review on the policy and programme background

For answering the question if FP6 NoE are a true-to-type materialisation of what they were intended to be and what their contribution they made to any durable integration of research resources and capacities it is important shortly reviewing the evolution of the NoE concept and its intentions at first. In the following, a short review of major policy and programme documents related to NoE is presented.

1. The starting point: the European Research Area as a new policy context for European RTD

The basic ideas for Networks of Excellence are rooted in the new policy objectives defined by the concept of the **European Research Area presented in a Communication from January 2000**²⁷. *‘Fragmentation, isolation and compartmentalisation of national research efforts and systems’* were identified as major problems and the creation of the European Research Area (ERA) is seen as a major step towards integration of science and research activities in the EU. *‘Networking of existing centres of excellence in Europe and the creation of virtual centres (of excellence) through the use of new interactive communication tools’* are the first aspects mentioned as embraced by the idea of the European Research Area.

This important communication was based on a brief assessment of the situation of European research which relied probably on implicit assumptions:

- the European research potential in several areas needs getting a ‘critical mass’ which was supposed to be necessary in order being competitive (comparison might have been made implicitly with particle physics, astronomy where Europe possesses clearly the critical mass) and,
- being too much fragmented or dispersed, it lacks also visibility for attracting non-European scientists and PhD students (the US have clearly this visibility which is an asset for attracting successfully scientific talents from foreign countries).

Although this last assumption is probably true, all assumptions behind the 2000 communication would have deserved deep reflections which have not been really undertaken (either at EU or national levels). The only initiative taken by the Commission was a kind of “cartography” of the European centres of excellence which was not a success.

There was no real assessment of: the potential benefits which one might expect gaining from the creation of networks of excellence and of durable ‘virtual centres of excellence’ and of the conditions for their success. For example, the conditions for involving national institutions (universities, national institutes, etc.) were not really discussed. The so-called ‘virtual centres of excellence’ which were supposed to be created were real institutional innovations introducing a new ‘layer’ of ‘supra-national’ or intra-European institutions in the European research arena. Those innovations would have deserved some elaborate thinking. So far, there was no in depth discussion on or assessment of this new facet of research structures and organisations in Europe.

The **Lisbon European Council** supported the establishment of the European Research Area in March 2000.

²⁷ European Commission: ‘Towards the European Research Area.’ COM(2000)6, 18.01.2000, p. 7

In the guidelines for EU research activities 2002-2006 “**Making a reality of The European Research Area**” published by the Commission in October 2000²⁸, a revamping of the Framework Programme is requested. NoE were mentioned as one of new instruments for moving from individual projects to a broader approach and towards more ‘structuring’ and longer-terms schemes in excess of four years.

Networks of excellence should take the following form:

Networking capabilities for excellence in the public (in particular university teams) and private-sector centres of excellence would be achieved with long-term joint programmes of activities. These programmes, representing an order of magnitude of several tens of millions of euros and with duration longer than that of the current research projects, would entail in particular:

- *Adopting a joint work programme in a field representing a substantial proportion or all of the activities of the entities concerned, ensuring that the activities complement one another and that there is a precise division of tasks;*
- *A minimum level of staff exchanges, over sufficiently long periods, between the various institutions involved;*
- *Intensive use of computer tools and electronic networks, and development of interactive working methods.*

The networks of excellence would be thematic, disciplinary and, in many case, interdisciplinary, with many developments taking place at the border-line between particular fields. They would in particular serve as a framework for basic or generic research activities, and when appropriate ‘risky’ research, which would not be carried out with a view to achieving pre-determined results.

Remarkable are the expected magnitude of the joint programmes “*representing tens of millions of euros*”, the longer-term orientation and the expectation that the joint work programme should entail “*a substantial proportion or all of the activities of entities*” involved in NoE. Despite these potentially substantial interventions into the setting of European universities and research organisations there was no real in-depth discussion on these new instruments going beyond information events where, however, the new instruments received rather sceptical feedback.

In March 2002, the **European Council in Barcelona** confirmed the 6th Framework Programme (FP6) as the main Community instrument supporting research at Community level making full use of the new instruments, among others, for promoting networks of excellence.

2. NoE in the 6th EU RTD Framework Programme and in other initiatives supporting ERA

In August 2002, the **6th EU RTD Framework Programme (FP6)** has been adopted which has been specifically designed and formulated to help achieve the European Research Area. In comparison to previous Framework Programmes oriented towards competitiveness of industry etc., FP6 was the first one with a clear focus on European research policy to become an important tool in setting up the European Research Area building especially on ‘new instruments’. Also in October 2002, in a Communication “**The European Research Area: Providing New Momentum**” it was confirmed that this should be done through the new

²⁸ European Commission: ‘Making a reality of The European Research Area: Guidelines for EU research activities (2002-2006)’. COM(2000) 612 final, 4.10.2000, pp. 14-15

support instruments such as networks of excellence which will make it possible to build up critical masses of resources²⁹.

In the **FP6 decision** the ‘integrating’ aspect of the networks of excellence was underlined:

- *The purpose of networks of excellence is to strengthen and develop Community scientific and technological excellence by means of the integration, at European level, of research capacities currently existing or emerging at both national and regional level.*
- *The activities concerned will be generally targeted towards long-term, multidisciplinary objectives, rather than predefined results in terms of products, processes or services.*
- *A network of excellence will be implemented by a joint programme of activities involving some or, where appropriate, all of the research capacities and activities of the participants in the relevant area to attain a critical mass of expertise and European added value. A joint programme of activities could aim at the creation of a self-standing virtual centre of excellence that may result in developing the necessary means for achieving a durable integration of the research capacities.*
- *A joint programme of activities will necessarily include those aimed at integration, as well as activities related to the spreading of excellence and dissemination of results outside the network.*

The **FP6 Rules for Participation** from December 2002 define that the criteria to be taken into account for networks of excellence are

- *the scope and degree of the effort to achieve integration and*
- *the network's capacity to promote excellence beyond its membership, as well as*
- *the prospects of the durable integration of their research capabilities and resources after the end of the period covered by the Community's financial contribution*

In the decisions on FP6 and the rules for participation, the long-term orientation and the effort towards ‘integration’ creating self-standing virtual centres of excellence ensuring ‘critical’ mass as well as the prospects for durability of the networks of excellence are defined as new criteria not known for Framework Programme activities so far. In addition, the combination of research and promoting excellence beyond the memberships are identified as remarkable aspects of the NoE concept.

In the decision on the **FP6 Specific Programme ‘Integrating & Strengthening ERA’** from October 2002 the general definitions of the objectives of NoE are identical with the FP6 decision. However, the activities a NoE will carry out in pursuing its objective are defined in detail as:

- *research activities integrated by its participants,*
- *integration activities which will comprise in particular:*
 - *adaptation of the participants’ research activities in order to strengthen their complementarity,*
 - *development and utilisation of electronic information and communication means, and development of virtual and interactive working methods,*
 - *short-, medium- and long-term exchanges of personnel, the opening of positions to researchers from other members of the network, or their training,*

²⁹ See: European Commission: ‘The European Research Area: Providing new momentum. Strengthening – Reorienting – Opening up new perspectives.’ COM(2002) 565 final, Brussels, 12 October 2002, p.5

- *development and use of joint research infrastructures, and adaptation of the existing facilities with a view to a shared use,*
- *joint management and exploitation of the knowledge generated, and actions to promote innovation,*
- **activities of spreading of excellence** which will comprise, as appropriate:
 - *training of researchers,*
 - *communication concerning the achievements of the network and the dissemination of knowledge,*
 - *services in support of technological innovation in SMEs, aimed in particular at the take-up of new technologies,*
 - *analyses of science/society issues related to the research carried out by the network.*

There, the central importance of the integration objective is underlined both through specific integrative research activities and through targeted measures towards integration.

The Commission responded to the reaction of the research community with major efforts towards transparency step by step publishing supporting documents in order to better explain the NoE concept. The latest version of the FP6 '**Provisions for implementing Networks of Excellence**'³⁰ document from March 2003 provides the following information:

- *Networks of excellence are designed to strengthen scientific and technological excellence on a particular research topic by **integrating at European level the critical mass of resources and expertise needed to provide European leadership and to be a world force in that topic.** This expertise will be networked around a joint programme of activities aimed principally at creating a progressive and durable integration of the research capacities of the network partners while, of course, at the same time advancing knowledge on the topic.*
- *Networks of excellence are therefore an **instrument designed primarily to overcome the fragmentation of European research** where the main deliverable consists of a durable structuring and shaping of the way that research in Europe is carried out on particular research topic. It is important that these networks do not act as 'closed clubs', concentrating only on strengthening the excellence of the partners inside the network. Each network will therefore also be given a mission to spread excellence beyond the boundaries of its partnership. Training will be an essential component of this mission.*
- *Networks of excellence will be expected to have **ambitious goals particularly in terms of providing European leadership and creating a world force.** They must assemble the **critical mass of resources and expertise** needed to achieve those goals. It is not possible to fix in advance a minimum value for this critical mass, as it will **vary from topic to topic.***
- *It is expected that in practice the **number of participants** will be substantially higher than three and generally at least six. Larger networks may involve hundreds of researchers. Others may be of a much more limited size, provided that they pursue ambitious goals and mobilise the critical mass needed to achieve these goals.*

In all cases, the number of participants and volume of resources to be integrated should be compatible with

- a) the overall objective of a **meaningful long-term integration of the research capacities of the participants** and*
- b) the **manageability** of the whole endeavour.*

³⁰ European Commission: FP6 Provisions for implementing Networks of Excellence. Background Document, 12 May 2003, pp. 1-2

In this light, networks of excellence are to be sharply distinguished from FP5 thematic networks, or indeed co-ordination actions under FP6. Thematic networks were designed for coordinating a group ('cluster') of projects funded at Community level. Concerted actions were used to coordinate research activities already funded within individual member states.

The start of FP6 was characterised by some confusion on the new instruments particularly on networks of excellence. Main issues were the size of the partnership, the role of research amongst the activities and the challenges of integration towards virtual centres of excellence. A main issue was referring to hundreds of researchers while at the same time requesting durable integration. Difficulties originated from lack of clarity of the concept especially with regard to 'integration'. How should 'virtual centres of excellence' be conceived with such a person-power distributed between different locations. Further problems were caused by inconsistency of communication from the Commission services towards the target audiences in academia and industry.

Looking back as witnesses of the preparation and the early implementation of FP6, the problems were probably rooted also in a more or less clear resistance and opposition of the research communities against the radical change of Framework Programme instruments and the core aspects of the concept of networks of excellence while there was little preparedness at the highest political Commission level to react to the concerns of the target audiences. In the end, quite a few proposers prepared proposals following the requirements of the programme but maybe without being convinced about the main baselines of the concept. It is not surprising that such starting conditions were not optimal for the development and implementation of the activities.

In April 2003, the Communication **"Investing in research – an action plan for Europe"**³¹ was published by the Commission. There was an emphasis on fostering excellence and integration of resources and regional national and European level. FP6 NoE are mentioned in general and also with regard to their special role for standardisation purposes.

On 16 June 2004, the Commission published the Communication **"Science and Technology - key for Europe's future"**³² emphasising the importance of *"European Centres of Excellence and of programmes to support transnational collaboration between research centres, universities and companies having an observable impact on:*

- *the quality of research in Europe, which they are helping to improve, whilst increasing its visibility, in key areas for growth;*
- *the dissemination of knowledge and results within the Union, and the ability of researchers to become involved in high-level projects.*

With the Sixth Framework Programme, formulas have been added to the range of possibilities – the "networks of excellence" and the "integrated projects" – which are having the effect of making research in Europe more structured by helping the development of "European centres of excellence".

Researchers must be able to fully exploit these opportunities – including the possibility of projects of a smaller size – according to their interests and needs.

In the Communication it is pointed out that *"support for networks of excellence, for example, should be provided where the capacity and motivation exist to integrate the activities of a*

³¹ European Commission: Investing in research – an action plan for Europe. COM(2003) 226 final, 30.04.2003, pages 14, 15, and 22

³² European Commission: Science and Technology, the key for Europe's future. Guidelines for future European Union policy to support research COM(2004) 353, 16.06.2004

small number of departments in a quasi-institutional manner”³³ which is a statement clearly contracting explanations given in other documents such as the above mentioned “Provisions for implementing Networks of Excellence”.

Also in June 2004, the **Marimon Report**³⁴ acknowledged the criticism on the networks of excellence while at the same time underlining the **relevance of the new instruments for integrating, structuring and strengthening the European Research Area**. The concept of **‘durable integration’ was identified as the main problem caused by the reluctance of many organisations to long-term commitment towards ‘virtual centres of excellence’** as requested by the objectives of the instrument. However, the report also underlines that the NoE concept follows a *long European tradition of trans-national collaborative research opening the possibility to set more ambitious goals in integration of research*.

The Marimon panel recommended that ‘Networks of Excellence’ should be designed as an instrument to cover different forms of collaboration and different sizes of partnerships.

Durable integration is not always feasible. For many domains, intermediate steps are needed to reach the conditions that could allow it in future. Rather than take a rigid view, the panel proposes to cover more needs with this instrument going from durable integration to various types of integration of research programs in trans-national networks. This also means flexibility in size. For example, clustering of only a few entities to form a new European level entity or integrated programme should be eligible. Small consortium NoE also have a role to play. Having more explicit indicators of ‘integration’ and ‘excellence’ can help participants and evaluators in making their choices.

Although NoE are more suitable for research groups and research centres, the lack of industry participation should also be addressed. If industry is not participating as project partner, because they do not wish to commit for such long periods and ambition of integration, then other models of involvement should be considered.

The Commission has responded³⁵ to the Marimon Report and reacted to each individual recommendation in full awareness of the problems. In addition, the Commission has organised corrective measures for the remaining part of FP6 and also considered the panel’s findings in the preparation of FP7 as appropriate. It was agreed that it was the definition and the application of the NoE instrument has led to dissatisfaction among some quarters of the European research community not the general objective of the scheme.

Although the Marimon panel identified the ‘integration’ requirement as the main problem it didn’t go deeper into reflecting on the notion of ‘integration’ and its possible far reaching consequences on the European research system. The concept of ‘centre of excellence’ and durable integrated partnerships involving universities, research centres and industry is known at national level - e.g. in Austria, Finland, Sweden, and The Netherlands. In these centres, industry is prepared to cooperate in the long-term with common research agendas and person-power. However, the conditions for success of ‘virtual centre of excellence’ integrating many partners from different locations and different countries has not been investigated in depth so far. In addition, there was also no follow up of the above recommendation of the Marimon panel regarding other models of industry involvement.

³³ Op. cit., p. 5, footnote 12

³⁴ Evaluation of the effectiveness of the New Instruments of Framework Programme VI. Report a High-Level Expert Panel chaired by Professor Ramon Marimon. 21 June 2004

³⁵ COMMUNICATION FROM THE COMMISSION responding to the observations and recommendations of the high-level Panel of independent experts concerning the new instruments of the 6th Framework Programme. COM(2004) 574 final, Brussels, 27.8.2004 and the annexed Working document of the Commission services

3. The New Lisbon Strategy

In the **Kok report**³⁶ from November 2004, the importance of excellence is mentioned and the creation of the European Research Council is supported. Centres or networks of excellence or other structuring or integrating measures are not mentioned.

In February 2005, in the course of the **new start of the Lisbon strategy**³⁷ ‘excellence’ is mentioned in connection of the European Research Council. ‘Centres of excellence’ are identified as crucial for innovation activities at local and regional level fully exploiting the possibilities offered by EU regional and social funds. At European level, the creation of the **“European Institute of Technology”** is proposed. Networks of excellence are not mentioned in the Communication, which was endorsed by the European Council at its meeting in Brussels, 22-23 March 2005³⁸.

In the Communication **“Building the ERA for knowledge and growth”**³⁹ from April 2005 an outlook on FP7 is given with an emphasis on research themes rather than ‘instruments’. Re-enforcing industry participation in European research activities is put high on the agenda and special attention is requested to encouraging industry to more actively contribute to networks of excellence.

4. The further development of the NoE instrument

The **Aho Report “Creating an Innovative Europe”**⁴⁰ from January 2006 underlines the importance of regional centres of excellence and the willingness to innovation but doesn’t mention networks of excellence or trans-national ‘virtual centres of excellence’.

In March 2006, the Commission services organised **workshops on the FP6 instruments, including one on networks of excellence**⁴¹. The workshop showed that there were still problems with realising the concept of integration. Only very few NoE were well developed so that durable integration would be established after the end of the project. Most participants thought of ‘soft integration’, e.g. in the form of integrated research themes. The most important problem reported was that the top management of organisations were reluctant to give long-term commitment to an in-depth integration of one of their departments or teams. The workshop showed that participants in NoE are either reluctant or not clear about the significance of integration. In many cases integration is substituted by research collaboration.

In conclusion, it can be said that there were still uncertainties regarding the NoE concept and confusion with the Thematic Network concept. There are many types of NoE and one size doesn’t fit all. Participants are mainly from academia. The concept of ‘durable integration’ still causes misunderstandings and confusion. It is most important that the top management of participating institutions is involved in decision making. However, the workshop showed also that there can be different forms of institutional integration, such as e.g. ‘virtual institutes’ or ‘reference centres’. A final point was that further work is necessary for developing indicators for measuring progress of integration in NoE.

³⁶ “Facing the challenge. The Lisbon strategy for growth and employment.” Report from the High Level Group chaired by Wim Kok. November 2004

³⁷ European Commission: Working together for growth and jobs: A new start for the Lisbon Strategy. COM(2005) 24, 02.02.2005

³⁸ European Council Brussels, 22 and 23 March 2005, Presidency Conclusions. p. 4

³⁹ European Commission: Building the ERA of knowledge for growth. COM82005) 118 final, 6.04.2005

⁴⁰ “Creating an Innovative Europe”. Report of the Independent Expert Group on R&D and Innovation appointed following the Hampton Court Summit and chaired by Mr. Esko Aho. European Commission EUR 22005, January 2005

⁴¹ I. Vickers: Independent Rapporteur Report on NoE Workshop held in Brussels, 8 March 2006

5. NoE in the 7th EU RTD Framework Programme

FP7, decided in December 2006, defines networks of excellence as “*Support for a Joint Programme of Activities implemented by a number of research organisations integrating their activities in a given field, carried out by research teams in the framework of longer term cooperation. The implementation of this Joint Programme of Activities will require a formal commitment from the organisations integrating part of their resources and their activities.*”⁴²

The **FP7 participation rules** state with regard to the payments from the Commission that “*periodic releases shall be made according to the assessment of the progressive implementation of the Joint Programme of Activities through the measurement of integration of research resources and capacities based on performance indicators negotiated with the consortium and specified in the grant agreement.*”⁴³

In the **Work Programme 2008** for the ‘Cooperation’ Specific Programme” it says e.g. for the NMP Theme: “*Networks of Excellence will be used to promote durable integration of key competencies where still needed, so as to support integrating research activities in strategic areas for European competitiveness. These Networks should show clear impacts in structuring and reinforcing research capacities in the fields covered by the Theme. Training is an integral part of the activities.*”⁴⁴

FP7 Negotiation Guidance Notes⁴⁵ from February 2008 define clearly the objectives of NoE emphasising the need for long term integration and the appropriate focus of the Joint Programmes of Activities related to this goal. Potential NoEs have to indicate “*how the research domain addressed by the network will benefit from the long term integration of the beneficiaries’ activities and capacities, how the implementation of the Joint Programme of Activities (JPA) will contribute to the creation of a ‘virtual centre of excellence’ and how the JPA entails for its implementation the combination and complementary use of a significant volume of resources from the beneficiaries.*”

The work planned to achieve the objectives of the project has to be described in detail - for the full duration of the project. “*The Joint Programme of Activities (JPA) comprises all activities carried out jointly by the beneficiaries. It should entail, for example,*

- *Mutual access to infrastructure, equipment, material, data and knowledge;*
- *Exchanges of researchers, managers, technicians;*
- *Redesign of the research portfolios and the research priorities, and*
- *Reallocation of resources.*

The JPA should be designed in a way that increases the number and the quality of the results produced, while optimising the use of the beneficiaries. A detailed work plan should be presented, broken down into work packages which include consortium management and assessment and progress of results.”

⁴² Decision N 1982/2006/EC of the European Parliament and of the Council of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013). Official Journal of the European Union. L412/1-41, p. 40

⁴³ Regulation (EC) No 1906/2006 of the European Parliament and of the Council of 18 December 2006 laying down the rules for participation of undertakings, research centres and universities in actions under the Seventh Framework Programme and for the dissemination of research results (2007-2013). Official Journal of the European Union L391/1-18, Art. 15, 4., p. 13

⁴⁴ FP7 Cooperation Work Programme: NMP, p. 7

⁴⁵ European Commission: Negotiation Guidance Notes. Fp7 Collaborative Projects, Networks of Excellence, Coordination and Support Actions, Research for the benefit of Specific Groups (in particular SMEs). Version 10/02/2008, pp. 30-31

In the **FP7 Guide for Applicants**⁴⁶ with regard to size and resources of networks of excellence the following explanation is given:

“As experience acquired with Networks of Excellence clearly confirmed, a real integration of activities at the scale envisaged is not possible in large partnerships. Although applicants are free to determine how many partners should participate in their Network of Excellence once the minimum conditions have been satisfied, they clearly will have an advantage to limit the number of participants. A Network of Excellence between three and seven participants would seem to be optimal in this respect.

Proposals for Networks of Excellence should be presented by research managers at the higher level of responsibility which is necessary for decisions in terms of staff, equipment and research policy to be taken which are necessary to implement the Joint Programme of Activities.”

In the course of the interviews, the expert group realised that there are different views on the implicit recommendation to limit the size of NoE to three to seven partners. Some Commission officers raised the point that for NoE in certain scientific fields larger partnerships are required.

In the available FP7 legal and support documents, the definitions and explanations of NoE seem appropriate and should be sufficient for avoiding misunderstandings or misinterpretations if considered adequately during application, contract negotiation and implementation – both by the Commission services and the research community actively involved in NoE initiatives.

6. The ERA Green Paper and beyond

In the **ERA Green Paper**⁴⁷ there is the following statement regarding networks of excellence *“Research institutions should also be encouraged to create ‘virtual centres of excellence’ in the form of strong and durable partnerships between themselves and with industry, going beyond the usual project-based cooperation. This is the purpose of ‘networks of excellence’ in the research Framework Programme. A lesson learnt under the 6th Framework Programme is that such durable partnerships are only possible between a very restricted number of partners pooling a significant volume of resources. Thus, they typically involve very large research teams, or entire labs or research units.”* The whole issue of creating “virtual centres of excellence” is addressed in the ERA Green Paper and is also high on the agenda of the topic of ‘strengthening research institutions’. In its report⁴⁸, the expert group agreed that partnerships between universities, research institutions and others are of strategic importance. However, the group warned that partnerships should not become formalised legal structures driven by political considerations that may lack the necessary flexibility to respond to constantly changing demands.

In December 2007, the Commission launched the **‘Lead Market Strategy’**^{49, 50} with an emphasis on open innovation and clusters and policies supporting excellence and openness of clusters.

⁴⁶ See e.g. European Commission: Guide for Applicants. Food, Agriculture, Fisheries, and Biotechnology. Networks of Excellence. Call identifier FP7-KBBE-2007-1., p. 4

⁴⁷ “The European Research Area: New Perspective.” GREEN PAPER. COM(2007) 161 final, 4.04.2007

⁴⁸ Ch. Ullenius et al.: ‘Strengthening research institutions with a focus on university-based research’: report of the ERA Expert Group, European Commission, Directorate General for Research, Directorate 4, EUR 23322 EN, Brussels, 2008, p. 6

⁴⁹ European Commission: A lead market initiative for Europe. COM(2007) 860 final, 071221

⁵⁰ European Commission: Commission Staff Working Document, Annex II to COM(2007) 860 final. SEC(2007) 1730, 071221, p. 16