

INTERNATIONAL REVIEW PANEL REPORT

January 2010

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I. The IRP: Mandate, membership and approach

Pursuant to its funding agreement with the Government of Canada, the Canada Foundation for Innovation (henceforth “the CFI” or “the Foundation”) regularly reviews and reports on its performance. The current report includes both an overall performance evaluation (OPE) and a value-for-money audit, both of which have been carried out by the consulting firm, KPMG. As well, an important innovation in the current evaluation process is the creation of an International Review Panel (henceforth “the Panel”) to review the design of the work to be undertaken by KPMG, and then, based on KPMG’s findings and Panel members’ expertise and judgment, to formulate overall conclusions regarding the CFI’s performance to date. The latter is to include “an assessment of the achievements of the CFI against its national objectives and address global questions regarding results, and design and delivery, and relevance.” The Panel is then asked “to comment on the implications of these findings for the future of CFI in relation to its stated national objectives.”¹

The members of the Panel bring a range of international perspectives and experience. It should be noted as well that a number of the Panel members bring not only extensive international experience in relation to research and research funding, but also direct experience with the CFI’s project approval processes and the Canadian research landscape as a result of having served on assessment committees for the CFI and other funding agencies and programs in Canada in years past. The Panel members are:

- Arthur May, Chair, President Emeritus and Vice-Chancellor, Memorial University of Newfoundland and former President of the Natural Sciences and Engineering Research Council of Canada (NSERC). Dr. May has also served as Chair of One Ocean, a Newfoundland and Labrador-based consortium of the oil and gas and fishing industries; Chair of the Atlantic Innovation Fund; and federal Deputy Minister of Fisheries and Oceans.
- Don Aitkin, former Vice-Chancellor and President of the University of Canberra, and Foundation Chair of the Australian Research Council. Dr. Aitkin has also served as Chair and CEO of Agrecon, a Canberra-based R&D company, and as a Director of ArtSound FM, a Canberra radio station.
- Michael Barber, Vice-Chancellor, Flinders University, Adelaide, Australia, and former senior executive at the Australian Commonwealth Scientific and Industrial Research Organization.
- Robert C. Dynes, President Emeritus, University of California, and former Chancellor, University of California San Diego. Dr. Dynes was also employed in private sector R&D for more than 25 years with Bell Laboratories. He currently sits on boards of two start-up companies in southern California and has in the past sat on others.

¹ Canada Foundation for Innovation, *Overall Performance Evaluation: Terms of Reference for Members of the International Review Panel*, April 2009, p. 1.

- Paule Leduc, former Rector, Université du Québec à Montréal, and former President of the Social Sciences and Humanities Research Council of Canada (SSHRC).
- Glenn Wells, Deputy Director and Head of Research Programmes, UK Department of Health, and former Business Development Manager for the Wellcome Trust. Dr. Wells has worked in drug discovery for a medium-sized biotech firm and participated in many industry-academia collaborations. At the Wellcome Trust, he set up three companies in the UK and US, and sourced and negotiated venture capital in the UK, EU and US.
- Ernst-Ludwig Winnacker, Secretary-General, Human Frontier Science Program, former Secretary-General of the European Research Council, and former President of the German Research Foundation (DFG). Dr. Winnacker has served on the boards of Bayer AG, MediGene AG and Wacker-Chemie AG.

Following the competitive bid process that led to the selection of KPMG to design and implement components of the overall performance evaluation and the value-for-money audit, the Chair and two other Panel members met in November 2008 to review KPMG's OPE design. Subsequently, several conference calls were held with members who had been unable to attend the November 2008 meeting in order to discuss the research funding landscape and the project design and status. The full Panel then met in-person for an intensive two-day discussion in Ottawa on August 6-7, 2009. The latter meeting included ample opportunity for Panel members to be briefed and pose questions to KPMG consultants regarding the OPE and value-for-money audit findings. Then, following preparation of the penultimate draft report, the Chair and four other Panel members briefed the CFI's Board of Directors on the report's content at the Board's scheduled meeting in Halifax on November 17, 2009.

II. An impressive record of achievement

The Panel fully endorses the findings of the overall performance evaluation and the value-for-money audit in relation to the CFI's performance to date. Based on its review of the results of these studies and on members' knowledge of research funding arrangements in other countries, the Panel is unanimously of the view that, in relation to results, design and delivery, and relevance, the CFI's record of achievement to date is outstanding. The CFI is widely admired internationally and, indeed, is a model that has been and will be emulated elsewhere.

A. Results

The Panel considered the CFI's effectiveness in meeting its four broad national objectives:

1. *To build research capacity: increase Canada's capability to carry out important world-class scientific research and technology development*

The CFI has had major impacts on research capacity in Canada. First and most obvious has been the *dramatic increase in the quantity and quality of university research infrastructure*. Since it was created in 1997, the CFI has committed nearly \$5.2 billion to support more than 6,300 research infrastructure projects at institutions across Canada.² The result is a large increase in the quantity, range and quality of research infrastructure available to Canadian researchers.

It is very significant that the enhancement of research infrastructure has been accompanied by improvements in the quantity and quality of research performed in Canada, as well as a substantial increase in research productivity. For example, 18 percent of university department heads who responded to KPMG's survey rated the quantity of research in their departments pre-CFI as excellent or world-class, but 20 percent rated it as only fair or poor. Now, 64 percent of those department heads rate the quantity of research as excellent or world-class and only two percent rate it as fair or poor. A similar pattern emerged when department heads were asked about research quality – 82 percent of them now rate research in their departments as excellent or world-class in quality, as compared to only 27 percent who were prepared to rate pre-CFI research as excellent or world-class.³ As well, KPMG reports that total annual publications per principal user of CFI projects have increased significantly since CFI's inception.⁴ As a result, in the words of one international member of the Panel, "Canada is now taken seriously as an international player in the vital world of research and development."

Second, the CFI's approach to the selection and funding of projects has had a *transformational impact on the culture and aspirations of the Canadian university research enterprise*. The CFI's uncompromising commitment to excellence and its insistence that institutions adopt a strategic approach to the identification of project proposals has sparked an ongoing culture shift within research institutions. The universities have had to look critically at themselves and make their own decisions on their strengths and priorities. The resulting culture shift has been marked by soaring aspirations in the research community to participate in and, in some areas of critical mass, to lead international-level collaborations at the cutting-edge of research. Canada is now home to a number of world-class research institutes, or what one international member of the Panel describes as "globally significant sites." For example, in the context of the recent Canada-California Partnership initiative, one Panel member noted that California cancer stem cell researchers clearly saw it as in their best interests to collaborate with Canadian researchers who had developed world leading capacity and expertise in the area.

² As of September 22, 2009. Canada Foundation for Innovation web site: www.innovation.ca/en/about-the-cfi/cfi-overview

³ KPMG, *Final Report: Overall Performance Evaluation and Value-for-Money Audit (OPEA)*, Ottawa, October 30, 2009, p. 17.

⁴ *Ibid.*, p. 16.

Together with other government initiatives over the past 12 years, the CFI has contributed in important ways to this shift in research culture and to the building of research capacity. Indeed, the results of the Outcome Measurement Studies (OMS) reported by KPMG – for example, a three fold increase, since the CFI’s creation, in annual research funding per Principal User in the nine theme areas studied, and the fact that CFI investments have leveraged considerably more partner funding than required to meet the 60 percent requirement in the CFI formula⁵ – suggest that various federal and provincial research funding streams have actually converged to build research capacity.

The Panel is convinced that the CFI’s foundational and catalytic roles have been instrumental in revitalizing and transforming university research in Canada and in growing its capacity for world-leading research.

2. *To strengthen Canada’s research workforce: attract, retain and develop highly skilled research personnel in Canada*

It is Panel members’ experience that research talent is increasingly in demand internationally. It is also increasingly mobile, a view supported by KPMG’s data.⁶ With regard to CFI’s performance in this environment, the Panel finds the KPMG findings compelling. For example, 77 percent of CFI project leaders and principal users (PLs/PUs) who responded to a KPMG web survey rated as high or very high the importance of CFI projects either to their staying in their current position or to their having moved to that position from elsewhere in Canada or abroad. PLs and PUs rated CFI infrastructure highest among possible factors in attracting or retaining them. Institutional vice-presidents (research) and departmental heads also ranked CFI-funded infrastructure as the most important or among the most important factors in their ability to attract and retain research talent.⁷

Even more important in this era of escalating international competition for stellar research talent is the finding that 56 percent of PLs and PUs were attracted from abroad⁸ – suggesting a substantial enhancement of Canada’s international reputation and a possible reversal of the “brain drain” that so worried Canadian authorities in the 1990s.

Finally, the KPMG findings demonstrate that the CFI has had a most positive impact on the training environment for the next generation of researchers for Canada’s workforce. In this regard, it should be noted that more than two-thirds of PhDs employed full-time in Canada work outside of universities.⁹ The data from Project Progress Reports indicate that institutions have attracted about 1.5 post-doctoral

⁵ Ibid., p. 16.

⁶ Ibid., pp. 20-21.

⁷ Ibid., p. 21.

⁸ Ibid., p. 20.

⁹ Association of Universities and Colleges of Canada.

fellows and 4.6 graduate students per CFI-funded project (with some of the larger projects, of course, attracting significantly more than these average per project numbers). As well, more than 90 percent of CFI projects have served as a key resource in the research work of post-docs and/or graduate students.¹⁰

In summary, the Panel concludes that the CFI has been remarkably successful in helping Canada to attract, retain and develop research talent.

3. *To foster productive collaboration: promote networking, collaborative efforts and inter/multidisciplinarity among researchers, institutions, and sectors*

Internationally, cutting-edge research is highly competitive. Researchers compete to be the first to make breakthroughs in their fields and for recognition and funding. Research institutions compete for research talent and funding and the prestige that accompanies them. Countries also compete for research talent and for the economic and social benefits that accrue from a strong national research effort in an international knowledge economy. It is a process in which good people attract good people and excellent research attracts excellent research.

To the extent that this competition generates a drive to excellence, it is healthy. Indeed, research funding regimes based on peer review, like CFI's expert review process, are fundamentally competitive in nature. Around the world, research is becoming more and more competitive. At the same time, the nature of research is changing as the big issues of our day require research efforts that cannot be limited to the resources or labours of individual researchers, institutions, disciplines or even countries. They require productive collaboration.

An important part of the culture shift in the Canadian research community over the period since the CFI's creation has been a growing emphasis on collaboration across institutional, disciplinary and international boundaries. One Panel member describes this as a gain in the country's "intellectual infrastructure." The CFI has clearly played an important catalytic role in this shift. It has insisted that institutions applying for CFI funding must have strategic research plans in place. The development of such plans requires, by definition, thinking outside and across traditional disciplinary and faculty silos within the institutions. Furthermore, collaboration is an important factor in the assessment of CFI applications, and the funding formula requires institutions to reach agreement with provincial and private sector or other partners. At times – for example, in relation to high performance computing and to site licences for digital research materials – the CFI has compelled increased inter-institutional cooperation by insisting that regional project applicants work together to develop national proposals. With regard to collaboration across disciplinary lines, one Panel member calls the CFI's emphasis

¹⁰ KPMG, *Final Report: Overall Performance Evaluation and Value-for-Money Audit (OPEA)*, Ottawa, October 30, 2009, p. 22.

on cross-disciplinary collaboration “a turning point” for Canada after years of resistance in parts of the research community.

KPMG’s data indicate that institutional vice-presidents (research) see a large improvement in the quality of strategic research planning carried out in cooperation with other research institutions and research funding organizations, including provincial funders.¹¹ With regard to collaboration among researchers, CFI project leaders and principal users, in particular, view the CFI as important or very important in fostering academic collaboration and networking.¹² In terms of collaboration with end-users (defined as “potential users of the research results outside of the academic research community who intend to develop practical applications from the research findings”), PLs and PUs who responded to the KPMG survey reported that in the past year, they had been involved in 6,800 collaborations with end-users, 76 percent of which used CFI projects as key resources. Notably, three-quarters of PLs and PUs consider CFI projects as key resources in collaborations with Canadian industry.¹³

Finally, as noted earlier, the CFI has made a major contribution to Canada’s being “at the table” in international research collaborations. By helping to make Canadian research more visible than ever before at the international level, CFI has helped to create many opportunities for Canadian researchers to engage in international partnerships.

In summary, the Panel concludes that the CFI has made major contributions to the promotion of inter/multidisciplinarity and of networking and collaborative efforts among researchers, institutions, and sectors.

4. *To strengthen Canada’s capacity for innovation: support economic growth as well as health and environmental quality through innovation*

A recent report prepared by the Council of Canadian Academies at the request of the Government of Canada notes that “the quality of Canada’s research institutions is considered to be world class, and there appears to be an ample supply of scientists and engineers,” *but* overall economic innovation performance – converting research findings into new goods, services and processes for the marketplace – has been “subpar”:¹⁴

In view of its large public investment in university research, Canada could further benefit from improved R&D co-operation between universities, businesses and, in many cases, government scientific establishments. While Canadian academic science has received international recognition, the direct payoff from this

¹¹ Ibid., p. 13.

¹² Ibid., p. 23.

¹³ Ibid., p. 24.

¹⁴ Council of Canadian Academies, Abridged version (*Report in Focus*) of *Innovation and Business Strategy: Why Canada Falls Short*, April 2009 (full report released June 2009), p. 9.

investment in terms of new businesses created has been meagre. The relative weakness of business R&D and the disappointing level of university research commercialization appear to be two symptoms of the same underlying condition – a lack of orientation by Canadian business to the commercial exploitation of opportunities at the leading edge of science and technology.¹⁵

Because Canada’s relatively weak business innovation performance has contributed to what the CCA report calls “a serious productivity growth problem,”¹⁶ it is clearly of great concern to Canadian authorities. The CFI has set as one of its objectives the strengthening of Canada’s capacity for innovation. In this regard, the Panel makes the following observations:

- Because Canada’s relatively weak innovation performance is attributable in significant measure to weak business innovation performance, and to the extent that the solutions will lie in innovation driven by “market pull” rather than “science push,” it is important to be realistic about the practical limits to the CFI’s ability, by itself, to improve Canada’s innovation performance. In this regard, while strengthening Canada’s innovation capacity was one of the CFI’s objectives from the beginning, it seems clear that the creation of the CFI was intended, first and foremost, to address the specific problem of Canada’s deteriorating university research infrastructure and the related threat of a research “brain drain”. In the late 1990s, “innovation” in the Canadian context and elsewhere was often treated as synonymous with discoveries arising from institutional (primarily university) research. A decade later, it is more widely understood that “innovation” is broader than “research” and that while a strong university research effort remains crucial to an innovative society, there are other essential components in any country’s innovation system. To function well, an innovation system must also include what one Panel member calls “deliverables” – i.e. applications in the form of new products, processes, services and policies that ultimately make a difference in peoples’ lives. Such a system requires increased interaction and collaboration between researchers and implementers¹⁷ at every stage in the innovation process. Since its creation, the CFI has contributed to strengthening Canada’s innovation capacity most fundamentally through building university research capacity – as was intended – but it is also contributing through encouraging cross-sectoral research collaboration and knowledge transfer/translation.
- The CFI has itself been highly innovative in its structure and in the design and delivery of its programs. These will be discussed in more detail in a subsequent section of this report.

¹⁵ Ibid., p. 8.

¹⁶ Ibid., p. 26.

¹⁷ “Implementers” here refers to those who apply research findings through, for example, improved processes of production or service delivery, new goods and services in the marketplace, or innovative public policies and programs.

- Research outcomes, especially the transformative impacts of research on the economy and society, can take many years, even decades, to become manifest and measurable. In Canada, this situation has been made more difficult, especially in relation to research impacts in the economy, by the weak receptor capacity of Canadian industry. Resource industries and foreign-owned industries have historically performed relatively little research in Canada and so have not fully developed the capacity to innovate through the application of research findings. Nevertheless, there are some positive signs that the CFI is already having an impact on innovation in Canada. The earlier-cited KPMG survey data regarding the numbers of PL/ PU collaborations with end-users are impressive. The Panel notes, as well, that based on Project Progress Reports, KPMG concludes that 30 percent of CFI projects have generated new or improved products, processes, services or costs savings; 25 percent have generated new or improved public policies and programs; and 18 percent have created private or public sector jobs.¹⁸
- The CFI's catalytic role in the ongoing culture shift within the research community has included stimulating researchers to place much more emphasis than in the past on knowledge transfer and the potential end uses or practical applications of their research. Again, KPMG's data are most encouraging in this regard: fully two-thirds of CFI project leaders, principal users and departmental heads who responded to the KPMG survey have actively explored practical applications of their research including, among others, applications in industry, public policy, health care, and the environment.¹⁹ In an academic environment, the successful evolution to a culture which values delivery of the research product for economic and societal benefit at the same level as it values fundamental knowledge is a slow process. In one Panel member's experience, this process has taken decades in California. The indications are clear that this is happening in Canada as a result of the CFI's stimulus and value rewards. The continued evolution should be nurtured with a suitable reward system.

In sum, the Panel concludes that in relation to its objective of strengthening innovation capacity, the CFI's efforts are already beginning to show very positive results and more can be expected with continued support.

B. Design and delivery

The Panel approached the subject of design and delivery from a relatively "macro" perspective, focussing its attention on whether the foundation model and the CFI's overall approach to funding research infrastructure represent the most appropriate and efficient means to achieve its objectives. From this perspective, the Panel views

¹⁸ KPMG, *Final Report*, p. 25.

¹⁹ *Ibid.*, p. 25.

the CFI's design and delivery processes, in the words of one international member of the Panel, as "world best practice."

The foundation model has been crucial to the CFI's impressive record of success. The Canadian government, to its credit, created a model which has allowed the CFI a significant measure of autonomy and flexibility while ensuring appropriate due diligence and accountability for the use of public monies. The CFI's Board and staff, for their part, have exercised that flexibility in a manner that has consistently promoted excellence and safeguarded the public interest.

Governments in Canada and elsewhere have long recognized the importance of basing research funding decisions, first and foremost, on excellence. In the CFI foundation model, Canada has embodied that principle in an organizational form worthy of emulation elsewhere.

For best results, it is essential that research funding structures and processes be appropriate to how scientific research is conducted and that they enable excellence in that research. Flexibility is key because the research process, particularly in the case of *relatively* more basic or non-directed research,²⁰ is inherently unpredictable and innately opportunistic. The best research of this type carries with it levels of risk. Some directions result in astounding results, while others are disappointing. The Panel is impressed at the extent to which the CFI's autonomy and the non-cyclical nature of its funding have allowed it to direct monies to excellent research wherever it is found within eligible research institutions across Canada and to be relatively nimble in designing and adjusting its programs to meet Canada's research infrastructure needs and seize opportunities to develop critical mass in areas of emerging research strength. An example of the CFI's nimbleness is the decision of the CFI Board to create the Exceptional Opportunities Fund as a vehicle to respond to those instances where unique opportunities require rapid responses.

In the words of one Panel member, the foundation model "has allowed wise decisions to be made." This has involved, on the one hand, the CFI's setting some strategic directions "from the top down" through the architecture of its various programs. Thus, for example, in addition to its three core programs (the Leading Edge Fund, the New Initiatives Fund and the Leaders Opportunity Fund) to support research infrastructure projects at individual institutions, the CFI created the

²⁰ Often, discussions of research imply that all research can be divided into pure (or basic or curiosity-driven) research on the one hand, and applied (or directed or targeted) research on the other. The reality is much more complex; and it is more accurate and more useful to view research along a continuum from the most theoretical and non-directed or "pure" research at one end, to the most directed and targeted or "applied" research at the other. Most research arguably falls at points between these two extremes. As well, it should be kept in mind that even the most "applied" or "directed" research rests on theoretical underpinnings and breakthrough discoveries in "pure" or "basic" research. A well-functioning innovation system requires excellent research across the full continuum and benefits from effective interaction among research practitioners across that continuum.

National Platforms Fund to encourage proposals involving infrastructure that supports research in many fields and that transcends individual institutions.

On the other hand, by requiring institutions to develop their own strategic research plans, the CFI has ensured that decisions about areas of actual and potential research strength are taken – most appropriately – “from the ground up” as institutions, as well as provinces, identify their own priorities for CFI project applications. Once these areas are identified, the resulting proposals for transformative new infrastructure projects compete for funding through the CFI’s rigorous, competitive expert review procedures which include international assessments. On average, only about three in ten of these proposals actually receive funding in any given open competition.²¹

The CFI’s model, with its combination of “top down” and “bottom up” decision-making, its commitment to excellence as manifested in its approval processes, and its flexibility are highly appropriate to Canada’s size and diversity, as well as to the requirements of the research endeavour itself.

It is also efficient. The Panel is strongly of the view that the foundation model promotes efficient and effective use of funds because the CFI does not face pressures to spend all of its funds by fiscal year-end. The CFI has very low administrative overhead costs (around 2.5 percent) which compare favourably with counterparts in Canada²² and internationally. Importantly, while CFI exercises due diligence in project approval and financial oversight, it does not try to micro-manage the research process itself. This both limits administrative overhead costs at the Foundation and provides institutions and researchers with the flexibility that excellent research demands.

²¹ The CFI’s Policy and Program Guide (2008) describes the CFI funding architecture as based on a three-way program delivery system:

1. Open competitions for transformative infrastructure projects. The Leading Edge and New Initiatives Funds competitions are the main open competitions.
2. Pre-determined allocation-based program which gives universities the flexibility and rapid turnaround time needed to facilitate the recruitment and retention of leading researchers. The Leaders Opportunity Fund addresses this need.
3. Program to defray a portion of operating and maintenance expenses to ensure optimal use of CFI-funded infrastructure. The Infrastructure Operating Fund addresses this need.

The 30 percent success rate is typical of the open competitions in no. 1 above. These projects account for the largest portion of CFI investments. In nos. 2 and 3, the institutions receive individual allocations which they, in turn, allocate. In the case of the Leaders Opportunity Fund, the allocation within institutions is on a competitive basis and, because the institutions do considerable internal pre-screening of projects, the success rate among those projects submitted to CFI is in excess of 80 percent. This is entirely appropriate given the intent of the Leaders Opportunity Fund to assist the universities in putting together competitive packages of research support (infrastructure, direct research costs and operating funds) to attract and retain excellent researchers.

²² A March 2007 evaluation of Canadian foundations by KPMG found the CFI’s operating and administrative costs per dollar disbursed to be the lowest among the foundations examined. Cited in KPMG, *Final Report*, p. 26.

Finally, the CFI's "one-stop shopping" model for federal research infrastructure funding is efficient from the point of view of the research community, in contrast, for example, to the complex system at the federal level in the United States.

The Panel has been very impressed with the CFI's commitment to due diligence, accountability and transparency in its stewardship of public funds. These are essential corollaries to the flexibility and autonomy that the CFI has been granted. KPMG's survey shows that a substantial majority of respondents – particularly among vice-presidents (research) who are most involved with the CFI's funding approval process – see that process as transparent and consider the CFI's guidelines for preparing and rating proposals clear or very clear.²³ KPMG's value-for-money audit documents in some detail the due diligence procedures that the CFI employs to ensure that approved projects are consistent with the CFI's objectives and that funding is used for approved purposes. It also documents the communications plans and strategies that the CFI has developed for the purposes of transparency and accountability. In the handful of areas for improvement that it identifies, the value-for-money audit suggests that in most instances, the CFI has already initiated appropriate changes.²⁴ This is consistent with the culture of continuous improvement in the organization that the Panel has noted in its interaction with CFI personnel.

C. Relevance

The Panel considered the question of the CFI's relevance from two perspectives: relevance to Canada's needs and interests, and relevance to the requirements and operations of the research enterprise itself.

First, with regard to relevance to Canada's needs and interests, the CFI was created at a point in time when Canada's university research reputation was slipping internationally, due in part to the deteriorating state of the country's university research infrastructure. The creation of the CFI with a substantial federal endowment was a dramatic step that caught international attention and began the process of re-building Canada's reputation as a university research "player" – i.e. as an attractive destination for research talent and as a worthy collaborator in international research projects. By 2006, when the Council of Canadian Academies undertook a bibliometric analysis comparing Canada's published research performance to that of other countries, it found that Canada has broad strength in published research: above the world average in both publication quality and intensity in 38 percent of the 125 areas examined, and above the world average in publication quality in 70 percent of those disciplinary areas.²⁵ Based on a large-

²³ Ibid., p. 27.

²⁴ KPMG, *Canada Foundation for Innovation, OPEA Project, Performance Audit Update for the IRP*, August 6, 2009.

²⁵ Council of Canadian Academies, *The State of Science and Technology in Canada*, Ottawa, 2006,

scale survey of informed opinion, that same study concluded that the CFI, together with Canadian universities, research hospitals, granting agencies and the Canada Research Chairs program, represent “strong advantages for Canada in respect of knowledge generation and the production of highly trained people.”²⁶

In a period when research performance was becoming increasingly important to countries’ economic prospects, the CFI’s creation and its record of achievement since then have been directly relevant to Canada’s needs and national interests. Not only have the CFI and other, subsequent federal and provincial initiatives provided a basis for what one Panel member calls “a globally significant Canadian research effort,” they have also provided a basis for research to address issues of national importance. To cite but one example, the Neptune project, a large-scale oceanic research infrastructure project funded in part by the CFI and led by the University of Victoria, is enabling multidisciplinary and interdisciplinary research in areas relating to, for example, climate change, non-renewable marine resources and undersea seismic activity.²⁷

In addition, given Canada’s record in technology transfer and industrial R&D, efforts to improve performance in these areas are directly relevant to the country’s needs and interests. As noted in the section above regarding innovation, the CFI has actively encouraged researchers to place much more emphasis than in the past on knowledge transfer and the potential end uses or practical applications of their research; and as a result, KPMG data suggest both an impressive number of PL/ PU collaborations with end-users (about 6,800 collaborations over the past year alone²⁸) and the generation of significant numbers of new or improved products, processes, services or costs savings.

Second, with regard to relevance to the requirements and operations of the institutional research enterprise itself, the CFI’s approach to funding research infrastructure, as discussed in the section on design and delivery above, has been and remains highly relevant and appropriate to how scientific research is conducted and to how research is evolving internationally. The continual advancement of all areas of research results in requirements for new or evolved and improved facilities and infrastructure to answer contemporary questions often in need of enhanced

p. 84. At p. 75, the Council described its data sources in these terms: “This report uses two databases produced by Thomson Scientific to compute bibliometric statistics. The first is the Science Citation Index® (SCI), which provides extensive coverage of high-quality scientific research in the natural sciences, health sciences and engineering. It currently indexes approximately 3,700 of the world’s leading science and technical journals. The second database is the Social Sciences Citation Index (SSCI). It includes bibliographic information for over 1,700 of the world’s leading social sciences journals and also covers individually selected items from approximately 3,300 of the leading science and technology journals. The journals in these two databases are considered to be the most important peer-reviewed journals in their respective fields and account for more than 80 percent of the world’s citations.”

²⁶ Ibid., p. 97.

²⁷ See www.neptunecanada.com/about-neptune-canada

²⁸ KPMG, *Final Report*, p. 23.

precision. The Panel notes that CFI competitions typically elicit much larger numbers of project applications than can be funded – an indication that the research community continues to view CFI support for research infrastructure as highly relevant to its requirements. Insofar as the CFI would not fund more than 40 percent of these proposals' costs, it is clear that provincial, private sector and other funding partners also see research infrastructure investment as highly relevant. Viewed from an international perspective, this is not surprising given that other countries are investing heavily in cutting-edge infrastructure. Canadian researchers are undoubtedly aware that both their competitors and collaborators in various other countries are benefiting from their governments' investments in the pursuit of excellence and competitive advantage.

D. The CFI's record to date: Summary and conclusion

The Canada Foundation for Innovation was created in the late 1990s with the intent, first and foremost, to confront the challenge of Canada's deteriorating university research infrastructure and the attendant threat to Canada's ability to attract, retain and develop research talent. It is the Panel's assessment that the CFI has been very effective and, indeed, instrumental in growing Canada's capacity for world-leading research, as well as in revitalizing Canadian university research. Through its insistence on institutional research plans, its skilful combination of "top-down" and "bottom-up" decision-making and its commitment to excellence, it has had a transformational impact on research culture and aspirations. So, too, have the combined "facility effect" and "organization effect" of the CFI's infrastructure investments in the context of institutional strategic research plans.²⁹ The CFI has also demonstrated remarkable success in helping Canada to attract, retain and develop research talent.

The CFI was intended, as well, to promote research collaboration across institutional, disciplinary, sectoral and international boundaries, and to contribute to improving Canada's capacity to innovate. In the Panel's view, the CFI has made major contributions to increasing inter/multidisciplinarity and networking and collaboration among researchers, institutions, and sectors, both domestically and internationally. The Panel is also of the view that the CFI has strengthened Canada's innovation capacity most fundamentally through building university research

²⁹The KPMG report defines "facility effect" as "the collective power of integrated suites of state-of-the-art (SOA) equipment, often in purpose-built facilities, and deliberately sited to maximize accessibility, multidisciplinarity, and multi-sectoral effects, often across multiple departments." It notes that "(t)his collective power is greatly strengthened by an 'organization effect' – in which institutions deliberately and explicitly address this strength in their SRPs and facility designs, and organize their research, training, and innovation programs around it." Finally, it stresses that "(t)hese impacts could not have occurred to nearly the same extent through programs focused on individual researchers with individual equipment requests, or without the SRP requirement." Ibid., p. 2.

capacity – as was intended – but it is also encouraging cross-sectoral research collaboration and knowledge transfer/translation. These efforts are already beginning to show very positive results and more can be expected.

Finally, in the twelve years since its creation, the CFI has proven itself highly knowledgeable of and relevant to Canada’s needs and the demonstrated needs of the research community. It has responded effectively and efficiently to those needs and, in the view of the Panel, CFI’s design and delivery processes are world best practice.

In short, the Panel is unanimously agreed that through its first twelve years of existence, the CFI has been an impressive success. The Panel notes that the Canadian government has reinforced this success by periodically injecting additional funds.

III. Considerations for the future

At the request of the Canadian government, the Foundation is now in the process of developing a five-year strategic plan.³⁰ With this process in mind, the Panel turned its attention to several key questions for the future: Is the CFI well-positioned to continue to address real needs and to meet its objectives in a changing international research landscape? What opportunities arise for the CFI in this changing landscape and what challenges will it face? What will it take for the CFI to continue and expand its record of achievement?

A. *The changing landscape*

In the decade to come, there is every reason to expect continuing and, indeed, accelerating competition among a growing list of countries whose strategic plan is to be R&D players and leaders. At the same time, the research landscape will also be marked by growing collaboration across disciplinary, sectoral and international boundaries, a continuation of trends already underway (see the earlier section of this report on the CFI’s objective of fostering productive collaboration).

Tackling the most pressing problems and issues of our times will require bringing together a broad range of people, skills, knowledge and research that transcend traditional disciplinary silos. These will necessarily include the skills and insights of researchers in the social sciences and humanities because understanding human behaviour – what one Panel member calls “bringing people into the equation” – will

³⁰ In Budget 2009, the Government of Canada announced the provision of “\$600 million for future activities of the Foundation, including the launch of one or more new competitions by December 2010 in support of areas of priority identified by the Minister of Industry in consultation with the Canada Foundation for Innovation, and guided by the Foundation’s strategic plan.” *The Budget Plan*, p. 150. Available at: <http://www.budget.gc.ca/2009/home-accueil-eng.asp>

be critically important and may well garner some of the largest returns in addressing these problems and issues.

Confronting these problems will also require increasing intersectoral collaboration in the conduct of research and in knowledge transfer. As well, either because the issues are truly international in nature (e.g. global peace and security, climate change, pandemics, food security, the health of the world's oceans, and circumpolar health and conservation) or because they are widespread in their incidence in many countries (e.g. aging populations, juvenile diabetes, HIV-AIDS, and effective regulation of financial markets), they will demand research collaboration on an international scale.

The Panel fully expects that these trends to increasing research competition and collaboration will place pressures on governments to invest more in research and, more broadly, in their innovation systems. However, with members from Australia, Germany, the U.K. and the U.S., as well as Canada, the Panel is also conscious of the immediate pressures that the global recession has placed on treasuries, not least through the expenditure of large sums on public infrastructure projects to provide short-term economic stimulus.

As the world emerges from the recession, a reduction in these types of stimulative infrastructure investments may well follow in many countries. In this context, it is important to distinguish between short-term infrastructure projects designed to stimulate immediate job creation, especially in construction, and the kinds of long-term research infrastructure in which the CFI has invested. While the latter projects can certainly create short-to-medium term employment (including construction jobs), their economic impacts are generally longer-term and more profound insofar as they contribute to competitiveness, innovation, productivity and social well-being. It may be tempting for governments to curtail such longer-term investments as they attempt to reduce public deficits in the wake of the current recession, but those countries that resist this temptation will undoubtedly prosper more in the long term.

At a minimum, however, fiscally constrained governments can be expected to adopt an increasingly strategic approach to investing in research and innovation. They can also be expected to insist upon efficiency, effectiveness and the avoidance of costly duplication in the delivery of their research investments.

B. Challenges and opportunities

In this environment, Canada – and the CFI – will face both challenges and opportunities.

- *The infrastructure capacity challenge/opportunity: ensuring that Canada will have the research infrastructure required to attract research talent and enable top quality research in a highly competitive international environment*

As a result of the CFI's success to date, Canada is much better positioned in this regard than it was in the mid-1990s. The country's stock of research infrastructure has increased very significantly in quantity and quality, and universities' capacity to attract, retain and train researchers to meet the needs of the economy and society has improved markedly. Nevertheless, Canada's research infrastructure challenges remain very significant if the country is to compete effectively on the international research stage over the decade to come. These include bringing more of the country's facilities to the standards of internationally "best equipped labs" and improving the operational capability of that infrastructure.³¹ With its admirable track record, its foundation model and its demonstrated commitment to excellence, the CFI is ideally positioned to take on these challenges if it has the resources to do so.

One challenge for the CFI will be to address both the *need for new projects* to elevate Canada's overall stock of research infrastructure and the *need to renew essential existing projects*. In relation to the need for *new projects*, KPMG's survey data suggest that about one quarter of current CFI project leaders and principal users will, in the next five years, lead CFI applications for new infrastructure unrelated to previous CFI investments, and almost three quarters of department heads expect new applications from their departments.³²

With regard to the need for *renewal of existing projects*, again almost one quarter of PLs/PUs who responded to KPMG survey expect to lead renewal applications in the next five years, and about 54 percent of department heads who responded foresee renewal applications from their departments in that same time frame.³³ In this regard, it should be emphasized that investing in research infrastructure is never a once-and-for-all activity for a country that wants to be a serious international research player. Research infrastructure inevitably becomes obsolete either because of technological advances or because of advances in knowledge.

Significantly, as Canadian researchers compete and collaborate more and more on an international stage and as their global aspirations grow, so too does their desire for increasingly sophisticated infrastructure facilities not only with high technical capability³⁴ but also with high operational capability³⁵ to maximize these facilities' research results and productivity.³⁶ It is important for the CFI to consider its role in supporting not only the technical capability of infrastructure projects, but also their operational capability.

³¹ See, for example, KPMG, *Final Report*, pp. 14-15 and p. 18.

³² *Ibid.*, p. 32.

³³ *Ibid.*, p. 32.

³⁴ Defined in the KPMG survey as technical and scientific specifications such as measurement capabilities, scientific outputs, accuracy, throughput, etc. of the specialized equipment.

³⁵ Defined in the KPMG survey as including the infrastructure's operating space, user capacity, computing capabilities, operating and maintenance levels.

³⁶ KPMG *Final Report*, p. 33.

Part of the challenge of ensuring operational capability is the continuing issue of operation and maintenance (O&M) of infrastructure projects. In 2001, the federal government provided to the CFI a one-time allocation for O&M. When that allocation was exhausted, the CFI continued to pay a portion of the institutions' O&M costs related to CFI funded infrastructure projects even though it did not receive further dedicated funding for this purpose. It is the Panel's understanding that the Foundation intends to continue its current practice of supporting a portion of these O&M infrastructure related costs. The Panel considers this an entirely appropriate use of CFI funds to help to ensure the operational capability of CFI-funded infrastructure.

A secondary question, however, is how to support O&M costs beyond the point when an institution's allocation from the CFI Infrastructure Operating Fund has been exhausted. The Panel recognizes that this is a significant challenge, especially in some large infrastructure projects involving multiple funding partners and costly facilities whose useful life is measured in decades. It might be appropriate for the CFI to continue to play a role in helping to cover O&M costs and, more generally, maximizing the on-going operational capability of these large and unique facilities over and above those eligible costs for CFI purposes (i.e. routine operating costs on an on-going basis) for an extended period of time. However, if the CFI is to play a significantly larger role in supporting O&M costs *and* continue to build Canada's stock of research infrastructure, it will require dedicated O&M funding from government. In the absence of dedicated funding, a CFI decision to provide increased support for O&M will have consequences for the Foundation's ability to respond to increasing needs for new and renewed infrastructure.

- *The collaboration challenge/opportunity: further increasing interdisciplinary and intersectoral collaboration within Canada and internationally*

Due in no small part to the CFI's efforts, the culture of Canada's research community appears far more collaborative than in past decades. The challenge and opportunity is now to broaden and deepen this collaboration.

First, while the CFI has actively promoted collaboration across disciplinary lines, the Panel has the sense that the CFI is still widely perceived as funding only "scientific infrastructure," narrowly defined. This perception is not necessarily fair in light of, for example, the CFI's important investments in two important digital library consortia focussed on the social sciences and humanities – Digital Content Infrastructure for the Human and Social Sciences and the Synergies project. Nevertheless, the perception remains, and the importance of involving social sciences and humanities researchers in research to address national and global issues presents an opportunity for the CFI to encourage projects that broaden interdisciplinary collaboration beyond the natural and physical sciences.

Second, as noted earlier in this report (see the section on the CFI's objective of strengthening Canada's capacity for innovation), the CFI's funding model has promoted cross-sectoral partnerships in the financing of research infrastructure projects, and the KPMG data suggest that the CFI has helped to motivate researchers to devote increasing attention to knowledge transfer/translation and the potential end uses or practical applications of their research. However, while there are clearly numerous examples of effective knowledge transfer from universities and other public research institutions to the private, not-for-profit and public policy sectors,³⁷ Canada's overall record in economic innovation is not strong. In the light of other countries' increasing emphasis on knowledge transfer and given the importance of research to economic, social and public policy innovation, there is certainly an opportunity for the CFI to consider placing more emphasis on intersectoral knowledge transfer/translation.

- *The international leadership challenge/opportunity: securing for Canada a world leadership role in specific research areas in which it has a strategic interest, strategic advantage and actual or potential critical mass; and being at the table as a player in other major international research collaborations*

The Panel expects the research landscape to be characterized by the emergence of more and more international consortia and institutes, often multi/interdisciplinary in nature and with multiple funding streams and more streamlined governance structures than in the past. This is already happening to some extent in the area of research telescopes, for example. In fields where it has a strategic interest and actual or potential critical mass, Canada has the capacity to lead some of these collaborations. Indeed, as noted earlier in the section on the CFI's objective to build research capacity, Canada is already home to a number of world-class research institutes. Of course, Canada cannot lead in all fields, but the participation of Canadian researchers in international collaborations led by other countries is nevertheless important to provide Canada with critical access to the most cutting-edge science in these areas.

The CFI is well suited to help secure an important leadership role for Canada at the international research table. With its experience in using infrastructure funding to stimulate positive change in the Canadian research community over the past 12 years – both through the design of its programs and through its insistence on strategic research plans – the Foundation is ideally placed to act as a catalyst in taking Canada's research effort to this international leadership level.

To a considerable extent, of course, the CFI's ability to secure a more prominent international role for Canada will depend upon its success in meeting the infrastructure and collaboration challenges and opportunities described above.

³⁷ See, for example, *Momentum: The 2008 Report on University Research and Knowledge Mobilization*, Association of Universities and Colleges of Canada, Ottawa, 2008.

C. *How can CFI contribute to taking Canada's research effort to the next level?*

In using its funding of infrastructure projects to promote strategic thinking at the institutional level and increase research collaboration, the CFI has been ahead of the curve. In addressing how it can build on this record to help take Canada's research effort to the next level, the CFI Board of Directors may wish to consider the use of strategic or dedicated funds, possibly on a pilot project basis. Precedents for such strategic funds include the current National Platforms Fund and the former International Funds.

In future, strategic or dedicated funds might be used to:

- *support Canada's share of costs associated with internationally-shared research infrastructure in order to facilitate Canadian researchers' participation in and, in some areas, leadership of international consortia*

There are already precedents for the CFI's funding research infrastructure that has enabled Canada to lead or participate actively in internationally collaborative research endeavours. Through its International Funds Competition in 2001 and its International Joint Venture Project in 2005, the CFI invested in Canadian-based projects, such as the Sudbury Neutrino Observatory (SNOLAB), the research icebreaker CCGS Amundsen, and the Neptune project referenced earlier in this report, as well as in Canadian participation in major scientific infrastructure projects outside of Canada, including the Spallation Neutron Source at Oak Ridge National Laboratory in Tennessee; the Canada-Kenya Research Laboratory, for the study of infectious diseases, in Nairobi; and the Atacama Large Millimetre Array (ALMA) Telescope in Chile.³⁸ The CFI Board may wish to consider the possibility of focusing further attention on these types of projects.

- *support infrastructure projects that will enable interdisciplinary and multidisciplinary research, particularly research that will involve researchers from the social sciences and humanities as well as those in the physical, natural and health sciences.*

It will be essential to include social sciences and humanities researchers in research projects on some of the most important issues of our times. However, with some exceptions, it is not at all clear, in view of the nature of the academy, that this will automatically happen "from the ground up" in the absence of appropriate incentives for broader collaboration. With its reservoir of good will and respect in the research community, particularly in the traditional scientific disciplines, and its excellent record in stimulating cross-disciplinary collaboration, CFI may be well placed to exercise leadership in broadening multi/interdisciplinarity to involve partnerships

³⁸ See AUCC, *Momentum*, pp. 99-100, for brief descriptions of these and other internationally-focused projects funded by the CFI in the 2001 and 2005 competitions.

among researchers from a full range of disciplines – social science and humanities as well as the natural, physical and health sciences – to address major issues and problems of national and international importance. Again, this could take the form of a dedicated fund for infrastructure projects that support broad-based, cross-disciplinary research.

- support infrastructure projects that will promote intersectoral knowledge transfer/translation.

While the earlier-cited report by the Council of Canadian Academies points to “a lack of orientation by Canadian business to the commercial exploitation of opportunities at the leading edge of science and technology” as the root cause of “the disappointing level of university research commercialization” in Canada,³⁹ it also notes that the “overall performance of university technology transfer in Canada has not been strong,” at least in part because of funding limitations facing technology transfer offices. It concludes that:

...there is an unambiguous case for improving the critical infrastructure for identifying and mobilizing potentially commercializable knowledge as it emerges from university-based research. In many cases, this will involve well-designed partnerships between universities and private-sector businesses or government labs.⁴⁰

The CFI cannot be expected singlehandedly to turn around Canada’s innovation performance. Nor, in the view of the Panel, would it be wise to shift the CFI’s core mandate away from ensuring that Canadian universities and other research institutions will have the research infrastructure required to attract and develop research talent and enable top quality research. Nevertheless, the CFI does have an important role to play in promoting cross-sectoral collaboration and supporting infrastructure to facilitate innovation.

To these ends, the CFI may want to consider creating a dedicated fund to support infrastructure projects that include a full plan for knowledge mobilization. The intent would be to fund infrastructure that supports collaborative research and knowledge transfer/translation across sectoral boundaries. Such infrastructure would not be limited to traditional technology transfer offices. It could also include various mechanisms and venues to facilitate active collaboration at all stages in the innovation process from research design to applications in the marketplace and public and not-for-profit sectors. Researchers from the full range of disciplines would be involved in identifying potential research applications, as well as the paths and obstacles to successful application, and implementers would contribute to research design.

³⁹ Council of Canadian Academies, *Report in Focus – Innovation and Business Strategy: Why Canada Falls Short*, p. 8.

⁴⁰ *Ibid.*, p. 16.

While the CCA report's discussion of knowledge transfer focuses on commercialization of university research discoveries, the Panel is suggesting that CFI take a broader view to include infrastructure that supports knowledge mobilization to address a range of economic, social and public policy challenges – in other words, to put research results to work for the economic and social betterment of Canadians. To provide but one example, behavioural research that contributes to more effective health promotion applications can have a real impact not only on health outcomes but also on health care costs and governments' bottom line.

- support infrastructure projects to promote Canadian leadership in selected areas of strategic interest to Canada and where there exists in Canada actual or potential critical research mass

No country can be a world leader in all areas of research. For a country of Canada's size to play a leadership role in some areas, it must set priorities. For example, some possible research areas that come to mind for Canada are oceanography, telecommunications, polar research, adaptation to climate change, genomics, energy and other natural resources.

In setting priorities, however, it is important to find the right balance between the need to focus resources in a few areas of established strength and critical mass, and the importance of not choking off the possibility of completely new areas of research strength emerging in future. In this regard, it is worth noting the Panel's understanding that CFI's "top-down, bottom-up" decision process has resulted in a close alignment of CFI projects with the broad S&T priority areas identified by the Canadian government.

In light of its national vantage point and its experience at setting strategic directions and priorities, designing programs accordingly and then letting institutions themselves identify research strengths, the CFI may be ideally placed to bring coherence to Canada's research efforts in areas of strategic national interest and significant but dispersed research strength, while avoiding an overly centralized, top-down approach to choosing "winners." As well, the CFI could play an important role in ensuring effectiveness and efficiency in the use of public funds for large-scale infrastructure (so-called "big science").

Thus, for example, the CFI might ask institutions to identify their own areas of strength in international research collaboration, their potential for international leadership in those areas and the large-scale infrastructure that would be required. The CFI could then develop strategic "road maps" in the most promising areas of Canadian research strength. These road maps would identify the optimal mix of large-scale and smaller-scale infrastructure, as well as O&M funding, required to maximize the chances of success over specified periods of time. To ensure coordination and collaboration and avoid inefficient and costly duplication of

facilities, the CFI could then invite institutions to submit joint infrastructure applications to a dedicated fund for this purpose.

D. *What will it take?*

The Panel is strongly of the view that continuing the CFI's record of excellence over the next decade will require:

- *maintenance of the foundation model as it has been applied in the CFI's case over the past 12 years*

If, as this report has concluded, the CFI is well-positioned to play a catalytic role in taking Canada's research effort to a new level internationally, it is precisely because of the success of the foundation model. In fact, as noted earlier, Panel members consider the CFI model to be world-leading and worthy of emulation elsewhere. For the CFI to respond nimbly to Canada's research infrastructure requirements in a highly dynamic international environment and to undertake the kinds of initiatives that the Panel has suggested above, it must continue to have flexibility and autonomy in setting strategic directions and funding excellence wherever it is found. At the same time, the CFI must continue its strong commitment to public accountability, transparency and due diligence.

On the latter point, the Panel notes comments from some participants in the KPMG study to the effect that the workload involved in meeting CFI's reporting and accountability requirements was not always seen as commensurate with the amount of money and risk involved in each project. The Panel understands that CFI management is aware of these concerns and will look into them. From the Panel's perspective, it is important to ensure that reporting and other compliance requirements are focused and proportional. At the same time, however, the Panel fully recognizes that careful stewardship of public money is essential and the CFI's commitment to due diligence has contributed mightily to the Foundation's excellent record and reputation in this regard.

- *the resources to do the job*

Panel members are certainly conscious of the fiscal pressures that governments have faced as a result of the global recession over the past year and will continue to face in the short-to-mid-term as a consequence of budgetary deficits induced or exacerbated by the recession. Governments will confront difficult choices and some will be tempted to curtail longer-term investments in research and innovation. However, as argued earlier in this report, the Panel is convinced that it will be the countries that resist this temptation that will prosper in the longer term. For the CFI to play the role envisaged in this report, thereby helping to ensure that Canada is one of those countries that prospers, the Foundation will require significant resources.

The Panel considered the 40-60 funding formula that has been in place since the creation of the CFI and concluded that it remains optimal. The 40 percent federal share is substantial enough to leverage matching funding from the provinces and the private sector or other partners. Indeed, the number of proposals coming forward with these funding commitments in place has far outstripped the available CFI funds. A less substantial federal share of individual project funding would risk undermining the powerful leveraging effect evident in the current arrangement. On the other hand, an increase in the federal share, without a significant increase in funding to the CFI, would result in fewer transformative, new infrastructure projects being funded and lower the current success rate of 30 percent in CFI open competitions. The Panel's considered opinion is that this 30 percent success rate is appropriate to ensure the excellence of the projects that are approved, but anything less than 30 percent would run a serious risk of discouraging institutions, which incur significant costs in preparing these project applications, from bringing forward new proposals. This could lead to important lost opportunities.

Based on its surveys, KPMG estimates that the CFI's share of total anticipated requests for new infrastructure and renewal of infrastructure could total \$5 billion over the next five years.⁴¹ If the success rate of 30 percent in open competitions is maintained, this would result in a minimum requirement of at least \$1.5 billion from the CFI over the next five years for renewals and new projects to sustain and extend Canada's research infrastructure capacity. However, the Panel cautions that, given methodological uncertainties, this figure may underestimate the potential sums associated with the investment opportunities and requests that the CFI will face.

In addition, it should be emphasized that this figure does not include monies that would be required if the CFI were to cover a portion of operation and maintenance costs of large and unique facilities or a greater portion of current eligible infrastructure operating costs over an extended period of time. As noted earlier in this report, if the CFI is to take on these additional responsibilities without compromising its ability to respond to needs for new and renewed research infrastructure, it will require additional dedicated funding from government for O&M purposes. Nor does the minimum \$1.5 billion figure include additional resources that would be required for the CFI to play an expanded role through creation of dedicated or strategic funds to take Canada's research effort to the next level.

- *continued strong and creative leadership on the part of the CFI Board and management*

Through CFI's first 12 years of existence, its Board and management have demonstrated an unflagging commitment to excellence and to continuous improvement. They have inspired change in the Canadian research community with

⁴¹ KPMG, *Final Report*, p. 30.

a skilful combination of communication and consultation with stakeholders, leadership in setting strategic directions, and bottom-up identification of research strengths.⁴² These attributes will be crucial to continued success over the decade to come.

⁴² In this regard, the Panel notes that KPMG's value-for-money audit (Draft Report, Aug. 12, 2009) points out that the CFI's management strength received public recognition in January 2009 when the Queen's University School of Business named the Foundation one of the Top 50 Small and Medium Employers in Canada (p. 17). The CFI's strong performance in engaging major stakeholders in strategic planning was recognized by the Conference Board of Canada when it awarded the Foundation the Spencer Stuart National Governance Award in 2006 (p. 14).