

# **Evaluation of the Networks of Centres of Excellence**

## **Final Report**

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This evaluation study was conducted independently by the KPMG Consulting LP. The content of this report reflects the views of KPMG Consulting, and does not necessarily reflect the views of the Social Sciences and Humanities Research Council of Canada, the Natural Sciences and Engineering Research Council of Canada, the Canadian Institutes of Health Research, or Industry Canada.

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# Executive Summary

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## 1. Introduction

This report discusses the evaluation of the Networks of Centres of Excellence (NCE) Program, as required by Treasury Board. The NCE is a program of Industry Canada and the three federal granting councils: the Natural Sciences and Engineering Research Council (NSERC), the Canadian Institutes of Health Research (CIHR), and the Social Sciences and Humanities Research Council (SSHRC). The NCE goal is “to mobilize Canada’s research talent in the academic, private and public sectors and apply it to the task of developing the economy and improving the quality of life of Canadians,” with specific objectives to:

Stimulate internationally competitive, leading-edge fundamental and applied research in areas critical to Canadian economic and social development;

Develop and retain world-class researchers in areas essential to Canada’s productivity and economic growth;

Create nation-wide multidisciplinary and multisectoral research partnerships that integrate the research and development priorities of all participants;

Accelerate the exchange of research results within the network and the use of this knowledge within Canada by organizations that can harness it for Canadian economic and social development.

## 2. Context

The NCE is only one of many sources of research support available to university researchers. When the NCE Program was initiated in the mid-1980s, it was somewhat controversial. There were two central features of the program: (1) the “distributed network model,” in which groups of researchers at universities distributed across Canada collaborated on common research problems; and (2) the focus on generating practical applications from fundamental research programs, working in concert with industry. There were virtually no other significant research programs in existence anywhere in the world that were similar to the NCE Program.<sup>1</sup> Since that time, those once controversial aspects are now almost common practice. Thus the NCE model is less unusual, while the research environment has changed significantly around it — it was appropriate to take another look at this program and its context.

## 3. Evaluation Methodologies

The main evaluation methodologies recommended included: (1) international literature review, to obtain information on how similar programs in other countries address similar problems with respect to the changing research environment; (2) review of NCE performance data and other reports; (3) survey of all network partners through an e-mail based survey; (4) interviews with Network Scientific Leaders and Network Managers; (5) Web-based survey of Network Researchers; (6)

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<sup>1</sup> Even five years ago, it was uncommon to find non-Canadian scientists who had ever heard of the distributed network model.

interviews with members of the Expert Panels and NCE Selection Committee (with special attention paid to obtaining “outside” perspectives from individuals outside academia and non-Canadians that are not direct beneficiaries of the program); and (7) other interviews with NCE Program Administrators and officials within the granting agencies.

The response rates to the researcher and partner survey were very low – 12% and 10%, respectively – calling into question the validity of the findings. However, on the whole we believe the findings are valid and reasonable because: (1) the findings are consistent across all data sources; (2) there were no significant difference between the earlier and the later responses to the researcher survey; (3) the findings make sense given the nature of the NCE Program design and operation; (4) in other studies we have never met a situation in which response bias was problematical enough to cause significant changes to the main findings; (5) the low response rates are consistent with the complaint that there is too much reporting required by the NCE.

## 4. Findings on Program Rationale

The study found that the NCE is still a necessary and valuable component of the Canadian research and innovation system, even though “normal” granting council programs and other national programs have often incorporated NCE-type elements in their design. The main advantages of the NCE are that, in comparison to other somewhat similar programs, it provides significantly more:

- Research networking and collaboration
- Partnerships with users
- Pan-Canadian networking
- Multidisciplinarity
- Cross-disciplinarity
- Ability to train highly qualified personnel (HQP) in novel ways
- Support for all phases of research and development (R&D)
- Ability to support risky R&D
- Critical mass and international recognition
- User focus

Particular attention was paid to potential overlap of NCE networks with the new CIHR institutes, since some features of the latter are similar to NCE networks. As the 13 CIHR institutes had been operational for less than 14 months at the time of our data gathering, many informants were insufficiently familiar with them to comment definitively on the issue. It was pointed out that any overlap in *process* is unimportant so long as there is no overlap in *content* among individual networks/institutes. The mandates, foci and funding levels for CIHR institutes differ from those of NCE networks. The two structures appear to be responding to different needs, in different ways, and thus the existence of the institutes does not weaken the rationale for the NCE Program. It is reasonable to conclude that if Directors of health-related NCEs and Scientific Directors of CIHR institutes communicate regularly and effectively, complementarity of efforts should be assured.

The international literature review provided strong support for the NCE concept. In general, all countries reviewed had addressed recent changes to the research environment in ways that reflected

the NCE to a greater or lesser extent. It is now difficult to find an OECD country that does not have a program to support virtual networking.

## 5. Findings on Program Impacts

**Process Impacts.** The NCE Program has transformed the way research is conducted. Overall, most respondents believed that the processes used by the networks were either the same, better, or much better than those arising from “normal” granting agency support. Very few believed they were worse. This included differences in research, collaboration, multidisciplinary, cross-disciplinary, student training, partnerships with users, knowledge and technology transfer, intellectual property (IP) protection, and development of local and national critical mass. Of course, not all respondents agreed that it was different from “business as usual,” and this probably reflects a lack of real commitment to NCE goals among some individual researchers or, perhaps, at some individual networks.

**Knowledge Transfer.** Most of the HQP trained by networks (at least 88% in 2000-2001) find employment after leaving the network (typically after graduation), with roughly half subsequently employed by industry, an effective means of knowledge transfer. A substantial number are also employed by government, in which scientific knowledge is becoming increasingly important to allow knowledgeable decision-making.

**Technology Transfer.** As of the year 2001, 97 spin-off companies associated with the NCE had been created, and there is active patent activity — 56 patents granted among 170 filed in 2000-2001 alone. This only represents a portion of NCE technology transfer, as several networks rely on other mechanisms to achieve impacts.

**Intellectual Property Protection.** There are still problems within some networks in terms of IP protection and exploitation, reflecting both the variety of IP ownership rules at various universities, and variable levels of trust and collaboration between individual networks and their university Industry Liaison Offices.

**Achievement of Long-Term Goals.** Overall, the NCE appears to have been successful or very successful in meeting its overall goal and four specific objectives. To the extent that respondents found the program slightly lacking, it was mainly in the area of Objective 2, developing and retaining world-class researchers essential to Canada’s productivity and economic growth. Overall, a significant finding is that the partner organizations were typically as satisfied, or even more satisfied, with NCE design, delivery, and impacts than were the network officials and researchers. This is an unusual finding in R&D evaluations, as typically program officials are the most positive about any given program, researchers are slightly less satisfied, and partners (especially in industry) are the least satisfied (even if still generally positive).

The study found that it was often possible to link specific impacts to the different processes used within networks. Many of the network accomplishments are believed to be of high economic and social importance, and many examples were provided of potential applications. Roughly a third of researchers, and nearly 60% of partners, believed that their networks had scientific and/or commercial results that were truly groundbreaking in nature. A high proportion of partners (85%) were satisfied or very satisfied with their NCE experience overall.

## 6. Findings on Program Design and Delivery

The program design and delivery were generally rated as sound. However, a substantial minority of respondents worry about the benefits versus costs of participating in the program because of issues noted below.

**Relevance of Program Design, Goals, and Objectives.** Virtually all respondents agree that the program design, goals, and objectives are still relevant. However, serious problems were mentioned in terms of:

The reporting burden, which is considered onerous. (Some reporting is required by individual networks, rather than the NCE Directorate.)

The perceived “requirement” for demonstrating future self-sustainability during each network’s second phase mid-term review, which consumes considerable effort on the part of the networks and even Expert Panels. (This appears to be a misperception about the intent of the Directorate: “self-sustainability” is *not* a requirement, and no network has been refused funding for not having such a plan in place.)

Perceived undue emphasis of the network selection and renewal criteria upon industrial benefits that can be measured in dollar terms. (The Directorate has emphasized that this is not actually the case, so this may reflect some problems in communication or in the selection process.)

The Expert Panel members commented that the NCE should promote the program far more internationally, perhaps even selling the model abroad.

**Effectiveness of Program Delivery.** The overall amount of administrative, logistical, and policy support provided by the Directorate to the networks is not seen in nearly as positive a light by participants, with roughly a quarter of network officials and 15% of researchers rating this as poor or very poor. The chief complaints are listed below:

Very heavy workload during the application process for new networks. This can take up to a year and involve many individuals, who often feel “in the dark” as to what the Directorate really requires, and with applications having a poor chance of success.

Less assistance than required from the Directorate with network operational matters, especially for new networks. Although most of the NCE program officers received “good marks” for their assistance and expertise, many respondents considered them underutilized.

Possibly, not enough emphasis from the Directorate to new applicants as to the extent of network management and administration required.

**Alternatives to the NCE Model.** No substantial “concrete” alternatives were identified, and it is difficult to see how existing programs could fill the gap if the NCE Program were terminated (at least without duplicating its features). Very few network officials or members of Expert Panels and the Selection Committee believed that there was a serious alternative to the basic NCE model, although somewhat more researchers thought so. (Researchers presumably have more alternatives available to them.)

**The NCE Role in International Collaboration.** The program is said to be roughly weak to moderate in its encouragement for international collaboration. Most respondents noted that the role

of the NCE should be increased in light of the growing need to access not only the best researchers in the nation, but the best in the world. Expert Panel members sometimes saw a surprising lack of crucial international linkages in proposals for new networks.

**Factors that Facilitate or Hinder Success.** The main factors leading to success in individual networks are:

World-class scientific leadership.

Strong administrative support, including having a strong network manager and Board of Directors.

A strong and active role for partner organizations throughout the network planning and research processes (not just a role in “name only”).

True collaboration among researchers (not “collaborations of convenience”), who represent the best people in the field (not just an “old boy’s club”).

Integrated research program, in which the themes are mutually self-supporting (as opposed to being unlinked, or in which individual projects are not linked), and to which the network researchers are fully committed.

Multidisciplinary approach in which the “peripheral disciplines” are well integrated into the overall network strategy, as opposed to being brought in for appearance’s sake.

Not having these factors was likely to lead to failure. Researchers also commented that excess “bureaucracy” impeded progress, while partners commented that complex IP issues and poor relations between networks and university-industry liaison officers (UILOs) could hinder progress, as could trying to cope with the diversity of needs among partner organizations.

**Role of the Social Sciences and Humanities (SSH).** The network selection criteria were recently revised in order to put more weight upon network impacts in social, legal, ethical, and policy arenas (i.e., SSH fields). Weight was also put upon the attention paid by networks to these factors during network operations (i.e., including networks in the sciences, engineering, and medical fields).

There has been mixed success on these fronts. Almost certainly, there has been more success in integrating SSH issues into the “NSERC” and “CIHR” networks, especially in the newer, targeted networks. However, it is still difficult to do (especially in non-targeted competitions) and the appropriateness of doing so varies by network. There are a number of problems that currently prevent more SSH-led networks, and in general it appears that the NCE is not the most appropriate model for SSH researchers to use for creating networks. (Problems include the lack of experience of SSH researchers in running such large networks, and the resulting lack of research focus; the lack of SSH-based organizations as NCE sponsors; the diffuse nature of receptor organizations; and the difficulty in measuring impacts in SSH fields.) However, there have been recent changes within SSH fields that may facilitate future creation of SSH-based networks, including greatly increased levels of collaboration within SSH disciplines, and more SSH strategic thinking about how to generate socio-economic benefits.

**The 14-Year Sunset Rule.** This is probably the most contentious of the current NCE regulations, and there are clearly good arguments for and against continuing this rule. There was certainly no consensus among the evaluation’s respondents as to the appropriateness of this rule, and opinions tended to be strongly either pro or con. Clearly, there was some support for vaguely defined

“flexibility” in this rule. The literature review found that networking programs in other countries generally have even shorter sunset timeframes than the NCE, but on the other hand, most international programs do not have all the NCE features, or have a more limited focus. Overall, we do not believe we have sufficient evidence from the evaluation to make a sound judgment either way.

**Winding Down Networks.** A number of networks have now terminated, while five others will reach their 14-year sunset in 2005. Should there be continuing support of some kind to terminated networks? Again, the evaluation evidence is not sufficient for us to make a reasoned argument either way.

The members of the Expert Panels and Selection Committee did not have strong opinions on this score. Opinions among network officials were divided, even assuming there is no change to the current sunset rule. Many respondents believed that it made little sense to try to maintain a “network” in the absence of research funding, while others thought that funding to support a limited number of meetings among Principal Investigators made some sense. (Virtually no one thought that “self-sustainability” in the absence of NCE funding was achievable.)

In the past, the eight networks that were terminated experienced significantly decreased total funding levels after termination, and their activity emphasis changed significantly. The existence of long-term networking activities was related to the “true” collaboration and commitment of network scientists prior to termination, as well as the commitment from the Boards and industry partners.

## 7. Recommendations

- 1. Recommendation: Continue the Program.** The evaluation showed that the NCE is still a valuable and unique part of the Canadian research landscape. This is true even though a number of other programs now share some NCE design and operational features. Not only does the NCE have significant benefits for Canadian researchers and partners, it compares very well to similar programs worldwide. Although a number of recommendations are suggested below to improve it, these must be seen in the context of relatively minor adjustments to a very successful program.
- 2. Recommendation: Reduce Application Effort for New Networks.** Preparing an initial application for a new network reportedly takes the better part of a year for the key participants. During this period, the NCE Directorate maintains a mainly hands-off attitude and many applicants have reported being essentially in the dark as to what is likely to win approval.<sup>2</sup> Not all of the voluminous documentation is always read by members of the Expert Panels (there is currently an 80-page limit for the main text, plus two supplementary volumes). Overall, there is room for improvements to this process.
- 3. Recommendation: Review the Network Selection and Review Process.** It is necessary to ensure that the network selection and review process takes sufficient account of benefits that can arise through mechanisms *other* than creation of new industrial products and processes.

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<sup>2</sup> The NCE Program administrators report that they make themselves available during the application process, but they don't “push themselves” on the applicants, and not all applicants take advantage of their advice.

4. **Recommendation: Review Annual Reporting Data.** Many network respondents complained about the high reporting load.<sup>3</sup> Review the extent to which the current annual reporting data are actually being used, and simplify reporting if possible. Note that only some of the reporting is required by the NCE Directorate: some is required by individual networks themselves.
5. **Recommendation: Investigate Receptor Capability Among Decision-Makers.** Some networks have found that there is a lack of receptor capability among decision-makers such as government officials and policy advisors who are ultimately responsible for translating network results into concrete societal impacts (e.g., through new regulatory frameworks or new government policies). This problem is especially acute where non-industrial impacts are hoped for. It would be highly worthwhile to devote effort to thinking how to increase this specialized form of receptor capability.
6. **Recommendation: Continue to Address SSH Concerns.** There is currently difficulty in creating new SSH-based networks, and (to a lesser extent) in integrating SSH concerns into new networks based in the other two major disciplines. Although this situation appears to be improving, additional thought is required.
7. **Recommendation: Clarify the Intent of “Sustainability” in the Cycle 2 Mid-Term Review.** The intent of the Directorate with respect to network activities following the termination of NCE Cycle 2 funding must be clarified, since many respondents incorrectly believed “self-sustainability” was required.
8. **Recommendation: Increase Facilitation of International Collaboration.** Increase the emphasis on having appropriate international collaboration, and explore methods for facilitating it. This emphasis is particularly relevant during reviews of new network applications, but of course is also appropriate during mid-term reviews.
9. **Recommendation: Increase Assistance to New Networks on Administrative Matters.** Provide more means through which the NCE Program administrators and other NCE participants can help get new networks “up and running.”
10. **Recommendation: Strengthen Activities for Highly Qualified Personnel.** Ensure that network-specific HQP activities exist within all networks, so that training has added value compared to that available through “normal” programs.
11. **Recommendation: Monitor the Relationship Between the Networks and the CIHR Institutes.** As the CIHR institutes mature, it will be important to ensure that there is a minimum of duplication (overlap in content) between the institutes and the health-related networks. On the contrary, it will be important to ensure that there is a high level of complementarity and cooperation between the two.

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<sup>3</sup> Of course, this is a common finding in many evaluations, but it was more common, and more intense, than usual here. It should be noted that this evaluation did not specifically focus on reporting requirements and thus we have limited information.

**12. Recommendation: Do Not Conduct Another Formal Evaluation in the Near Future.**

The NCE has now been very thoroughly investigated in three separate studies since 1993, and the evaluations are another source of “reporting burden.” Waiting at least eight years until the next formal review would be appropriate.

**13. Recommendation: The 14-Year Rule.** We find we do not have enough evidence to comment on this rule. There are clearly strong arguments (and strong proponents) both for keeping this rule, and for making it more “flexible” in some way. Little evidence came to light during the evaluation that is not already being considered by the NCE’s Management Committee.

# 1. Introduction

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## 1.1 Context of the NCE Evaluation

### 1.1.1 The NCE Program

The Networks of Centres of Excellence (NCE) is a program of Industry Canada and the three federal granting councils: the Natural Sciences and Engineering Research Council (NSERC), the Canadian Institutes of Health Research (CIHR), and the Social Sciences and Humanities Research Council (SSHRC). The goal of the NCE is “to mobilize Canada’s research talent in the academic, private and public sectors and apply it to the task of developing the economy and improving the quality of life of Canadians,” with specific objectives to:

Stimulate internationally competitive, leading-edge fundamental and applied research in areas critical to Canadian economic and social development.

Develop and retain world-class researchers in areas essential to Canada's productivity and economic growth.

Create nation-wide multidisciplinary and multisectoral research partnerships that integrate the research and development priorities of all participants.

Accelerate the exchange of research results within the network and the use of this knowledge within Canada by organizations that can harness it for Canadian economic and social development.

Funding is provided by the NCE Directorate to networks of groups of researchers, with each network working on a common research problem (e.g., genetic diseases, or telecommunications devices). Each NCE network contains researchers from many universities across Canada. There is active management of the research and other activities (e.g., training, technology transfer) – each network has a Scientific Leader and a Network Manager,<sup>4</sup> a Research Management Committee, a Board of Directors, and other committees as required. Each network then allocates NCE funding internally to its various research and other activities, conducts its own internal reviews, and seeks to find ways to exploit research results for practical ends. External reviews are conducted periodically by Expert Panels appointed by the Directorate. Networks may obtain funding for up to two seven-year cycles; i.e., up to 14 years in total.

All networks obtain funding from the NCE Directorate, but use this to lever funding from other organizations, including the private sector, the provinces, host universities, etc. In Phase I (1989/90 – 1993/94), the federal government invested \$240 million in the NCE, while partners invested \$61.3 million. In Phase II (1994/95 – 1997/98), the federal contribution was \$178.2 million, while partners invested \$182.8 million (all figures for partners include in-kind contributions). Annual NCE Directorate funding has recently been increasing, from \$39 million in 1997/98 to \$77 million in

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<sup>4</sup> Different networks may use different terms.

1999-2000. The program began with 15 networks in 1989/90. Currently there are 22 networks, seven of which have been in existence since 1989/90.

## 1.1.2 Support for University Research

The NCE is only one of many sources of research funding available to Canadian university researchers. Most university research is supported by grants from the three federal granting councils: NSERC, CIHR, and SSHRC. Applications for grants are made by individual researchers or groups of researchers, and the applications are reviewed by selection committees composed of their scientific peers (and, in some cases, by individuals from outside academia). There are many types of grants available: e.g., for “pure” (fundamental) research, for “strategic” research (in areas that are believed to be important for Canada's social or economic benefit), for university-industry collaborative research, for purchase of scientific equipment, for access to large international scientific facilities, etc. Some grants are one-time amounts, others last for a few years. Of course, researchers may also obtain funding from other sources such as similar provincial programs, university funds, foundations, the private sector (typically for “contract research” to investigate a specific applied problem), etc. Individual researchers typically have research support from several sources – including the NCE – at any given time.

## 1.1.3 Context of the Evaluation

The NCE has embarked on its third major evaluation within the past nine years, as required by Treasury Board. The 1992/93 “interim” evaluation<sup>5</sup> was early in the program’s lifetime, and dealt mainly with program design and program and network management issues to ensure the program was “on the right track.” The second, carried out in 1996-1997,<sup>6</sup> was very thorough. It focused mainly on understanding the value added by the networking aspects of the program, and on documenting the program’s impacts on research, training, and users in government and industry.

Although the previous evaluations showed that the NCE model has benefits to participants, there are also costs. Further, since the time the NCE began, the research environment has changed significantly around it – the NCE model is now less unusual, and there are more options available to researchers for doing somewhat similar types of research. Thus it was appropriate to take another look at this program and its context.

For example, when the program was initiated in the mid-1980s, it was somewhat controversial. There were two central features of the program: (1) the “distributed network model”<sup>7</sup>; and (2) the focus on generating practical applications from fundamental research programs, working in concert with industry partners. At the time, no one knew if these features would add value, or indeed if they would work at all. The program was conceived as being experimental in nature, and individual networks took widely varying approaches to network management, research collaboration, and interactions with industry. There were virtually no other significant research programs in existence

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<sup>5</sup> *NCE Interim Evaluation*, The ARA Consulting Group (now part of KPMG Consulting), February, 1993.

<sup>6</sup> *Evaluation of the Networks of Centres of Excellence Program*, The ARA Consulting Group (now part of KPMG Consulting), January, 1997. Until recently this study was generally referred to as the “final” evaluation, but that would no longer be appropriate.

<sup>7</sup> Also called “virtual networking”

anywhere in the world that were similar to the NCE.<sup>8</sup> Since that time, the number of networks has expanded considerably, and those once controversial aspects are now common practices. Where previously it was difficult to find network-type programs, now we have NSERC’s Research Networks program, the Canadian Institutes of Health Research (CIHR), and a number of programs of the Social Sciences and Humanities Research Council (SSHRC). Where once it was considered potentially dangerous to link pure research too closely to industry, now the National Research Council encourages (or at least supports) its staff to create start-up companies to exploit NRC research findings, and all three granting councils have university-industry programs. Where “sole author” science was once considered the ultimate test of scientific strength, now there are programs that encourage not just national collaboration, and not just international collaboration, but full intercontinental collaboration.<sup>9</sup> The current evaluation specifically investigated whether the unique features of the NCE still make sense given these changes.

## 1.2 The NCE Logic Model

The following exhibit is the study team’s logic model for the NCE Program. A logic model for a program illustrates the program’s main activities, outputs, and intended outcomes and how these are logically linked, where

activities are the tasks that are carried out by program personnel, such as managing the NCE Program;

outputs are the goods and services which are produced as a result of the activities – for example, agreements with the networks; and

outcomes are things that are done or experienced by others (people outside of the program administration) as a result of the outputs – for example, research is conducted in the specified areas.

The objectives of a program are included among the program’s intended outcomes. The term “impacts” refers to outcomes which occur over the longer term.

The Activities and Outputs sections of the NCE logic model are self-explanatory. Here we elaborate on the Outcomes section. Since logic models are a simplified picture of a program, we have tried to highlight the characteristics of the NCE Program that are unique and the most important. In the first line of the outcomes section, for example, we have highlighted the following:

the research is *managed* in accordance with a research program plan, and that plan is intended to ensure that the research contributes to national socio-economic goals (left box);

the research is carried out in a way that involves a high degree of *networking and collaboration* among researchers (middle box);

the networks all involve *partnerships between the network and industry and/or government* (right box).

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<sup>8</sup> Even five years ago, it was uncommon to find non-Canadian scientists who had ever heard of the distributed network model.

<sup>9</sup> For instance, the international Human Frontier Science Programme.

Similarly, in the next outcomes line (those outcomes that should follow from the first line), although the left box could apply to other research programs (except maybe for the “leading edge” descriptor), the middle and right boxes highlight the unique nature of the NCE:

the relevance of the research to the needs of industry or government (in particular, the network partners);

the relevance of the research to Canada’s socio-economic development;

the multi-disciplinary nature of the research training.

In the third line of outcomes we have emphasized the fact that, in addition to contributing to the transfer of findings and research knowledge, the NCE Program makes a major contribution to strengthening the research base, through training of new researchers and attraction and retention of experienced researchers. The final line of outcomes reflects the ultimate program objectives.

## **1.3 Evaluation Issues**

### **1.3.1 High Priority Evaluation Issues**

The issues considered of highest priority in order to focus on the current validity of the program in the face of changes to the research environment were:

Issue 1 – Is there a real need for the NCE Program?

Issue 2 – What are the unique and/or incremental impacts of the NCE Program?

Issue 3 – If the program is still needed, what changes to program design would make it more relevant and effective?

Issue 4 – What are the factors in a network that facilitate/hinder success?

Issue 5 – What should be the appropriate role of the social sciences and humanities (SSH) in leading networks, and within the operation of individual networks?

Issue 6 – Is the 14-year funding cycle appropriate for all networks?

### **1.3.2 Medium Priority Issues**

These issues were still important, but less so for the current study:

Issue 7 – What is the appropriate manner in which to wind down the networks that will soon see their funding terminated?

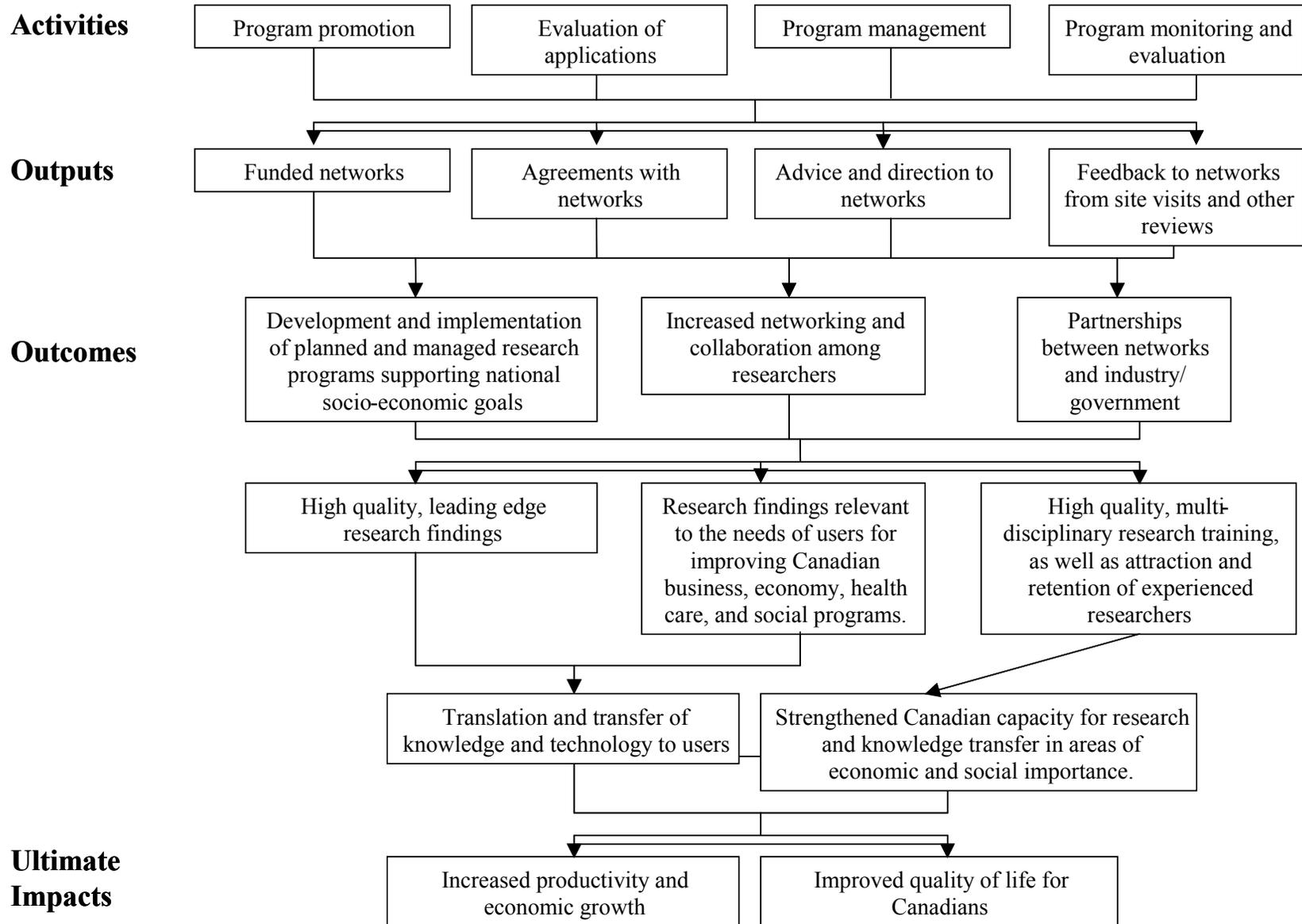
### **1.3.3 Low Priority Issues**

These issues were addressed in the study to a limited degree.

Issue 8 – Does the NCE encourage, facilitate, and support multidisciplinary and multisectoral research where this is appropriate?

Issue 9 – How effective is NCE program delivery?

## Logic Model—Networks of Centres of Excellence Program





## 2. Evaluation Methodologies

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### 2.1 Phase I – Design Stage

The design stage for this study was conducted from September through November, 2001. A brief description of activities is shown below.

#### 2.1.1 Interviews concerning Evaluation Issues

We interviewed:

Jean-Claude Gravel, NCE Director and Management Committee

Chantal Abou Debs, NCE Program administrator

Louise Poulin, NCE Program administrator

Janet Halliwell, Executive Vice-President SSHRC

Mark Bisby, CIHR, NCE Management Committee

Steve Shugar, NSERC, NCE Management Committee

Marie Tobin, Industry Canada, NCE Management Committee

Michael Yeo, NCE Selection Committee

Ned Ellis, SSHRC, NCE Management Committee

Janet Walden, Chair NCE Management Committee (during NCE Chairs conference)

Yves Gingras, Centre interuniversitaire de recherche en sciences et technologie, UQAM (via e-mail)

#### 2.1.2 Requests to the Networks Concerning Evaluation Issues

We also sent a request for assistance regarding the identification of evaluation issues to all network managers (with an early version of the potential issues attached). We had responses from the Canadian Bacterial Diseases Network (CBDN), the Canadian Institute for Photonic Innovations (CIPI), the Canadian Institute for Telecommunications Research (CITR), the Canadian Language and Literacy Research Network (CLLRNet), the Health Evidence Application and Linkage Network (HealNet), the Institute for Research into Intelligent Systems (IRIS), the Intelligent Sensing for Innovative Structures network (ISIS), Micronet, the Mathematics of Information Technology and Complex Systems network (MITACS), and the Mechanical Wood-Pulps Network.

#### 2.1.3 Document Review

We reviewed:

Year at a Glance 1999-2000 (this was essentially the annual report for that year)

Annual Reports, 1996-1997, 1997-1998, 1998-1999, and 2000-2001

The 2000-2001 NCE performance reporting “tables”

NCE Selection Committee Reports January 2000, January 2001, and April 2001  
2000 and 2002 NCE Program Guides and Addendum  
A variety of NCE “success stories” available on the NCE Web site

## 2.2 Phase II – Evaluation Methodologies

### 2.2.1 Overview

Overall, respondents most closely associated with the program (and most likely to benefit from it) were contacted during this evaluation, since the main intent was to provide a strategic review of whether this program was still needed for these organizations. The blank survey and interview guide instruments are found separately bound in the Design Report, and the correspondence of the questions to the evaluation issues is also found in that report. The appendices of this report contain the instruments with statistical data from respondents “filled in.” Both surveys had low response rates; implications for the accuracy and reliability of the results are discussed in section 2.3.

### 2.2.2 Literature Review

We conducted a brief literature search to identify any evaluations or other reviews of Canadian and international programs that are similar in nature (i.e., involving distributed networking, collaboration, and partnerships with users) and intent to the NCE. The main purpose was to identify how other countries and programs have responded to similar needs and changes to the research environment, therefore helping analyze the true need for a program like the NCE. The bulk of this review was conducted through a search of the Web sites of research funding agencies, but a few interviews with knowledgeable people were also done. Appendix G contains a list of programs reviewed.

### 2.2.3 Document and Performance Data Review

**NCE Performance Data.** The NCE requires that each network provide detailed performance data on an annual basis. Several types of data are rolled up in reports that were useful for the evaluation, essentially as background information on the extent of intermediate impacts and, to a much lesser degree, ultimate impacts. Reports that were useful included the NCE annual reports.

**Reports of the NCE Selection Committee and Expert Panels.** The reports of the Expert Panels and Selection Committee were reviewed (both those regarding new networks and those regarding renewal of existing networks).

### 2.2.4 Surveys of Network Partners

We sent surveys via e-mail attachments to all network partners in industry, government, and universities for whom contact information was available. (The NCE Directorate had contact information for roughly 90% of network partners in industry and universities, but only about 10% of those in government.) We used the NCE lists to e-mail surveys to partners in industry and universities. One potential problem was that the person listed in the database as the partner contact may not be the person most knowledgeable about the NCE or about the individual network operations and impacts (e.g., some people listed as contacts may be in the partners’ contracts or legal departments). We provided a cover letter that explained the nature and purpose of the survey, and asked the respondent to pass the survey along to a more knowledgeable individual within the organization if that was appropriate.

There were roughly 734 partners in the networks' databases. Of these, about 167 were "bounced back" as having invalid e-addresses, leaving a total population of 567. The initial response rate (after the initial e-mail notice, plus three follow-ups) was very low, about 5%. To increase the response, the Directorate asked individual networks to encourage their partners to respond. In addition, KPMG Consulting randomly telephoned about half the partners to ask them to respond. In the end, a total of 55 responses were obtained, for a final response rate of 10%. It should be noted that quite a few of the partners telephoned, commenting that they had little to do with the networks; we believe that many organizations that are only participating through network outreach activities (e.g., secondary schools) are also on the list of partners, and thus the response rate is misleading.

Statistical data from the partner survey are found in Appendix F, and open-ended comments are found in Appendix J (bound separately).

## **2.2.5 Interviews with Network Scientific Directors and Network Managers**

We attempted to interview all network scientific leaders and network managers (theoretically 44 individuals, but a few networks were too new to have full-time scientific leaders or network managers), as well as a sample of other key individuals (e.g., those responsible for technology transfer) as appropriate. A few networks had scientific leaders that were too new to comment on the issues, or did not have network managers, and there were only about 6 "other individuals" available for interviews. The interview guide was sent to respondents (usually via e-mail) ahead of time.

A total of 31 individuals were interviewed. The list of respondents is found in Appendix A. Statistical data from these interviews are found in Appendix C.

## **2.2.6 Survey of Network Researchers**

A web-based survey was provided for ease of access and data entry and analysis; it was available on a customized KPMG Consulting Web site for complete security and anonymity. All NCE researchers were sent an e-mail notifying them of the survey's availability (the e-mail list was provided by individual networks). Although the survey was pre-tested, some respondents found that their web browsers did not read the survey properly; KPMG Consulting provided these individuals with the survey through other means.

There were 1,983 names provided by the networks, with about 100 "bouncing back" due to invalid addresses, leaving 1,883 in the population. As for the partners survey, the initial response rate (after three e-mail follow-ups) was low, about 8%. To increase the response rate, the Directorate asked individual networks to ask their researchers to participate. In addition, KPMG Consulting randomly selected 300 researchers from the lists and faxed them the survey. In the end, a total of 226 responses were obtained, for a final response rate of 12%.

Because of the possibility of response bias in such a small sample, we separately analyzed the early returns and the later ones; although there was a tendency for the later responses to be less enthusiastic about NCE, it was by a very small amount (e.g., 2-3% of responses would move from a category like "NCE is much better" to "NCE is better" in the later responses). Statistical data from the researchers survey are found in Appendix D. A complete listing of open-ended comments are found in Appendix I (bound separately).

## 2.2.7 Interviews with Members of the NCE Expert Panels and Selection Committee

A sample of 24 of the most knowledgeable individuals were interviewed, again sending them the interview guide ahead of time. We selected the respondents in consultation with the NCE Directorate. We made sure to include individuals who were not from academia, and/or not from Canada, to obtain a more “outside” perspective: 42% of respondents were from outside academia, and 58% were from outside Canada.

The list of respondents is found in Appendix B. Statistical data from these interviews are found in Appendix E.

## 2.2.8 Other Interviews

**NCE Program Administrators.** This was done as one group interview to allow for the best exchange of viewpoints. A total of eight individuals participated.

**SSRHC Officials and Advisors.** These specialized interviews with senior SSHRC officials were focused on Issue 5: the involvement and integration of the social sciences and humanities within the NCE Program and within individual networks.

**Interviews at the Granting Agencies.** A small number of key individuals within the granting agencies were interviewed.

## 2.2.9 Survey of Chairs of Network Boards of Directors

A census of the 22 Chairs were sent surveys via e-mail attachments. A total of 4 responses were obtained, for a response rate of 18%.

## 2.3 Discussion of Study Validity

The low response rates to the researcher and partner survey call into question the validity of the findings. Certainly these response rates are much lower than one would hope for in order to make sweeping pronouncements about the program, especially where significant problems were identified, and this should be borne in mind by readers. However, on the whole we believe the findings are valid and reasonable because:

The findings are consistent across all data sources. In particular, the findings from the researcher survey and partner survey (with low response rates) are very similar in both nature and degree to the findings from the interviews with network officials and with members of the Expert Panels and Selection Committee (which had nearly 100% response rates within a large sample of their respective populations).

We separately analyzed the early responses to the researcher survey and those obtained later (after the final follow-up). There was no difference in the nature of findings, and very little difference in the degree. In general the later responses were slightly less positive (as opposed to more negative) than the early responses. For example, in a given question the early responses might be that 30% of respondents were “very satisfied” and 22% were “satisfied”, while the equivalent findings for the later respondents might be 27% “very satisfied” and 24% “satisfied”. None of the differences changed the tenor of our conclusions in any way.

The findings make sense. Neither the positive nor the negative findings are inconsistent with what one might expect given: (1) the nature of the NCE Program design and operation; (2)

the results of the international literature review and the opinions of non-Canadian members of the Expert Panels and Selection Committee (who have a more “external” view of the program); or (3) the findings of the two previous NCE evaluations.

In other studies conducted by KPMG Consulting in which response bias was specifically investigated,<sup>10</sup> we have never met a situation in which this was problematical enough to cause significant changes to the main findings.

The low response rates are consistent with the complaint that the NCE requires too much reporting; this community appears to be “fed up” with requests for information.

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<sup>10</sup> For example, in highly political and controversial situations in which respondents could serve their self-interest by lying or exaggerating, we have sometimes explicitly compared findings from surveys to findings from interviews to findings to direct observations.

## 3. Findings on Program Rationale

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Throughout the next three sections, we include representative quotes from respondents.<sup>11</sup> Where appropriate, we also include references to statistical data found in the appendices. For example, data from network researchers regarding the collaboration process are found in Appendix D, question 2b; this would be referenced as (D:2b).<sup>12</sup> Tabular data for the Chairs are not presented; there were too few responses for meaningful statistical analysis.

### 3.1 Overall Need for the NCE

Because of the changing Canadian academic research environment described in section 2, this was a key question to answer. This study finds that, notwithstanding the number of other Canadian programs that now have goals similar to those of the NCE, and/or have structures somewhat similar to the NCE, and/or support activities similar to those of the NCE networks, there is still a clear niche for the NCE Program and it is still a valuable component of the Canadian innovation system. The NCE collaboration is unique in terms of its amount of networking and the sheer range of topics, disciplines, and involvement cross-Canada of both scientists and users. Overall, these findings were consistent irrespective of who was being questioned: network officials (scientific leaders, network managers, and other network officials), network researchers, members of the Expert Panels and Selection Committee, partners, or Chairs (C:1a, D:1a, E:1a, and F:1). It is noteworthy that, on average, network partners were just as positive in this regard as the other groups.<sup>13</sup> The types of advantages the NCE has over other funding support mechanisms (listed in roughly decreasing frequency in which they were mentioned) include those in the following sub-sections.

### 3.2 Research Networking and Collaboration

Data from recent years in Exhibit 3.1 show that the NCE has been successful in garnering support from a wide variety of organizations both in Canada and, to a more limited extent, from abroad. (Note that the exact nature of “participation” is unclear from these data; some are undoubtedly informal or related only to outreach. See section 2.2.3.) The table implies that each of the 22 networks studied has, on average, about 55 “participating organizations.”

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<sup>11</sup> Where necessary, we have edited these slightly for clarity or brevity, but the meaning is identical.

<sup>12</sup> There is a great deal of statistical data; for simplicity's sake, we do not refer to all individual sub-questions.

<sup>13</sup> Note that many respondents who said “don't know” in the appendix data did so because they were not familiar with funding programs in other disciplines, or (in the case of Expert Panel members) with more than one or two individual networks.

### Exhibit 3.1: Collaboration by Type of Organization

	2000-2001	1999-2000	1998-1999	1997-1998
Number of participating organizations:				
- Canadian universities	54	55	49	45
- International universities	95	43	9	16
- Canadian companies	500	475	389	380
- International companies	96	88	73	83
- Canadian hospitals	34	39	17	42
- International hospitals	10	7	1	3
- Canadian federal departments & agencies	59	45	28	37
- International federal depts. & agencies	6	7	3	3
- Provincial departments & agencies	78	86	73	85
- Other Canadian organizations	201	203	78	200
- Other international organizations	68	63	21	19
<b>TOTAL organizations</b>	<b>1,201</b>	<b>1,111</b>	<b>741</b>	<b>912</b>

\* Source: NCE Annual Reports and Year at a Glance.

Almost all study respondents reported that NCE collaboration was better or much better than “normal” (C:2b, D:2b, E:2b, F:2b). The NCE researchers reported that this collaboration was usually “real” and resulted in “team spirit” within their networks that encouraged strongly cooperative research focused on forging links among the research, development, and user communities.

*The basic difference between the NCE and NSERC is that we are forced to take collaboration seriously. (Researcher)*

*Based on my experience both as a researcher and as a member at large on the board of directors, the NCE Program has provided a coordination of focused research effort never seen before in Canada. (Researcher)*

Not all researchers agreed with these feelings, of course. A minority (14%) commented that the process was not different from usual, or was worse (4%); this may reflect relatively new networks, or those that have not fully embraced the NCE principles.

*. . . it is clear that networks are good sources of strong research. The problem is that REAL networks are created organically among people with common interests. In contrast, funded networks such as . . . NCE tend to be rather forced. People join them mainly as another source of funding, not as a resource for collaboration.*

### 3.3 Partnerships with Users

There are several pieces of information that support the finding that the NCE creates partnerships with users. First, the 2000-2001 data in Exhibit 3.1 indicate that each of the 22 networks has, on average, about 50 partners and other participating organizations, many of which are outside academia. (Not all participating organizations are formal “partners” in the sense of having signed the networks’ Internal Agreement; for example some are organizations such as secondary schools that

are targeted during network outreach activities. These figures therefore overestimate the number of “true collaborators,” as is also indicated by the relatively low response rate in the partner survey; see section 2. Nevertheless, the data show a higher number of participants than would be the case in many “normal” granting council programs.)

A second important piece of evidence is the extent of funding provided by NCE partners. In Phase I (1989/90 – 1993/94), the federal government invested \$240 million in the NCE Program, while partners invested \$61.3 million. In Phase II (1994/95 – 1997/98), the federal contribution was \$178.2 million, while partners invested \$182.8 million (all figures for partners include in-kind contributions).<sup>14</sup> Recent data are shown in Exhibit 3.2; total funding has increased just over 60% from 1997/98 to 2000/01. Note that these figures do not include the entire contribution by Canadian universities, which additionally bear the costs of salary support to NCE researchers,<sup>15</sup> as well as the indirect costs of research.<sup>16</sup> These salary and indirect costs were estimated at about \$39 million in 1997-1998 alone, much higher than the universities’ explicit cash and in-kind contribution of about \$2.4 million.

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### Exhibit 3.2: NCE Funding by Type of Organization

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Contributions to NCE Program	2000-2001 (\$million)		1999-2000 (\$ million)		1998-1999 (\$ million)		1997-1998 (\$ million)	
	Cash	In-kind	Cash	In-kind	Cash	In-kind	Cash	In-kind
NCE	77	0	64	0	46	0	39	0
Universities	1.1	4.6	0.78	2.1	0.76	1.2	0.65	1.7
Industry	17	32	14	27	15	29	16	22
Federal (non-NCE)	4.8	1.8	1.7	3.2	2.0	2.5	2.1	2.4
Provincial	5.4	1.7	4.5	1.4	6.2	0.86	5.7	0.86
Other	10	3.6	12	3.5	12	5.9	7.9	1.7
<i>Partners sub-total</i>	38	46	33	37	37	39	32	28
<b>TOTAL</b>	<b>116</b>	<b>46</b>	<b>97</b>	<b>37</b>	<b>83</b>	<b>39</b>	<b>71</b>	<b>28</b>
<b>TOTAL cash + in-kind</b>	<b>162</b>		<b>134</b>		<b>122</b>		<b>99</b>	

\* Source: NCE Annual Reports and Year at a Glance.

The third important piece of information is from the surveys and interviews regarding the way in which the program encourages partnerships to form. A large majority (75% or more) of respondents regarded the NCE as superior to “normal” funding sources in this regard (C:2e, D:2e, E:2e, F:2e). Within this group of findings, the opinion of the partners themselves is probably most relevant – 83% rated the NCE as better or much better; only 6% as worse. Although other programs also support

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<sup>14</sup> Source: NCE Directorate

<sup>15</sup> Although NCE researchers do not spend all of their time on NCE projects, most researchers obtain funding from many other sources as well.

<sup>16</sup> Indirect costs include administrative and overhead costs (e.g., physical infrastructure, operating expenses, accounting, etc.). Such costs are difficult to estimate precisely but are roughly 40% of the direct costs of research (i.e., NCE grants plus salaries). See Mireille Brochu, *Indirect Costs on Federal Research Contracts to Universities*, March 1996.

such interactions, they tend to be much more short-term in nature, they involve fewer partners from fewer sectors (and thus the research may not be as innovative or multidisciplinary, and there may not be as many opportunities to exploit the findings), and the information flow is more one-sided (knowledge from the universities to industry, money from industry to universities), whereas in the NCE the relationship is more of a partnership. The program objectives, coupled with the periodic reviews, have forced networks to take the knowledge transfer and technology exploitation criteria very seriously, and consider the need to collaborate with industry from the beginning. These are crucial elements within a program that still, at its heart, supports a great deal of fundamental research.

*I do not know of other programs that would, in my opinion, have fostered the kind of relationship we currently enjoy. "Working with industry" may be more accepted, but it is usually not particularly collaborative. Industry is often seen as just another source of funds for an investigator's programs, as opposed to an equal partner in the work.*  
(Partner)

*It is still the one major program that links researchers (university, government, private sector) in areas of industrial competitiveness.* (Researcher)

*One area in which there's been enormous change is mathematics; this community was very reluctant to do anything applied, now there's a complete change of attitude, I lay this at the feet of NCE. I'm absolutely amazed, this was worth the whole program all on its own.* (Expert Panel member)

*[My network] typically offers greater interaction between potential stakeholders and researchers than other programs. . . Although there may be other programs and research funding opportunities which would allow stakeholders to interact and work with researchers, [my network] also provides a forum for stakeholders to interact with each other and to collaborate.* (Partner)

*Programs like Canada Research Chairs and the Canadian Foundation for Innovation exclude other key players in the research scene such as government research laboratories. The NCE provides a broader base of participation with benefits reaching a broader scope.* (Partner)

*This is also the only granting system, which facilitates and encourages collaborations and support from industry. The other programs also support presumably applied research but this is somehow brought down as "less fun science" by the peer review process. The comment we hear is, "It should be left to companies." There is an interface between basic and applied research that the NCE cover in a unique and better way than any program.* (Researcher)

There may also be some economies of scale for the company participants:

*In a "private money only" scenario, it is difficult to justify pre-competitive research except for very large organizations. Having experience with both working with individual universities and the [...] NCE network, I can say that the [network] approach results in less overhead and more research output compared to our individual programs.*  
(Partner)

There still remain some strong critics of the entire NCE *raison d'être* among researchers, a minority of whom believe that the program takes away support from fundamental research, or “bends” it inappropriately to the will of corporate Canada:

*The purpose of these centres is to subordinate university research to the interests of private capital. This is an ill-disguised subsidy to the corporate sector, which can well finance its own research, while taking funds away from the public universities who do need the tax support to further innovative work. Truly innovative work is rarely "profitable" in the short term. (Researcher)*

### 3.4 Pan-Canadian Networks

The NCE supports pan-Canadian collaboration, bringing together the best researchers across Canada to investigate specific topics. This is actively supported through activities such as Annual General Meetings, network conferences and workshops, newsletters, etc. Most other programs tend to support networks that are more regional either because of their provincial focus (as in the Ontario Centres of Excellence) or because of how they operate in practice (often because of more limited funding). Further, the NCE actively manages this collaboration (as well as other activities such as technology and knowledge transfer) to ensure it actually occurs.

*There are some overlaps and duplications with existing programs . . . [but these others] fund smaller numbers of groups. Some do exactly the same things, but the amounts of money are smaller, they have a limited life, and fewer are pan-Canadian. (Multiple time Expert Panel and Selection Committee member)*

*In many recent programs the vast bulk of funding flows into a few institutions (U of T, UBC, McGill), and other universities tend to get minimal support. The NCEs encouraged nation-wide participation. This is important to preserve. (Researcher)*

### 3.5 Multidisciplinarity

At least 75% of all respondents rated the NCE as better or much better than “normal” at being multidisciplinary, finding multiple ways of addressing each research topic; this again is practical because of the large funding and the pan-Canadian focus (C:2c, D:2c, E:2c, F:2c); 6% or fewer found it worse. The wide breadth of disciplines represented in networks was by far the most common comment made about this factor, and many respondents commented that organizing research into themes forced multidisciplinary thinking.

*The NCE is not multidisciplinary – it is interdisciplinary, or even antisciplinary. Knowledge users do not have disciplinary knowledge needs, they have real problems. Best to address these by ignoring disciplines, and NCEs allow this. (Researcher)*

### 3.6 Cross-disciplinarity

The NCE is far ahead of other programs in terms of cross-disciplinarity;<sup>17</sup> i.e., integrating research across the three “major disciplines” (i.e., natural sciences and engineering, medical and health research, and social sciences and humanities) within one integrated research program. Although there has been only mixed success on this front in many networks (especially regarding SSH integration), almost no other program even attempts this. A number of respondents noted that their research topics (especially when linked to other themes) simply could not have been supported through “normal” programs, and some commented that the NCE forced researchers to have “open minds” about the relevance of other fields.

*NCEs seem to offer the possibility to be of wider scope – e.g., [my network] involves researchers from the life sciences, social sciences, engineers, lawyers, economists, etc.* (Researcher)

*Where program is unique: it’s the most effective for bridging among three main discipline areas.* (Expert Panel)

*I find one of the biggest differences between the NCE and other types of funding is that the NCE promotes research among investigators that crosses the boundaries of CIHR, SSHRC, & NSERC. My own funding traditionally would come from SSHRC.* (Researcher)

*The NCE has a much broader mandate than the granting councils, even with multidisciplinary research being more common these days, there’s lots of NCE research you wouldn’t find in normal council work.* (Expert Panel)

Some supporting data come from Exhibit 3.3, in that it can be seen that the NCE provides support for all three major discipline groups, although this table does not illustrate the degree of cross-connections, and the data are approximate only (used for administrative purposes).

**Exhibit 3.3: NCE Funding by Granting Council**

	2000-2001 (\$ million)	1999-2000 (\$ million)	1998-1999 (\$ million)	1997-1998 (\$ million)
<b>Funding:</b>				
NSERC	39	35	27	22
CIHR	24	21	14	14

<sup>17</sup> There are no widely accepted, consistent definitions of the terms “multidisciplinary,” “interdisciplinary,” and “cross-disciplinary.” For the purposes of this report, we use multidisciplinary to mean research that uses findings or techniques from a number of fields *within* one of the three major discipline groups (i.e., natural sciences and engineering supported by NSERC, medical and health supported by CIHR, and social sciences and humanities funded by SSHRC); interdisciplinary to mean research that falls somewhere *between* two of these “internal” fields; and cross-disciplinary to mean research that uses findings or techniques from two or more of the NSERC, CIHR, and SSHRC major disciplines.

SSHRC	12	7.5	5.4	3.9
Letters of Intent	0.2	0.3	0.3	-
NCE Administration	2.7	1.9	1.5	1.2
<b>TOTAL</b>	<b>77</b>	<b>66</b>	<b>48</b>	<b>40</b>

### 3.7 Training of Highly Qualified Personnel

NCE funding provides training for many highly qualified personnel (HQP<sup>18</sup>), as seen in recent data in Exhibit 3.4. There is a strong trend upwards: the total number of HQP supported has increased roughly 50% from 1997/98 to 2000/01.

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#### Exhibit 3.4: Training and Highly Qualified Personnel (HQP)

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	2000-2001	1999-2000	1998-1999	1997-1998
<b>Researchers and HQP supported by NCE:</b>				
University researchers	1,396	1,140	992	742
Non-university researchers	304	359	184	139
HQP supported by the NCE	2,159	1,820	1,208	1,615
HQP supported by other sources**	2,092	1,756	1,349	1,478
<b>Total researchers and HQP</b>	<b>5,951</b>	<b>5,075</b>	<b>3,733</b>	<b>3,974</b>

\* Source: NCE Annual Reports and Year at a Glance.

\*\* Other sources include hospitals not affiliated to universities, provincial Centres of Excellence, non-governmental organizations, municipal organizations, other research institutes, etc.

The nature of the training is also different from “normal” in that it allows all types of HQP much more access to other network scientists through the many collaborative activities most networks support, such as theme meetings, workshops, Annual General Meetings, etc. The NCE also allows HQP grounding in the “business of business,” through exposure to the R&D concerns of network partners, and active participation in knowledge transfer (and in some cases, commercialization) activities. In some cases, it is also the first time that some of the faculty scientists have been involved in such activities. Overall, most network officials and members of Expert Panels and Selection Committee rated the NCE as better or much better than “normal” in this regard (C:2d, E:2d), although this was one area where a substantial proportion (roughly a third) of researchers and partners (D:2d, F:2d) commented that to date they had not seen much difference, sometimes because their network was new and had not yet really addressed this topic, but sometimes because less attention had been paid to this factor than to research and technology transfer.

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<sup>18</sup> HQP are defined as trainees and research staff such as graduate students, postdoctoral fellows, research associates, technicians and summer students.

*The NCE Program allowed students and Postdoctoral researcher access to working in a government laboratory research environment having unique capabilities. . . (Partner)*

*The NCE Program involves the private sector in setting road maps for research, thereby achieving an excellent balance between research emphasis and relevant postgraduate student education. (Partner)*

*[The network] has opened the eyes of our graduate students and post-docs to the extended career possibilities in basic and applied research. (Researcher)*

### **3.8 Integrated, Large Scale, Long-term Support for all Phases of R&D**

This response was especially made by network officials and members of Expert Panels. The NCE essentially integrates the types of support available from the many other programs available. In particular, it supports research and innovation all the way from pure research to commercial and/or social application under a single umbrella organization, so that an individual researcher need not apply multiple times to multiple funding sources to do the same thing through other programs.<sup>19</sup> The 14-year maximum network term allows long-term programmatic research and development planning, organized into related research themes. This is coupled with budgets for individual networks that are, in Canadian terms, very large, and certainly much larger than those available from almost all other granting council sources.<sup>20</sup>

### **3.9 Ability to Fund Riskier Research**

Because individual networks act like mini-granting councils and can explicitly fund a “portfolio” of projects (some conservative, some risky), the NCE can support different types of research problems and, in some cases, riskier research, than through “normal” programs. For example, a few people made comments such as:

*. . . since multi-group efforts were reviewed within one program, riskier (more innovative) sections were funded due to the fact that they were balanced by lower risk sections within the same program. (Researcher)*

### **3.10 Critical mass and International Recognition**

The NCE creates internationally known Canadian centres of expertise. Even with the relatively limited total funding Canada can provide for research, the country is “in the ballgame” internationally in selected areas, both in terms of research but also regarding industrial receptor capability. Positive impacts on critical mass were particularly commented upon by non-Canadian members of the Expert Panels.

*Absolutely essential way of creating critical mass and significance. (Partner)*

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<sup>19</sup> This also requires every application to be successful. Of course, network funding alone may not be sufficient to allow all aspects of exploitation to be supported for each researcher, but it still provides an easier option than the “multiple programs” route.

<sup>20</sup> Even in international terms, these budgets are significant. Some respondents from the UK and even the US reported being “quite envious” of some network funding.

*When the first biosciences NCEs were created, concern was expressed about the lack of a receptor capacity in Canada for this kind of research. What has transpired over the last dozen years has been the rapid growth of new biotech companies created to apply the results of NCE research. As a result, Canada is beginning to have its own industrial base in the biosciences sector instead of simply being a “branch plant” player for big pharma.*  
(Partner)

*The NCE Program creates a critical mass that would be impossible to create locally. This critical mass can tackle more involved problems in a specific field than researchers in a given University or given region can tackle. This also avoids duplication of research effort and creates division of work between researchers of different universities.*  
(Researcher)

### 3.11 User Focus

The more singular focus on network scientific leaders, network managers, technology transfer officers, etc. allows them to know their users well, understand who the key players are, who is likely to take up the technologies best, etc. In this regard, they are (or believe they are) more efficient than a university-industry liaison office (UILO) can be.<sup>21</sup> Also, users are often represented in the advisory committees of the networks.

*World beating products. [Network] research in the area of [...] design has created a pool of HQP in this area. The [...] area is one of our company’s competitive advantages.* (Partner)

*There is collaboration with users. For example, my neighbours who have arthritis are heavily involved in the NCE relating to arthritis. The advisory board for the CIHR institute relating to cancer[on the other hand] is populated entirely by doctors and academics.* (Researcher)

*The [...] Network has built linkages between industry, government and academia that would not have occurred through universities alone. These linkages are and will continue to be very valuable as the demands for very complex [...] research increase.*  
(Partner)

### 3.12 The NCE and CIHR

The CIHR has created 13 virtual institutes to coordinate and plan health research agendas that address specific health areas or the health concerns of specific populations. Each institute has its own strategic plan and sets a coordinated, multidisciplinary research agenda. At this stage of their development, CIHR institutes have funding mainly for bringing together stakeholders (e.g., representatives of public interest groups, health practitioners and other users of health research findings, government officials and researchers) and for planning and implementing initial strategic initiatives (capacity development, etc).

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<sup>21</sup> Although the UILO officials would not necessarily always agree.

The central core of each institute has some similarities to the administrative centre of an NCE network, e.g., a director, a small staff, and an advisory board. Unlike the NCE networks, the institutes do not at this stage have large budgets for research programming.<sup>22</sup> The bulk of CIHR institute funding flows through centrally administered grants and awards programs.<sup>23</sup>

Because several features of CIHR's virtual institutes are similar to NCE networks, some questions were specifically directed towards possible duplication of effort.<sup>24</sup> Expert Panel members commented that they did not have a problem with the NCE and CIHR using similar *mechanisms*, so long as the *content* of networks/institutes funded under the two programs were not identical. This implies that co-ordination between the two organizations in terms of topics would suffice.

Many respondents believed there were significant differences between NCE networks and CIHR institutes, but it was not always clear whether they were commenting on CIHR or on the organization from which it evolved (the Medical Research Council). CIHR is probably too new for informants to fully understand the Institutes and thus be able to effectively compare them to NCE networks. The main differences perceived by these informants are shown below, with some commentary from the study team in brackets. Note that all conclusions should be regarded as tentative at this time.

- (1) The CIHR institutes have lower funding for research, since at this stage a significant portion of resources are for functions that mirror the administrative functions of NCE networks rather than for research itself. (Also note that the institute networking is among a wide range of stakeholders, rather than among university centres, as in the NCE.)
- (2) The CIHR institutes were perceived by several respondents to be much more regionally based than NCE networks. (By definition, however, CIHR Institutes are intended to be pan-Canadian. This may reflect the early stage of development of the institutes, or that respondents were observing that the Institute Director, like an NCE Director, is based in his or her home institution.)
- (3) The CIHR was said to rarely support high-risk projects, whereas these can be supported as one element of an NCE network's "portfolio." (This is, of course, a matter of opinion, and would be difficult to document given that CIHR has been operating for only 20 months.)
- (4) The CIHR institutes were said to not be cross-disciplinary to nearly the same degree. (*Multidisciplinary* integration<sup>25</sup> is in fact a priority for CIHR, but *cross-disciplinary* research<sup>26</sup> is currently less common than in an NCE network. However, this comment may still reflect

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<sup>22</sup> In future, CIHR may allocate more funding for these specific thematic areas, although peer review of grant applications will probably still be conducted centrally rather than in individual Institutes.

<sup>23</sup> And from NSERC or SSHRC if the institute is cross-disciplinary.

<sup>24</sup> We did not, however, specifically investigate details of CIHR institutes.

<sup>25</sup> In the sense of integrating research in the four CIHR "pillars" of research, all of which are of course related to health or medicine.

<sup>26</sup> In the sense of integrating "CIHR" research with research in the "NSERC" or "SSHRC" fields.

the relatively small research funding levels for CIHR institutes, or the relatively new state of CIHR institutes compared to NCE networks.)

Respondents made comments such as:

*The most inventive research projects in [my network] that I have participated in have involved researchers from quite different disciplines – some would otherwise have been funded through NSERC and some through the CIHR. In other words, it is unlikely that these researchers would have gotten together except through [this network].*  
(Researcher)

*The CIHR might fund a “Are seatbelts safe?” study, but not how to make the seatbelts better too, using engineers and physicists.* (Expert Panel member)

### 3.13 Data from the International Literature Review

Detailed information is found in Appendix G. Generally, the literature review (plus a small number of interviews) found that network-style programs have become far more common than was the case when a similar review was done during the 1992–1993 NCE Interim Evaluation. In fact, it was difficult to find a country that did *not* have some form of virtual networking program. Some of these, such as Australia’s Cooperative Research Centres, have been explicitly modelled on the NCE. Others have used only portions of the NCE model (e.g., linking only a few universities together, rather than many); while others have expanded versions of the NCE model (e.g., the European Framework initiatives, which link researchers in different EC countries working on problems commonly agreed to be strategic<sup>27</sup>). These other countries are responding to similar pressures (e.g., the need to be internationally competitive; the need to increase take-up of research findings by industry) and have responded in similar ways, although to differing degrees:

All other countries have one or more programs with similar mandates that link research, training, and knowledge and/or technology transfer.

Many countries support virtual networking. However, in some programs virtual networking is encouraged rather than required, and many countries also support “centre” programs physically located at one university (or shared among a very small number of universities), possibly with “participants” at other institutions.

Most other programs also support long-term integrated research programs, and many provide roughly similar levels of funding to individual networks and/or centres. However, most other networks do not last as long as the networks’ 14 years, although at least one allows longer terms (to 20 years).

Industrial partnerships are either encouraged or required in these other programs. However, some clearly focus more on fundamental research than explicit technology transfer (with user organizations kept informed through outreach activities, but not acting as collaborators), while others are clearly much more applied in nature. Of the programs reviewed, the NCE

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<sup>27</sup> Interestingly, the Framework programs were initiated partially to *reduce* overhead and administrative costs that were otherwise duplicated in different countries, whereas a criticism of the NCE is that its administrative and management costs are too high.

probably has as much, or more, “reach” of any program all the way from fundamental to applied research.

Few other programs seem to encourage their networks or centres to protect intellectual property on their own (the universities handle it), but this was somewhat difficult to ascertain from our Web-based study.

Virtually all countries encourage and support multidisciplinary *within* one of the three major discipline groups.

Some countries have programs that support cross-disciplinarity *across* the three major discipline groups, although the NCE seems to be (by far) the strongest proponent.

Many programs support explicit management of the research program, although the NCE appears to be at the higher end of the continuum. (It was difficult to tell exactly how much management is required in the other programs; we are inferring from the Web site discussions.)

Many other countries use targeting more than Canada. This is often tied to *ex ante* assessments of strategic importance in various disciplines, such as the UK’s Foresight Program. In some cases, it appears that independent foresight exercises are used to target sub-programs within individual research granting council programs (e.g., some sub-programs associated with the UK’s LINK program are specifically tied to the UK’s Foresight).

Only one other program was found that had an explicit funding component to attract or retain “star” researchers. As in Canada, this function appears to be handled mainly through other agencies or programs.

Although it was difficult to tell from our brief review, it appears that most other programs use a “hands-off” review of applications (i.e., not providing active assistance to applicants) similar to the NCE’s.<sup>28</sup> One of the UK programs (EPSRC’s IEP) actively assists applicants to create appropriate research consortia during the proposal process.

One final piece of evidence here – it was noteworthy that the non-Canadian respondents from the Expert Panel and Selection Committee unanimously gave high praise to the NCE model and overall concept. Several noted that they were “jealous” of NCE’s large-scale integrated model and high levels of funding per network.

### 3.14 Dissenting Opinions

Not everyone agreed, of course, that the NCE was unique or really needed. In particular, roughly a quarter of network researchers were unsatisfied or very unsatisfied with their NCE experience (D:17). The main criticisms of the program (ordered roughly from most to least frequently mentioned) were:

The NCE was a “waste of money,” especially with respect to the relatively small amount of funding the average researcher received compared to the large amount of time, effort, and administration associated with the application process, the review process, annual reporting,

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<sup>28</sup> And, of course, virtually all response-based programs of the three granting councils.

and network management and administration. Although this was the most common comment of program critics, dislike of these features of the NCE was echoed by many individuals who were otherwise supportive of the program.

The networks do not support true collaboration or useful networking. Critics believe some networks are created as “networks of convenience” that may or may not “gel” at a later date. (Some Expert Panel members also commented on this phenomenon, especially among unsuccessful network applications, but it was mentioned that some existing networks still did not have fully integrated research programs.)

*Sometimes, collaboration emerges from the NCE network but it is a very hit and miss affair. A lot of public money is spent in bureaucracy and travel with people struggling to collectively find common ground while preserving their individual entrenched views of what research they wish to do – mostly, this is organizationally unproductive and personally distressing. (Researcher)*

The networks sometimes support cliques or “old boy’s networks,” in which innovative ideas supported by younger researchers are not given much attention.

A small minority of researchers simply stressed the need to support basic research, feeling that the basic concept of large-scale university-industry programs<sup>29</sup> did not make sense.

### **3.15 Conclusions with Respect to Program Rationale**

Overall, the NCE model is clearly still relevant and an effective response to the pressures facing modern research. Even given that some “NCE-like” support can be obtained from various other Canadian programs, the NCE has distinct advantages, including the “one-stop shopping” nature of its support across a wide range of R&D activities from completely fundamental research through to applied work, all supported by activities (e.g., collaboration, partnering, training, knowledge transfer) that are generally better or much better than available through “normal” support.

Having said this, there are significant costs to NCE participants. Various structural and operational problems are significant enough that some network officers and researchers have had “sober second thoughts” about their involvement. Even while almost no one would actually dismantle a program perceived as being so successful, some of these individuals would be leery of becoming involved a second time. These problems can be overcome, and none is so serious as to make the current program in any way inappropriate. However, it may be an appropriate time for the NCE to consider a strategic re-thinking. These problems will be discussed further below.

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<sup>29</sup> And collaborations with other types of users such as health care systems

## 4. Findings on Program Impacts

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This evaluation did not focus on a detailed investigation of the nature or size of NCE impacts. Instead, sufficient information was gained about these topics to support the conclusions drawn in section 3, namely, that the evaluation team could be convinced that the program rationale could be justified in terms of differences in processes used by networks and the types of longer-term impacts that the NCE has created. Many of these impacts have already been discussed to some degree in section 3.

### 4.1 Process Impacts

The road to incremental impacts lies partially through the different *processes* that networks employ compared to those used through “normal”<sup>30</sup> funding sources. Overall, most respondents believed that the processes used by the networks were either the same, or better or much better than that resulting from “normal” granting agency support. Very few believed they were worse. These processes included factors such as conducting research, collaborating, interdisciplinarity, student training, partnerships with users, knowledge and technology transfer, intellectual property (IP) protection, and development of local and national critical mass referred to in section 3.

*Research funding may have changed, but people's work habits have not. There must be incentives to change those habits – the NCE structure provides the best incentive.*  
(Researcher)

Specific statistical data are found in C:2, D:2, E:2, and F:2 and have been discussed in detail earlier. Note that network officials were (perhaps predictably) slightly more positive in these regards than researchers; even so, very few researchers believed that the processes were worse than “normal.” Partners, if anything, were even more convinced than the other groups about the process advantages of being in a network, with the exception of intellectual property protection (see F:2).<sup>31</sup>

### 4.2 Knowledge Transfer

Most of the HQP trained by networks (at least 88% in 2000-2001) are known to find employment after leaving the network (typically after graduation), as seen in Exhibit 4.1. Of interest is that roughly half the HQP are subsequently employed by industry, an effective means of knowledge transfer. A substantial number are also employed by government, in which scientific knowledge is becoming increasingly important to allow knowledgeable decision-making.

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<sup>30</sup> We will use the term “normal” to refer to all other granting council programs, even though some of them (such as CIHR institutes, or the tri-council and Industry Canada Genome Canada project) have some features similar to NCE.

<sup>31</sup> We mention this because, in many other evaluations, the industry partners (even in successful programs) are notably less positive than program officers or scientists on a wide range of topics including the need for the program, partnering, program impacts, etc. The NCE results seem somewhat at odds with the low partners response rate (which may imply lack of enthusiasm for the program); although a clear explanation of this paradox is lacking, we believe it mainly represents the fact that many network “participants” are not active “partners,” as noted in section 2.

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## Exhibit 4.1: Post-Network Employment of HQP

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	2000-2001	1999-2000	1998-1999	1997-1998
<b>Post-network employment of NCE HQP:</b>		Not reported		
- Industry	46%		49%	56%
- University	34%		28%	31%
- Unemployed or unknown	12%		10%	3%
- Government	6%		8%	5%
- Other	3%		5%	3%

\* Source: NCE Annual Reports and Year at a Glance.

## 4.3 Technology Transfer

### 4.3.1 Overall Impacts

Direct technology transfer is also featured in networks. Some recent data are shown in Exhibit 4.2. Note that, as of the year 2000, nearly 80 spin-off companies associated with the NCE had been created, and there is active patent activity. Still, this table only represents a portion of important NCE activities, as several networks rely on other mechanisms; for example, the networks in the microelectronics fields typically carry out pre-competitive research (since this is the preference of their industrial partners), and others rely on application of research results by users in government or public service organizations (e.g., in fields such as forestry or health care).

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## Exhibit 4.2: Technology Transfer

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	2000-2001	1999-2000	1998-1999	1997-1998
Patents	170 filed; 56 awarded	66 filed, 31 awarded	102 filed, 36 awarded	Not reported
Licences	74 granted, 34 in negotiation	71 granted, 43 in negotiation	44 granted, 38 in negotiation	Not reported
Spin-off companies related to NCE	19	14	8	56 to date

\* Source: NCE Annual Reports and Year at a Glance.

Data from the evaluation surveys and interviews provide supporting evidence for these findings. In general, respondents found that there had been important impacts not only for industry but also for government and other organizations involved with the networks. Some partners commented that, although progress in these areas has been good, even more resources could be devoted to knowledge and technology transfer.

*... the multi-disciplinary geomatics research encouraged through [this network] has provided benefits to the federal government in a number of ways: for example, at least*

*two [government] programs are embracing new concepts and approaches, initially explored through a single [network] project. Spin-offs . . . will result in technology development useful for Canadians and for Canadian industry. (Partner)*

*The exposure to patenting and licensing is an exciting and rewarding experience for our members and their trainees, and it does provide Canada with novel biotech enterprises. (Researcher)*

*The alternative programs do not value target-oriented research, in fact there is clear discrimination toward R&D in these areas. There are no incentives to transfer IP and no rewards or incentives to foster technology transfer. There is no real appreciation for the creativity of moving discovery to applications and products just lip service [in the other programs]. (Researcher)*

*The NCEs have succeeded in establishing focused research networks in strategic areas for Canada but have had varying degrees of success in transferring research results for commercial applications. This program needs to be further refined but should not be terminated as it represents one of the best means for Canada to optimize its research capabilities and to build in mechanisms to facilitate commercial applications of research results. (Partner)*

*NCEs do not allow for enough funds to make a serious attempt at technology transfer and commercialization. It is necessary to have interested partners in the research. NCEs should award \$3M for the research and \$1M for technology transfer operations. (Partner)*

### **4.3.2 Intellectual Property Protection**

A short discussion of IP protection is worthwhile since it is still an area where some networks feel they have been successful, but others do not. The variety of IP ownership rules in different universities continues to be a stumbling block. The relationship between individual networks and their university Industry Liaison Offices varies: in some, it is excellent; in others, highly problematical (this may be more a matter of personalities than the NCE or network model). On the positive side:

*Networking and excellent follow-up for productivity and surveillance in patent development and applications. (Researcher)*

However, there still are problems, and this is one process area where respondents are not quite as positive (C:2g; D2g, F:2g):

*. . . the handling of IP is notoriously difficult when many universities in many provinces are involved. (Researcher)*

*There's a "happy tension" in our dealings with the UILOs, we're not exactly in love. (Network official)*

*NCE expects the networks to be run like small business enterprises but no business can run effectively without owning its product. Our product is intellectual property. (Network official)*

## 4.4 Long-term Impacts – Achievement of Goals

Overall, almost all respondents believe that the NCE has been successful or very successful in meeting its overall goal and four specific objectives (C:3, D:3, E:3, and F:3). Scientific leaders and network managers are the most positive on this score, with researchers somewhat less so (but still generally positive), and partners in between. To the extent that respondents found the program slightly lacking, it was mainly in the area of Objective 2, developing and retaining world-class researchers essential to Canada's productivity and economic growth.<sup>32</sup>

Older networks were all able to point to specific research results, and applications arising from those results, that they did not believe would have occurred through “normal” granting council programs. It was often possible during interviews with network officials to link specific impacts to the different processes used within networks. For example, some results would not have occurred without collaboration between scientists in different disciplines, or access to core facilities, or links to the users, or ability to follow the progress of research from inception to commercialization. Even some of the “new” networks can point to things that would never have resulted without the NCE structure. Incremental impacts include the following sample (we have not listed all accomplishments of each network, nor the accomplishments of all networks, but list these to give an idea of the nature of long-term impacts):

CBDN	A new cattle vaccine expected to protect consumer from E. coli 0157. A human vaccine is also under development. Research on E. coli 0157 led to production of a vaccine for cattle. This was done as collaboration between a UBC scientist and VIDO at the University of Saskatchewan. Intervention by the Network led to protection of the intellectual property where the university had not shown interest. The vaccine was licensed to Alberta Research Council and subsequently sublicensed to Bioniche Vetripharm. The Walkerton event has given prominence and importance to this cattle vaccine, affecting future government policy re food regulation and water safety.
CGDN	Discovery of 13 new genes from 1998-2000 and over 35 since 1990. Products to target presenilin, resulting in a treatment for Alzheimer's which otherwise would not have been patented and commercial value lost. Discovery of new candidate genes for ovarian cancer, novel enzyme treatment for PKU, early identification of retinoblastoma. Equity and royalty stream has generated an endowment of \$6.2 million; nine spin-off companies with \$406 million capitalization; \$35 million in non-NCE funding invested.
CITR	CITR has always focused on pre-competitive research and development of (and access to) HQP. Recent HQP trained by CITR joined major players such as Nortel, Newbridge, and Stentor and helped develop Asynchronous Transfer Mode (ATM) and Internet Protocol traffic management in Canada. Similarly, HQP trained in Code Division Multiple Access technologies have been hired by Nortel. In addition, CITR scientists have addressed many commercially-important technical questions for its partners.
HealNet	Evidence-based decision-making is a new slogan. HealNet helped create support for this idea and change the culture through, e.g., the National Forum on Health and the Canadian Health Research Forum. Ontario has just funded a new program led by one of the HN theme leaders. Overall, the ex-HN people are in very high demand across the country and internationally.
IRIS	The haptics interface research lead by McGill and also involving UBC. Start-up company Haptics Interfaces Inc (HTI) created.

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<sup>32</sup> Note that the recently initiated Canada Research Chairs program is specifically directed towards this goal, thus complementing NCE.

ISIS	The spin-off company FOX-TEK (which makes fibre optic instruments for strain measurements) could not have been created w/o the network. There will be cost savings through building and rehabilitating structures with fibre reinforced products (e.g., telephone poles, bridge decks), and reduced environmental impacts. New building codes have been created, and four design manuals created by ISIS are being sold worldwide.
Mechanical Wood Pulps	The Fibre quality analyzer came out of UBC. A very small company collaborated with MWP and went on to commercialize it. This project was successful, with huge export sales and won awards. The firm (Optest Equipment) is now on sound footing and provided new jobs in the Hawkesbury area.
Micronet	Nine spin-offs from Micronet, in addition to numerous licences. Micronet's efforts led to highlighting the need for highly qualified personnel in the microelectronics area and led to studies conducted by Industry Canada about the extent of that need and its effect on the Canadian economy (eMPOWR initiative).
MITACS	MITACS has had "huge success" across a broad range of economic sectors. The project with Ballard Powersystems has developed new models for fuel cell membranes. Ballard is now forming their own mathematical modeling group and hiring MITACS PDFs to work in the group. The project with Lockheed-Martin Canada has developed much better search-and-rescue software that is now being patented. There were very few students and PDFs working on applied research before MITACS. This has changed dramatically with huge numbers of students now undertaking this type of research

Roughly a third of the network researchers reported that they had achieved results that were truly ground-breaking in terms of the science or the potential "practical" application by network partners and/or other users (D:5a); this figure is quite high given the fundamental nature of much of the science. Nearly 60% of the partners believed similarly high levels of achievements had been made (F:5a), confirming the opinions of network officers and scientists. This is probably the most important type of impact for partners, and a high proportion of partners (84%) were satisfied or very satisfied overall with their involvement with the networks (F:18).

# 5. Findings on Program Design and Delivery Issues

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## 5.1 Introduction

Although the program design was generally rated as sound, and program delivery was in many cases adequate or better, some serious concerns were raised. These were significant enough that even some network scientific leaders and network managers, as well as researchers who are otherwise positive about the NCE, may worry about the benefits versus costs of participating.

## 5.2 Relevance of Program Design, Goals, and Objectives

### 5.2.1 Overall

The overall program design was seen by most respondents as relevant and effective (C:6, D:6, E:5, F:6). The program goals and objectives are seen by almost all respondents (80-90%) as still being relevant or very relevant (C:7a, D:7a, E:6a, F:7a). No significant issues were raised on this score, and again network partners were the most positive group of all (see F:7a). However, some serious but more limited problems were raised by many respondents. These are discussed below.

### 5.2.2 Annual Reporting Burden

Reporting is, of course, a fact of life for R&D programs receiving significant federal funding. However, even in this context the level of dissatisfaction within the NCE about annual reporting is high.<sup>33</sup> When combined with frequent and extensive reviews, the total paperwork increases even more. Moreover, many network investigators receive a relatively small amount (about \$40k, on average) of their overall research funding from the NCE; thus the “reporting per research dollar” is high relative to other granting council programs.

*Reporting is very onerous. The number of papers you receive and have to write is very high. Does it really help to do all this reporting? Enormous number of complaints, especially about ProGrid – extraordinary complaints about this.*  
(Member of Expert Panel, and network researcher, but see text)

*There is an enormous administrative overload and poor support to get it done. Rules are not clear and change continuously. NCE policy conflicts with policy at my university and I am crushed in the middle.* (Researcher)

*In the early stages of the network, the paperwork and reporting was onerous. Once our network was established, these tasks became more streamlined and easy to accomplish.*  
(Researcher)

However, not all the reporting is due to NCE Directorate requirements: some is required by individual networks themselves. For example, the Directorate requires annual statistical and

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<sup>33</sup> None of the network officials who were explicitly asked whether they could recall an instance in which these data were actually used to adjust their network or the program could recall an instance. However, use of these data was not specifically investigated in this study.

financial reports, as well as financial/compliance audits and a “network” annual report from each network. However, it does not require quarterly reports from the researchers themselves, as at least one network does for its internal purposes. Each network can establish its research review process, and the requirements vary among each Research Management Committee.

It is also unfortunately true that different data are needed by different organizations: by networks for internal management, by the NCE Directorate for program review, and by Central Agencies for accountability (including data needed for evaluation such as this one.) Further, there appears to be a fuzzy line between the “burden” required by the NCE Directorate and that of other programs; the ProGrid complaint above is a good example – the NCE Directorate does not use this tool, although the Canada Foundation for Innovation does, as well as at least one individual network partner. This evaluation did not investigate reporting requirements in detail; our conclusion is that there appears to be need for improvement, but probably not just by the NCE Directorate.

### 5.2.3 Self-sustainability

This appears to be a misperception on the part of many members of the academic community. Network officials believe that their second phase mid-term review requires that the network have a plan in place for long-term self-sustainability once the NCE funding terminates. Many respondents from the networks and several expert panel respondents believe self-sustainability is impossible without continuing federal support, and trying to create such a plan wasted a lot of time. (This did not mean that the Expert Panel members saw this as an excuse for allowing support past 14 years; most still believed creation of new networks was preferable.) Several Expert Panel members also reported expending considerable effort on this aspect of their review.

*The expectation was that after 14 years we would somehow be self-sustainable. This was a goofy idea from the beginning. The strength of the NCE is . . . not to make basic researchers become strictly industrial R&D types. (Researcher)*

*If self-sustainability is not realistic, then why ask it as a criterion, just accept that the network will end. Then no expectations, but no need for enormous effort either. (Expert Panel)*

*Not enough funds to adequately do commercialization too much friction with universities over IP issues; 14 year limit for self-sustainability unrealistic. (Researcher)*

On the other hand, networks near termination have clearly thought about long-term solutions:

*It is clear that some NCEs do not target self-sustainability, and in the absence of such a target, funding beyond 10-15 years is less productive. I think longer funding cycles should be linked to serious attempts to build self-sustainability or other long-term goals that might exceed 14 year funding possibilities. (Researcher)*

In fact, self-sustainability is not an NCE requirement. The Program Guidelines prior to 2002 stated: “In addition [to reporting on progress], the network must also detail its plan to accelerate its research

and commercialization activities *sustainable*<sup>34</sup> after the termination of the NCE funding.” The most recent Program Guidelines stated this even more softly: “The network must also detail, in its strategic plan, measures to accelerate its knowledge and technology transfer activities for the final years of funding.”<sup>36</sup> The NCE program officers noted that sustainability was really “a hope,” not a requirement, and no network has failed to receive funding because of the lack of such a plan.

## 5.2.4 Selection and Renewal Criteria

Many respondents mentioned that the Directorate (and the selection criteria for expert panels and selection committees) are too focused on dollar-value industrial benefits through product development, to the exclusion of important societal benefits that may arise through other means, or that cannot be easily measured in terms of sales revenues, spin-offs, etc. For example, benefits to society such as improved health, societal cost savings, improvements to government decision-making or regulatory ability are not seen to be given nearly enough emphasis.

The accuracy of these comments is difficult to judge. On the one hand, the NCE has always been promoted by Industry Canada as an industrial support program. On the other hand, the NCE Program guidelines *do* discuss other types of benefits, and are clear that these are valid and important. The respondents’ comments may reflect the fact that the actual selection process tends to focus unduly on industrial impacts.

*The emphasis on "products" is extremely daunting for many individuals, especially social scientists like myself. . . Also, the guidelines for renewal of NCEs seems mysterious and elusive. Researchers who look to other NCEs to see who was renewed and who was not, often find it difficult to understand what the criteria for renewal really are. (Researcher)*

*There is relatively little funding or chairs available for policy work in social science areas . . . Some of the new programs are very focused on the market place, job training and creating economic shifts – new areas and activities. Topics that don't fall within this policy objective or are less aligned with industry or government partnerships are left out. (Researcher)*

Part of the problem is that it is more difficult to measure impacts in the social sciences (and to a more limited extent in the health sciences), although recently there has been considerable thought put into how to generate societal benefits in these fields:

*[Need] the use of evaluation criteria that provide valid measures of the social impact of research There's little consensus yet about what indicators may be the most useful ones (Researcher)*

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<sup>34</sup> Our emphasis. Page 6, previous NCE Program Guide.

<sup>35</sup> Current Program Guide (2002).

## 5.2.5 Promotion of Canadian NCE Expertise and Reputation

Several of the Expert Panel and Selection Committee respondents noted that the development of international presence was an important impact of the program, and that the NCE doesn't promote itself enough internationally. During the literature review, we found that many of the individuals at other programs worldwide were relatively unaware of the NCE. Some Expert Panel respondents mentioned that the NCE could sell the model abroad.

## 5.3 Effectiveness of Program Delivery

### 5.3.1 Overall

The overall amount of administrative, logistical, and policy support provided by the Directorate to the networks is not seen in a very positive light by participants (C:11, D:11a, F:11), with roughly 25% of network officials and 15% of researchers rating this as poor or very poor (only 6% of partners rated it so low, but many respondents were not familiar enough to comment). Program delivery was seen as a mixed success by many respondents (C:20, D: 16, F:17): generally adequate, but with some shortcomings. The main problems are discussed below.

### 5.3.2 Network Application Process

The amount of work required during the initial application for a new network (i.e., after being short-listed following the first Letter of Intent) is enormous. This is particularly true during open (non-targeted) competitions, which put an especially high workload on the academic groups preparing proposals. For groups coming together for the first time and with little experience with the NCE, they often feel they are “working in the dark” with respect to what the Directorate really wants to see in the applications, and that the amount of required proposal detail is huge. Because the NCE follows a review process similar to that used during the response-driven grants programs of the granting councils, the NCE program officers maintain a “hands-off” attitude during the process. (The Directorate has in the past organized a teleconference with all the leaders of groups invited to submit a full application, and a program officer was assigned to each group to advise them as needed.<sup>37</sup>) Sometimes groups of researchers come together in the proposals that do not reflect true collaborations, but instead “networks of convenience” referred to earlier (perhaps partially because the applicants do not have sufficient information as to how to put “real” networks together).

*Far and away the most important improvement would be MUCH longer timeframes for the assembly of a team and the preparation of applications. The haste with which planning is forced to proceed is a major barrier to development of genuine partnerships across the network. (Researcher)*

*The application process is very punitive, and you're doing nobody a favour to have them go off and develop a proposal. Almost always the Panels say they had much more insight into the network after the field visits, rather than reading the huge volumes of material. If you can't describe the application in 30 pages, you're off track. Use a business model for the evaluation, a venture capital model: have an expanded letter of intent, plus a panel (e.g., of NCE program officers) to work with the applicants. (Expert Panel)*

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<sup>36</sup> Some applicants have called often, some not at all, according to the program officers.

A related problem referred to by several Selection Committee members was the difficulty in judging the relative merits of applications in different fields. These individuals mentioned that judging was much easier in the recent targeted competition, and a number of panel members were strong supporters of targeted competitions in general (while acknowledging the difficulty of selecting the targets).

*I'm friendly to strategic programs, I think it's been the targeted calls that have done the best . . . If you leave this to researchers, you'll get discipline-driven or platform-driven proposals.* (Expert Panel)

### **5.3.3 Assistance with Operational Matters**

Fully half of network officials (C:20, third row) believe there is poor or very poor support from the Directorate in this regard (this is the respondent group most likely to have good information on the topic). New networks in particular feel that there is often not enough support from either the program officers or existing networks to help them set up the network. At best, it takes one to two years to get “up and running,” which is then followed shortly by the first mid-term review. Additionally, it is not felt that the expertise of network officials is utilized to help each other, and especially new networks.

*My greatest criticism of the NCE Program is that it does not exploit fully the resources available in the senior management it has fostered into being. The senior management in most NCEs are trained at long term visioning and are working, sometimes at cross purposes, to bring Canada to a new level of productivity and leadership in the world in the promotion and management of science. Why not get this group to work more systematically together towards this goal, and exploit more fully the complementarities between the networks?* (Researcher)

*A major review at 3 years is a significant hurdle, and tends to dissuade researchers from the long-term commitments involved in a substantial expansion of graduate student and postdoc numbers.* (Researcher)

On the other hand, with respect to complaints mentioned in sections 5.3.2 and 5.3.3, the NCE program officers noted that they do, in fact, spend considerable time interacting with networks, and especially with new networks. For newly awarded networks, the program officers report that they spend a “huge” amount of time advising them, including sending them “best practices” by e-mail on appropriate network structures, organizing an information session, providing an “NCE Handbook” giving them more information on how to start a network (e.g., incorporation, Boards, communication plan, etc.). The complaints should therefore be taken in the context of the NCE being aware of the issue; however, more effort is probably required.

### **5.3.4 Requirements of Network Management**

The network administrative role is heavy and the study team believes it is often underestimated at the outset by network proponents. Even disregarding the paperwork, the effort required for research management, identification of promising technologies, IP protection, liaison with partners, technology transfer, training, etc. is often much higher than anticipated by new networks, which may not put enough resources into this function. It is, however, a crucial feature of successful networks, and several respondents commented on this. Of course, this is not directly related to the Directorate, although it calls for the NCE to provide better briefing of potential applicants with regard to proper planning of the necessary managerial and administrative resources.

*There needs to be an understanding that NCE managers need not be the best scientists in the world: the criteria to choose the Director are NOT the same as the criteria used to review the science. Large-Scale, Multi-disciplinary multi-team management is a skill that very few individuals have within research and there is little or no recognition given to the support, skills and knowledge that are required. It's not something that can be done in one's spare time. (Researcher)*

## 5.4 Alternatives to the NCE Model

Very few respondents among network officials, members of Expert Panels and the Selection Committee, or partner organizations believed there was a serious alternative to the basic NCE model (C:9, E:8, F:9), although somewhat more researchers thought so (D:9).<sup>38</sup> The hesitations were not mainly with respect to the benefits afforded by networking, but about the load of management, administration and red tape<sup>39</sup>:

*The NCEs in their early years played a very valuable role. Now I think they are more negative than positive. The need to show unrealistic technology transfer is too great, the administrative overhead likewise. The money would be better allocated and more effectively spent through the councils. (Researcher)*

*Its not what is missing but that there is too much structure, too many constraints, too many quarterly reports. Research doesn't come in neat packages, with milestones to be passed every week,, month or quarter. It comes from leaps and bounds of increased understanding, and the structures look like a civil service machine that is stuck on process with no concern for results and efficiency. (Researcher)*

One older network (CARNET), of course, decided not to re-apply for funding partially because of this problem.

A couple of partners commented on the need to think more carefully about the need to refine the “after-NCE” portion of the commercialization process, while keeping in place the basic model.

*What is needed is a complementary program to help manage and to add value to NCE technologies that find their way into spin-off companies. (Partner)*

## 5.5 The NCE Role in International Collaboration

The program encourages international participation, but does not allow networks to supply NCE funding to researchers outside Canada. (Current granting council rules do allow foreign researchers to obtain up to three months’ travel expenses when visiting Canada in joint research projects. Also Networks can use partner funds to support research abroad.) The current role of the NCE is said to be roughly weak to moderate in strength (C:7b, D:7b, E:6b, F:7b); again partners were most likely to

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<sup>37</sup> This makes sense given that researchers— who typically only receive a small proportion of their research funding from the NCE – have many more alternatives for research support.

<sup>38</sup> Some of the researchers’ comments clearly reflected a lack of support for the underlying NCE goals, and a desire to conduct “business as usual” through fundamental research programs. However, many complaints were based on efficiency arguments – the costs outweighed the benefits.

find this role strong. Most respondents noted that this role should be increased in light of the increasing need to be able to access not only the best researchers in the nation, but the best in the world (C:7c, D:7c, E:6c, F:7c), with all respondent groups being in strong agreement. Some Expert Panel members commented that they saw a lack of crucial international collaborations in applications for new networks; however, they agreed that providing research funding to support these collaborations is not required, except perhaps travel expenses for researchers visiting Canada.

*More international collaboration, this may be the next big step. We don't have all the answers in Canada, so there are clear benefits for more international collaboration. Get our house in order, then get "the relatives" involved. (Expert Panel)*

## 5.6 Factors that Facilitate or Hinder Success

The main factors influencing individual network success (in very roughly decreasing order of mention) are<sup>40</sup>:

World-class scientific leadership.

True collaboration among researchers (not “collaborations of convenience”), who represent the best people in the field (not being only part of an “old boy’s club”), effected especially through face-to-face meetings.

Strong administrative support, including having a strong network manager and Board of Directors.

A strong and active role for partner organizations throughout the network planning and research processes (this was by far the most common factor mentioned by respondents in the partner survey).

Integrated research program, in which the themes are mutually self-supporting (as opposed to being unlinked, or in which individual projects are not linked), and to which the network researchers are fully committed. Related to this is the need for excellent communications.

Multidisciplinary approach in which the “peripheral disciplines” are well integrated into the overall network strategy, as opposed to being brought in for appearance’s sake.

Conversely, not having these factors was likely to lead to failure. Researchers additionally commented that excess “bureaucracy” impeded progress, while partners commented that complex IP issues and poor relations between networks and UILOs could hinder progress, as could trying to cope with the diversity of needs among partner organizations.

## 5.7 Role of the Social Sciences and Humanities

### 5.7.1 Introduction

The network selection criteria were recently revised in order to put more weight upon network impacts in social, legal, ethical, and policy arenas (i.e., not just impacts relevant to Canadian

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<sup>39</sup> Based on data from Expert Panels and Selection Committee, researchers, and partners.

industry). Weight was also put upon the attention paid by individual networks (i.e., including networks in the sciences, engineering, and medical fields) to these factors during network operations. The unstated intent was to involve social sciences and humanities (SSH) research more fully (e.g., in having SSH researchers be more successful in leading networks), and in involving the SSH in a more integrated manner generally (e.g., within the program overall and in terms of participation within individual health-oriented and science/engineering-oriented networks).

## 5.7.2 Data from General Surveys and Interviews

Network officials rated attempts at integrating SSH concerns as partially successful (C:18), while members of the Expert Panels and Selection Committee rated them as generally unsuccessful (E:14),<sup>41</sup> although agreeing that the newer, targeted networks have been more successful than in older ones.<sup>42</sup> Several respondents made the comment that an unvarying application of a rule requiring SSH participation in *all* networks did not make sense: some networks could clearly benefit from such participation, but in others there was little or no apparent “fit.”

## 5.7.3 Data from Interviews with Senior SSHRC Officials

In addition to asking survey and interview respondents about these issues, a special exercise was conducted to investigate the appropriateness of the NCE model for SSH scientists; see section 2. The findings related to this issue were:

**Recent emphasis on the appropriate inclusion of SSH disciplines in NSERC and CIHR networks.** Senior SSHRC officials believe this has been successful – there is now much more consideration of SSH disciplines in structuring network research programs. The “new” selection process is believed to be working fairly well, since inclusion of SSH disciplines is carefully considered, in general, in the selection process. Several members of the Expert Panels, as well as some individual network officials, agreed with this sentiment, especially for the four new networks selected during the most recent targeted competition. Both the SSHRC officials and some members of the Expert Panels and Selection Committee were aware of network applications being refused because of insufficient SSH participation in the proposed network.

It was noted that the recent targeted NCE competition – although a huge amount of work – did work from the SSH perspective. Targeting was thought to be much better at ensuring an even discipline spread and, in particular, an appropriate focus on SSH disciplines. (The NCE program officers noted that all four of the newest networks include a SSH component, whereas many of the older networks were more “uni-Council” or not as broadly multidisciplinary.)

**Creation of SSH-based networks.** Senior SSHRC officials felt that there are some disadvantages for proposed SSH-based networks for the following reasons (several of these factors were also mentioned by Expert Panel and Selection Committee members):

The participation of Industry Canada as one of the four NCE sponsors means that generation of industrial benefits – and especially new products, processes, and start-up companies – is

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<sup>40</sup> Most respondents of both types had little information on the success in creating or maintaining SSH-based networks, and mainly commented on integration issues.

<sup>41</sup> Although about half of this group did not know enough to comment.

given more emphasis than other means of generating societal benefits (even financial ones that might result from cost savings generated through SSH research, such as reduced justice system costs). There was support within SSHRC for also involving Health Canada, HRDC, and Heritage Canada as equal partners to Industry Canada – this would help “even out” the Industry Canada influence. (However, this would open the door to many other relevant departments such as Fisheries and Oceans Canada, Environment Canada, etc., and would probably make the Directorate unworkable.)

The NSERC and CIHR members of the Selection Committee have a common language; this is not true of the SSH members.

SSH researchers tend to be more critical, even of their own disciplines. This is the nature of these disciplines, and it should be acknowledged at the beginning of the selection process (but often is not).

The scale of NCE proposals is a factor – SSH researchers have much less experience putting together large proposals. (SSH researchers at universities don’t even have the same level of administrative support as other types of scientists.) Large SSH-led NCE networks tend to attack too wide a range of research topics. The smaller SSHRC networking programs are more successful in achieving a strong research focus and are usually a more appropriate model for SSHRC researchers.

Leadership is also a factor here – there may not be many SSH researchers who are capable of creating a large integrated research program, again partially because of lack of experience, but also because of the lack of a common language among SSH researchers.

The SSH receptor sectors are much more nebulous and difficult to define. Also, there are methodological problems associated with measuring the impacts of SSH research, and this works against SSH applications (and, especially, the continuation of SSH networks).

On the other hand, senior SSHRC officials believed that there are recent changes within SSH fields that may facilitate future creation of SSH-based networks:

There has been greatly increased levels of collaboration within SSH disciplines.

SSH researchers are beginning to think in a strategic way about socio-benefits, far more than was true 10 to 15 years ago. For example, SSHRC is now designing a performance measurement system that asks grant holders to report such impacts.

## **5.8 The 14-Year Sunset Rule**

The Terms and Conditions of the NCE Program under the 1997 Memorandum to Cabinet<sup>43</sup> allows a maximum 14-year term for funding individual networks (i.e., over a maximum of two seven-year cycles). The network officials and researchers mentioned many impacts that could not be achieved without such a long term of funding, including the ability to create stable research groups, the flexibility to shift people and resources among different themes and projects, and the ability to plan for long-term goals.

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<sup>42</sup> MC – Feb, 18, 1997 – 05-0006-97-MC and TB, April 24, 1997- 825255.

The need to terminate funding<sup>44</sup> for every network after a maximum of 14 years is probably the most contentious of the current NCE regulations. Most networks and Chairs of the Boards of Directors are lobbying NCE to eliminate the sunset rule, and instead to base renewal strictly on success:

*In recognition of the important and continuing contribution being made by Networks, it is the recommendation of the Chairs Committee that the success of the mature Networks be recognized by eliminating the fourteen year rule, and allowing those Networks that have successfully completed fourteen years to apply for renewal funding for addition 7-year periods. This will allow the Networks to retain their identities, their infrastructures and their missions intact. (Letter from Chairs to Directorate, March 19, 2002)*

The argument is that a funding sunset unfairly punishes networks working in areas where research solutions are only likely to arise in the very long term or where commercialization takes place over long timeframes (e.g., in the medical fields); or where research infrastructure needs to be maintained for decades (e.g., in agriculture, forestry). This was agreed by many respondents to be a good argument, but of course there is also a good counter-argument: that funding sunsets allow new research or application ideas to be supported within a fixed budget and prevent “old” networks from becoming entrenched and out-of-date. There was certainly no consensus among evaluation respondents as to the appropriateness of this rule. Even network officials were not in complete agreement here (C:12): Those who disagreed with the sunset rule disagreed very strongly, while others felt that there were certainly situations where networks had effectively addressed their original problems within the 14-year span. Of course, this tended to vary by field and sector (C:14; F:14), although all respondents argued that potential renewal past 14 years should be based on individual network success, not the field or sector.

These split opinions were also found among members of the Expert Panels and Selection Committee (E:10, E:12), although these individuals tended to be more supportive of the idea of forced sunsets, arguing more forcefully for the benefits of new ideas and new networks being supported. They noted that most other international programs for networked research have similar sunset rules, often over even shorter timeframes. Nevertheless, some respondents liked the idea of “flexibility” in this rule, while acknowledging the practical difficulties and having few concrete suggestions for implementation. Some individuals suggested a compromise: allow a few networks (say, two) to continue past 14 years if exceptional arguments could be made for them.

Many network researchers and (especially) partners also thought the 14-year term was appropriate (D:12, F:12), although again there was disagreement from a substantial minority of respondents. It is worth noting that there were far more “don’t know” responses regarding the appropriateness of this term for the medical and SSH fields than in the NSERC disciplines.

## 5.9 Winding Down Networks

A number of networks have now terminated, while five others will reach their 14-year funding sunset in 2005. Of interest is whether there should be some mechanism in place to continue their legacy after termination of NCE funding. (There is currently a Research Management Fund designed to

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<sup>43</sup> This is not the same as terminating the network, which may continue to exist through other means of support.

provide bridge funding to help continue network activities after the NCE maximum duration, but it does not provide research funds. And of course, networks may continue to obtain funding from other partners. The question is whether this is enough.)

The members of the Expert Panels and Selection Committee did not have strong opinions on this score. Opinions among network officials were divided, even assuming there is no change to the current sunset rule (C:17a). Many of the latter respondents believed it made little sense to try to maintain a network in the absence of research funding, while others thought that funding to support a limited number of meetings among Principal Investigators made some sense (this would require only perhaps \$20-30k annually). It was pointed out that the amount of capitalization derived from network IP would have to be at least \$25-30 million in order for the interest to provide sufficient “top up” to industry funding to continue a network with funding equivalent to that from the NCE; this was considered quite unrealistic even in the most successful networks (and, of course, would have to be divided in some way with universities, depending on IP ownership). Network partners were much more likely than other respondents to agree that some type of post-network funding was required to maintain a legacy for Canada (F:16a); only 7% of respondents thought it was inappropriate.

A study of eight networks that were terminated in the past<sup>45</sup> found that some limited networking and collaboration did continue after termination, but funding levels dropped significantly and the “network” activity emphasis changed. Only one network (Neuroscience) found continued research funding, and even there shifted emphasis to training. Two (Neuroscience and Inspiraplex) now focus entirely on commercialization; another (Insect Biotech) restricts its activities to an annual conference and informal networking.<sup>46</sup> One (CNSR) now continues in part within the Canadian Space Agency. Three (CARNET, OPEN, CEMAID) did not continue in any fashion, and the last (Concrete) had a limited three-year continuance with support from industry and NSERC. The existence of any long-term networking activities was related to the “true” collaboration and commitment of network scientists prior to termination, as well as commitment from the Boards and industry partners. At the time, termination came as a surprise to most of these networks and they did not have a transition plan in place; this situation will be different for networks at the end of 14 years and it remains to be seen what will arise from the current cohort of networks.

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<sup>44</sup> *A Study of Former Networks of Centres of Excellence, Final Report*, The Impact Group, December 2001.

<sup>45</sup> Of interest is that more than one respondent who came from a terminated network mentioned that they originally applied to NCE simply to obtain more research funding, without believing in the networking concept. However, they had become “converts”, and continued to maintain their network connections long after the network terminated.

## 6. Conclusions

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### 6.1 Program Rationale

The study found that the NCE is still a necessary and valuable component of the Canadian research and innovation system, even though “normal” granting council programs and other national programs in some cases have incorporated NCE-type elements in their design. Compared to similar programs, the NCE can be said to provide the following advantages:

**Research networking and collaboration.** The NCE has been successful in gathering support from a wide variety of sources. Over 1,100 organizations are currently involved – from academia, industry, hospitals, federal and provincial agencies, and international organizations – although the true extent of “participation” appears to vary widely. The collaboration among NCE researchers is more extensive, wider ranging, and useful than the networking through most “normal” sources of support. The 14-year network allowable lifespan affords the ability to develop long-term programmatic R&D planning. This is coupled with budgets for individual networks that are, in Canadian terms, very large, and certainly much larger than available from almost all other granting council sources,<sup>47</sup> again assisting in the development of long-term planning.

**Partnerships with users.** Each network has, on average, roughly 50 partners, many of which are potential “users” in industry and/or government. Partners contribute significantly to the total resources: roughly \$61 million in NCE’s Phase I compared to NCE’s \$240 million; \$183 million in Phase II compared to NCE’s \$178 million. In 2000-2001, partners contributed \$38 million in cash and \$46 million in-kind, compared to NCE’s \$77 million. A large majority of evaluation respondents (75% or more) regarded the NCE as superior to other programs in its encouragement and support for partnering: the NCE is longer-term, with more resources, more multidisciplinary, and concern for the issues of user organizations emerging through true partnership arrangements.

**Pan-Canadian networking.** NCE supports pan-Canadian collaboration, bringing together all the best researchers across Canada to investigate specific topics. Most other programs tend to support networks that are more regional either because of their provincial focus (as in the Ontario Centres of Excellence), or because of more restricted resources. Further, this networking is actively managed by each network.

**Multidisciplinary.** The NCE was found to be more multidisciplinary than “normal” programs by at least 75% of respondents (varying by group). The networks find multiple ways of addressing each research topic; this again is practical because of significant resources and pan-Canadian focus.

**Cross-disciplinarity.** The NCE is far ahead of other programs in terms of integrating research across the three “major disciplines” (i.e., natural sciences and engineering, medical and health research, and social sciences and humanities research) within one research

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<sup>46</sup> Even in international terms, these budgets are significant. Some respondents from the UK and even the US reported being “quite envious” of some network funding.

program. Although there has been mixed success on this front in many individual networks (especially regarding SSH integration), almost no other program even attempts this (although recently CIHR is making similar efforts).

**Ability to train HQP in novel ways.** In 2000-2001, the NCE supported almost 1,400 university researchers, about 300 non-university researchers, and about 2,200 HQP. A further 2,100 HQP are in NCE networks but supported through other funding. The NCE allows HQP more grounding in the “business of business”, both through exposure to the R&D concerns of network partners, and through active participation in knowledge transfer (and in some cases, commercialization) activities. This is an area, however, that was not highly rated in terms of uniqueness or superiority compared to other programs, especially within newer networks.

**Support for all phases of R&D.** The NCE essentially integrates the types of support available from the many other programs available. In particular, it is a single umbrella organization that supports innovation all the way from conducting pure research to creating commercial and/or social applications, so that an individual researcher need not apply multiple times to multiple funding sources, as would be necessary if attempting a similar range of work through other programs.

**Ability to support risky R&D.** The “portfolio” approach of individual networks allows them to support a few high-risk projects to a greater degree than is usually possible through other research support programs.

**Critical mass and international recognition.** The NCE creates internationally known Canadian centres of expertise. Even with the relatively limited total funding, Canada can provide for research compared to some other countries and is “in the ballgame” internationally in selected areas.

**User focus.** The more singular focus of network scientific leaders, network managers, technology transfer officers, etc. allows them to know their users well, understand who the key players are and who is likely to take up the technologies best, etc.

Particular attention was paid to potential overlap of NCE networks with the new CIHR Institutes, since some features of the latter are similar to NCE networks. As the 13 CIHR Institutes had been operational for less than 14 months at the time of our data gathering, many informants were insufficiently familiar with them to comment definitively on the issue. It was pointed out that any overlap in *process* is unimportant so long as there is no overlap in *content* among individual networks/institutes. The mandates, foci and funding levels for CIHR Institutes differ from those of NCE networks. The two structures appear to be responding to different needs, in different ways, and thus the existence of the Institutes does not weaken the rationale for the NCE Program. It is reasonable to conclude that if directors of health-related NCEs and scientific directors of CIHR Institutes communicate regularly and effectively, complementarity of efforts should be assured.

The international literature review provided strong support for the NCE concept. In general, all countries reviewed had addressed recent changes to the research environment in ways that reflected the NCE to greater or lesser extent. It is now difficult to find an OECD country that does not have a program to support virtual networking. Many of the international programs incorporate some, but not all, NCE features, with considerable differences across countries and programs. Several non-Canadian members of the NCE Expert Panels or Selection Committee commented that they were “jealous” of the resources and strengths of the NCE.

Notwithstanding the foregoing, there is a strong sense of unhappiness in some quarters – fully a quarter of NCE researchers were dissatisfied or very dissatisfied with their NCE experience, mainly with respect to the workload of the application, review, and annual reporting processes. These will be discussed below.

## **6.2 Program Impacts**

### **6.2.1 Process Impacts**

The NCE Program has transformed the way research is conducted. Overall, most respondents believed that the processes used by the networks were either the same, better, or much better than those arising from “normal” granting agency support. Very few believed they were worse. This included differences in research, collaboration, interdisciplinarity, student training, partnerships with users, knowledge and technology transfer, intellectual property (IP) protection, and development of local and national critical mass. Many compelling examples of these differences were given by network officials, researchers, and members of Expert Panels and the Selection Committee. Of course, not all respondents agreed that it was different from “business as usual”, and this probably reflects a lack of real commitment to NCE goals among some individual researchers or, perhaps, at some individual networks.

### **6.2.2 Knowledge Transfer**

Most of the HQP trained by networks (at least 88% in 2000-2001) find employment after leaving the network (typically after graduation), with roughly half subsequently employed by industry, an effective means of knowledge transfer. A substantial number are also employed by government, in which scientific knowledge is becoming increasingly important to allow knowledgeable decision-making.

### **6.2.3 Technology Transfer**

As of the year 2001, 97 spin-off companies associated with the NCE had been created, and there is active patent activity – 56 granted among 170 filed in 2000-2001 alone. This only represents a portion of important NCE activities, as several networks rely on other mechanisms; e.g., the networks in the microelectronics fields typically carry out pre-competitive research and others rely on application of research results by users in government or public service organizations.

### **6.2.4 Intellectual Property Protection**

There are still problems within some networks in terms of IP protection and exploitation, reflecting both the variety of IP ownership rules at various universities, and variable levels of trust and collaboration between individual networks and their university Industry Liaison Offices.

## **6.3 Long-term Impacts – Achievement of Goals**

Overall, the NCE appears to have been successful or very successful in meeting its overall goal and four specific objectives. To the extent that respondents found the program slightly lacking, it was mainly in the area of Objective 2, developing and retaining world-class researchers essential to Canada's productivity and economic growth. This may partially reflect a feeling that HQP programs are not “as different” as other features of the networks. Overall, a significant finding is that the partner organizations were typically as satisfied, or even more satisfied, with the NCE's design, delivery, and impacts than were the network officials and researchers. This is an unusual finding in

R&D evaluations, as typically program officials are the most positive about any given program, researchers are slightly less satisfied, and partners (especially in industry) are the least satisfied (even if still generally positive).

The study found that it was often possible to link specific impacts to the different processes used within networks. For example, some results would not have occurred without collaboration among scientists in different disciplines, or access to core facilities, or links to the users, or ability to follow the progress of research from inception to commercialization. All of the “old” networks were able to point to specific research results, and applications arising from those results, that they did believe would not have occurred through “normal” granting council programs. Even some of the “new” networks (or the Expert Panel members that reviewed them) can point to features of their programming that would never have resulted without the NCE structure. Many of these accomplishments are believed to be of high economic and social importance, and many examples were provided of potential applications. Roughly a third of researchers, and nearly 60% of partners, believed that their networks had scientific and/or commercial results that were truly groundbreaking in nature. A high proportion of partners (85%) were satisfied or very satisfied with their NCE experience overall.

## **6.4 Program Design and Delivery**

### **6.4.1 Overall**

The program design and delivery were generally rated as sound. However, a substantial minority of respondents worry about the costs versus the benefits of participating in the program because of issues noted below.

### **6.4.2 Relevance of Program Design, Goals, and Objectives**

Virtually all respondents agree that the program design, goals, and objectives are still relevant. However, serious problems were mentioned in terms of:

The annual reporting, which is considered onerous. (However, some reporting is required by the networks themselves, not the Directorate.)

The perceived “requirement” for demonstrating future self-sustainability during each network’s second phase mid-term review, and which consumes considerable effort on the part of the networks. (This appears to be a misperception about the intent of the Directorate: “self-sustainability” is *not* a requirement, and no network has been refused funding for not having such a plan in place.)

Perceived undue emphasis of network selection and renewal criteria upon industrial benefits that can be measured in dollar terms. (Again, the Directorate has emphasized that this is not actually the case, so this may reflect some problems in communication or in the selection process.)

The Expert Panel members commented that the NCE should promote the program far more internationally, perhaps even selling the model abroad. (In our international literature review, we found that few respondents had heard of the NCE.)

### **6.4.3 Effectiveness of Program Delivery**

The overall amount of administrative, logistical, and policy support provided by the Directorate to the networks is not seen in nearly as positive a light by participants, with roughly a quarter of network officials and 15% of researchers rating this as poor or very poor. The chief complaints are listed below, and it should be noted that these are significant enough to cause even some NCE supporters to worry about the underlying validity of the program:

Very heavy workload during the application process for new networks. This can take up to a year and involve many individuals, who often feel “in the dark” as to what the program requirements really are, and with a poor chance of success. (Some assistance is available from the Directorate, although not all applicants take advantage of it.)

Less assistance than required from the Directorate with network operational matters, especially for new networks. Although most of the NCE program officers received “good marks” for their assistance and expertise, many respondents considered them underutilized.

Possibly, not enough emphasis from the Directorates to applicants as to the extent of required network management.

### **6.4.4 Alternatives to NCE Model**

No substantial “concrete” alternatives were identified, and it is difficult to see how existing programs could fill the gap if the NCE were terminated (at least without duplicating its features). Very few network officials or members of Expert Panels and the Selection Committee believed that there was a serious alternative to the basic NCE model, although somewhat more researchers thought so. (Researchers presumably have more alternatives available to them.)

### **6.4.5 NCE Role in International Participation**

The program is said to be roughly weak to moderate in its encouragement for international collaboration. Most respondents noted that the role of the NCE should be increased in light of the growing need to access not only the best researchers in the nation, but the best in the world. Expert Panel members commented that they sometimes saw a surprising lack of crucial international linkages in proposals for new networks.

### **6.4.6 Factors that Facilitate or Hinder Success**

The main factors leading to success in individual networks are:

World-class scientific leadership.

Strong administrative support, including having a strong network manager and Board of Directors.

A strong and active role for partner organizations throughout the network planning and research processes.

True collaboration among researchers (not “collaborations of convenience”), who represent the best people in the field (not just an “old boy’s club”).

Integrated research program, in which the themes are mutually self-supporting (as opposed to being unlinked, or in which individual projects are not linked), and to which the network researchers are fully committed.

Multidisciplinary approach in which the “peripheral disciplines” are well-integrated into the overall network strategy, as opposed to being brought in for appearance’s sake.

Conversely, not having these factors was likely to lead to failure. Researchers commented that excess “bureaucracy” impeded progress, while partners commented that complex IP issues and poor relations between networks and UILOs could hinder progress, as could trying to cope with the diversity of needs among partner organizations.

#### **6.4.7 Role of the Social Sciences and Humanities**

The network selection criteria were recently revised in order to put more weight upon network impacts in social, legal, ethical, and policy arenas. Weight was also put upon the attention paid by individual networks to these factors during network operations (i.e., including networks in the sciences, engineering, and medical fields). The unstated intent was to involve social sciences and humanities (SSH) research more.

In general, the evaluation found that there had been mixed success on these fronts. Almost certainly there has been more success in integrating SSH issues into the “NSERC” and “CIHR” networks, especially in the newer, targeted networks. However, it is still difficult to do (especially in non-targeted competitions) and the appropriateness of doing so varies by network. There are a number of problems that currently prevent more SSH-led networks, and in general it appears that the NCE is not the most appropriate model for SSH researchers to use for creating networks. (Problems include the lack of experience of SSH researchers in running such large networks and the resulting lack of research focus; the lack of SSH-based organizations as NCE sponsors; the diffuse nature of receptor organizations; and the difficulty in measuring impacts in SSH fields.) However, there have been recent changes within SSH fields that may facilitate future creation of SSH-based networks, including greatly increased levels of collaboration within SSH disciplines, and more SSH strategic thinking about how to generate socio-economic benefits.

#### **6.4.8 The 14-Year Sunset Rule**

The network officials and researchers mentioned many impacts that could not be achieved without at least 14 years of funding, including the ability to create stable research groups, the flexibility to shift people and resources among different themes and projects, and the ability to plan for long-term goals. However, the need to terminate *every* network after a maximum of 14 years is probably the most contentious of the current NCE regulations, and there are clearly good arguments for and against continuing this rule. There was certainly no consensus among the evaluation’s respondents as to the appropriateness of this rule, and opinions tended to be strongly either pro or con. Clearly, there was some support for vaguely defined “flexibility” in this rule; e.g., allowing a few networks (say, two) to continue past 14 years if exceptional arguments could be made for them. The literature review found that networking programs in other countries generally have even shorter sunset timeframes than the NCE, but on the other hand, most international programs do not have all the NCE features, or have a more limited focus. Overall, we do not believe we have sufficient evidence from the evaluation to make a sound judgment either way.

## 6.4.9 Winding Down Networks

A number of networks have now terminated, while five others will reach their 14-year sunset in 2005. Should there be continuing support of some kind to terminated networks? Again, the evaluation evidence is not sufficient for us to make a reasoned argument either way.

The members of the Expert Panels and Selection Committee did not have strong opinions on this score. Opinions among network officials were divided, even assuming there is no change to the current sunset rule. Many respondents believed it made little sense to try to maintain a “network” in the absence of research funding, while others thought that funding to support a limited number of meetings among Principal Investigators made some sense. (Virtually no one thought that self-sustainability in the absence of NCE funding was achievable.)

In the past, the eight networks that were terminated experienced significantly decreased total funding levels after termination, and their activity emphasis changed significantly. The existence of long-term networking activities was related to the “true” collaboration and commitment of network scientists prior to termination, as well as the commitment from the Boards and industry partners.

## 7. Recommendations

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The recommendations are listed in roughly decreasing order of importance. Some are accompanied by discussion based on further information obtained from the NCE Program administrators and other sources.

- 1. Recommendation: Continue the Program.** The evaluation showed that the NCE is still a valuable and unique part of the Canadian research landscape. This is true even though a number of other programs now share some NCE design and operational features. Not only does the NCE have significant benefits for Canadian researchers and partners, it compares very well to similar programs worldwide. Although a number of recommendations are suggested below to improve it, these must be seen in the context of relatively minor adjustments to a very successful program.
- 2. Recommendation: Reduce Application Effort for New Networks.** Preparing an initial application for a new network reportedly takes the better part of a year for the key participants. During this period, the NCE Directorate maintains a mainly hands-off attitude and many applicants have reported being essentially in the dark as to what is likely to win approval.<sup>48</sup> Not all of the voluminous documentation is always read by members of the Expert Panels (there is currently an 80-page limit for the main text, plus two supplementary volumes). Overall, there seems room for improvements to this process.

**Discussion:** Although reducing the size of proposals would obviously reduce effort, the NCE tried a 60-page limit in the last competition only to find that networks felt there wasn't enough room to adequately cover their proposal. There is no obvious solution, but some possibilities include:

Reducing the time between the Letter of Intent and submission of the Full Application. If nothing else, this would put an upper bound on how much work can be done.

Adding more time for the site visits of the Expert Panels, some of whom noted that the question-and-answer periods were not always quite long enough to investigate crucial issues such as the extent of “true” networking, leadership, and the integration of research themes. (This would help fill any gaps left by shorter or less complete applications.)

Using a more “hands-on” application process, closer to a “business model.”<sup>49</sup> It would require a more rigorous Letter of Intent phase, so that fewer groups are

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<sup>47</sup> The NCE Program administrators report that they make themselves available during the application process, but they do not “push themselves” on the applicants, and not all applicants take advantage of their advice.

<sup>48</sup> That is, the type of process used when, for example, a venture capital firm assists a start-up, or when a start-up prepares a business plan. It does *not* refer to making the networks more business focused.

asked to prepare full applications. The Full Application would be much shorter, more in line with a business plan, and NCE program officers and other NCE officials would provide active assistance to create the best possible proposals. There are some obvious potential problems with this approach, and certainly it would be quite different from the granting council norm. Some other programs use this technique,<sup>50</sup> and a review of these would help identify pros and cons.

- 3. Recommendation: Review the Network Selection and Review Process.** It is necessary to ensure that the network selection and review process takes sufficient account of benefits that can arise through mechanisms *other* than creation of new industrial products and processes.

**Discussion:** Although there is certainly an emphasis on quantifiable benefits, the NCE Program Guide is clear that non-industrial benefits (e.g., better environment, increased health and safety, better government decision-making) are also valid. This problem may be partially a matter of communication from the Directorate rather than needing changes to the NCE policy itself, as there appears to be some misperception of NCE requirements. It may also arise partially due to the difficulty of finding a common metric to evaluate proposals in very different fields, so that it is easier to judge the worth of networks that anticipate industrial benefits.<sup>51</sup> It may partially be addressed through further encouragement by the Directorate to the Expert Panels and Selection Committee to ensure that they use these criteria properly. Possibly the networks (especially those oriented towards the social sciences) need more assistance in measuring and reporting such benefits (SSHRC is currently revising its reporting requirements in order to better account for this fact, and the CLLRNet network is also investigating this issue.)

- 4. Recommendation: Review Annual Reporting Data.** Many network respondents complained about the high reporting load.<sup>52</sup> Review the extent to which the current annual reporting data are actually being used, and simplify reporting if possible.

**Discussion:** Such data can be used in three ways: (1) to help the networks in their internal management; (2) to help the Directorate manage the program as a whole; and (3) to help the NCE explain and justify the program to Central Agencies and the general public (e.g., through program evaluations). Each unfortunately requires different types of data, and some degree of reporting is formally required by Treasury Board. However, it is possible that some of the current data are not very important for any of these reasons; any opportunities to streamline the reporting should be taken. KPMG Consulting found that the data were, in fact, useful for the evaluation, although generally only data summed across Canada were used, whereas the data are collected in great detail by institution (possibly this is the only sensible

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<sup>49</sup> For example, the Environment and Infrastructure Program of the UK's Engineering and Physical Sciences Research Council, or France's Réseau d'innovation.

<sup>50</sup> In the opinion of members of Expert Panels, targeted competitions would help on this score, but we do not have sufficient evidence to comment.

<sup>51</sup> Of course, this is a common finding in many evaluations, but it was more common, and more intense, than usual here. It should be noted that this evaluation did not specifically focus on reporting requirements and thus we have limited information.

way to do it, however<sup>53</sup>). The NCE Program administrators reported that all monitoring data were used by them in some fashion as well. Further, some reporting (e.g., lengthy text-based reports, or quarterly reports) are actually required *by individual networks* or their committees (e.g., the Research Management Committees) as opposed to being required by the Directorate (which only requires annual reporting, and mainly in a statistics-based report). Thus not all the burden is being imposed by the Directorate, and individual networks would have to participate in the review process. There is an initiative currently under way within the granting councils and the NCE to co-ordinate their reporting requirements as much as possible, perhaps through web-based designs,<sup>54</sup> and certainly this should form part of the review. Similar co-ordination with other organizations such as the Canada Foundation for Innovation or the Canada Research Chairs program may be possible.

- 5. Recommendation: Investigate Receptor Capability Among Decision-Makers.** Some networks have found that there is a lack of receptor capability among decision-makers such as government officials and policy advisors who are ultimately responsible for translating network results into concrete societal impacts (e.g., through new regulatory frameworks or new government policies). It would be highly worthwhile to devote effort to thinking how to increase this specialized form of receptor capability.

**Discussion:** This problem is similar to the well-known problems of lack of Canadian industrial receptor capacity, although not necessarily due to the same causes.<sup>55</sup> Possibilities for attacking the problem include: (1) finding ways to create “brokers” in this field, analogous to the technology transfer offices and officers within networks and universities (2) holding intra-network workshops to address this issue (several current networks are in this position); (3) holding joint NCE-government workshops on the topic (having decision-makers part of the process would be very helpful; and (4) targeting a new network in this area (it is a social sciences issue). Some aspects of this problem obviously bear upon the political process, which must be taken into account.

- 6. Recommendation: Continue to Address SSH Concerns.** There is currently difficulty in creating new SSH-based networks, and (to a lesser extent) in integrating SSH concerns into new networks based in the other two major disciplines. Although this situation appears to be improving, additional thought is required.

**Discussion:** This issue is inter-related with the problem discussed in item #5: SSH research findings tend to be difficult to translate into action. Finding solutions to the decision-making receptor capability problem would reduce the “SSH problem” as well. It is also related to the greater difficulty in measuring SSH impacts discussed in item #3.

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<sup>52</sup> And an evaluation that focused on how NCE affects different regions of the country would find the detailed data by institution and province useful.

<sup>53</sup> We caution that there is a tendency to add even *more* data collection requirements when web-based designs are used, on the theory that these are “easy” to use. This theory is, at best, unproven.

<sup>54</sup> In some cases, for example, there is receptor *capacity* among decision-makers (in that they are perfectly able to understand the research results, and wish to apply them), but their *capability* to do so is hindered by the existing regulatory framework, political issues, etc.

With respect to creating SSH-based networks, this is not currently considered to be a serious concern within SSHRC, since smaller and more focused virtual networking programs tend to work better. However, some additional approaches are possible: (1) targeting one or more new networks in SSH fields would help in evaluating proposals, since SSH applications could be judged only against one another (this was done in the NCE targeted competitions in 1995 and 2000); (2) holding a cross-disciplinary workshop designed to assist SSH researchers in managing large, pan-Canadian networks and helping transfer knowledge from the other disciplines; (3) including “brokers” within SSH networks (see previous recommendation). Such approaches obviously have some policy implications; however, we do not have enough evidence to make firm recommendations on this topic, especially since it is not entirely clear to what extent there is a need for SSH-led NCE networks.

With respect to integrating SSH issues within NSERC or CIHR networks, this appears to be more successful in at least the most recent competition,<sup>56</sup> perhaps because the targets were in fields that could clearly benefit from SSH input.

We believe that the current approach of the NCE Program is valid and should be continued; i.e., to emphasize SSH integration as appropriate within new networks, and to have the Expert Panels and Selection Committee address this topic (including linking new network activities to SSH scientists in other countries, as appropriate).

- 7. Recommendation: Clarify the Intent of “Sustainability” in the Cycle 2 Mid-Term Review.** The intent of the Directorate with respect to network activities following the termination of NCE Cycle 2 funding must be clarified.

**Discussion:** Many networks, and several members of the Expert Panels, believe that networks must demonstrate self-sustainability during the final mid-term review in order to receive the remainder of Cycle 2 funding. Many networks reported expending considerable effort on this criterion even though they were almost certain it was impossible, effort that detracted from their ability to conduct focused research. In fact, self-sustainability is not a requirement. The most recent Program Guidelines stated, “The network must also detail, in its strategic plan, measures to accelerate its knowledge and technology transfer activities for the final years of funding.” (The previous guidelines essentially asked networks to discuss which activities might be sustainable after funding ended.) For the NCE, sustainability is really “a hope,” not a requirement, and no network has failed to receive funding because of the lack of such a plan.

- 8. Recommendation: Increase Facilitation of International Collaboration.** Increase the emphasis on having appropriate international collaboration, and explore methods for facilitating it. This emphasis is particularly relevant during reviews of new network applications, but of course is also appropriate during mid-term reviews.

**Discussion:** The lack of such collaboration in new network applications was sometimes noted by Expert Panel members, even to the extent of networks occasionally proposing work

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<sup>55</sup> And quite likely throughout the last three competitions, not just in the year 2000 targeted competition; new networks arising from these competitions have all incorporated at least two of the major disciplines, whereas earlier networks often only had one.

that has been done by researchers in other countries. The Directorate might take a more active role in encouraging international links where this has been noted by Expert Panels as a weakness. However, it is difficult to develop even the Canadian collaborations, so probably the most emphasis on this score should be later in a network's lifetime. Providing research funding to researchers outside Canada is probably not required, and would be prohibited under current granting council guidelines, but the appropriateness of this restriction could be discussed with the councils. One caveat: because it is not required in network applications, and because researchers outside Canada currently cannot receive NCE research funding,<sup>57</sup> sometimes such collaboration exists but is not very visible.

- 9. Recommendation: Increase Assistance to New Networks on Administrative Matters.** Provide more means through which the NCE Program administrators and other NCE participants can help get new networks “up and running.”

**Discussion:** Many new networks underestimate the time and effort required to create a viable administrative structure, and to operate it. As a result, they may not devote enough resources to these functions, and may not hire staff who are sufficiently qualified. Although the Directorate already provides considerable assistance (e.g., a draft Internal Agreement, training, handbooks, a one-day workshop), there is room for improvement, for example in assistance to new Boards of Directors, on legal and intellectual property issues, on ensuring that partner universities provide the services they agreed to, perhaps providing a web-based “FAQ”, etc. The “old” networks can have an increased role here as well, for instance by providing a mentorship program.

- 10. Recommendation: Strengthen Activities for Highly Qualified Personnel.** Ensure that network-specific HQP activities exist within all networks, so that training has added value compared to that available through “normal” programs.

**Discussion:** Current network activities directed towards HQP are certainly not weak, but this is one area where many respondents tended to think there was less difference between the NCE and other programs. This is probably especially true in new networks, which have had less chance to deal with HQP issues. It would be appropriate to concentrate on any HQP weaknesses beginning with the mid-term review in the first network funding cycle.

- 11. Recommendation: Monitor the Relationship Between the Networks and the CIHR Institutes.** As the CIHR Institutes mature, it will be important to ensure that there is a minimum of duplication (overlap in content) between the Institutes and the health-related networks. On the contrary, it will be important to ensure that there is a high level of complementarity and cooperation between the two.

- 12. Recommendation: Do Not Conduct Another Formal Evaluation in the Near Future.** The NCE has now been very thoroughly investigated in three separate studies since 1993. The evaluations are another source of “reporting burden”, as demonstrated by the low

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<sup>56</sup> The NCE does allow funding travel expenses for up to a three month's stay for face-to-face meetings among Canadian and international researchers.

response rates to the researcher and partner survey. Waiting at least eight years until the next formal review would be appropriate.

**13. Recommendation: The 14-Year Rule.** We find we do not have enough evidence to comment on this rule. There are clearly strong arguments (and strong proponents) both for keeping this rule, and for making it more “flexible” in some way. Little evidence came to light during the evaluation that is not already being considered by the NCE’s Management Committee.