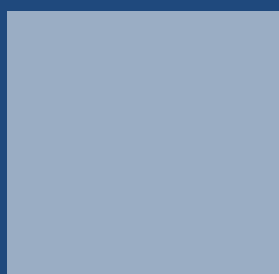
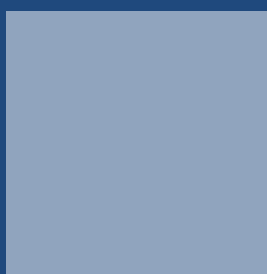
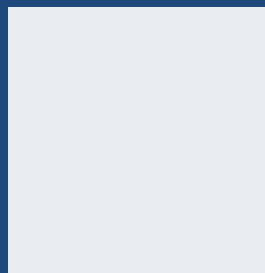
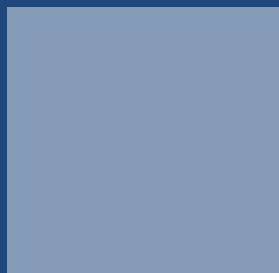
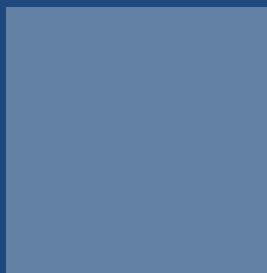
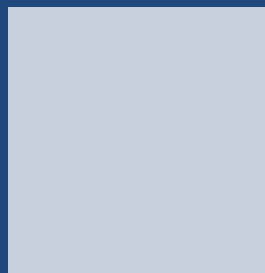
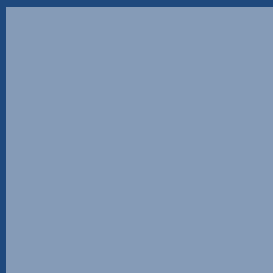
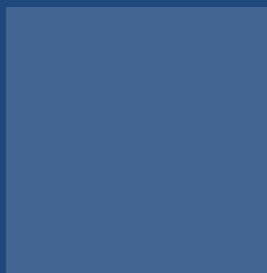
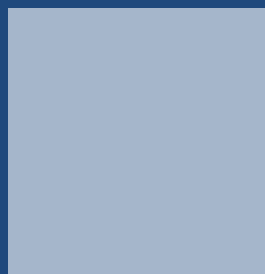
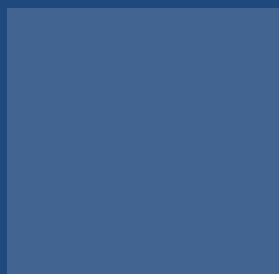


Final Report

Design and Implementation of a Performance Audit

Prepared for:
CANARIE Inc.

September 28, 2010



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1. Introduction

1.1 Background

CANARIE is a not-for-profit corporation supported by membership fees, with major funding of its programs and activities provided by the Government of Canada. Under its Funding Agreement with Industry Canada of March 28, 2007, as amended CANARIE is required to have a performance audit completed by September 30, 2010. The purpose of the audit is to assess the economy, efficiency and effectiveness with which CANARIE funds have been used.

1.2 Audit Scope

The performance audit has been guided by audit objectives and criteria, given in Appendix A, developed through the approach set out below (Section 1.3). The audit also engaged three similar organizations to assess CANARIE's relative performance in respect of the audit issues. A separate note on the results of this benchmarking exercise is provided under separate cover. The audit provides an assessment of (i) governance and strategic planning, (ii) network operations and programming and, (iii) corporate management, and covers the period of the current Funding Agreement.

1.3 Audit Approach and Methodologies

The performance audit was carried out in accordance with the performance audit policies of the Office of the Auditor General of Canada (2004) and informed by CANARIE's Performance Audit and Evaluation Strategy (PAES). This audit is based on the evidence available to the auditors during the period of the study, July 5, 2010 through September 30, 2010.

The audit involved three phases beginning with the Survey (Planning) Phase, which included a broad based appraisal of CANARIE's operations through preliminary interviews of selected CANARIE executives and Board members to provide information to be used to fine tune initial decisions with respect to scope, audit objectives, audit criteria and areas for more in-depth review. The product of the Survey Phase was a Design Report that contained a detailed description of the performance audit design and the work plan including interview guides to be used in the Examination Phase.

The Examination Phase involved in-depth interviews and a thorough analysis of the CANARIE data and documents. The document review served several purposes. In addition to helping understand the organization, the review identified the main management processes and structures that are in place and, drawing from best practices, determined whether they are adequate and operational (effective), efficient and cost effective (economical). This phase also included the

benchmarking of CANARIE performance against three similar organizations, one in Europe and two in the United States.

The Reporting Phase brought together the analysis, findings, and recommendations in a structure and style that conform to audit standards, meet the requirements of Industry Canada, and are useful to CANARIE management.

2. Audit Findings

2.1 Governance and Strategic Planning

Audit Objective 1: Processes for governance of CANARIE and its programs and activities provide reasonable assurance that the programs and activities are consistent with the objectives of CANARIE.

- *The Board has the necessary plans and processes including appropriate committees in place to govern efficiently and effectively.*

The Board of Directors is properly constituted to carry out its major governance functions. The soundness of the governance is based on best practice governance policies including by-laws, Board structure and decision-making processes that include Board committees, rules of procedure, conflict of interest guidelines, and communications policy. The current standing committees cover the key areas of concern in governing CANARIE, i.e., Executive Committee (human resources, strategic planning and budgeting, operations and procedures, and membership), Audit and Investment Committee, Governance and Nominating Committee, and ORAN Advisory Committee together with its subcommittee, the CANARIE Network Technical Committee. The Chairs of the committees report to the Board on a regular basis. In addition to standing committees, the Board also convenes ad hoc committees, when and as necessary, such as the current CEO Search Committee and Steering Committees to make recommendations to the Board on program terms of reference and on funding of specific projects.

The Board generally follows best practices in both providing oversight to the management of CANARIE through the development of governance and operational policies implemented by staff and in taking substantive decisions, based on materials and discussion at Board meetings. Operational policies are supported by effective plans and processes linked to CANARIE objectives as set out in the Funding Agreement with Industry Canada. The plans and processes are concerned with financial management, compliance management, program management and human resource management.

The current practice of the Board is to self-assess its functioning through interviews of outgoing Board members by the Board Chair and Vice-Chair and through biennial Board assessments. An important consequence was the change in the tenure of the Chair from one year to two years. This change was in response to more rapid turnover in senior staff at CANARIE and to giving the Chair more time to exert influence on the direction and management of CANARIE.

- *The Board composition is balanced in terms of competencies, gender, regional and diversity considerations.*

The Board membership is reasonably well balanced in terms of competencies and regional considerations but not in terms of diversity including gender. For example, the twelve Board members are distributed across all five regions of the country, but there is only one female member. In terms of sectoral representation, the bylaws require that at the annual meeting of CANARIE, one half of the Board be elected by industry members and one half by institutional members. We commend the actions of the Governance and Nominating Committee in maintaining a profile of the Board relating to expertise, knowledge, skills, experience, spheres of influence, and sectoral and regional representation but challenges to attaining a balance remain:

- Gender balance has clearly not been achieved with currently only one female member on the Board. Diversity criteria (gender as well as racial) need more attention in considering Board balance.
- Broadening industry representation to include members from small, medium and large-sized companies from both the supplier and user sectors would better reflect Canadian industry interests across the range of CANARIE activities related to network operations and technology innovation and extend the range of advice available to the Board. This could be accomplished by diversifying the industry representation within the current size of the Board or by increasing the size of the Board. Through this greater industry outreach, CANARIE would also be serving the objectives of the Federal S&T Strategy to increase industry participation in innovation.
- The Funding Agreement calls for members of the Audit and Investment Committee to be ‘financially literate and have broad knowledge or experience in investment matters’. We find as did the Compliance Audit in 2008 that the Committee does not yet have the broad knowledge or experience in investment matters called for in the Audit, recognizing that the Audit and Investment Committee did agree in its meeting of November 10, 2008 as a result of the Audit to increase the literacy requirements of the Committee. We find that having a Board member with a professional background in finance and investment would be prudent.(see Audit Objective 6)

Both the current and proposed policies respecting the nomination of directors state that “During the year between annual meetings, the Board may, from time to time, appoint as additional directors individuals qualified to be directors provided that in addition to the directors elected at the annual meeting, such additional directors shall not cause the maximum of thirty (30) to be exceeded...”. We find this bylaw not to be in conformity with best practice as it gives the Board license to increase Board membership without the consent of members. The Model By-Laws for a not-for-profit company and the current policies of Corporations Canada do not support the Board having such a power. A bylaw (as included in the current bylaws but not in the new draft policy) that permits the Board to make replacements in case of a Board vacancy would be acceptable.

We find the current size of the Board to be in line with the Boards of peer organizations in Canada and the US¹.

- ***Board decisions are followed-up in an efficient and effective manner.***

The follow-up to Board decisions by CANARIE staff is efficient and effective. Following a Board meeting, there is a debriefing for staff that sets out the major decisions and action items taken by the Board excluding decisions taken in in-camera sessions. Action items are delegated to the appropriate manager and acted upon. Longer-term items are noted for planning purposes and future action. These items are discussed at the debriefing of staff following the Board meeting and assigned to the relevant manager for action. That person is then responsible to report back to senior management and the Board on the matter.

Board minutes document this process. In one recent example, the Chief Strategy Officer was asked to develop a detailed implementation plan for a partnership with the Canadian University Council of CIOs (CUCCIO) for the delivery of Canadian Access Federation services. On the return of the detailed plan, the Board approved the partnership proposal. In another example, the Board asked staff to develop more elaborate service level objectives for the network as part of performance monitoring; this matter was delegated to staff and work is underway.

Audit Objective 2: Processes for establishing long-term goals, strategies and objectives are transparent and accessible to stakeholders.

- ***The planning processes engage the Board of Directors, the CANARIE staff and all key stakeholders and are transparent.***

The Funding Agreement requires CANARIE to submit an Annual Business Plan to the Minister that includes the planned activities for the upcoming year and the anticipated results as well as a Communications Plan. The Board is fully engaged in developing these plans through the work of the Executive Committee whose responsibilities include preparing recommendations to the Board regarding strategic planning and budgetary issues. The Committee is supported in all its planning activities by CANARIE staff, in particular the Chief Financial Officer, the Chief Technology Officer and the Chief Strategy Officer.

The full engagement of stakeholders continues to be a challenge for CANARIE. A survey of stakeholders in 2009 indicated low visibility for CANARIE particularly among potential network user communities. The finding resulted in a new communications strategy directed at increasing visibility and providing more opportunities for stakeholder interchange. An outcome was the targeting, in addition to the annual CANARIE Users Forum, of other fora such as Summit 09, a joint initiative of CANARIE and Cybera, Alberta's ORAN partner, to increase exchanges among

¹ Comparisons of ORANO, RISQ and BCNet to Peer Organizations in Canada and the US, Hickling Arthurs Low Corporation, March 2007

developers, suppliers, users and others on issues at the forefront of advanced network technologies.

A strategic mandate review currently being undertaken by the CANARIE Board and staff to determine the appropriate evolution of the CANARIE network and its services provides another example of improved transparency in CANARIE planning processes. Four working groups were established with representation from a broad range of researchers and other users related to network operations, products and services, network innovation and new markets. As a result of the review, CANARIE is exploring a number of options for future initiatives and continues to consult the working groups. In order to improve the transparency of consultations with the ORANs, the ORAN Advisory Committee, which used to meet twice a year for information, now meets five times a year as a full committee of the Board. The chair of the Committee is a Board member reporting to the Board on Committee outcomes.

- ***The planning processes are based on the results of research.***

Planning processes have been based on both benchmarking and technology foresight exercises. A review of selected international peer organizations by Andrew Bjerring was commissioned to support the strategic mandate review process. Ongoing benchmarking of CANARIE's budget allocations informs submissions of CANARIE staff to the Board of annual and longer-range budgeting materials and proposals. Technology foresight, on the other hand, has not received much attention since the departure of the Chief Research Officer. We find the absence of a research plan in the annual Business Plan to be indicative of this weakness in the planning processes of CANARIE.

- ***The planning processes adequately take account of the five-year mandate and funding cycle of CANARIE.***

The planning processes do take into account the funding cycle in that their focus is the attainment of defined objectives for the five-year mandate given in CANARIE's Funding Agreement. The five-year mandate provides both benefits and challenges to CANARIE's planning. On the one hand, the mandate gives certainty of annual funding but, on the other, creates difficulties in planning for the longer-term commitment inherent in the support of network infrastructure. The underlying assumption in CANARIE's current planning, however, is that its mandate will be renewed and, therefore, no formal acknowledgement of the potential termination of the mandate is made in planning documents. The present approach, consequently, is for planning to address five-year goals but also include a longer-term view of CANARIE and its sustainability. In previous funding cycles, assumptions were made that funding would not be renewed and contingencies were therefore built into planning and budgeting.

We find the impact of the two approaches to have material consequences for planning. The non-renewable approach could lead to the ORANs reducing or suspending investments to mitigate their risk and thus reducing the utility of the network to users. The difference in approach is also highlighted in the licensing of fibre. In the non-renewable case, maintenance would likely be

paid for upfront, whereas in the renewable approach maintenance would likely be paid for later and investments in improvements made now.

Despite the positive approach to future funding, we find the experience of the last funding decision to have created concerns in CANARIE and its ORAN partners and other stakeholders about the future of the network infrastructure. As part of the strategic review mandate process, potential solutions to maintaining the network beyond the current mandate were discussed. These included funding the infrastructure through A-base allocations or submitting a funding request for CANARIE's next mandate early to avoid last minute decision-making. The implications of the first option for CANARIE are considerable and go beyond the scope of this performance audit but in brief it would mean a change in CANARIE's status as an independent organization, having to relinquish its ability to appoint its Board and CEO. On the second option, CANARIE initiated discussions with Industry Canada on the possibility of early approval of network funding but were informed that such a process was not permissible under the government's budgetary rules.

Audit Objective 3: The corporate structure of CANARIE is appropriate to reaching results in an economical, efficient and effective manner.

- *The corporate structure is appropriate to the economical operation of CANARIE ie operating at the lowest reasonable cost to ensure the planned results.*

As of August 30, 2010, CANARIE's organizational structure consists of four senior management positions, the President & CEO, the Chief Strategy Officer, the Chief Technology Officer, and the Chief Financial Officer responsible for 17 staff positions. From benchmarking studies², the total number of positions is in line with peer organizations in Canada, Europe and the United States except for relatively lower staffing in technical support (see Audit Objective 7). The evidence available to this audit suggests the current structure has served CANARIE well and no major gaps or deficiencies in the structure within the limitations of the 15% O&M restriction placed on administrative expenses by the Funding Agreement have been noted.

- *Roles and responsibilities of CANARIE management and staff are clearly set out in the corporate structure.*

Roles and responsibilities of each position in the corporate structure are clearly set out. Any changes to the roles and responsibilities of senior positions as discussed above would need to be accompanied by appropriate changes to the roles and responsibilities of supporting positions.

² ibid

2.2 Network Operations and Programming

Audit Objective 4: The plans, practices and processes that are in place are appropriate for the economical, efficient and effective management of the CANARIE network operations and related activities.

- ***CANARIE's practices and processes in the management of its network are cost-effective.***

We find CANARIE's practices and processes in the management of its network are cost effective, to the extent resources permit and given its mandate as a publicly funded institution. First, CANARIE's network is not a commercial network, and is used on as needed basis. Ongoing traffic is only about 10% of the network capacity, but this is necessary to be able to serve big science with periodic large capacity demands. Second, CANARIE operates the network with relatively few technical resources. Almost all the respondents we consulted feel that CANARIE is economical and cost efficient because it operates the network and related activities with so few technical resources. A review of previous benchmarking studies³ indicates that CANARIE does operate its network with fewer technical resources than comparable operations. Several respondents noted that with so few technical resources CANARIE is probably not as effective as it could be.

- ***CANARIE makes effective use of co-delivery opportunities.***

A review of the signed ORAN connection agreements with 10 provinces and 2 territories indicates that CANARIE is following a co-delivery model. Under the co-delivery model, CANARIE provides access to the national network at no cost in exchange for the ORAN establishing and operating one or more GigaPops. We find that CANARIE makes good use of co-delivery opportunities; however, it was evident from interviews that improvements could be made in operating CANARIE's Network Operations Centre (NOC) as a 24/7 operation, e.g., supplementing CANARIE's technical resources by sub-contracting with ORANs and/or universities. In order for this to happen, greater clarity is needed on the roles and responsibilities of the different parties particularly between the national and regional networks.

- ***CANARIE ensures its network operations are an essential research infrastructure serving client needs.***

We find that CANARIE does ensure its network operations are an essential research infrastructure serving client needs, given its mandate. CANARIE conducts an annual users forum to ensure that its research infrastructure is serving client needs. Reports on users forums are submitted to the Board for review and discussion, and performance of the network included

³ See Andrew K. Bjerring, January 11, 2010, *Review of Selected International Peer Organizations*, which compared JANET (UK), Internet2 (USA), NORDUnet (Nordic countries), SURFnet (Netherlands), and AARnet (Australia); and Hickling Arthurs Low Corporation, 2007, *BCNET, ORANO and RISQ Benchmarking Study*, which compared BCNET, Cybera, ORANO and RISQ in Canada, and CENIC, Merit, NYSERnet, LEARN, PNWGP and SoX in the USA.

in the Annual Performance Report. Users are informed of CANARIE's response to client comments. However, CANARIE's five-year mandate can compromise any efforts to ensure its network operations are an essential research infrastructure. This is because CANARIE's clients, whose research typically goes beyond five years, cannot be assured of a national network beyond a five-year horizon. In addition, some respondents feel that CANARIE has lost its place of technical leadership due to the retirement of technical senior personnel.

- ***CANARIE makes best efforts to ensure access to its network.***

We find CANARIE does make best efforts to ensure access to its network. It does this by offering three programs: 1) Infrastructure Extension Program (IEP) which provides funds to support the creation of extensions to the CANARIE Network for government laboratories, educational institutions and other facilities without a connection; 2) Lightpath Program which allows researchers with a connection to obtain dedicated CANARIE network infrastructure resources to build their own networks; and 3) ORAN Infrastructure Program (OIP) which provides funding support to the ORANs to further develop their research network capabilities.

Audit Objective 5: The plans, practices and processes that are in place are appropriate for the economical, efficient and effective management of CANARIE's technology innovation programs and related activities.

- ***CANARIE's programs such as the NEP, IEP and OIP are managed in an economical, efficient and effective manner.***

CANARIE's technology innovation programs support the development, demonstration and implementation of next generation technologies to advance CA*net as a leading-edge research network. Its flagship Network-Enabled Platform (NEP) Program funds the development of tools and software that help researchers, in a wide range of disciplines, to fully exploit and share the massive amount of data and research that flow along the CANARIE network. Other programs include the Infrastructure Extension Program (IEP), ORAN Infrastructure Program (OIP) and Lightpath Program mentioned earlier. There is also the Green IT Program, which funds projects aimed at reducing ICT's carbon footprint and measuring the impact of ICT and cyberinfrastructure on university energy consumption; the ORAN Communications Program (OCP) which provides funding for communications initiatives that demonstrate the value of national and regional partnerships in the provision of advanced networks, networking technologies and the applications and services for which they are used; and the ORAN Activity Support Program (OASP) which provides funding support to facilitate the addition of staff or support operating costs of the provincial ORANs in order to enable them to better serve CANARIE's objectives as defined in CANARIE's Funding Agreement with Industry Canada.

Based on a review of program documentation, including signed project agreements, and from consultations with stakeholders, we find that CANARIE's technology programs are managed in an economic and efficient manner. However, similar to the first criteria of the previous audit

objective, some respondents noted that, with so many programs and so few technical resources, CANARIE is economical and cost efficient but is probably not as effective as it could be.

- ***CANARIE makes effective use of co-delivery opportunities***

We find that CANARIE does make effective use of co-delivery opportunities where appropriate such as the ORAN Infrastructure Program (OIP). However, for programs that deal directly with end users, such as the Network Enabled Platform (NEP), co-delivery may not be appropriate as it would involve, potentially, co-funding, co-managing the RFP and selection process, and co-monitoring.

- ***Access to CANARIE's programs is equitable. The selection and approval process for CANARIE programs is efficient and effective.***

Request for Proposals (RFPs), eligibility and selection criteria, funding amounts, and other background information on the technology innovation program are available on CANARIE's web site. We find that access to CANARIE's technology innovation programs is equitable, i.e. the same information is made available to everyone. However, with the exception of OASP and OCP, selection is based on merit, i.e., there are no quotas to ensure equal selection of different stakeholder groups and/or regions. Project selection is based on a two phase process, where a general RFP asks for a 10-page letter of intent, and only those short-listed are asked to submit a full proposal. The time from Request for Proposal (RFP) to Contract Award averages between 8 and 9 months, which is reasonable for due diligence with public funds. This is consistent with the finding of the 2008 Compliance Audit which noted that "CANARIE has an open competitive process to solicit proposals and select Eligible Projects based on a peer review process following established guidelines" and that CANARIE is in compliance with the project selection requirements outlined in the Funding Agreement.

- ***CANARIE's programs promote the development and diffusion of shared middleware.***

A review of programs and through discussions with stakeholders indicates that CANARIE develops and promotes "project" middleware but not necessarily "shared" middleware. Attitudes and funding constraints are key factors that inhibit the sharing of middleware. The development of middleware is an expensive undertaking, getting people to share is not an easy process, and the most successful "shared" and open projects received large amounts of funds. We find that insufficient funds and resources mean that CANARIE has been unable to put in place processes for and effort to promote sharing middleware between projects.

Our review of signed NEP project agreements regarding intellectual property is consistent with the finding of the 2008 Compliance Audit that the language meets the requirements outlined in the Funding Agreement for title to and exploitation of intellectual property created during a funded project.

2.3 Corporate Management

Audit Objective 6: The financial, administrative and risk management policies, processes and practices support the economical, efficient and effective operation of CANARIE.

- *Financial auditing, investment policies and risk management policies are appropriate and being implemented efficiently and effectively.*

We find that the financial audit, investment policies and risk management policies are appropriate in that they meet or exceed the requirements of the Funding Agreement. From an examination of Board minutes and from interviews with Board members and staff, we determined that they are being implemented efficiently and effectively. Staff and Board Members noted that the appropriate systems are in place with regular reporting to the Board and its Audit and Investment Committee. As noted above, while financial and risk management has improved significantly, there remains a concern that the Audit and Investment Committee does not have the required specific financial expertise. The Board has added this requirement to the Terms of Reference for the Committee and has canvassed the members of the Committee to ensure that they assess their own capability in this area. We find that the Board could go beyond these steps and nominate one or more persons to the Board who have express, direct experience in financial audit, investment policy, and risk management.

- *CANARIE's administrative obligations are being undertaken in an efficient and effective manner.*

We find that the administrative reporting is thorough and in accordance with the Funding Agreement. From interviews, it was determined that Industry Canada is satisfied with the information it obtains from CANARIE annual reports (one to the Minister and one for public consumption and has complimented CANARIE on the completeness and timeliness of its reporting. We note that CANARIE continues to examine ways to improve the efficiency of the processes it uses to collect information for and the preparation of the two annual reports.

- *Financial planning accounts for the five-year funding cycle in the most efficient and effective way possible.*

The financial planning does take into account the five-year funding cycle. It does this by not only recognizing the practical reality of the limitation caused by such a process but also by attempting to plan beyond that cycle on the assumption that new funding will be approved. We find this dual approach to planning to be an efficient way to deal with the limitations created by the five-year funding cycle; but, as noted elsewhere in this report, the limitations on financial commitments beyond the five-year plan do have serious network and program planning implications for CANARIE.

Audit Objective 7: Human resources planning, management, and policies are up-to-date and economical, efficient and effective in ensuring that the necessary resources are available.

- *Current human resources policies are compliant with relevant provincial employment requirements and policies.*

We find that CANARIE has a comprehensive set of Human Resources Policies covering all material aspects of the employer-employee relationship. The Policies appear to be compliant with Provincial laws and regulations; CANARIE's manual on human resources acknowledges the applicability of these laws and regulations, as appropriate. There is a process of continuous improvement in place to ensure the continued and further development of those policies and processes.

- *CANARIE's human resources planning, management and policies are efficient and effective.*

We find that human resources planning and management could receive more attention. It was noted that over the past year there has been a degree of uncertainty among staff and the Board over CANARIE's future staffing requirements caused, at least in part, by the delay in recruiting a new President.

A review of the annual Business Plans indicates that human resources planning issues are not addressed in the creation of these plans. This may contribute to the uncertainty in the human resources area. An annual process that more formally links human resources planning to the annual Business Plan could help to address this situation.

- *The skills of the CANARIE staff are appropriately aligned to address the requirements of its Funding Agreement and Strategic Plan.*

From interviews and a review of job descriptions, we find the skills of the staff to be aligned with the requirements of the Funding Agreement and the Strategic Plan.

We find that there is a perception that there has been a loss of technical and technological leadership at CANARIE that should be addressed. From previous benchmarking studies⁴, it is evident that CANARIE has proportionately fewer in-house technical staff than similar R&E network organizations. This is largely because CANARIE has chosen to outsource a portion of its technical support activity. While cognizant of the 15% ceiling for administrative expenses, we note, based on benchmarking studies that CANARIE could reconsider the outsourcing

⁴ Comparisons of ORANO, RISQ and BCNet to Peer Organizations in Canada and the US, Hickling Arthurs Low Corporation, March 2007

decision given that others (e.g., GÉANT and CENIC) have found that the in-house technical support is more efficient and effective at supporting network and service innovations.⁵

Audit Objective 8: Communications plans, programs and processes that are in place are appropriate for the economical, efficient and effective communication and marketing of CANARIE, its programs and activities.

- *Communication plans, process and programs are efficient and effective in creating awareness of CANARIE nationally and internationally.*

Based on a review of the annual Business Plans, CANARIE's website and interviews with Board members, CANARIE staff and stakeholders, we find that the communications and public relations function has improved significantly over the past year or so. There is a sense that stakeholders, including the research community are more engaged with CANARIE than previously. We find that CANARIE has a detailed communications strategy in place; that it is being implemented effectively and that it is being updated and adjusted as required. We also find from interviews and reviews of the current Communications Strategy and the draft new Strategy that CANARIE could increase its communications activities related to its future plans and the future of network technologies.

- *CANARIE is seen as a highly credible R&E organization both nationally and internationally.*

We find that CANARIE is seen as a very credible R&E network organization both nationally, especially among its stakeholder groups, and internationally, especially among similar types of organizations around the world (based on discussions with representatives of the target organizations in the benchmarking exercise). There is, however, some perception that CANARIE has lost its leadership position in the technology itself – a loss of technological vision. We find this perception to stem from the loss of the previous Chief Research Officer as well as a more comprehensive approach to research and education infrastructure by peer organizations in the UK, US, Australia and elsewhere. We note that CANARIE is taking steps (vis. the current, ongoing strategic review) to broaden its understanding of and influence on future network technological innovations.

- *CANARIE effectively coordinates with the ORANs joint communications plans and activities.*

Within the resources available, CANARIE has effectively coordinated communications plans and activities (for example, by jointly hosting the annual summit with one of the ORANs) with the regional networks. It was felt that cooperation among the communications officials of CANARIE and the ORANs could be put on a more formal basis by implementing the proposed Communications Council. We note that the GÉANT network of the European Union hosts

⁵ *Benchmarking Report*, Hickling Arthurs Low Corporation, September 2010.

meetings of the “communications managers” from GÉANT and the National Research and Education Networks (NRENs) twice per year.⁶

Audit Objective 9: Frameworks and processes for performance measurement and monitoring are in place and working as intended.

- *Mechanisms with clear responsibilities are in place to monitor and report on the results of network use, programs and other related activities.*

The Compliance Audit, dated June 23, 2008, reported against the broad category entitled “Program Management, Performance Measurement, Audit, Evaluation and Reporting” with the following high-level conclusion: “CANARIE has met all the requirements in the Funding Agreement in this category.” For the purposes of this Performance Audit and in respect of performance measurement and reporting, and based on our document review and interviews, we find that those mechanisms and processes remain in place and continue to operate as intended.

We find that there are clear plans and responsibilities for the monitoring and reporting of the results of the network use, innovations projects and other activities on an annual basis. The performance monitoring process is based on the accountability framework and consistent with the Strategic Plan. There was concern noted by some respondents that the results of the performance monitoring process could be better used to inform the communications process to all stakeholders including staff, the Board, governments, the ORANs and others.

- *Performance measurement and monitoring is accurate and consistent.*

The performance measurement appears to be accurate and consistent (save for the planned “evolution” noted below). The process could benefit from being benchmarked against the performance of other similar R&E networks and organizations.

- *Performance measurement and monitoring mechanisms evolve to facilitate efficient and effective corporate management.*

The new performance measurement system has been in place for two years and appears to be working well based on our interviews and the expressed satisfaction of the Board with the process and the response of Industry Canada to CANARIE’s Annual Performance Report. The system is designed to evolve as required to make the results of the process more relevant to the organization’s planning processes. Adjustments are made as part of the annual reporting process based on feedback from the Board.

⁶ Ibid.

- *Performance targets have been established against which CANARIE's operations can be assessed.*

We find that performance targets have been established and updated as necessary against which CANARIE's operations can be assessed. Some interviewees noted that the metrics for network and program operations are more straightforward while metrics for corporate operations are more difficult to define. There is currently a planning process in place to tighten up some of the measures, in particular those that relate to network operations.

3. Summary Findings and Recommendations

3.1 Governance and Strategic Planning

Audit Objective 1: Processes for governance of CANARIE and its programs and activities provide reasonable assurance that the programs and activities are consistent with the objectives of CANARIE.

Summary Findings

The Board of Directors is properly constituted with appropriate processes to carry out its major governance functions. The Board follows best practices in both providing oversight to the management of CANARIE through the development of governance and operational policies and in taking substantive decisions. Continued monitoring by the Board of project progress against program objectives and the approved budgets could be enhanced. Operational policies are supported by effective plans and processes linked to CANARIE objectives as set out in the Funding Agreement with Industry Canada.

The Board membership is reasonably well balanced in terms of competencies and regional considerations but not in terms of diversity, including gender. Other challenges include broadening the scope of industry representation and improving the level of investment expertise represented on the Board. This issue was identified in the Compliance Audit respecting the experience of Board members in investment matters and does not yet seem to have been addressed, namely the members of the Audit and Investment Committee were judged not to have the necessary “broad knowledge or experience in investment matters” as required by the Funding Agreement. We find that to be a continuing weakness from the point of view of the Board’s fiduciary responsibilities.

Recommendation 1.1: The Board and the Governance and Nominating Committee should give particular attention to improving the gender balance on the Board and to diversifying industry representation to include a balance of members from small, medium and large sized companies and from supplier and user sectors.

Recommendation 1.2: The Board of Directors should appoint at least one member with in-depth knowledge and experience of investment matters who could serve on the Audit and Investment Committee.

Audit Objective 2: Processes for establishing long-term goals, strategies and objectives are transparent and accessible to stakeholders.

Summary Findings

The Board of Directors and CANARIE staff are fully engaged in developing long-term goals and strategies based on the objectives set out in the Funding Agreement with Industry Canada. The full engagement of stakeholders, however, continues to be a challenge. A survey of stakeholders in 2009 indicated low visibility for CANARIE particularly among potential network user communities. The findings resulted in a new communications strategy directed at increasing visibility and providing more opportunities for stakeholder interchange.

The five-year mandate of CANARIE is a significant factor in the planning providing both benefits and challenges. On the one hand, the mandate gives certainty of annual funding but, on the other, creates difficulties in planning for the longer-term. The underlying assumption in current planning is that CANARIE's mandate will be renewed. Previous planning periods have assumed the reverse and built in contingencies.

- **Recommendation 2:** The CANARIE President with the support of the Board should enter into discussions with Industry Canada to determine solutions to the funding of the network infrastructure that would ensure its future sustainability.

Audit Objective 3: The corporate structure of CANARIE is appropriate to reaching results in an economical, efficient and effective manner.

Summary Findings

The current corporate structure has served CANARIE well and no major gaps or deficiencies in the structure within the limitations of the 15% O&M restriction placed on administrative expenses by the Funding Agreement have been noted. We find that the recent restructuring (the elimination of the Chief Research Officer position) has created a more streamlined organizational model that could readily respond to mandate and programming changes.

- **Recommendation 3:** CANARIE should maintain the current corporate structure subject to future planning requirements.

3.2 Network Operations and Programming

Audit Objective 4: The plans, practices and processes that are in place are appropriate for the economical, efficient and effective management of the CANARIE network operations and related activities.

Summary Findings

CANARIE's plans, practices and processes are appropriate for the economical and efficient management of its network operations and related activities. CANARIE does make effective use of co-delivery opportunities and does make best efforts to ensure access to its network by offering programs for users without a connection, to upgrade users with a connection, and to help further develop the research network capabilities of ORANs. Effectiveness of operations is, however, compromised by two issues: i) CANARIE's five-year mandate which means that users cannot be assured of a national network beyond a five-year horizon; and ii) operating the network with relatively few in-house technical human resources compared to peer organizations, which makes its operations economical and cost efficient, but means that CANARIE may not be operating with optimum effectiveness. The five-year mandate issue is covered by recommendation 2, and the technical resources issue is given below.

- **Recommendation 4:** CANARIE should reconsider its decision to outsource the technical support for the network in order to ensure that it has the most effective structure for maintaining the network and promoting innovation in line with its human resources, strategic and annual business plans.

Audit Objective 5: The plans, practices and processes that are in place are appropriate for the economical, efficient and effective management of CANARIE's technology innovation programs and related activities.

Summary Findings

CANARIE's plans, practices and processes are, for the most part, appropriate for the economical, efficient and effective management of its technology innovation programs and related activities. Access to technology innovation programs is equitable, the process for selecting and approving programs is efficient and effective, and CANARIE does make effective use of co-delivery opportunities where appropriate. We find that CANARIE develops and promotes project middleware but not necessarily shared middleware. Funding constraints and attitudes are key factors inhibiting the sharing of middleware. The development of middleware is an expensive undertaking, getting people to share is not an easy process, and the most successful shared and open projects received large amounts of funds. Funding and resource constraints have meant that CANARIE has been unable to put in place processes for sharing middleware between projects.

- **Recommendation 5:** As noted in Recommendation 4, above, CANARIE should ensure that its technical human resources are adequate for managing its technology innovation programs in line with its human resources, strategic and annual business plans.

3.3 Corporate Management

Audit Objective 6: The financial, administrative and risk management policies, processes and practices support the economical, efficient and effective operation of CANARIE.

Summary Findings

Subject to the governance issue we noted in Recommendation 1.2, above, we find that the financial and risk management policies and processes are in place to ensure the economical, efficient and effective operation of CANARIE. Improvements have been made to the financial management regime being implemented by staff under the direction of the Board of Directors.

- **Recommendation 6:** CANARIE should continue its current practice of introducing improvements of its financial and risk management policies and processes, as appropriate.

Audit Objective 7: Human resources planning, management, and policies are up-to-date and economical, efficient and effective in ensuring that the necessary resources are available.

Summary Findings

Human resources planning needs to be addressed on a more formal basis. Over the last year especially, there has been uncertainty in the human resources planning and management as a consequence, at least in part, of the delay in the appointment of a new President. This is becoming problematic especially as many acknowledge that the organization is understaffed at the moment and, therefore, the existing staff is over-extended.

- **Recommendation 7:** An annual review of human resources (required skills and full-time equivalents) requirements should be included in the annual Business Plan with justifications based on the administrative, network and program plans for the year. This planning process should be coordinated with the employee performance review exercise that is conducted annually.

Audit Objective 8: Communications plans, programs and processes that are in place are appropriate for the economical, efficient and effective communication and marketing of CANARIE, its programs and activities.

Summary Findings

Communications activities related to all stakeholders and audiences have improved significantly over the last year, although specific measures of the success of these new efforts are not yet in place. CANARIE continues to be well recognized both nationally and internationally. There is, however, some emerging opinion that CANARIE has lost its image as a technological leader and visionary organization.

- **Recommendation 8:** CANARIE should continue the implementation of its communications strategy and its continued evolution to ensure that it is forward looking in its messaging. It should do this through direct cooperation with the ORANs by implementing the proposed Communications Council.

Audit Objective 9: Frameworks and processes for performance measurement and monitoring are in place and working as intended.

Summary Findings

The required performance measurement frameworks are in place and working as intended.

- **Recommendation 9:** CANARIE should continue to ensure that the framework evolves so that it can continue to inform Board of Directors planning decisions to improve the network, innovation projects and corporate operations.

A. Audit Objectives and Criteria

Figure A: Audit Objectives and Criteria

Audit Objective	Audit Criteria
Governance and Strategic Planning	
1) Processes for governance of CANARIE programs and activities provide reasonable assurance that the programs and activities are consistent with the objectives of CANARIE	<ul style="list-style-type: none"> The Board has the necessary plans and processes including appropriate committees in place to govern efficiently and effectively. The Board composition is balanced in terms of competencies, gender, regional and diversity considerations. Board decisions are followed-up in an efficient and effective manner.
2) Processes for establishing long-term goals, strategies and objectives are transparent and accessible to stakeholders.	<ul style="list-style-type: none"> The planning processes engage the Board of Directors, the CANARIE staff and all key stakeholders and are transparent. The planning processes are based on the results of research. The planning processes adequately take account of the five-year mandate and funding cycle of CANARIE.
3) The corporate structure of CANARIE is appropriate to reaching results in an economical, efficient and effective manner.	<ul style="list-style-type: none"> The corporate structure is appropriate to the economical operation of CANARIE ie operating at the lowest reasonable cost to ensure the planned results. Roles and responsibilities of CANARIE management and staff are clearly set out in the corporate structure.
Programming	
4) The plans, practices and processes that are in place are appropriate for the economical, efficient and effective management of the CANARIE network operations and related activities.	<ul style="list-style-type: none"> CANARIE's practices and processes in the management of its network are cost-effective. CANARIE makes effective use of co-delivery opportunities. CANARIE ensures its network operations are an essential research infrastructure serving client needs. CANARIE makes best efforts to ensure access to its network.
5) The plans, practices and processes that are in place are appropriate for the economical, efficient and effective management of CANARIE's technology innovation programs and related activities.	<ul style="list-style-type: none"> CANARIE's programs such as the NEP, IEP and OIP are managed in an economical, efficient and effective manner. CANARIE makes effective use of co-delivery opportunities. Access to CANARIE's programs is equitable. The selection and approval process for CANARIE programs is efficient and effective. CANARIE's programs promote the development and diffusion of shared middleware.
Corporate Management	
6) The financial, administrative and risk management policies, processes and practices support the economical, efficient and effective operation of CANARIE.	<ul style="list-style-type: none"> Financial auditing, investment policies and risk management policies are appropriate and being implemented efficiently and effectively. CANARIE's administrative obligations are being undertaken in an efficient and effective manner.

Audit Objective	Audit Criteria
	<ul style="list-style-type: none"> Financial planning accounts for the five-year funding cycle in the most efficient and effective way possible.
<p>7) Human resources planning, management, and policies are up-to-date and economical, efficient and effective in ensuring that the necessary resources are available.</p>	<ul style="list-style-type: none"> Current human resources policies are compliant with relevant provincial employment requirements and policies. CANARIE's human resources planning, management and policies are efficient and effective. The skills of the CANARIE staff are appropriately aligned to address the requirements of its Funding Agreement and Strategic Plan.
<p>8) Communications plans, programs and processes that are in place are appropriate for the economical, efficient and effective communication and marketing of CANARIE, its programs and activities.</p>	<ul style="list-style-type: none"> Communication plans, process and programs are efficient and effective in creating awareness of CANARIE nationally and internationally. CANARIE is seen as a highly credible R&E organization both nationally and internationally CANARIE effectively coordinates with the ORANs joint communications plans and activities.
<p>9) Frameworks and processes for performance measurement and monitoring are in place and working as intended.</p>	<ul style="list-style-type: none"> Mechanisms with clear responsibilities are in place to monitor and report on the results of network use, programs and other related activities. Performance measurement and monitoring is accurate and consistent. Performance measurement and monitoring mechanisms evolve to facilitate efficient and effective corporate management. Performance targets have been established against which CANARIE's operations can be assessed.



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