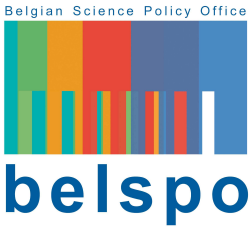
Ex-post evaluation of the IAP programme (phase VI, 2007-2011)

Main Evaluation Report

Commissioned by

Belgian science policy office (Belspo)



Executed by:

IDEA Consult and ADE

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1 INTRODUCTION: CONTEXT AND AIM OF THIS EVALUATION

The Federal Science Policy Office (Belspo) supports via the "Inter-University Attraction Poles Programme" (IAP programme) interuniversity networks of excellence consisting of academic research teams from both linguistic communities of Belgium. The current, sixth phase of this programme is running from January 2007 until end December 2011. During this sixth phase, 44 networks receive support corresponding to a total amount of 143 million EUR. In 2010 an ex-post evaluation of the supported networks under phase VI and of the IAP programme has been carried out, based on peer-review by international experts and with the support of specialised consultants. This evaluation represents an important input for the preparation of the next, seventh phase, which is foreseen to be launched in early 2012. In this context the overall objectives of this ex-post evaluation were:

(1) Assessment of the performance (in terms of both scientific performance and networking performance) of each network over the 2007-2010 period;

(2) Evaluation of the programme itself, in particular the extent at which the programme has reached its objectives;

(3) Formulation of recommendations for the next, seventh IAP phase.

For the organisation and methodological support of the ex-post evaluation, Belspo recruited a team of external consultants specialised in evaluation methodology and assessment of scientific projects and research programmes. The consultants supported the Belspo team with regard to the following activities:

(1) Design and implementation of the evaluation methodology.

(2) Identification and selection of experts for the panel meetings.

(3) Preparation of the panel evaluation (pre-analysis of each network's performance).

(4) Moderation and support of the panel meetings themselves.

(5) Comparative analysis and synthesis of the evaluation of all 44 networks.

(6) Transversal analysis of the effectiveness of the IAP programme, resulting into a set of recommendations for the next phase.

This report summarises the findings of the ex-post evaluation for phase VI. It is structured as follows:

- The next chapter will provide the reader with a description of the programme and its main operational characteristics such as: eligibility criteria, selection procedure, or type and size of funding;
- Chapter three will present the methodology followed for this evaluation;
- Chapter four will describe and discuss the results of the whole evaluation process, at the level of the network (44 networks), scientific domain (Life Sciences, Applied and Exact Sciences, Human and Social sciences), as well as at the Programme level.
- A fifth, concluding section will present the final recommendations for the next IAP phase.

2 PROGRAMME DESCRIPTION

2.1 Objectives and rationale

The "Interuniversity Attraction Poles" (IAP) Programme aims to provide support for teams of excellence in basic research that belong to Belgium's various (linguistic) Communities. These teams work as part of a network in order to increase their joint contribution to general scientific advances and, where applicable, to international scientific networks. The programme is unique in Belgium: it is the only tool that supports bottom-up driven collaboration in fundamental research between scientific institutions from both linguistic communities.

The IAP programme aims to give an impulse at the formation of interuniversity networks of excellence in basic research. More in detail its objectives can be summarized as follows[1]:

(1) To give teams that are already recognised within the international scientific community additional human and material resources for building a sufficient **critical mass**.

(2) To promote **long-term, structured collaboration** among university research teams of both Belgium's linguistic Communities and teams belonging to the federal scientific institutions.

(3) To foster **complementarity and interdisciplinarity** among these teams.

(4) To enable **young teams** to benefit from the environment of excellence provided by a network and its international renown and influence.

(5) To facilitate the insertion of Belgian research teams into European and **international networks**.

2.2 History

The IAP programme was first launched by the Belgian Federal Authority in 1987. It has developed over six 5-years periods; in total it has mobilised 515 million EUR since its creation.

Today the IAP networks have become a hallmark of excellence on the Belgian science policy scene. The IAP represent one of the last frameworks offering scientists from Belgium's different Communities the opportunity to develop structural co-operation. The Belgian Federal Science Policy Office (Belspo) is in charge of the operational and daily administrative and financial management of the networks.

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[1] The analysis of the objectives of the Programme, including their translation into evaluation dimensions, will be developed more in-depth in the next chapter (methodology).

Table 2-1: The IAP programme: budget and number of networks per phase

IAP-phase	Period	Budget	Number of networks
Phase-I	1987 - 1991	40 million EUR	14
Phase-II + prolongation	1990 – 1995 1995 - 1996	50 million EUR 10 million EUR	23
Phase-III	1992 - 1996	50 million EUR	16
Phase-IV	1997 - 2001	110 million EUR	35
Phase-V	2002 - 2006	112 million EUR	36
Phase-VI	2007 - 2011	143 million EUR	44

Source: Belspo

2.3 Key features of an IAP Network

An IAP Network of scientific teams funded by the Federal Science Policy Office has some specific characteristics. These key features are summarised below[2].

- The programme is targetting fundamental research, but there is no specific thematic focus (fully bottom-up driven).
- An IAP network is an interuniversity network of scientific teams.
- Each network comprises at least 4 partners belonging to 3 different Belgian institutions:
  - The various partners belong to a Belgian university, a federal scientific institution, the Royal Military Academy or the Institute of Tropical Diseases.
  - Each network includes at least one partner belonging to a university from Belgium's French Community and one partner belonging to a university from the Flemish Community.
  - A partner only belongs to one single IAP.
- Each network is led and coordinated by a co-ordinator specifically appoitned for this task.
- A minimum funding threshold for each network as a whole is 2.5 million EUR for the five-year period (including the budget reserved for collaborations with European partners). The minimum funding threshold over the 5 years is 800,000 EUR for the coordinators and 400,000 EUR for the other partners.
- A minimum of 60% of the total budget for each partner is set aside for the recruitment of personnel (employment contracts must be of a minimum length of one year). Each partner of an IAP-network must hire at least one full-time scientist or the equivalent at part-time.

[2] More details can be found in: Belgian Science Policy, *"Interuniversity Attraction Poles (IAP) - Phase VI (2007-2011). Call for Proposals - Information document"*, May 2006, 13 p. (available at http://www.belspo.be/belspo/iap/pdf/informationdocument_en.pdf)

- Mandatory tasks:
  - Each IAP must hold a network meeting each year and report yearly on its activities (yearly report);
  - Each IAP network must develop and manage its own IAP website.
  - Each network must organise at least one international symposium during the IAP contract period in order to increase the network's international visibility.
- Recommendations (not mandatory tasks):
  - Network proposals should include young emerging teams as partners.
  - Networks may develop partnerships with non Belgian universities or public research institutions in the European Union (not including inter-governmental research organisations such as CERN, EMBL or ILL).
  - The networks are invited to create a "graduate training school".

2.4 Cooperation with a non-Belgian research institution

- Partnerships with non-Belgian universities or public research institutions in the European Union must produce added value for the network as a whole.
- The IAP-VI programme funds only the foreign partner in the amount of 50%. The remaining 50% is the responsibility of the foreign partner.
- The maximum amount allocated by the IAP programme for the foreign partner is 100,000 EUR per network over 5 years (i.e. a total of 200,000 EUR when including the 50% from the foreign partner institution). A network may not include more than 4 foreign partners.
- Funding of the co-operation serves chiefly for the exchange of researchers and the costs of the research and may not, in any case, be used to fund the purchase of equipment.

2.5 Proposal evaluation and selection procedure

The selection of IAP networks occurs following a 3-stages procedure, following the call for proposals launched at the beginning of each phase:

(1) Submission procedure;

(2) Ex-ante evaluation;

(3) Final selection (including multi-lateral negotiation with universities).

2.5.1 Submission procedure

The submission procedure takes place in 2 steps. The first is the submission of an expression of interest and the second is the submission of a research proposal. The expressions of interest and research proposals must be submitted by the Rectors of the universities themselves for which a research unit from their institution will act as coordinator. This implies a "pre"-selection within the universities even before the submission of a proposal: universities select the teams to be put in a network before submitting.

2.5.2 Ex-ante evaluation

Network proposals that meet the eligibility conditions undergo a remote evaluation by 4 international experts per proposal ("peer review"). This evaluation concerns both the cohesion of a proposed network and the scientific quality of its project.

Based on this ex-ante evaluation the proposals are ranked. The ranking list represents the basis on which the final selection will be made during a multilateral negotiation between Belspo and all universities.

2.5.3 Final selection (including multilateral negotiation with universities)

Final network selection is done on the basis of the ex-ante evaluation (ranking), but also taking into account the priorities formulated by the university institutions as a whole and the budget envelope allocated at the outset to each. Because of the pre established budget allocation keys (see box below) the universities know, before the selection of the networks, how much they will receive from the IAP programme.

In order for the final selection to match the allocated budget enveloppe, it occurs that during the multilateral negotiation with universities some adjustments are made within positively evaluated networks. This can take the form of e.g. reducing the budget proposed to a specific partner and reallocating the funds to another research team of the same university. It may even lead to a situation where a partner is removed from a positively evaluated network because of budget constraints.

For phase VI, in total Belspo received 86 expressions of interests after launching the call. 66 proposals were received and evaluated; 44 projects (ie networks) were finally selected for funding.

Box: IAP Budget allocation – Distribution keys

The distribution of the IAP budget is decided on beforehand (i.e. before submission and evaluation of proposals) and according to two distribution keys : the intercommunity distribution key (between the linguisitic communities) and the interuniversity distribution key (between the universities within each community). For phase VI, these pre-established distribution keys were the following:

1. Intercommunity distribution key:
    a. Universities of the Flemish Community = 56%
    b. Universities of the French Community = 44%
2. Interuniversity distribution key:

Universities of the Flemish Community		**Universities of the French community**	
KULeuven	43,070%	UCL	34,50 %
UGent	31,974%	ULB	26,92 %
UA	12,245%	ULg	23,01 %
VUB	11,579%	FUNDP	5,33 %
Uhasselt	2,132%	UMH	3,30 %
		FUCAM	1,86 %
		FSAGx	1,89 %
		FPMs	2,01 %
		FUSL	1,18 %
Total	100%	Total	100%

Source: Belspo

2.6 Project and programme evaluation

At the end of each phase, the networks are evaluated as regards research quality and team synergy (**ex-post evaluation**). The international experts in charge of this evaluation base their assessment on various reports produced by the network. The aim of this evaluation is to assess the performance of the networks and their activities through independent, foreign peer-review and as input for the preparation of the next phase.

The first three phases of the IAP programme were evaluated through remote evaluation (4 experts per netwerk). For phase IV (1997-2001) and phase V (2002-2006), site visits were organised involving three independent experts per network. Given the high number of IAP networks under the current phase VI (2007-2011), it has been decided to configure the ex-post evaluation process in two steps: a remote evaluation combined with panel evaluation, complemented by a transversal evaluation at programme level (see next chapter: approach and methodology).

In 2000, Belspo commissioned an overall evaluation of the IAP programme to measure the specific contributions of this action in favour of basic research. This evaluation was carried out by a panel of three independent foreign experts specialised in the evaluation of public research and development policies.

From this evaluation it emerged that the IAP programme had amply met expectations as regards progress towards its objectives and that it constitutes an important science policy instrument worthy of being maintained and developed.

The IAP programme is also monitored by a Steering Committee which has an advisory role about the shaping and the evolution of the programme. This steering committee counts 12 members and 3 observers:

- 6 civil servants (2 from the Federal Administration, 2 from the Flemish Community and 2 from the French Community);
- 6 representatives from the universities (3 from the French speaking universities and 3 from the Flemish speaking universities);
- 3 observers (1 per linguistic Community).

2.7 IAP programme Phase VI: some statistics

2.7.1 Some key data

The IAP programme, Phase VI – key figures:

- Budget : 143 million EUR
- Duration : 01/2007 – 12/2011
- Organisation :
  - 44 networks of 4 to 15 teams
  - 324 research teams (250 Belgian teams; 74 EU-teams)
- Participants : universities, federal scientific institutions
- Open to participation of non-Belgian universities and public research institutions within the European Union
- Research fields: life sciences, exact and applied sciences, and human and social sciences.

2.7.2 *Budget distribution*

The total budget amounts up to 143 million EUR over the full duration of the phase (5 years, 2007-2011). It is divided as follows:

- 94% for the Belgian universities;
- 3% for the participation of a Belgian federal scientific research institute, the Royal Military Academy and the Institute of Tropical Diseases;
- 3% for the participation of non-Belgian universities and public research institutions within the European Union (participation in the form of co-funding amounting to 50%).

With regard to research fields, the 44 networks supported cluster as follows: Life sciences (19 networks); Exact and applied sciences (16 networks); Human and social sciences (9 networks).

2.7.3 *Human resources*

The programme finances 44 networks of 4 to 15 teams each. In total 324 research teams are supported, with 250 Belgian promotors and 74 European partners. The 6th phase represents a total human resources pool of ca. 5000 researchers involved in the 44 IAP-networks, of which ca. 500 researchers have been directly paid by the IAP programme (see Table 2-2 and Table 2-3 below)[3]. By the 1st of January 2009 the IAP networks on average employed mainly doctoral students (48% à 49%) and post-docs (33%-35%), and to a lesser extent also technicians (13-14%) and administrative staff (3-5%).

Table 2-2: Number of staff supported (paid) by the IAP programme – all networks (headcounts) (by the 1st of January 2009)

Domain	Administrative	PhD Students	Post-docs	Technicians	Total
Life Sciences	7 (3%)	89 (43%)	56 (27%)	56 (27%)	**208 (100%)**
Exact and Applied Sciences	12 (5%)	95 (43%)	100 (45%)	14 (6%)	**221 (100%)**
Human and social sciences	5 (5%)	71 (72%)	18 (18%)	5 (5%)	**99 (100%)**
Total	**24 (5%)**	**255 (48%)**	**174 (33%)**	**75 (14%)**	**528 (100%)**

Source: Idea Consult based on Belspo data.

Further analysing the numbers of researchers paid by the IAP programme according to the staff category (see Table 2-2 and Table 2-3) reveals interesting difference between research domains.

[3] This is the total number of persons who have been paid at the moment as of the 1st of January 2009. Looking at the most recent data about persons employed at some point during phase 6 (2007-2009), the total number of persons paid by the IAP programme amounts up to 925 (head counts) and 862 (full time equivalents).

Table 2-3: Number of staff supported (paid) by the IAP programme – all networks (full-time equivalents) (by the 1st of January 2009)

Domain	Administrative	PhD Students	Post-docs	Technicians	Total
Life Sciences	5,0 (3%)	86,3 (45%)	55,1 (29%)	46,1 (24%)	**192,5 (100%)**
Exact and Applied Sciences	5,4 (3%)	93,6 (45%)	97,1 (47%)	11,6 (6%)	**207,5 (100%)**
Human and social sciences	2,8 (3%)	64,8 (75%)	15,9 (18%)	2,8 (3%)	**86,4 (100%)**
Total	**13,1 (3%)**	**244,6 (49%)**	**168,1 (35%)**	**60,5 (13%)**	**486,4 (100%)**

Source: Idea Consult based on Belspo data.

In exact and applied sciences on average 43% of paid researchers are PhD students, 45% are Post-Docs and the rest is comprised of administrative (5%) and technical (6%) personnel. In the life sciences networks the share of doctoral students among all supported individuals is 43%, post-docs 27%, and technicians 27%. In the human and social sciences networks the overwhelming share of the supported researchers are PhD students (72%), followed by post-doc researchers (18%) and 10% at the account of administrative (5%) and technical (5%) personnel.

The higher share of technicians in the life sciences networks can be explained by the very nature of the research fabric in this field: almost every research life sciences group has own research facilities which it extensively uses. In the exact and applied sciences more work is done in the less numerous but larger joint research facilities. It is observed that the research groups in human and social sciences rely much more on contribution of their doctoral students and less on that of the post-docs, which may point to greater difficulties in hiring post-docs in these science fields.

2.7.4 Connection to foreign research teams

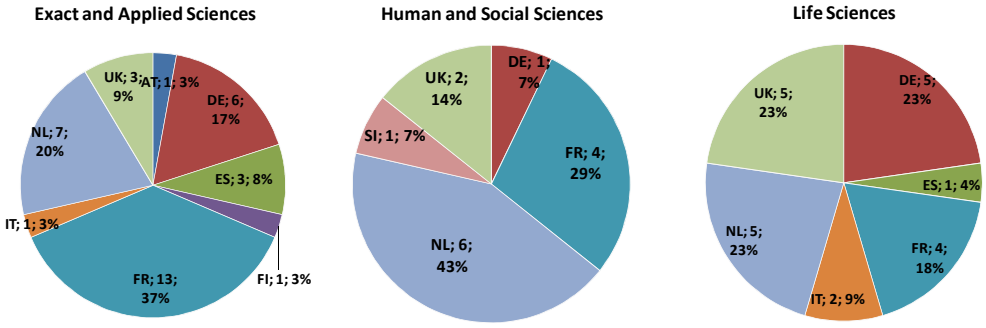
The IAP networks are well-connected to foreign EU research teams: in a very large majority of networks (39 out of 44) there is at least one non-Belgian EU-partner officially involved and funded. The geographic distribution of the European partners differs however by scientific domain. In the domain 'Exact and Applied Sciences', most partners are French research groups (37%), followed by the Dutch ones (20%) and the research groups from Germany (17%). The 'domination' of France may be explained by the presence of large-scale facilities on its ground (such as ILL or ESRF in Grenoble) or in its vicinity (such as CERN in Genève, Switzerland). Compared to other EU-27 Member States, France is also relatively specialised in fields such as "Mathematics and Statistics" and "Physics and Astronomy"[4].

[4] European Commission (2007), "Towards a European Research Area. Science, Technology and Innovation. Key Figures 2007", (EUR 22572), Brussels, 2007, p.92. In order to assess the areas of relative scientific specialization of countries, the literature often uses so-called 'scientific activity profiles'. A country's level of activity in a given scientific field is measured by comparing the world publication share of the country in the particular field to the world share of the country for all fields combined. For France it reveals a relative specialization in the two fields mentioned.

In life sciences there a four top countries with a high share of foreign partners: Germany, Netherlands, United Kingdom (with 23% each), and France (18%). The distribution of partners across countries is less skewed than in the case of exact and applied sciences, which may be due to the more 'decentralized character' of research in this field, against the more prominent role of large-scale research facilities in exact and applied sciences. The importance of Germany as large scientific pole of competence in biotechnology and microbiology (e.g. EMBL in Heidelberg) is certainly a factor explaining the higher score of this country in the field of life sciences.

In human and social sciences Dutch and French research groups account for the largest part with 43% and 29% correspondingly. Here the presence (or absence) of large-scale facilities plays a minor role. A more probable explanation is the presence of cultural-linguistic ties between Dutch versus French speaking research communities.

Figure 1: European partners in the IAP-Networks by their land of origin, absolute figures and % (Phase VI)

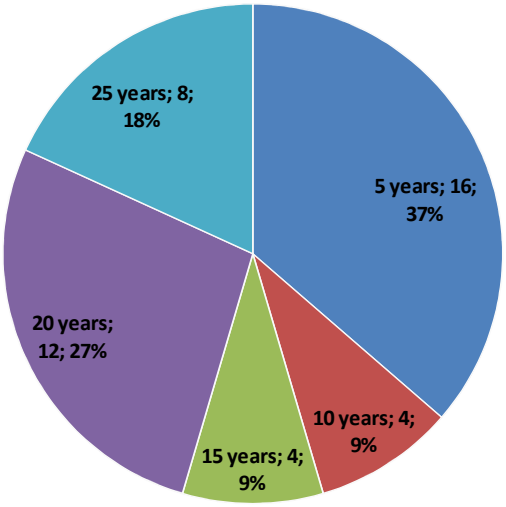


2.7.5 *Age of the networks and continuity of leadership*

Phase VI represented a significant expansion of the IAP programme both in budget terms and in number of networks supported. Between phase V and phase VI, the number of networks supported increased from 36 to 44. As shown on the figure below, not less than 16 networks (more than one-third of the total) were created in 2007. Almost half of the networks are 10 to 20 years old. Eight networks are 25 years old and were formed already during the very first phase of the programme in the late eighties.

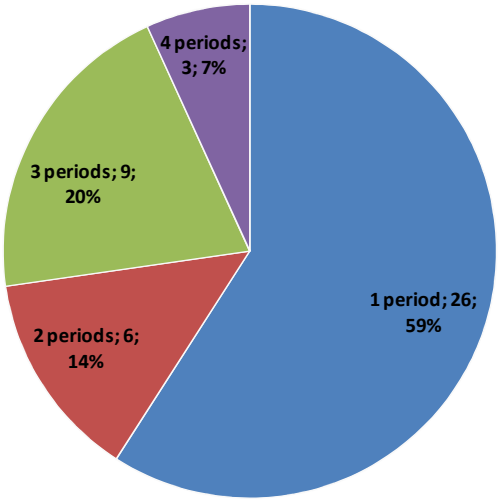
This, however, does not mean that 'old' networks remained unchanged over the years: all of them underwent gradual but significant adaptations in team composition, leadership or research agendas. The next figure below shows that the majority of networks (26 of them) has been under management of the current coordinator for only this 6th, last phase (2007-2011). Only three IAP networks have remained under current leadership for more than three periods (more than 15 years) (see also Table 2-4 below with more details per network).

Figure 2: Number of IAP-Networks according to their 'age' (by 2011), absolute figures and % (Phase VI)



Source: Belspo

Figure 3: Number of IAP-Networks according to the number of the IAP periods under the management of the current coordinator, absolute figures and % (Phase VI)



Source: Belspo

Table 2-4: IAP Networks (Phase VI) according to the number of years of existence

Domain	Network	Age	Coordinator	Phases under Current Coordinator	Comment
Life Sciences	P6/05	25	VAN SCHAFTINGEN	3	
	P6/12	20	LEO	1	
	P6/13	5	LANCELOT	1	Created under Phase VI
	P6/14	20	PARMENTIER	1	
	P6/15	15	PAYS	3	
	P6/18	20	PIETTE	1	
	P6/19	20	JORIS	1	
	P6/20	10	MARTIAL	2	
	P6/28	20	WUYTACK	1	
	P6/29	20	ORBAN	4	
	P6/30	20	CARMELIET	2	
	P6/31	5	SIPIDO	1	Created under Phase VI
	P6/33	25	INZÉ	3	
	P6/35	5	JOOS	1	Created under Phase VI
	P6/36	5	ROGIERS	1	Created under Phase VI
	P6/38	5	BOSSUYT	1	Created under Phase VI
	P6/40	15	PIPELEERS	3	
	P6/41	5	BERNEMAN	1	Created under Phase VI
	P6/43	10	VAN BROECKHOVEN	2	
Exact and Applied Sciences	P6/02	5	VAN MOERBEKE	1	Created under Phase VI
	P6/03	10	VAN KEILEGOM	1	
	P6/04	20	GEVERS	4	
	P6/08	5	DELPLANCKE	1	Created under Phase VI
	P6/10	25	EMPLIT	1	Resulted from fusion of two Phase IV networks into one network in Phase V
	P6/11	10	FRERE	2	
	P6/16	5	STRIVAY	1	Created under Phase VI
	P6/17	5	CLOOTS	1	Created under Phase VI
	P6/21	25	BELMANS	1	
	P6/23	25	VAN DUPPEN	2	
	P6/24	25	VAN HOUTTE	2	
	P6/25	5	DE MOOR	1	Created under Phase VI
	P6/26	5	PRENEEL	1	Created under Phase VI
	P6/27	25	JACOBS	1	Resulted from fusion of three Phase III networks into one network in Phase IV
	P6/39	5	D'HONDT	1	Created under Phase VI
	P6/42	25	PEETERS	1	
Human & Social Sciences	P6/01	5	ROUSSEAUX	1	Created under Phase VI
	P6/06	15	LENOBLE	3	
	P6/07	20	D'ASPREMONT	3	
	P6/09	15	DEWATRIPONT	3	
	P6/22	20	WAELKENS	4	
	P6/32	20	BOONE	3	
	P6/34	20	TANRET	3	
	P6/37	5	DESCHOUWER	1	Created under Phase VI
	P6/44	5	VAN DER AUWERA	1	Created under Phase VI

Source: Idea Consult based on data from Belspo

3 APPROACH AND METHODOLOGY

3.1 Overview

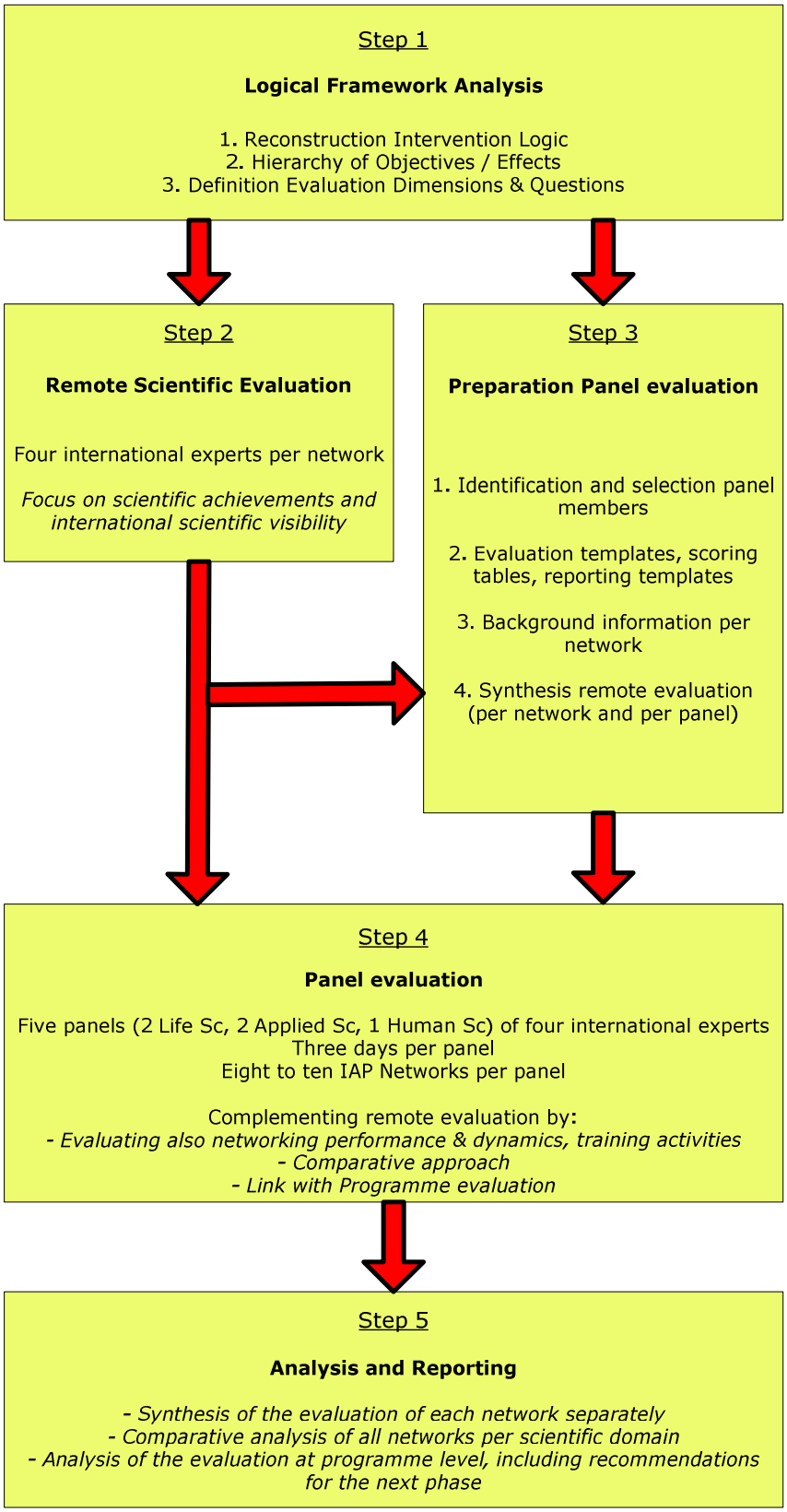
The figure below shows the overview of the whole evaluation process as well as the logical interaction between its components. It should be clear that the whole process has been conceived as an iterative process where each step uses the results from the previous step and further builds up upon it in a complementary way. The steps in the evaluation process were:

1. **Logical framework analysis and the reconstructed 'intervention logic'**. This is the starting point of any evaluation, as it (re-)defines the objectives pursued by the programme, its expected impacts, and subsequently the dimensions along which the evaluation will be carried out as well as the key evaluation questions;
2. **Scientific remote evaluation of each network**. This constitutes a first important input in the evaluation results. International experts assessed in detail (and independently from each other) each network individually (4 experts per network), focussing on the scientific achievements and international visibility of the network and based on written evidence (yearly reports, publications, web-sites etc).
3. **Preparation of the panel evaluation**, consisting of the identification and selection of international experts as panel members (see table 3.1 below), as well as the preparation of background documentation per network and common evaluation procedure.
4. **Panel evaluation** built further on the results of the remote scientific evaluation but focused primarily on "network performance". Five panels of four international experts each paid close attention to the quality of coordination and management of the network, the coherence and cohesion of the network (or the lack thereof), the quality of integration of research teams and research activities, the presence and development of a network-specific critical mass, or the presence of well-structured network-wide training activities for PhD students or post-docs. In a nutshell: panels assessed the added value of networking.
5. **Analysis and reporting**, consisting of three elements: first the synthesis of the evaluation of each network separately, second, the comparative analysis of all networks per scientific domain and finally the analysis of the evaluation at programme level, including recommendations for the next phase.

Compared to the remote assessment, the panel evaluation had a double advantage:

- First, it benefitted from a comparative approach (eight to ten networks per panel).
- Second, interactive and face-to-face discussions with the coordinator and some partners made possible to assess more in-depth issues linked to coordination and management, cohesion and coherence, and networking dynamics.
- Third, the panels also made the explicit link to the programmes objectives, i.e. assessing also to what extent the networks (and the programme in general) have met their objectives.

Figure 4: Overview of the evaluation procedure



Source: Idea Consult

3.2 STEP 1 :Logical Framework analysis

The very first step of the evaluation procedure was the analysis of the IAP programme, more in particular its rationale and the objectives pursued. The characteristics and the objectives of the programme, as well as the specific objectives of the individual networks supported were analysed and put in a logical framework. The main aim of this first step was to 'reconstruct' the 'intervention logic' of the IAP programme and of its constituents, i.e. the individual networks. Inputs to this reconstruction were the general documents describing / presenting the programme, the various calls issued, as well as the networks' proposals.

The reconstructed intervention logic is shown on Figure 5 below. It shows the key objectives of the Programme according to a 'hierarchical order', i.e. objectives are grouped in four categories:

1. **Global strategic objective** represents the highest-level objective and is defined very generally. Global Strategic objectives provide a good basis for assessing an intervention to longer term and more diffuse effects (or global impacts).

2. **Intermediate strategic objectives** refer to the medium-term objectives of the IAP programme contributing to the global strategic objective. Intermediate strategic objectives provide a basis for assessing an intervention in relation to its medium-term effects (or *intermediate impacts*) on both direct and indirect beneficiaries/recipients of assistance.

3. **Specific objectives** indicate through which channels the intermediate strategic objectives can be reached. They have a (more) direct link with the core activities that take place under IAP programme. They provide a basis for assessing an intervention in relation to the medium-term *results* that occur at the level of direct beneficiaries/recipients of assistance.

4. **Operational (activity-related) objectives** are the lowest-level, most specific, short-term objectives and have a close link with the activities undertaken by the partners in the projects (networks) funded. They provide a basis for assessing an intervention in relation to its *outputs*. The latter can be defined as what is directly produced/supplied through the implementation process.

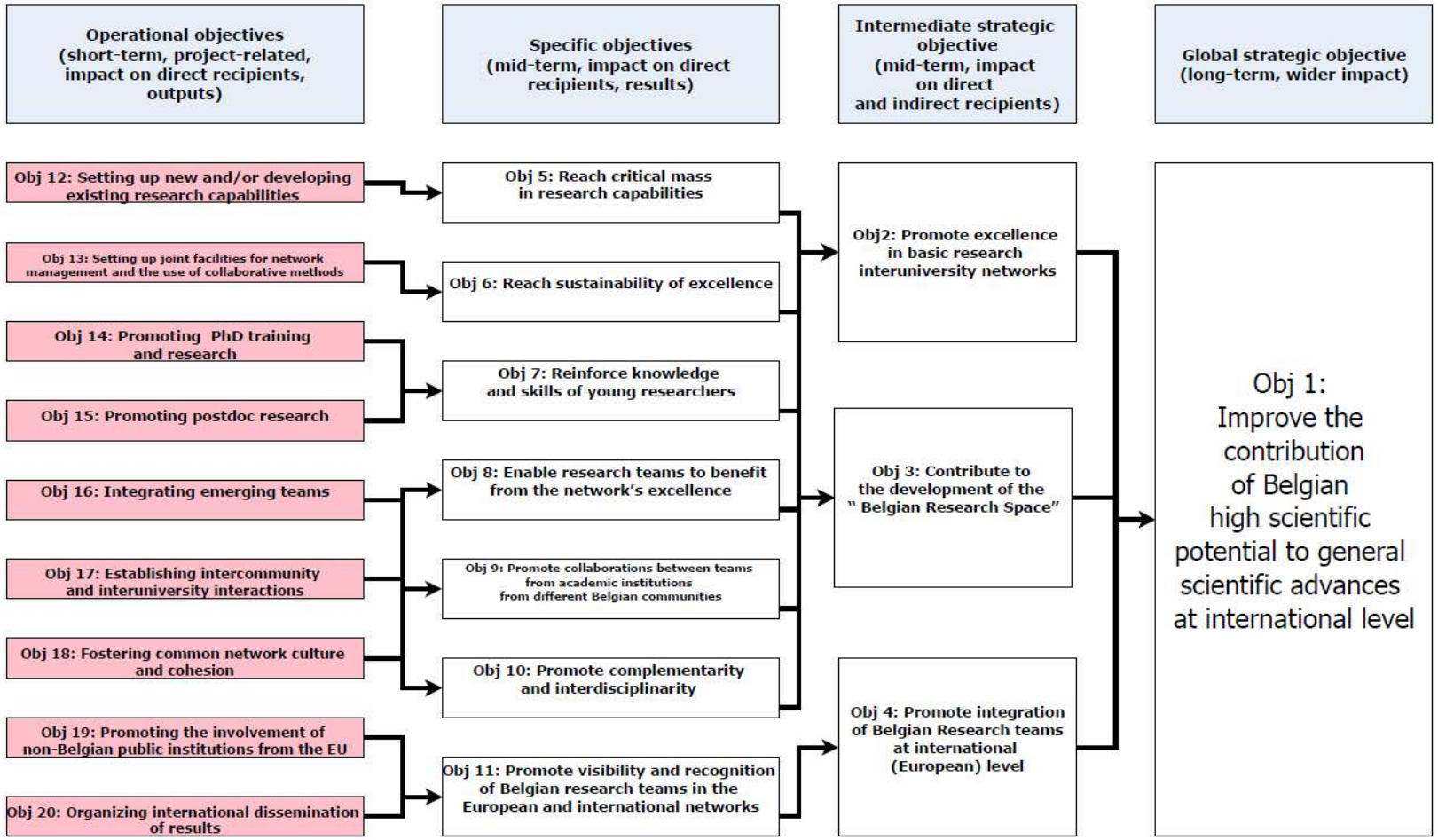
The figure also shows the main interactions or relations between the various objectives, i.e. to what extent specific objectives contribute to higher-level objectives.

The reconstruction and definition of the objectives was made in close co-operation with (and validated by) Belspo. **This represents the basis on which the evaluation dimensions, the evaluations questions and the evaluation templates have been developed**.

Therefore, the next stage consisted of regrouping the objectives pursued by the programme (and its supported networks) and translating them into a fixed set of evaluation dimensions. Starting from the left side of the figure (operational objectives), one can distinguish 'clusters' of objectives such as:

- 'Improving research capabilities' (Obj 12, 13, 5);
- 'Training / Promoting young scientists' (Obj 14, 15, 16, 7, 8);

Figure 5: Reconstructed Intervention Logic of the IAP programme: Hierarchy of objectives



Source: Idea Consult and ADE

- 'Improving interaction/networking' (Obj 17, 18, 9, 10);
- 'Improving international embedding' (Obj 19, 20, 11).

These clusters of operational and specific objectives overlap each other to some extent and contribute all to the realisation of common strategic and long-term objectives (impacts). Translating these clusters of key objectives led to the list of evaluation dimensions and key evaluation questions listed below. This list represents the key questions that experts had to answer. They were subsequently translated into questionnaires (remote evaluation), score cards and reporting templates (panel evaluation) for the two evaluation rounds.

Evaluation dimensions – Key evaluation questions

1. **Research capabilities and critical mass**
    - To what extent did the IAP network progress towards reaching critical mass in research capabilities and ensuring sustainability of excellence?
2. **Training and promoting skills and knowledge**
    - To what extent did the IAP network succeed in reinforcing knowledge and skills of young researchers (through promoting PhD and post-doc training and research)?
3. **Networking, Coordination and Integration**
    - How do you judge the progress the IAP-network achieved in developing common network management, culture and fostering cohesion?
    - To what extent did the IAP network succeed in establishing intercommunity and interuniversity interactions and integrating emerging teams?
    - How do you judge the progress the IAP network achieved in promoting the involvement of non-Belgian public institutions from the EU?
4. **IAP's overall standing**
    - To what extent does the IAP network promote collaborations between teams from academic institutions from different Belgian communities and contribute to the development of the "Belgian Research Space"?
    - How do you assess the IAP-networks ability to promote complementarity and interdisciplinarity?
    - To what extent is the IAP network able to promote excellence in basic research interuniversity networks and their integration at international (European) level?
5. **Standing and potential of the IAP in the overall programme**
    - To what extent has this IAP network contributed to the overall objectives of the IAP programme?
    - What is the potential of this IAP network towards the future?
6. **Standing of the IAP programme in general**
    - How does the IAP programme compares to similar funding programmes? What is the real added value of the IAP programme?
    - Should the IAP programme be continued in the near future and under which conditions/changes (if any)?

3.3 STEP 2: Remote Scientific Evaluation

In June-August 2010, a remote evaluation of each IAP-network was carried out by 4 independent experts per network (in total 44 x 4 = 176 experts were involved with the remote evaluation). The evaluation was executed through filling in an electronic questionnaire received and returned by e-mail. The expert's judgment was made based on a common set of documents (such as review reports, annual activity reports, project's proposal) previously sent, as well as the consultation of the network's web-site. Each expert filled in the questionnaire in isolation from the other evaluators; at no point there was contact or interaction between them (the names of other evaluators had not been communicated). The experts were selected by Belspo on beforehand based on their internationally recognised specific scientific expertise in the research field(s) of the network considered. For each network, one out of the four experts had also participated in the ex-ante evaluation of the network's proposal.

Each expert was asked to answer questions (as well as to justify and to comment his/her answers) dealing with 6 topics:

- Quality of the information provided by the network (e.g. richness, accuracy of review reports, web-site etc);
- Quality of the scientific achievements;
- Quality of the partnership (degree of networking, level of effective collaboration, quality of organization etc);
- Position of the IAP-network (level of novelty of research carried out, international reputation within the scientific field, degree of scientific critical mass, international visibility etc);
- Output (publications, PhD and post-doc training, integration and promotion of young emerging teams);
- General appreciation of the network (including a 'SWOT' analysis) and recommendations;

When answering a question each expert had to fill in a score using a fixed set of possibilities, i.e. "NA" or a number between 0 and 5, where:

- 'NA'=Not Applicable;
- 0='cannot be judged due to missing information';
- 1=Poor;
- 2=Average;
- 3=Good;
- 4=Very Good;
- 5=Excellent.

Additionally, each expert was given the possibility to formulate at the end of the evaluation form a series of additional questions to be asked by the panel members to the network's representative(s).

The individual remote evaluation reports were an important input for the panel evaluation. On top of these individual reports, for each network **a synthesis report** of the four remote evaluation reports was written by the consultants as input for the panel experts.

A comparative analysis of the remote evaluation reports reveals that the remote evaluators were able to assess very soundly the quality of the scientific achievements (in relation to the initial research agenda and work programme of the network). Their assessment was in general very detailed on this point, detailing the achievement work package per work package and partner per partner. Very often, the remote evaluators also checked the impact factors of the publications listed by the network (as well as the impact factor of the Journals involved) using data from Thomson's 'Web of Science'. Their assessment of the scientific position of the network's members in the international scientific community was also thoroughly documented.

Most remote evaluation reports however failed to some extent to 'grasp' the other, equally important, 'networking issues'. Issues such as 'the effective training of PhD students through network-wide activities', 'degree of integration of research partners' or 'quality of management and coordination' appeared, understandably, to be much more difficult to assess from a distance and using only written reports (many remote evaluators answered some of these questions with a "zero-I-cannot-judge"). This analysis was communicated to the panel experts during the briefing session on the first day of each panel, so that it was clear for the panel members that more attention should be given to these aspects.

3.4 STEP 3: Preparation Panel Evaluation

The panel evaluation represented the next step in the ex-post evaluation cycle. It built further upon the findings of the previous, remote evaluation. The preparation of the panel evaluation consisted of two main sub-steps: the identification and selection of adequate experts as panel members on the one hand, and the prodution of some background documents and briefing material for the panel members on the other hand.

3.4.1 Identification and selection of panel experts:

Identification and selection of panel experts occurred shortly before and during the remote evaluation. No one remote evaluator was invited to be part of a panel. While the remote evaluators had been selected based on their scientific merits and their internationally recognised scientific expertise in the specific research field(s) covered by a network, the panel experts had another profile. For the panel it was decided to opt for well-experienced scientists in the field with a large experience in research programme management and evaluation. Typically the ideal profile looked after was that of research managers or directors in high-level research institutes or at universities. Obviously, all panel experts (as the remote evaluators) had to be non-Belgian and to sign on beforehand a declaration of absence of conflict of interest. On top of the 'evaluator's profile', an adequate geographical mix between the experts selected was also guaranteed.

Various databases were consulted in order to identify suitable experts, such as databases compiled in the context of projects carried out for the European Commission[5] or for the Flemish Government[6], as well as the latest list of evaluators of the European Science

[5] Idea Consult carried out various ex-post evaluation of FP6 and had access to lists of members, team leaders or coordinators involved with FP-funded research projects. Idea Consult also compiled a database of more than 200 national and inter-governmental "Research-Performing Organisations" (non-university research-performing organisations such as Fraunhoffer, CNRS, EMBL etc) in the context of a project for the EuropeanCommission (DG RTD). These database allowed us tracking interesting organisations and individuals.

[6] Idea Consult evaluated twice IMEC and VIB as well as different research programmes of IWT-Flanders.

Foundation[7]. In total with contacted more than 300 experts from all EU-27 Member States and Associated Countries. We ended with a short list of 20 candidates (and some others on a 'reserve list') validated by Belspo (see table below).

Table 3-1: List of panel experts

Family Name	First Name	Affiliation
Arévalo Nieto	Gonzalo	National Contact Point FP7, Carlos III Health Institute, Spain
Barsony	István	Director of the Research Institute for Technical Physics and Materials Science, Hungarian Academy of Sciences
Baudin	Karine	Coordinator International Affairs, INSERM, France
Bernd	Arnold	Staff scientist, German Cancer Research Center, Heidelberg
Bijl	Rob	Deputy Director of the SCP/The Netherlands Institute for Social Research
Bressler	Patrick	Head of Office. Fraunhofer-Gesellschaft Brussels Office.
Cau Ontiveros	Miguel Ángel	Professor in Archeology, Universitat de Barcelona, Spain
Deem	Rosemary	Dean of History and Social Sciences, University of London, UK
Finazzi	Alessandro	Rector, University Rome Tor Vergata, Italy
Franconi	Rosella	Chief Scientist at ENEA, Italy
Heral	Maurice	Deputy director aquaculture research, IFREMER, France.
Hoffmann	Patrik	Head of the Laboratory for Advanced Materials Processing, EMPA-Swiss Federal Institute for Materials.
Jermann	Martin	Acting Director of the Paul Scherrer Institute (PSI), Switserland
Krasnogor	Natalio	Professor of Applied Interdisciplinary Computing, School of Computer Science (University of Nottingham), UK
Lafuente	Diego	Head of the Spanish Federation of Technology Centers.
Mawby	Terry	STFC Rutherford Appleton Laboratory, UK
Peach	Ken	Director John Adams Institute for Accelerator Science (JAI), UK.
Quak	Ewald	Senior Research Fellow, Institute of Cybernetics, Tallinn University of Technology, Estonia
Timmins	Peter	Group Head for Large Scale Structures, Institut Laue-Langevin, France
Wojta	Johann	Programme coordinator Cardiovascular diseases, Vienna Medical University, Austria

3.4.2 Preparatory documents

Two full weeks before the start of a panel, the experts got access to a securised 'E-Workspace' set up on the server of Belspo. Experts received a personal access code and

[7] European Science Foundation, "ESF Pool of Reviewers – Membership List May 2009 – April 2010", April 2010, Strasbourg, 109 p.

were able to access and download a series of documents to prepare the panel evaluation. On top of some administrative documents, the experts were given access to both general documents describing the method and evaluation process to be followed during the panel evaluation, and specific documents per network. In concreto, the following preparatory documents were available:

1. **Information on the evaluation procedure**, including the 'mandate' (i.e. evaluation dimensions to be considered) and the evaluation templates (score card, reporting grid, reporting template) that the experts were expected to fill in during the panel discussion or shortly thereafter;

2. **Background information on the IAP programme** (description of rationale, objectives, eligibility rules, selection criteria etc);

3. **Per network** (and per panel):

    a. **Background information** on the project (network) (year of creation, budget, names/affiliation of coordinator and partners, short description of the aim of the network etc);

    b. Indicators table: the **'key facts'** of the network (staff, publications, meetings etc);

    c. **Synthesis report** of the remote evaluations by the consultants

    d. **Individual remote assessments** (4 per network);

    e. **Review report** 2007-2009

    f. Project description and Activity reports 2007 and 2008

    g. **If applicable:** the reaction of the coordinator on the remote evaluation[8]

The experts were also recommended to process these documents in the order mentioned above (i.e. starting with the description of the evaluation procedure). Belspo staff and the consultants remainded available during these two weeks for any clarification needed.

3.5 STEP 4: Panel Evaluation

3.5.1 General Principles

In total five panel were organized, with four experts per panel:

- 'Exact and Applied Sciences 1' (11/10 – 13/10) evaluated 8 IAP networks;
- 'Exact and Applied Sciences 2' (11/10 – 13/10) evaluated 8 IAP networks;
- 'Human and Social Sciences' (18/10 – 20/10) evaluated 9 IAP networks;
- 'Life Sciences 1' (08/11 – 10/11) evaluated 10 IAP networks;

[8] The remote evaluation reports have been sent to each network's coordinator in the course of July-August 2010. The coordinator was invited to react on the conclusions / observations of the remote evaluator, but only to correct factual mistakes or misunderstandings.

- ‘Life Sciences 2’ (08/11 – 10/11) evaluated 9 networks;

The panels experts conducted the evaluation with assistance and support from experts from Idea Consult and ADE. The IAP-programme managers from Belspo attended the panel discussion as well (as observers). A chairman was appointed on beforehand and conducted / moderated the discussion.

Each panel took three days in total, broadly structured in three sub-parts (more details follow):

- Briefing of the panel members;
- Discussion and interaction with networks co-ordinators and representatives (2 to 5 networks reviewed per day);
- Internal debriefing among panel members and reporting / writing.

3.5.2 During the panel meeting

3.5.2.1 Briefing of the experts

The first half day consisted of an extensive briefing of the experts by the programme managers and the consultants. The main purpose of this briefing was to ensure a maximum of coherence among the experts and the panels through a clear understanding of the evaluation protocol and the role of everybody. The experts got briefed on the following items:

1. The Belgian R&D landscape and the place of the federal science policy office (and the IAP programme) within it;
2. The IAP programme and its key characteristics;
3. The evaluation procedure: detailed description of the process (i.e. which dimensions/questions to be tackled? who is doing what? which type of reporting form / scoring grid needs to be filled in? how to give marks?).
4. Results from the scientific remote evaluation (per panel): what do we know already? What should be further (better) assessed?

An important point discussed with the experts during this extensive briefing referred to the way of scoring the evaluation dimensions. During and shortly after the panel discussion with the network, the panel experts were asked to give a score per dimension between 1 and 5, with 1=’poor’, 2=’average’, 3=’good’, 4=’very good’ and 5=’excellent’. However, one had to be as coherent as possible in what to understand under, for instance, ‘excellent’. After discussion, the following guidelines were defined in agreement with the experts:

1. In terms of ‘critical mass’ and building up of excellent and recognized research capabilities, a network was considered as ‘good’ when ‘critical mass’ and recognized research capabilities are reached in a sustainable way at *national* level. It was considered ‘very good’ when it represents sustained scientific critical mass at international level, and ‘excellent’ when it represents sustained scientific critical mass in its field at world level.
2. In terms of training and promotion of new scientists, a network was considered very good to excellent when it applied ‘beyond state-of-the-art practices’ and was contributing to the promotion and production of a new generation of talented scientists.

3. In terms of 'network coordination/management', networking and partnership activities, a network was considered very good or excellent when coordination / networking activities resulted in effective and efficient integration of research agenda's in a sustainable way, mutually-reinforcing each other.

4. In terms of 'overall standing' (contributing to the development of 'a Belgian Research Space', integrating network activities at international level), the more sustainable the integration of activities was, the higher the mark (i.e. in line with programme objectives).

5. An important point made by all experts was the need to take the 'age' of the network into account when evaluating it. Definitely, things such as 'building up networking activities in a sustainable way', or 'integrating research agendas' needs per definition a minimum of time. Thus, one should not expect the same level of integration from a 'young network created less than 5 years ago, as compared with 'older' networks active since the early nineties. So, experts tend to score and evaluated 'in a dynamic way', i.e. looking primarily at trends rather than at absolute levels of achievements.

3.5.2.2 Panel discussion per network

The panel experts received at the beginning of each session a specific scoring template in which they could give marks and write comments for each of the evaluation dimensions considered.

Each panel session with a network took 70 minutes in total and was divided as follows:

1. Internal briefing (8 min): A short briefing on each network was prepared on beforehand by the consultants and presented to the experts at the beginning of the session. The briefing was mainly based on the remote evaluation and emphasized the 'weak spots' of the network, as well as the 'grey zones' (i.e. issues insufficiently covered by the remote evaluators and on which, consequently, the panel should shed more light). The briefing was shortly discussed and amended by the experts. The result of this first step was the drafting of a 'shopping list', i.e. a list of questions or key issues to be discussed with the network's representatives.

2. Welcome network's representatives and introduction of the panel experts and of the evaluation process (chairperson, 2 min);

3. Presentation by the network's coordinator on the key achievements of the network and its future (10 min);

4. Discussion between panel experts and networks representatives (40 min):

    a. Key issues (20 min), as defined during the internal briefing;

    b. Strengths & Weaknesses of the network and adjustments for the future (10 min);

    c. Strengths & Weaknesses of the IAP programme (10 min);

5. Internal debriefing (10 min): after the network's representatives had left, the panel filled in a pre-formatted excel-table with a common, consolidated score and comment for each of the six evaluation questions. Experts were free to use also the notes taken by the consultant during the discussion.

3.5.2.3 After the panel discussions per network: end-of-day sessions

At the end of each day, the experts were given time (1h15 up to 2h) to write the consolidated network evaluation reports for the networks reviewed that day. Evaluation reports contained the consolidated scoring and conclusion for each evaluation dimension, as well as recommendations for the network. Additionally, there was also time to discuss the results and impressions from the whole day, including the review process itself, to propose adaptations if needed.

After the last network session (third day), the experts also had an extra look at the scoring of each dimension for all networks and 'recalibrated' them if necessary. This allowed correcting for some inconsistencies in scoring the networks. If necessary the comment was revised as well. **This was a very important step in the evaluation process, since the main advantage of the panel evaluation was its comparative approach.**

At the end of the third day, and when all network evaluation reports were written, an extra session was foreseen for the panel to write an evaluation report at panel level, with conclusions based on the evaluation of all networks. A final, common session with the two panels (from the same domain) together was then organized for the panel experts to share and confront their findings and evaluation across panels and at 'domain' level. Panel experts were also asked to draft recommendations at the level of the IAP programme as well.

3.6 STEP 5: Analysis and Reporting

After each panel meeting, each panel evaluation report was sent back to the panel chairperson for final validation. After the last panel meeting (mid-November), the consultants drafted a synthesis of all panel evaluation reports, including a draft set of recommendations. This synthesis was sent in end November to the five chairpersons for an additional round of input on both the consolidated conclusions and the proposed recommendations. The synthesis was amended and validated by all chairpersons; it is the basis for the evaluation at programme level and for the recommendations proposed at the end of this report.

The consultants also started drafting the final report with the presentation and analysis of the results. The final report integrates the results from the whole evaluation process, including both the remote assessment and the panel evaluation. The results (as well as the method followed to treat the information) are presented in the following chapter.

4 EVALUATION RESULTS

4.1 Introduction

This chapter presents the final results of the whole evaluation process. It is structured as follows:

- A first section presents the positioning of each IAP network against the panel average and based on the scores given by the panel experts. The method followed to rank the networks in a comparable way is described as well in this section. The final results are summarized in one table where IAP networks are ranked within their respective domain (Life Sciences, Exact and Applied Sciences, Human and Social sciences) and per evaluation dimension.

- A second section gives a general overview of the evaluation across domains (Life Sciences, Exact & Applied Sciences, Human and Social Sciences).

- A third section presents the results of the evaluation at programme level. This summarises the opinions of all experts having participated in the panel evaluation, following the structure of the six evaluation dimensions.

Recommendations follow in a fifth and conclusive chapter.

A more detailed analysis of the evaluation results per network is presented per research domain in a separate annex report.

4.2 Positioning of the 44 IAP-Networks

4.2.1 Method

At the end of the panel evaluation, the panel experts gave a common, consolidated score (between 0 and 5) to each network for each of the following five evaluation dimensions:

1. Research capabilities and critical mass;
2. Training and promoting skills and knowledge;
3. Networking, Coordination and Integration;
4. IAP's overall standing;
5. Standing and potential of the IAP in the overall programme.

Statistical tests (t-test, RankSum-test), however, revealed that the scores given by experts from different panels do not come from the same population and therefore should not be mixed or compared as such (in other words: a '4' from panel 1 is not necessarily equal to a '4' in panel 2).

Therefore, it was decided to rank each IAP network based on its position against the panel average. This approach is also consistent with the whole methodology of the

evaluation, in which panel evaluation is based on a comparative approach between networks.

Per panel, an unweighted average was calculated per evaluation dimension (five averages per panel based on the networks' scores). The ranking of each network was then based on its position against the panel average on each of the five evaluation dimensions. Categories (intervals) were defined based on the analysis of the panel-specific distribution of scores around their average (the procedure is detailed in the box below). Subsequently, the scores of each network were translated into their corresponding interval or category.

***Box**: Defining intervals for the ranking*

Applying standard deviation-based procedures to define intervals is in this case not recommended since the distribution of scores around the averages is non-normal. Using the median instead of the mean is not recommended neither because this would inflate the importance of some outliers. Instead, it was decided to use a constant, fixed intervals structure for each evaluation dimension and for each panel. The intervals were defined as follows:

- Interval A: Higher than [Average + 0,250];
- Interval B: Between [Average - 0,250] and [Average + 0,250];
- Interval C: Between [Average - 0,251] and [Average – 1,000];
- Interval D: Between [Average – 1,001] and [Average – 2,000];
- Interval E: Lower than [Average – 2,000].

These intervals are not equal to each other (the further from the average the bigger the interval) because they reflect at best the specific distribution of observations around the panel averages. Over the panels and evaluation dimensions the distributions are very similar and skewed to the left (negative skew): a tight concentration of observations at both sides of the average was combined with a long tail of few observations at the left side (towards low scores).

Based on these intervals, the five categories of scores were translated into the following corresponding statements:

- A='Excellent performance';
- B='Good performance - Improvement advisable';
- C='Improvement recommended';
- D='Structural adjustment required', and;
- E='Fundamental reconsideration'

4.2.2 Results

The tables below presents the results of the evaluation, based on this classification of scores in five categories, for each domain and per evaluation dimension separately. Within each category networks are mentioned in numerical order.

Table 4-1: IAP Networks Ranking per evaluation dimension (44 networks)

Evaluation Dimension	Cat.	Life Sciences (19)	Exact & Applied Sciences (16)	Human & Social Sciences (9)
1. Research capabilities and critical mass	A	P15, P28, P29, P30, P33, P36, P40	P03, P04, P10, P11, P24, P27	P06, P22
	B	P05, P12, P13, P14, P18, P20, P31, P35, P43	P02, P21, P23	P32, P34
	C	P19, P41	P08, P16, P17, P25, P26, P39, P42	P01, P07, P09, P37, P44
	D	---	---	---
	E	P38	---	---
2. Training and promoting skills and knowledge	A	P20, P29, P35, P36, P43	P04, P10, P21	P01, P34, P37
	B	P12, P13, P15, P18, P19, P28, P31, P33, P41	P08, P11, P23, P24, P25, P27, P39, P42	P06, P07, P22, P32
	C	P14, P30, P40	P03, P16, P26	P09, P44
	D	P05, P38	P02, P17	---
	E	----	---	---
3. Networking, Coordination and Integration	A	P12, P13, P15, P29, P30, P33, P35, P36, P43	P04, P10, P11, P16, P21, P23, P24, P27	P32, P34, P37
	B	P18, P19, P20, P28, P31, P41	P03, P08, P25	P01, P07, P22
	C	P14, P40	P26, P39	P06, P09, P44
	D	---	P02, P17, P42	---
	E	P05, P38	---	---
4. IAP's overall standing	A	P12, P15, P28, P29, P30, P31, P36	P04, P24, P27	P22, P34
	B	P13, P14, P18, P19, P20, P33, P35, P40, P41, P43	P02, P03, P10, P11, P21, P23, P26, P39, P42	P07, P09, P32, P37, P44
	C	---	P08, P16, P17, P25	P01, P06
	D	P05	---	---
	E	P38	---	---
5. Standing and potential of this IAP in the overall programme	A	P12, P13, P15, P28, P29, P36	P03, P04, P08, P10, P11, P21, P27	P07, P22, P34, P37
	B	P18, P20, P30, P31, P35, P40, P43	P02, P23, P24, P25, P26	P32
	C	P05, P14, P19, P33, P41	P16, P39, P42	P01, P06, P09, P44
	D	---	P17	---
	E	P38	---	---

Note: A='Excellent performance'; B='Good performance - Improvement advisable'; C='Improvement recommended', D='Structural adjustment required', and E='Fundamental reconsideration'.

4.3 Cross-domain evaluation results

It has been observed that most networks in all three domains have accumulated a substantial critical mass which is sufficient to achieve the objectives placed before them and the IAP programme in general. In the fields of exact and applied sciences and life sciences one can speak of a critical mass noticeable at the international and in some cases even at world level. In human and social sciences the degree of scientific excellence is mostly visible at the international and national level.

The European partners in the evaluated networks come from the prominent international research institutions and mostly from neighbouring countries (The Netherlands, France, Germany, United Kingdom), which can be considered as an advantage in terms of providing opportunities for easier networking and greater researcher mobility.

In the field of exact and applied sciences, networks rely relatively more on (very) large shared research facilities. It appears that the actual nature of research in this field provides additional incentive for networking and cooperation due to the fact that the scale of the most necessary research facilities goes beyond the means and capabilities of one individual institutions (such as large joint experiments in particle physics, for example). In the domain of life sciences the employed research facilities are more disperse. Each partner is capable to a certain degree of supporting own research infrastructure, which means that cooperation in these networks requires additional efforts in the form of, for example, a well-coordinated joint research agenda, where sharing of research infrastructures, samples, and materials plays an important role. Therefore, when examining the natural incentives for cooperation in the field of human and social sciences, it appears that their common research agenda -as driver behind networking- is even more prominent.

The above specifics influence the way the networks in different science domains organise knowledge sharing and promotion of skills of their researchers. In the field of exact sciences knowledge sharing is carried out mostly in the form of joint work in common experiments, where teams are likely to have the most degree of interaction. In the life sciences the important means of cooperation is sharing of samples, materials and research results. Interaction among researchers in such a framework relies on smaller teams, but requires higher degree of interdisciplinarity. In human and social sciences knowledge sharing is to a larger extent realized via sharing of data and research results. In such a setting it is important to be able to monitor the information exchange processes and stimulate them when the signs of fragmentation or dispersion are observed. Another important way to improve collaboration in the networks in all science domains is to consider possible interaction with other networks, something which occurs only sporadically at this moment.

The networks tend to organise their PhD training programmes by the means of researcher mobility and learning from colleagues while working together. These programmes use less regular means of interaction and knowledge exchange, such as doctoral seminars and workshops. Efforts have been made to set up a more structured PhD training programmes and facilities, but this had mixed successes. It is observed that the partners still rely to a large extent on the conventional means for PhD training provided by their host institutions.

During panel meetings it was observed that different management practices were used to manage and support the networks. In most cases (and in all domains) the networks rely on predominantly informal means of management and organisation. The channels for formal interactions are usually kept to the required minimum and there is large weight

put on interpersonal relationships of the research group leaders. Here the personality of the co-ordinator and some other key persons within the network (all senior scientists) and their ability to 'catalyse' and integrate activities is a crucial parameter.

In all three research domains it was observed that the impact of the IAP programme is very high and provides a necessary condition for the existence of the networks. All networks point out the limited administrative burden and high flexibility of the programme implementation, which is greatly appreciated. The IAP programme's financing for their research provides crucial support for collaboration activities among Belgian partners from different communities and their European counterparts. In that sense the IAP programme is both effective en efficient.

4.4 Evaluation of the IAP programme

4.4.1 Introduction

This final section presents the aggregated conclusions of the five expert panels. The synthesis that is presented here was drafted by the consultants and has been validated by the five chairs of the panels. The structure of these results follows the six key evaluation dimensions put at the beginning of this study.

4.4.2 Research capabilities and critical mass

The panels recognise the high level of scientific achievements of the individuals and teams supported: the core teams in the networks are excellent with an international reputation, and the contributions of the EU partners add to this scientific success. At network level also, the panels consider the scientific level of the networks under evaluation as very high in terms of the quality of the output. Close to half of the networks being funded are world-class, with some world-leading research being carried out. Other networks are performing worthwhile research at the national level, contributing significantly to the Belgian research environment and training.

The overwhelming majority of the networks funded by the IAP programme moreover succeeded at reinforcing significantly the research excellence of their components by pooling and integrating complementary scientific expertise. The panels saw mounting evidence of the IAP programme contributing to consolidating the scientific communities within Belgium and integrating them within Europe. It has contributed significantly to the building of critical mass in the Belgian Research Space by integrating high-level and complementary expertise from a large number of academic institutions. The IAP is clearly also contributing to the development of academic excellence and of new and existing research capacities in Belgium, this in most of the fields supported.

The panels also considered the development of the networks in a dynamic way, i.e. considering the 'age' of each network as important factor explaining its performance. While newly founded networks are on their way to establishing critical mass, which is a crucial objective of this programme, there is still room for improvement for several of them. These networks should be encouraged to think creatively on how to further develop their critical mass and scientific reputation.

With regard to the 'older' networks, a large proportion of them have in the course of the previous IAP phases developed far beyond the Belgian borders and are carrying out world-class research with large international exposure (and embedding).

It has been observed that the contribution of several IAP networks to the joint international research programmes was considered as 'a Belgian contribution' indicating the degree of international prominence achieved. This as well constitutes a good practice example, where the higher international standing of the network is achieved by putting forward the national character of its contribution to an international programme.

Usually in a network there are several partners that benefit from international (EU) funding, which may be conceived as one possible substitute for Belgian support. The panels consider that it is crucial to keep these networks largely involved in (and financed by) the IAP programme, as it is vital to keep an adequate connection and interaction between the best parts of the best networks and the remainder of the Belgian scientific base. On the other hand, one should avoid the situation where the natural consolidation of resources around long-standing networks prevents Belgian science policy to support the emergence of new, promising teams. Therefore, it is important that a network renews its own configuration, for instance by adding new emerging teams in order for them to benefit from the network's excellence and its international exposure and in order for the network to 'refresh' the research agenda. All these well-performing 'old' networks managed over the past IAP-phases to renew their structure, and the panels believe this was a key success factor.

About one-quarter of the 'old' networks, however, have apparently become complacent and should re-gain momentum and dynamism. They should (and be encouraged to) follow the example of their more dynamic counterparts. The good practices mentioned in the above paragraph can be used as inspiration in this regard.

4.4.3 Training and promoting skills and knowledge

The IAP programme has made possible to involve a large number of PhD students and postdocs in collaborative fundamental research: in January 2009 there were in total more than 2,100 PhD students and more than 1,000 postdocs involved in IAP networks activities (headcounts), of which respectively 12% (PhD students) and 17% (postdocs) were paid by the IAP programme. This involvement has allowed networks to improve the training of both PhD students and postdocs significantly and to ensure the sustainability of research in most of the fields supported. The networks have also provided evidence of the good cross disciplinary and cross community training of PhD students and post docs.

Several networks used IAP funding also to drive a network-specific graduate training programme, complementing the doctoral schools which are part of the devolved university system. Other networks seemed content to leave this aspect of graduate training to the universities.

Regarding 'IAP doctoral schools' more in particular, the panels recognise that there are difficulties in organising formal, inter-institutional doctoral schools because of differences both between Belgium's Communities and among universities. However, doctoral training can also be organized through summer schools and symposia. There could be a stronger recommendation on this last point, i.e. emphasizing network-driven training initiatives rather than using the term 'doctoral/graduate training school' in the call of this programme. In addition, the panels think there is still room for improvement in terms of inter-disciplinary training best practices, creative use of doctoral and post doctoral think tanks, and tracking of alumni in both academia and industry.

Some network-level efforts towards organising an own, well-structure network-wide doctoral training present a very promising good practice example worth being taken up by other networks. The panel sees large potential in the network-wide training activities towards promoting collaboration and skills and knowledge exchange. Similarly, there is

good effect achieved by the large network-wide workshops involving all participants inside and outside the partnership.

In this regard, some good practices were pointed out by experts such as the "Graduate school in Systems, Optimization, Control and Networks'', the "Spring School" and the "Study Days" organised by network P6-04 (Gevers). The Graduate School is open to doctoral students from all Belgian academic institutions (payable fee for others); it is organised around a series of doctoral lectures each year and it aims at discussing and reviewing the state-of-the-art in methods and techniques within the fields. The 'Spring School' is a yearly, more advanced 4 weeks long school to provide intensive training on advanced modelling techniques of importance in the field. 'Study Days' finally happens twice a year and comprise a two-day workshop with presentation from within the network. These three well-structured and well-organised types of network-wide training activities are considered to be extremely valuable for the training and promotion of young researchers. The wide involvement of participants is also very beneficial for the network-wide integration of activities.

Another good practice highlighted by the panel experts is the doctoral school of network P6-10 (Emplit). The doctoral school is considered as a very important activity of this network. Together with annual meetings, the doctoral school allows to share knowledge between groups, but also between students, researchers, teachers, and international guests. In this context the network organises a three-days long doctoral school at the Belgian sea coast every year. A large involvement of PhD students, post-docs and other senior researchers is guaranteed, and lectures are given by invited foreign scientists.

4.4.4 Networking, Coordination and Integration

The panels declared themselves impressed by the quality of the networking and coordination activities of some of the networks and recommend that good practices are transferred to the others. Several networks are indeed very well managed and well led. There are some innovative approaches (for example, such a good practice as the appointment of two academics as "catalysts" –i.e. senior researchers whose specific responsibility is to stimulate interaction within the network) and these networks have in place ideas for how to take the network forward to the next stage. In a few cases, the leadership and/or coordination/management were weak; more attention should be paid to the leadership competencies during selection procedure. It is also recommended to have enough attention, where necessary, to succession planning in old networks (i.e. promotion and training of new leaders should be planned early enough - years beforehand).

In general, there is no template for success with regard to 'successful management/coordination': there were many good and few poor examples in both large and small networks, and there is also a wide variation in the management style, from the very formally organised to the informal, but both can be equally effective. The cohesion achieved by the networks is somewhat variable also because it depends on a number of factors such as the research subjects selected, the quality of leadership, the complementarity of the components, shared overlapping themes etc.

The panels recognize the opportunities offered by the programme to support non Belgian partners which overall have been used to good effect by the networks (especially given the comparatively low level of funding going to non-Belgian partners). Most of the networks (around 90%) were able to identify and integrate appropriate European partners. This approach is a valuable contribution by Belgium to the creation of the European Research Area. The amount of money available to non-Belgian partners is small and has to be supplemented by institutional co-funding. This limits participation by non-Belgian universities and public research institutions.

Provided that the objectives of the IAP programme put strong accent on promotion of the Belgian research capacity and research space, increasing the financing quota of the non-Belgian institutions does not constitute a viable option. It has been observed that the European partners make especially valuable contribution to the network in two typical situations, which can be presented as good practices. First case is where the European partner provided a crucial complementary research competence. The second is the case where the European partner, being a very prominent research institution at the world scale, served as an important channel for internationalisation of the network's results or as a bridge between the IAP network and other existing international networks.

Emerging teams seemed to be variably supported and facilitated – maybe this needs to be made more explicit as an expectation in the next calls. Panel experts suggested that the integration of emerging teams might also be financially rewarded (for instance by providing a kind of 'funding bonus' above usual funding when a network has promoted and integrated successfully new emerging teams). But such a 'funding bonus' is rather difficult to implement in operational terms: there should be first, indeed, a clearer definition of what is meant by 'emerging team' in the calls, as the networks themselves seem to have very different definitions of this concept.

4.4.5 IAP's overall standing

The IAP scheme finances fundamental research to networks for a 5 year period, giving a stable base upon which the network can construct a collaborative programme among a large number of academic institutions from both Communities, and without having to compromise in order to meet other research goals, for example to meet the needs of industry. For all Belgian researchers evaluated it is a unique and extremely valuable scheme in many regards.

The programme effectively contributes to fostering collaboration between academic teams from different universities or public research institutions and from different linguistic communities. The programme succeeds in gathering the best Belgian academic research groups in many fields, increasing their international visibility and their ability to compete for international research support.

The panels for instance found strong evidence that having an IAP network was regarded as a prestigious award for Belgian scientists. This in turn allows them to access funding from other sources. The panels were impressed by the number of Belgian research teams supported by the IAP programme that were participating successfully on the international scene. Some prestigious international conferences were attracted to Belgium because of existing networks activities increasing the recognition of Belgian research. For some networks, there is still room for further leveraging of their reputation.

The complementarity and interdisciplinarity achieved by the networks is somewhat variable, depending on factors such as the quality of leadership, the research topics selected, the complementarity of the components. For that reason, the panels agree that more emphasis could be placed on the importance of interdisciplinarity – as not all networks seemed to be prioritising this.

4.4.6 Standing and potential of the IAP networks in the overall programme

The majority of the networks contribute significantly to the realisation of the programme's main objectives and they are well suited for future challenges. About one-fourth of them, however, require adjustments if they want to remain competitive in the future. These adjustments consist often of establishing more appropriate and more effective management and coordination structures (that foster multilateral interaction

and integration), improving leadership and networking activities, strongly rebalancing network composition (e.g. adding or removing partners), or improving long-term planning and self-assessments.

The interviews and discussions with networks' representatives were very helpful in assessing future challenges and how networks will meet them. Most of the networks have identified future challenges and are in a strong position to face them (e.g. some networks produced already a revised, long-term strategy for the next phase, identifying through participatory assessments new research priorities and potential new partners, some others decided on a strategy to better deal with interdisciplinary developments in their field –e.g. bioinformatics). Several networks have even contributed to the formulation of Grand Challenges in their area and at the international level (e.g. with regard to some implications of climate change in aquaculture).

The panels also felt that self-evaluation practices were very important for this assessment of future challenges. Therefore, it is recommended to make mandatory such types of self-assessments (such as 'internal SWOT-analysis') by the networks themselves. It is the opinion of the panel that the added value of such self assessment outweighs the additional administrative effort it may require.

4.4.7 Standing of the IAP programme in general

The experts from the five panels unanimously believe that the IAP programme is a very successful programme. Many other countries without the particular structural and cultural challenges that are specific to Belgium could benefit from such an approach. Moreover, the IAP programme is occupying a unique niche in the Belgian research funding landscape. The panels strongly recommend prolonging it in the next phase while keeping the same configuration, i.e. funded and organized at federal level.

The IAP programme is indeed the only funding instrument in Belgium that supports collaboration and networking in fundamental research between academic institutions from the various communities of this country and in a bottom-up approach. Such collaboration is not possible through existing regional or EU instruments. The experts found mounting evidence that the programme not only brings together the country's best researchers and allow them carrying out collaborative fundamental research in a sustainable way, but also that it generates significant positive network externalities. For most of the networks, the programme has made possible the pooling and integrating of complementary high-level scientific expertise and equipment, which has in turn led to increased critical mass, higher international exposure and embedding, reduced redundancies and lower fragmentation in the execution of research.

The programme has also contributed to nurturing new (next) generations of researchers. The panels believe that, if networking among top-scientists is possible at regional level or at international level, there is no reason why funding and developing Belgium-wide academic networks should not be possible.

As a matter of fact, this instrument plays an integrating and reinforcing role among academic researchers comparable to the one played in other countries by organisations such as CNRS (France) or Max Planck (Germany). This again shows the importance of the IAP programme, as similar institutions do not exist in Belgium.

Overall, the IAP programme is excellent; it stimulates research in Belgium that would otherwise not happen, and enables Belgian groups to compete at an international level. More in particular, *all network coordinators* emphasised the following comparative advantages of the programme:

- The programme is characterised by a high flexibility and "light-touch" administrative overheads. Compared to other supporting instruments at regional/community level or at EU level, the administrative burden is very reasonable and should be maintained. Coordinators mentioned in particular the accessibility and flexibility of the day-to-day management and follow-up of the Programme by Belspo.

- It is one of the very few schemes in Belgium offering long-term support for fundamental research.

- It makes possible to hire in an efficient way young people / researchers, and offers a framework for frequent exchanges of staff, resources (equipment, data, etc.) and knowledge. Therefore, it serves as a platform in terms of both human resources and money (leverage effect).

- It provides stimulus to coordinate collaborative research projects that would be otherwise either performed individually or less visible to the wider scientific community.

- It is a unique support tool for workshops and scientific meetings.

- It is a national scheme, though it allows for foreign participation. The small amount of funding for European partners was appreciated by most networks, who understood that this in reality supported mainly the additional cost of travel, while others would have preferred to be able to offer more support. The panels believe, however, that the level of European funding is appropriate, given the other budgetary pressures on the programme.

However, some weaknesses in the programme were observed.

- The panels observed a lack of sharing of best practices between networks especially concerning training for new researchers and leadership and management.

- Some network coordinators commented on the restriction imposed in recent IAP rounds about only being able to belong to one network. While the panels think that this restriction should remain, there should be some support for networks to collaborate (for example in joint meetings). It is clear that there is some inter-networking (joint publications, for example), but this is hidden (or at least not well advertised), perhaps because of concerns that this might be outside the scope of the network. The opportunity to benefit from interaction between the networks should be emphasized.

- Panels made some remarks concerning the concept of doctoral school that was left too loose and led to different interpretations as to what was required. This had a somewhat negative impact as the implementation and the assessment of doctoral training was inconsistent across networks.

- Experts also commented on the reporting and reviewing templates that do not reflect the societal, economic impact of research, missing an opportunity to document the wider relevance of the programme for Belgium and the true value of basic research.

- Finally, the panels are concerned by the fact that during the selection process of the networks and the multilateral discussion with the universities, it sometimes occurs that positively evaluated partners in selected networks are removed without regard to scientific implication because of budget contraints.

5 RECOMMENDATIONS

5.1 Continuation of the programme

Given its clearly demonstrated added value for researchers from both Belgian linguistic communities, it is strongly recommended to continue the IAP programme beyond 2011 in its current configuration, i.e. funded and organized at federal level.

Some adjustments, however, may be introduced to make it even more effective. The proposed adjustments are given below.

5.2 Number of networks and funding per partner

The panels consider that the current number of networks of excellence supported may be too high to ensure the adequate, minimum critical mass per network, which is one of the key *"raison d'être"* of the IAP programme. It may be envisaged to support fewer networks with a higher level of funding, including higher budgets for the partners selected (thus not necessarily bigger networks). In the context of current budgetary constraints it is unlikely that the IAP programme will experience a substantial increase of its budget for a subsequent phase.

Ceteris paribus (assuming unchanged budget), it is therefore recommended to significantly reduce the number of networks to be supported (i.e. at least by more than 10%) and to increase significantly the minimal amount of funding per partner.

5.3 Final selection

It is strongly recommended not to alter the composition of the networks that are selected to be financed, because of the harmful impact this may have on the working of the network and the realization of its research agenda.

5.4 Clarification in the calls of the notions of "emerging team" and "doctoral school"

There should be a clearer definition of what is meant by 'emerging team' in the calls, as the networks themselves seem to have very different definitions of this concept.

The panels also recommend removing the term 'doctoral school' from the calls because it is not well-chosen and it induces confusion among researchers. Training of PhD students is crucial, but organising a formal, inter-institutional doctoral school is hampered by differences between both Communities and universities. It is therefore recommended to emphasize network-driven training initiatives instead of the confusing 'doctoral school'.

5.5 Importance of the coordinator

The personality of the coordinator is a key to the success of a network. The quality of leadership therefore deserves stronger appraisal during the selection procedure. This could be done through a panel interview before final decisions of which network to fund are made. For example, each network coordinator could be invited to an interview and he/she might be allowed to come along with two other network representatives.

5.6 An 'age-specific approach' of the network

The panels make an important distinction between 'old' networks and recently created ones (regarding e.g. "networking maturity"), calling for some adjustments and an 'age-specific approach'. Review and application process for new versus old networks should be quite different, with much more emphasis on the processes driving initial networking (formalised or not) for the younger networks.

The younger networks had some initial difficulties in starting (particularly with recruitment). It would be helpful for coordinators of new networks to receive guidance early in the process, perhaps from a mentor from an established and successful network, or through an induction course. For example, while it may not be obvious, it is probably useful for a new network to appoint its (small) international advisory committee early on, and have a review close to mid-term, so that they can adjust their programme in the light of their early experience and also prepare for the follow-on bid.

When evaluating 'old' networks it is recommended to better monitor the performance of the current phase in comparison with the performance in previous incarnations. At this moment, ex-post evaluations of various phases seem rather disconnected from each other, even though they partly cover same networks.

5.7 Dynamism versus complacency

Becoming a very successful and dynamic IAP network (i.e. with world-class scientific output, longlasting partnership and international exposure / embedding) does not mean that it is not eligible anymore for IAP funding (because e.g. it may get alternative funding elsewhere), on the contrary. It is important to keep such networks well-connected to the domestic scientific base. It is therefore recommended to keep such networks involved in -and funded by- the IAP programme, and eventually to add new, promising teams to such networks in order for them to benefit from the network's excellence and international exposure.

IAP's best networks are networks that were able to renew their structure over the past IAP phases in order to induce new impetus and to refresh their research agenda.

Conversely, established networks that have become complacent or that have failed to create added value through networking dynamics, should be encouraged to follow the example of their surcessful counterparts, or should be stopped so that limited resources can be redirected to the successful ones or to new, promising initiatives.

5.8 Self evaluation

Self-evaluation practices are very important for a network to assess its strengths, weaknesses, opportunities and threats. Therefore, it is recommended to make mandatory such types of self-assessments from time to time (such as 'internal SWOT-analysis' every 12 or 18 months) by the networks themselves, eventually with external support. It is the opinion of the panels that the value added of such self assessment outweighs the additional administrative effort it may require.

5.9 Networks of networks

There should be more possibilities and support for IAP networks to collaborate or interact with other IAP networks. At this moment, the set of IAP networks supported appears to be a rather fragmented population (a research team selected can participate in only one network). During the evaluation the panels have found evidence that such an 'inter-networks' interaction would have been very beneficial to various IAP networks (e.g. by reinforcing each other's scientific potential or findings). It is therefore recommended to take initiatives to improve such an interaction. Interesting initiatives could be:

a. To organise at least biennial 'network of networks' meetings, or 'bilateral' meetings (i.e. between two networks).
b. To make already existing contacts, interaction more visible through Belspo's web-site.
c. To provide more support for joint meetings between networks (between coordinators only or wider).
d. To put more emphasis on joint-publications (cross-networks)
e. To encourage 'related networks' to better align their respective research agenda's.
f. To make more visible and to disseminate best practices between networks in terms of management, coordination, networking and training practices (the panels refer for instance to the concept of 'network catalysts' as used by some –successful- networks).

5.10 Network-driven training

Regarding network-driven training initiatives, it is recommended to foster inter-disciplinary training (via e.g. exchange of best practices), as well as the creative use of doctoral and post doctoral think tanks and the tracking of alumni in both academia and industry.

5.11 Centralised web-site

It is recommended that Belspo increases its support towards IAP networks in terms of dissemination of scientific results to a wider audience. A possible tool for this would be the use of a common web-site at Belspo (i.e. centrally managed common web-site replacing the IAP's web-sites). Several IAP networks consider the creation and maintenance of a well-thought website not as a priority and refer also to the additional workload that it causes. Delegating the maintenance of the web-site to a central hosting server may provide networks with additional resources and time for research. Delegating the maintenance of the network,

however, should not happen at the expense of the content (research results) and its promotion, which remains the responsibility of the IAP network.