A REVIEW OF FEDERAL SCIENCE & TECHNOLOGY HUMAN RESOURCES STUDIES

1994-2001

Report commissioned by the
Council of Science and Technology Advisors (CSTA)
Sub-committee on Federal Science & Technology Human Resources

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INTRODUCTION **3**

SECTION 1 – SCIENCE AND TECHNOLOGY WORKING GROUPS AND REPORTS **5**

WORKING GROUP #1 - MANAGEMENT AND SCIENTIFIC DEVELOPMENT AND TRAINING 7
WORKING GROUP #2 – SCIENCE CLASSIFICATION AND COMPRESSION 9
WORKING GROUP #3 – REWARDS, RECOGNITION AND INCENTIVES 11
WORKING GROUP #4 – THE WORKFORCE AND MOBILITY 14
WORKING GROUP #5 – RECRUITMENT AND REJUVENATION 19
WORKING GROUP #6 – TECHNICIANS AND TECHNOLOGISTS 20

SECTION 2 - RESEARCH & REPORTS FROM THE S&T COMMUNITY MNGMT OFFICE (TBS) **27**

THE BLUEPRINT 27
MANAGEMENT FRAMEWORK CONSULTATION PROCESS 27
Report #1 – Review of the Existing Options *28*
Report #2 – New Options *32*
Report #3 – Brainstorming Sessions *33*
Report #4 – Contingency Planning for Implementation *34*
Report #5 – Demographic Analysis of Participants *34*
Report #6 – Service-wide Community Management *35*
REVIEW OF STUDENT FOCUS GROUPS AND STUDENT FACT SHEETS 36

SECTION 3 - ADDITIONAL WORKING GROUPS AND STUDIES **38**

S&T MANAGEMENT DEVELOPMENT PROGRAM 38
WOMEN IN FEDERAL S&T 46
Report Recommendations *49*
Recruitment *49*
Retention *49*
Exit Survey *50*
RECRUITMENT REPORTS 52
CURRENT INITIATIVES AND STUDIES UNDERWAY 54

SECTION 4 – ANALYSIS **58**

COMMUNITY DEFINITION 58
MONITOR AND EVALUATE SUPPLY AND DEMAND CONDITIONS 59
ATTRACT (RECRUIT) 61
MAINTAIN & RECOGNIZE (RETAIN/REJUVENATE) 62
RETIRE 52

BIBLIOGRAPHY **52**

Industry Canada
Library - LKC

FEV
FEB 1 8 2015

Industrie Canada
Bibliothèque - BCS

Introduction

The Federal Government's Council on Science and Technology Advisors (CSTA) was established in May 1998 to provide the Cabinet Committee for the Economic Union (CCEU) with external expert advise on federal government science and technology issues. CCEU has asked CSTA to conduct an examination of the challenges unique to the renewal of federal science & technology (S&T) personnel, and to recommend practices and policies that address these challenges.

This report is one of a series of consulting studies commissioned by the *CSTA Sub-committee on Federal Science & Technology Human Resources (HR),* intended to provide input to their decision-making and recommendations.

Federal S&T human resources have been the subject of extensive review and analysis since 1994 when the Auditor General (AG) published a report expressing concern about the human resources management of S&T personnel particularly in the areas of recruiting new graduates, career development and management capacity. In response to the AG's Report, Treasury Board Secretariat (TBS) published the *Framework for Human Resources Management of the federal science and technology Community (Framework)* in 1996. This Framework was the launch point for four years of intensive study and analysis of the federal S&T HR issues. Therefore, the purpose of the current study is to summarize the research and reports that were generated in the period 1994-2001. This information will allow CSTA to obtain maximum benefit from the past research, studies and recommendations

It is important to note that the sheer volume of human resource work done by the federal Public Service S&T Community over this period of time is daunting. Therefore the approach taken by the author of this summary is to include sufficient detail for the CSTA Sub-committee members to grasp the salient findings and recommendations in the reports that have been reviewed. By using the summary, the members can then decide if they need to access the complete reports for further detail.

The **Blueprint**, a report that consolidates and summarizes the more than 140 recommendations from the six original S&T Working Groups, has been included as an annex in its entirety. When they were researched and written, the materials referred to in this document were intended to cover the S&T Community across the whole of the federal Public Service. Department-specific studies were not included.

Thus this current review's value is as a summary history and a reference tool to CSTA, as well as to other committees and working groups focusing on human resource issues facing the federal S&T Community. While some of the work from 1994 - 2001 is dated and certain recommendations have either been implemented or are no longer applicable in today's context, much of this research is still viable.

This Report contains **three summary sections:**

1. Direct outputs of the six original Working Groups established by TBS
2. Additional work done by the TBS S&T Community Management Office to support the working groups and summarize their findings
3. Additional research and studies focused on specific issues, including a brief summary of current initiatives

Section 4 provides an analysis and overview of the research to identify common themes, issues, challenges related to the **CSTA HR System Dimensions** of:

1. Monitor and evaluate supply and demand conditions
2. Attract (recruit)
3. Maintain & Honour (retain/rejuvenate)
4. Retire

Section 1 - Science and Technology Working Groups and Reports

As mentioned in the Introduction, the 1994 Auditor General (AG) report citing problems with the human resource management of federal scientific personnel lead directly to Treasury Board Secretariat (TBS) negotiating and publishing the ***Framework for Human Resources Management of the Federal Science and Technology Community.*** The *Framework* (as it will be called throughout this report) was part of the TBS response to the Public Accounts Committee on the AG findings and was published as a companion document to the *1996 Federal S&T* Strategy.

It specified four fundamental "ingredients" for a successful federal S&T Human resources regime:

1. *Structures, delivery mechanisms, authorities and policies* – Government must set up cost effective, flexible organizations supported by policies and authorities that enable managers and staff to carry out their responsibilities related to the roles of government.

2. *Productive and qualified staff* – science-based departments and agencies (SBDA) need: good science management and staff with the right competencies, appropriate rewards and recognition; core, transient and new types of employees; training, classification, compensation, performance management and pension portability.

3. *Matching people and work as need* – Organizations need to be able to rejuvenate the workforce and recruit new employees; train and develop managers and science staff; move people within and between different types of organizations, and move people out to other opportunities.

4. *An enabling work environment* – a strong organizational culture establishes a work environment and relationships that: support the staff; encourage partnerships, networks, innovation and knowledge sharing; and, enhances the intellectual capacity of staff in their pursuit to meet organizational and personal goals.[1]

It is important to note that these human resource ingredients are also implicit –and often explicit- in the previous CSTA studies:

- *Science Advice for Government Effectiveness (SAGE)*
- *Building Excellence in Science and Technology (BEST)*
- *Science and Technology Excellence in the Public Service (STEPS)*

[1] *Science and Technology for the New Century: A Framework for the Human Resources Management of the Federal Science and Technology Community*, March 1996

Each of the previous CSTA studies highlighted the fact that effective human resource management and the human capital of the federal scientific workforce are critical to Canadian success.

The *Framework* set up five (later six) working groups tasked with developing proposals to correct the identified list of problems. The groups were:

1. Management & Scientific Development and Training: focus on competency profiles and S&T knowledge, skills, abilities and training needs

2. Science Classification and Compression: focus on the Universal Classification System (UCS)[2] and incumbent-based classification

3. Rewards, Recognition and Incentives: research on non-salary compensation requirements

4. The Workforce and Mobility: research on the make-up of the workforce and all issues surrounding movement horizontally and vertically both inside and outside the public service to enhance careers/opportunities

5. Recruitment and Rejuvenation: review ways to manage the aging workforce and recruit new talent.

6. Technicians and Technologists: This working group was added at a later date as the 6th working group. Essentially it reviewed all of the above topics (e.g. training and development, recruitment and retention, classification, rewards and incentives, mobility) from the perspective of the technician and technologist population as a sub set of the S&T workforce.

These working groups had momentum, visibility, influence, and active departmental, science community and union participation. There was commitment from the most senior levels of government and each working group had an Assistant Deputy Minister (ADM) as the team leader. Working group members came from the SBDAs and represented all of the science disciplines. Human resources professionals were also assigned to the Working Groups. The Professional Institute of the Public Service of Canada (PIPSC) placed several members on the working groups and these union representatives served as full and active participants. The groups worked hard, well, productively and came up with solid, and often innovative, recommendations.

The outputs of the six working groups are summarized below.

[2] The Universal Classification System (UCS) is being designed and proposed by Treasury Board as a single, unified classification and pay system to cover all public servants. It would replace more than 40 separate classification systems that now exist.

Working Group #1 - Management and Scientific Development and Training

The Management and Scientific Development and Training (MSDT) Working Group published the *Framework for the Investment in Learning for the Federal Science and Technology Community (1996)*. This Framework is an excellent "how to" manual which remains valid and useable by any S&T organization developing a comprehensive approach to training and development. The outline is provided as a reference; it is indicative of what is available in this *Learning Framework* and is self-explanatory.

A Learning Strategy for S&T in the Federal Government

- Factors to consider in framing a strategy
- Integrating the learning strategy into the business plan

Identifying the Needs for Learning

- Identify learning needs to manage the degree of change required
- Select the learning required to meet the organization's objectives
- Decide on how the learning process will be planned and managed
- Assign responsibilities for learning
- Manage the learning investment

Determining the Right Learning Investment

- Selecting how much investment
- Making a wise investment
- Realizing multiple benefits from the investment
- Tailoring learning to organizational and business needs
- Ensuring cost-effective learning investments
- Looking for leverage in delivery of learning

Tracking Progress and Measuring Results

- Defining performance measures to link learning to business outcomes
- Government priorities
- Business Plan priorities
- Long-term requirements
- Tracking inputs and outcomes
- Measuring results rather than activities
- Evaluating results and feeding them back into the business planning cycle

Ensuring Success: Building a Learning Environment

- Communicating the value of learning to the organization's business
- Fostering management and employee buy-in
- Empowering people to take responsibility for learning

Government-wide Coordination and Promotion of the Learning Environment

Learning Framework Checklist

The MSDT Working Group, in addition to developing their *Framework*, made eleven recommendations:

Learning Framework

1. Implement *A Framework for the Investment in Learning for the Federal Science and Technology Community*
2. Define specific learning strategies to achieve the objectives of the S&T organization's business plan
3. Treat learning as an investment
4. Define the learning and career development of science workers
5. Define the learning needs of science managers
6. Promote shared accountability for the learning investment

Quality Assessments

7. Phase-in the use of quality assessments of learning in SBDAs in line with the TBS Quality Service Initiative Policy
8. Establish cross-departmental benchmarks of the quality assessments of learning by a committee of S&T Directors-General

General Recommendations

9. Promote scientific conference participation
10. Promote and utilize diverse learning methods
11. Establish fora for the exchange of S&T learning information

As a direct result of the work done by the MSDT Working Group, an additional working group was formed to design an *S&T Management Development Program* to be used service-wide. The results of this second effort are found in section 2 of this review.

Working Group #2 – Science Classification and Compression

One of the primary tasks of this working group was to examine the make-up of the federal S&T Community. Their first definition of the federal S&T Community was put forth in the *Report on the Definition of the Science Community, February 13, 1996* and in the *Report on Group Structure, October 18, 1996.*

The definition of what categories and groups of S&T workers are core members of the S&T Community has been the subject of much discussion over the past six years and has evolved from these original reports. The *current generally accepted working definition* is provided in the chart below for CSTA reference. This is the standard community definition now used for human resources studies, initiatives, demographics and analyses. Note that the National Research Council (NRC) titles and acronyms are not included in this list as this definition covers only federal public service employees and groups. It does not include crown corporations, separate employers and other organizations that are at arms' length. Computer scientists are deemed to have their own community. Social scientists, statisticians, mathematicians, and economists are also deemed to have their own community and these groups are therefore not included in the current working definition of the federal public service S&T Community.

Federal Public Service S&T Community

Category	Group	Standard Acronym
Research	Research Science Research Management Defence Scientific Service	RES REM DS
Health	Medicine Nursing Pharmacy Veterinary Medicine	MD NU PH VM
Technical	Engineering & Scientific Support Electronics General Technical Drafting & Illustration	EG EL GT DD
Applied Science & Engineering	Agriculture Biological Sciences Chemistry Engineering & Land Survey Forestry Sciences Meteorology Physical Sciences Scientific Regulation	AG BI CH EN FO MT PC SG

The first conclusion of this working group was that federal S&T work could all potentially be captured, described and fit into a single science classification in the new Universal Classification System (UCS). In other words, the nineteen groups above could potentially become one group. This amalgamation would have the desired effect of increasing mobility, easing transfers and exchanges, paying more equitable salaries, enhancing teamwork and creating a stronger more integrated S&T Community.

Their second conclusion was that the UCS could, in theory, encompass both "person-based" salary structures as well as the more traditional "job-based" salary regimes.

This is a critical point for the S&T Community, particularly research scientists. Person-based (also called "competency-based" and "incumbent-based") compensation systems pay individuals for their personal knowledge, skills, abilities, education and performance. *How* they do their job and their level of *output* determines the dollar amount of their salary. They can remain in the same position doing the same work for extended periods of time and, if performing, the S&T worker can continue to receive salary increases. This is currently how research scientists and defense scientists are compensated in the federal public service. They do not wish to see this changed.

Job-based systems pay a specific salary for the defined tasks that are being done. The *tasks or the job* therefore dictate the level of base pay and all individuals performing the same task are paid from the same salary scale. The rest of federal S&T workers are currently in job-based systems.

The analyses made to draw these conclusions are still logical and should be taken into account as a starting point when looking at classification issues for S&T workers. Note that, of all the working group reports, this is the most technical in nature and would principally be of interest to people studying the intricacies of classification.

Another output from the working group is a piece of software designed by Cognos, which allows for rapid assessment of positions against the UCS model.

Working Group #3 – Rewards, Recognition and Incentives

The team objectives were to propose an overall system that would contribute to, measure for and reward productivity. The working group looked at what they defined as the three strategic components of an overall reward system: base pay, variable pay, and ad-hoc rewards. They also recognized that it was essential to have a "rewarding work environment" and therefore also proposed recommendations on work environment.

UCS was an overlaying complication to the working group's deliberations. Essentially, they recommended a person or competency-based system. If this is possible in the construct of UCS, then they could support the S&T Community (particularly researchers) being included in the UCS pay structure. If a person or competency based approach is deemed to be incompatible with the final version of UCS, then the working group recommends a separate, different pay system for S&T workers.

It is important to note that as of the writing of this report, no decision has been made on UCS as it relates to the S&T Community in general and to person/competency-based pay. The Senior ADM Advisory Committee (SAAC)[3] continues to support the need for a pay system that can easy house competency-based pay. This remains a major unresolved issue.

The recommendations were divided into Research, Applied Science and Engineering and Health Sciences. The main recommendations remain relevant, valid, interesting. The non-UCS recommendations are summarized below.

Research[4]:

- The group should not only encompass the relatively small (in numbers) research scientists but also other employees who are involved in research as a substantial portion of their position.

- Base pay should be competency-based and based on the actual level of output of the employee rather than the expected level of output. Therefore an improved version of the person-based research (RES) compensation system was recommended.

- Annual lump sum productivity bonuses (at least 3-5% for exceptional results) should be given to teams.

[3] SAAC is a committee of Assistant Deputy Ministers from the major Science-based Departments and Agencies who oversee the work done by the S&T Community Management Secretariat and who represent all science departments in a variety of fora on the full range of S&T issues and topics.
[4] Rewards, Recognition & Incentives Project Team: *Recommendations Re the R&D Component of the S&T Population*, January 13, 1997

- Managers should be sensitized to and utilize non-pay forms of recognition on a regular basis. These include verbal and written recommendations, awards, participation in special developmental programs, and special assignments.

- New provisions should be made to install immediate local awards for exemplary results. The authority to give the award should be delegated to all managerial levels and the reward should be chosen based on what would be meaningful to the employee (e.g. new work-related tool, limited compensatory time off, gift certificates)

- Access to public and peer recognition: publish and attend conferences; internal newsletters and external news releases; internal award programs; formal internal processes to nominate candidates for prestigious external awards.

- *Patent Awards and Royalty Payments*: Modify the Public Servants Inventions Act to incorporate the possibility of awards to innovators and others involved in developing new technology-based intellectual property and the commercialization process. This would permit a share of the royalty/license stream of revenue to go to the inventors and developers of the intellectual property and cash bonuses to the commercialization or marketing team.

- *Create A Rewarding Work Environment*: A basic orientation package should be developed for use by Research & Development (R&D) Managers. Also, a basic check list should be created which sets the standards for the management of an R&D enterprise against which the quality of R&D managers should be independently evaluated.

- *Pensions*: The R&D population enters the public service late due to education and post-doctoral requirements. Therefore they are at a disadvantage for an unreduced pension at age 55. Solutions recommended include a hiring bonus, an increased amount of contribution, pension portability, and "throughput management".[5]

Applied Science and Engineering and Health Sciences[6]:

- *Base Pay* - UCS and job-based pay are appropriate

- *Salary Premiums* should be used as required (limited time basis, specific positions) as a means of attracting rare talent or responding to temporary labour market shortages.

[5] "Throughput management" refers to the full range of human resource planning, programs, initiatives and incentives used to ensure timely employee departures to make room for new employees while ensuring a suitable overlap for knowledge transfer.
[6] Rewards, Recognition and Incentives Project Team, *Recommendations Re the Applied Science & Engineering Component & the Health Sciences Component of the S&T Population*, May 2, 1997

- *One-time Salary Bonus payments* to attract desirable candidates both internally (for deployments and to entice term employees to complete their terms) and externally

- *Pay increments* should reflect performance with low performers receiving no increase and high performers receiving substantial increases.

- *Annual lump sum productivity bonus for teams*, the non-pay forms of recognition and reward and the local awards described for the Research group are also recommended for these two groups.

Finally the Rewards, Recognition and Incentives Report contains several generic annexes that remain relevant and are informative for decision-makers and researchers. In particular:

- Annex A – A description of the R&D Group
- Annex B – *Special Challenges of Managing in a Science and Technology Research and Development Environment*
- Annex C – Components of Successful Rewards Systems
- Annex D – *Role of Government in Laboratories in the 1990s*
- Annex G – *Use of Results-Based Compensation Systems in R&D Organizations*
- *Annex I – Executive Summary (of success factors).* These factors are worth repeating as they are themes that appear in all of the working group reports:

1. ***Senior Management Support***
2. ***Hire Creative People***
3. ***Employment Contract as a long-term commitment***
4. ***Allow for Freedom and Autonomy in Decisions About Work***
5. ***Provide Challenging, Interesting Project Assignments***
6. ***Provide Adequate Resources***
7. ***Encourage Risk Taking***
8. ***Ensure a Responsive and Equitable Reward and Recognition System***
9. ***Employ Managers who can operate in a consultative Style***
10. ***Encourage Effective, timely communications***
11. ***Tolerate non-conformity***

Working Group #4 – The Workforce and Mobility

The report from the Workforce and Mobility (WFM) Working Group contains relevant definitions and descriptions of employment relationships, employment models and career streams for S&T workers and these definitions remain a good starting point for any study of the S&T workforce. The report itself actually provides a synthesis of the interrelationships between the findings and recommendations *of all the working groups* as workforce issues touched on all topics under review.

The recommendations in the report are in nine (9) areas and include implementation plans. The areas are:

1. Community management
2. Workforce analysis and projection
3. Best practices
4. Elimination of barriers to Alternate Service Delivery (ASD)
5. Elimination of barriers to mobility
6. Building on existing mobility programs
7. Create a new S&T mobility program
8. How to support Implementation at the departmental level
9. Pilot programs

The following is a summary of the recommendations from this working group.

1. ***The S&T Community should be centrally managed as a true "community" with special characteristics and needs. This would include an infrastructure in place at TBS to support the community and with the Public Service Commission (PSC) serving as the program pilot arm of the community management concept, particularly during the implementation phase of 1-3 years.***

   a) Establish a permanent S&T unit at TBS to create programs, assist in policy development and customization, monitor trends, provide support and assistance
   b) Formalize the ADM Steering Committee as an implementation committee for the recommendations from this study and continue their active involvement and support for a period of 3-5 years.
   c) Implement a pilot to establish a best practices page on the TBS web site as a virtual forum to discuss and exchange information on a regular and continuing basis and to place proposals to solve HR problems
   d) Establish an S&T unit at the PSC who focus on implementing the mobility pilots as part of existing programs (see recommendation #6) and to ensure that S&T interests and needs are recognized in the development of new programs and the operation of current programs

2. ***Undertake a comprehensive service-wide S&T workforce analysis and projection in support of community initiatives as well as individual departmental initiatives.***

At the time of the working group study, the workforce issue of employee types (e.g. casual, term, indeterminate, part time) and their various potential relationships with the employer was entering a stage of rapid evolution. There was (*and still is)* very little information available on the types of employment relationships and contracts that will be needed in an Alternate Service Delivery (ASD) environment and in a working environment where more and more workers moving away from 9-5 office/laboratory type jobs. Most data available on the S&T Community provided information on "tombstone" demographics, with limited information available on education, competencies, training and development and skills/knowledge mix. Consultation with the team members and their departments as well as broader consultation with central agency representatives and available literature all indicated that the workforce configuration must change and change dramatically.

A better understanding of this new, evolving workforce (both supply and demand) is required. Therefore a formal workforce analysis and projection is recommended based on comprehensive analysis of the data elements currently available in departmental databases as well as on new data generated as required to have a complete workforce projection. One component of this research would specifically focus on employee-employer relationships and gather data from departments as to their business requirements and from the current and future workforce as to their requirements and expectations. It would be used in workforce planning.

3. ***Establish the mechanisms, processes, practices and information bases necessary to implement a service-wide sharing of information to ensure that an approval, authority, or pilot granted and operationalized in one science department would be granted and available to all other scientific departments.***

Throughout the course of the research, meetings and discussions, it became apparent that many organizations had found practical and credible ways of getting the job done within existing authorities and infrastructure.

It was therefore determined that one of the most valuable tools that could be developed for the scientific community would be an information sharing forum or mechanism. This would supplement the TBS web site initiative mentioned in recommendation #1. The primary purpose would be to ensure that an approval, authority or best practice granted and operationalized in one scientific department would automatically be granted and available to all other scientific departments. The primary points of this recommendation are that:

a) When a science department undertakes a pilot to test the impact of expanded flexibility, all science departments will be advised that the pilot is underway;

b) If the pilot is successful and authority is delegated or approval given to the pilot department, the same delegation or approval, where feasible, will be given generally to all departments.

4. ***The S&T Community should undertake an initiative that is focused on the systematic elimination of barriers and impediments to Alternate Service Delivery (ASD) and on actively supporting departments in commercialization, entrepreneurship and technology transfer.***

To balance the continually expressed requirement for more flexibility, it is recommended that the S&T Community (and each department individually) identify the specific flexibilities required to run their business. To respond to this survey, a structured process, possibly in conjunction with TBS, ASD Branch, would then be undertaken to ensure that all required flexibilities are granted as soon as feasible to ensure that the department/community can carry on their business free of systemic constraints.

5. ***The S&T Community should increase mobility within the federal government by aggressively eliminating barriers and impediments that currently impede movement.***

Similar to the ASD impediments approach in recommendation #4, the working group also recommends that all impediments and barriers to mobility be systematically identified and eliminating. Included in this process would be the following implementation activities:

a) Integrate details on specific mobility initiatives and activities to be undertaken by each department into their human resource and business plan. Make S&T activities visible in the departmental plans.

b) Create a central information source that feeds the S&T Community government-wide on mobility and assignment opportunities as well as on job vacancies. This source may be a website or can be build on existing software and databases.

c) Request that the PSC grant an Exclusion Order (EAO) for the S&T Community to be exempt from certain parts of the Public Service Employment Act (PSEA) for assignments up to three years in order to facilitate mobility opportunities based on longer term assignments.

d) PSC to investigate and implement ways of reducing the time and process burdens attached to hiring non-Canadian citizens.

e) Review all possible mechanisms to speed up the security clearance process.

f) Departments should streamline their internal practices and processes to decrease the staffing time that is departmentally generated and controlled.

g) Ensure that every assignment has a written agreement that includes details on return and integration not only to ease reintegration but also to provide a safety net to employees who accept assignments.

h) Review the pre-retirement and transition leave policies to incorporate maximum flexibility.

6. ***Maximize the utilization of existing formal mobility and rejuvenation programs by incorporating an S&T specific component into the program design and delivery.***

a) Implement a pilot designed to use the PSCs Interchange Canada program as a primary vehicle to support, facilitate and generate mobility between the federal government and other jurisdictions, including international assignments.

b) Implement a pilot to increase the S&T participation on the Career Assignment Program (CAP) program and thereby feed the future management pool.

c) Implement a pilot to create an S&T sub group on the Management Trainee Program run by the PSC which would encompass a marketing initiative, target recruitment of science graduates, and involve the S&T Community in the interviewing and placement process.

d) As and when new programs are developed by Central Agencies, ensure that the S&T population is recognized as having particular requirements and issues and is seen as a viable source of future managers and executives.

7. ***To supplement existing programs, create an S&T specific assignment-based Exchange Program that focuses on interdepartmental assignments of short and medium term duration (Scientific Personnel Mobility Exchange Pilot). This program should also focus on rotational assignments between regions and headquarters and vice versa.***

8. ***Develop S&T competency profiles and use these profiles as the basis of personal career development counseling and planning.***

a) Implement the Personal Career Development Plan pilot to test the effectiveness of profiles for career planning and to refine the process of formal career plans, which encompass training, development, assignments, experience and knowledge.

9. ***Support managers in the implementation of the human resources framework by providing them with training, infrastructure and financial support.***

Very important in this report is the description of ten pilot projects, which were used to immediately begin implementing and testing the recommendations from the various working groups. These pilot projects were:

1. Agriculture & Agri-food Canada's (AAFC) Matching Investment Initiative Pilots
2. Scientific Personnel Mobility Exchange Program
3. S&T Interchange Canada
4. S&T Career Assignment Program (CAP)
5. S&T Management Trainee Program (MTP)
6. Best Practices Web Site
7. Green Corps
8. People and Jobs
9. S&T Personnel Development Plan
10. National Water Research Institute (NWRI).com

A second report on the pilot projects was done in March 1998 by Consulting and Audit Canada entitled *Assessment of the S&T HR Pilot Projects.* It determined that eight of the ten pilots were up and running and doing well despite program review and downsizing. A separate management trainee recruitment program for S&T employees was not implemented nor was the computerized People and Jobs system.

Consultant's comment:

At the present time, the only two pilots that are still actively running are the Matching Investment Initiative at AAFC and the utilization, by several departments, of personal development plans based on competency profiles. The other pilots, rather than being run as central programs, have now evolved to departmental use of those pilot elements that provide meaningful or useful to the specific needs of the department.

When any future committees and working groups are considering programs of this nature, it would be advisable to review the experience and outcome of the pilots, including interviews with those individuals who have worked on them to effectively build on what was done and to learn from the experiences (both positive and negative).

Working Group #5 – Recruitment and Rejuvenation

This report gives a concise summary of the recruitment issues facing the science population in the late 1990's; these issues still remain. While the recommendations are broad and high level, they provide a good starting point for future work with a more detailed program-specific orientation.

The recommendations were that all federal SBDAs should:

1. Develop and implement promotional programs as a means of raising the level of awareness of federal S&T successes on the part of potential employees. These programs should focus on students and their purpose should be to generate students' greater interest in considering science as a field of study and SBDAs as potential employers.

2. Develop a long-term recruitment and rejuvenation strategy.

3. Increase the representation of designated groups in their S&T Community.

4. Encourage the employment of undergraduate and graduate students and post-doctoral fellows in their S&T organizations.

5. Establish collaborative arrangements with educational institutions, industry and other government agencies, within Canada and internationally.

6. Adopt plans to recruit and rejuvenate S&T managers.

7. Be delegated increased authority and flexibility for staffing and recruitment activities (particularly from the PSC).

Working Group #6 – Technicians and Technologists

This working group was added after the first five groups cited above. Essentially, it reviewed all of the above topics (e.g. training and development, recruitment and retention, classification, rewards and incentives, mobility) from the perspective of the technician and technologist population as a sub set of the S&T workforce. It is commonly referred to as the "Techno Team" report and is dated December 1997.

Their work incorporated a consultation with a significant number of technicians and technologists on their community-specific issues. The groups covered are:

- DD (Drafting and Illustration)
- EG (Engineering and Scientific Support)
- EL (Electronics)
- GL-MAN (General Labour - Manipulating)
- GT (General Technical)
- TO (Technical Officer - National Research Council only)

The report reconfirms many of the recommendations already cited by the original five teams (as summarized in the **Blueprint Summary** of all recommendations made by all of the five working teams – refer to Section 2 under Blueprint) as being applicable and essential for the technician and technologists' population. There are also several Techno Team-specific recommendations. The following is a summary of their findings. Recommendations in bold are from the other working teams; the Techno Team's issues, additions and group-specific comments are taken directly from the text of their report.

Note that this report is presented in more detail than some of the other reports as it clearly indicates the perspective of this group of S&T workers as compared with the research community or other S&T groups who receive more airtime. The consultant felt that their words ring true, are timely and are worth repeating.

Issue #1: There is a critical lack of younger, junior technologists

Recommendations:

1. **All federal S&T departments and agencies should develop a long-term recruitment and rejuvenation strategy.** The Techno Team suggested that this recommendation should be specifically expanded to cover the issue of recruiting technologists[7]. The performance indicator of *a balanced age and expertise distribution in federal S&T organisations* was added to the original recommendation.

[7] Unless otherwise indicated, "technologist" should be understood to mean "technicians & technologists" throughout these recommendations.

2. **Federal departments and agencies should encourage the employment of undergraduate and graduate students and post-doctoral fellows in S&T organisations.**

The Team expanded this recommendation to embrace the employment of graduates from community colleges and similar institutions where most technologists receive their formal training.

Specific recommendations from the Techno Team:

> We believe that the approach recommended by the Recruitment and Rejuvenation team is the right way to address the issue of rejuvenating the technologist work force. However, we see the issue as so serious that we will emphasise again that it is imperative to address it. The elements required are simple:
>
> - Allocate resources dedicated to filling the gap;
> - Set in place an active recruitment campaign to attract technologists with less than ten years' experience.

Issue 2: Education requirements and the education system are not meeting current needs

The Techno Team felt that there was a trend towards "over hiring" for technical positions by asking for educational levels that were not actually necessary to do the job. The reasons were many, but the impact of this trend of asking for unnecessarily high levels of education were stated as:

1. First, overqualified staff can become discontented, and often move to a position that better suits their qualifications as soon as one becomes available. Clearly, setting up situations that lead to employee discontent benefits neither the employee nor the organisation.

2. Second, experienced and capable technologists who do not have the education required for a given position are unable to compete for the position, even if they are capable, or perceive that they are capable, of doing the job. This in turn creates discontent among workers who believe they are being discriminated against.

No specific recommendations concerning this issue were identified by the other working groups. Therefore, the specific recommendations from the Techno Team were:

- The norm for technologist positions should be the education requirements listed in the selection standard.
- Managers requesting additional educational requirements should provide appropriate justification.

- Recognising that education and training fall under provincial jurisdiction, the federal government should gather quantitative data on the problem, and take steps to encourage and support appropriate provincial action.
- The federal government should establish formal programs in partnership with community colleges to provide education and training opportunities for future technologists, recognising that many will go on to serve industry. Some of course will remain in the public service, and help meet our own needs for skilled technologists.

Issue 3: Changing Role - As the role of the technologist changes, aspects such as career opportunities and teamwork must also evolve.

Initially the Team felt that the UCS would potentially help with these issues by levelling the classification playing field. In addition, they stated:

We believe that technologists, in common with other working groups, will not flourish as a group unless they see clear, rewarding career paths for those who strive hard and excel.

- The plan to implement the UCS must be fully implemented and must be seen to be fair to ensure that the highest levels of technologist groups such as EG can be reached on the basis of excellent technology work, rather than requiring supervisory duties.
- Any communication plan that targets new recruits must include accurate information on the work opportunities for technologists.
- Individual career plans must be an integral part of departmental human resource frameworks.

Issue 4: Technologists receive inadequate opportunities for "professional" recognition

Technicians and technologists suffer from an attitude that "papers are published by scientists, and only scientists can benefit from attending conferences." It is certainly true that publications play a key role in promoting research scientists, and that many conferences often deal with advanced science. Nonetheless, we believe that it is important to give proper recognition to technologists, for the following reasons:

Technologists make a substantial contribution to the intellectual development of research papers, and this contribution will increase as the boundary between technologist and scientist, as we note above, becomes increasingly blurred. Fairness alone dictates that such contributions should be appropriately recognised.

While many conferences do deal with science at a high level, many technologists can benefit from and contribute to the discussion at such conferences. Many more would benefit from attending meetings where there are trade shows that display, for example, the

latest research instruments and equipment. Just as scientists must keep abreast of the work their colleagues are doing, so must technologists be aware of state-of-the-art. developments if they are to contribute fully to S&T.

Recommendations related to this issue from the work of the other working groups

Although one of the working groups dealt specifically with rewards and recognition, the question of recognition for "professional" activities such as contributions to scientific papers was not addressed by this group. Neither did the group explicitly deal with the value of informal, non-monetary rewards that we believe are so important in their own right. There are therefore no recommendations in the blueprint that deal with this issue.

Specific Recommendations from the Techno Team

We recommend that:

- Attendance at conferences and/or trade shows be specifically included in training plans for technologists, recognising that there is a very important learning component in such fora; and
- Managers should ensure that appropriate recognition in scientific publications is given to all who contribute significantly to the work described in the publication.

When we discussed this issue with the focus groups, it became clear that the more general question of recognition for a job well done is very important to the technologist community. The simple "thank you" from a manager or supervisor, or a few words at, say, a staff meeting in acknowledgement of the support given, are extremely important, often far outweighing a more formal reward such as plaque or certificate. We believe that managers and supervisors need encouragement, and perhaps specific training, in how to use these simple but valuable recognition tools.

Issue 5: Formal award programs are inconsistent

The Team felt that rewards and recognition for technicians and technologists were not adequately covered in the other working team reports. Therefore they specifically recommended:

- All SBDAs should establish award programs specifically directed at recognition of S&T workers by their peers (we note that such programs do not have to be monetary in nature); and
- Managers and supervisors should be encouraged and supported in recognising the value of simple acknowledgement of a job well done, the basic "thank you", and if appropriate given training in how to adopt this behaviour.

Issue 6: Satisfaction with new ways of working is low

This discussion dealt primarily with new trends such as cost recovery, contracting out, commercialization, fee-for-service and difficulty with adapting and understanding the government's new ways of doing business. They felt that the other teams did not properly address these issues in their recommendations and therefore recommended:

With respect to contracting, which appears to be a particular source of conflict and dissatisfaction amongst technologists, we recommend that managers ensure that:

- contractors are qualified to do the work involved, and do not require direction, training or undue assistance from staff;
- work is done to specifications; and
- staff is fully informed about the work the contractor is expected to do, and the duration of the contract.

As far as the general issue of new ways of working is concerned, we recommend that:

- staff be specifically informed about new methods of operating, with a special emphasis on why the new methods are being encouraged, and on the opportunities that bring, as well as the challenges involved; and
- staff is given full opportunity to be involved in the process of change.

With regard to teamwork, we believe that properly functioning teams, in which all members contribute and are recognised for their contribution, result both in better work and a better working environment. We therefore recommend that:

- team leaders be trained in the skills and have the knowledge required to develop and manage teams;
- team members be trained in teamwork; and

- managers be encouraged to ensure that teams, when established, genuinely function as teams.

Issue 7: Performance appraisals are unsatisfactory

The team strongly felt that appraisals were important and should occur. They recommended:

- A formal written appraisal must be done if either the employee or the appraiser so requests;
- Appraisals must have input from both the employee and the appraiser and take into account regular feedback throughout the year;
- There must be a firm schedule for meetings and submission of final signed appraisal (or of signed acknowledgement that the process was followed, where a formal written appraisal is not required;
- Appraisals must include a statement of expectations or clear objectives (outputs, achievements) for the next appraisal period and appropriate training and career plans; and
- Most departments at different times have instituted training for supervisors in how to manage the appraisal process. We recommend that every supervisor take such training.

Issue 8: Mobility opportunities are inadequate for technologists

In general there was a high level of concern from this community that they were not getting the mobility opportunities they required - not within their own departments, not between government departments, and not between the public and private sector. In general they supported all of the recommendations of the Workforce and Mobility Working Group as being applicable to their situation. In addition, they recommended:

- Every assignment should have a written agreement that includes details on return and reintegration to help address the technologists' concerns with respect to job security after assignment; and
- We also believe that two of the mobility pilot programs would be especially useful to technologists. These are: Interchange Canada, which facilitates the movement of staff between government and the private sector; and the Scientific Personnel Mobility Exchange, which encourages exchanges within government.

Issue 9: Training for technologists is inadequate

They fully supported the recommendations of the Management and Scientific Development and Training Team, particularly the Framework for Investing in Learning. This framework deals with the importance of treating learning as an investment, and comprehensively addresses the training needs of S&T workers, including technologists.

In addition, they recommended:

- a clear statement of the role of each individual technologist, to be incorporated in job descriptions, competency profiles and in annual work plans;
- a written agreement between supervisor and technologist on training requirements both for current duties and career development; and
- follow-up at least annually (in conjunction with the annual performance appraisal) to ensure that training plans have been implemented.

There are several prerequisites, if these elements are to be successful:

- adequate training budgets must be established and be sacrosanct; and
- managers and supervisors must be held accountable in their own performance appraisals for ensuring that reasonable effort has been made to complete the agreed training.

Issue: There is a lack of solid and consistent demographic data to project supply and demand.

The Techno Team echoed the concern of all the working groups regarding the lack of supply and demand data. This concern was specifically addressed in the Workforce and Mobility Working Group as well as the Recruitment and Rejuvenation Working Group.

Section 2 - Research and reports from the S&T Community Management Office (TBS)

There were several horizontal studies done by the S&T Community Management Office.

The Blueprint

The *Blueprint* (1997) is quite possibly the most important and comprehensive overview document available from the *Framework* exercise. It is a compilation of all of the recommendations made by all of the working groups and includes recommendations, next steps, costs, implementation plans and performance measurement criteria. Although lengthy, it is manageable and works well as a reference tool.

It is also available in several formats, such as by recommendations only, categorized by themes and organized by the working group that made the recommendation.

As it is, in effect, a summary on its own, it is not repeated in the body of this review but can be found as Appendix 1.

Presented below are:

- Six reports resulting from a management consultation process that occurred in 1997
- The report on student focus groups held across the country
- The results from the working group established to design an S&T management development program

Management Framework Consultation Process

As recommendations began to crystallize from the six working groups, an extensive consultation process was undertaken to test the recommendations and ensure that the working groups were headed in the right direction. Twenty-five workshops were held in twelve geographic locations and encompassed 367 S&T workers.

Six detailed reports were produced and the data remains relevant and useful in today's human resource context. The findings hold true and are a useful starting point. *The reports are available under separate cover* however a summary of the major findings is presented below.

Report #1 – Review of the Existing Options

The 15 major recommendations from the working groups were ranked according to their importance. The recommendations that went to consultation were largely related to recruitment, workforce and mobility. Comments on the strengths and weakness of each recommendation were gathered and implementation issues documented.

The participants were asked to discuss their assigned options/recommendations and rate them according to whether they are *practical, do-able, workable and generally make sense.* The following rating guide was used.

Rating	Description
1	This is a good option (i.e., it will address the issues and is workable)
2	This is a questionable option (i.e., it addresses the issues only partially and may have some limitations)
3	This is not a good option (i.e., it does not address the issues and is not workable)

Other is used when the group was unable to reach a consensus or when they divided the option into parts and rated each part differently. For example, regarding Option 1 (the promotional program to raise awareness), many people stated that a promotional program is needed and good (rating #1), but using it for recruitment purposes is not supported (rating #3). They then coded the option as a 1/3.

As a general rule, any option that has a combined rating above 75% when adding the columns for rating #1 and #2 means that the recommendation did well.

A rating higher than 25% in the #3 rating category indicates that the recommendation may require further refinement.

Then each *group* was asked to pick the best recommendation from the list. The results were:

Option Description	# of Groups	# Times Selected as Best Option	Rated 1	Rated 2	Rated 3	Rated Other
A promotional program should be developed to raise the level of Canadian awareness of federal S&T activities and successes. This program would educate potential recruits about the federal government as an employer and could be used to attract the type of employee we want.	25	1	8%	52%	28%	12%
Special programs should be established by science-based departments and agencies (SBDAs) to recruit and train new S&T personnel.	25	2	24%	36%	36%	4%
Federal science facilities should establish collaborative arrangements with educational institutions, industry, and other government agencies.	26	11	73%	19%	0%	8%
SBDAs should encourage the private sector to invest in S&T establishments to accelerate recruitment of S&T personnel. Funds obtained from the private sector for research must remain within the federal science facilities to which they are directed.	25	0	4%	52%	36%	8%
Organize movement of S&T personnel between SBDAs, universities and private sector.	24	10	54%	46%	0%	0%
Create an S&T specific assignment based exchange program for interdepartmental assignments of short and medium term duration. This program should also focus on rotational assignments between regions and Headquarters and vice versa.	24	1	42%	42%	4%	13%
Maximize the utilization of existing formal mobility and rejuvenation programs by incorporating an S&T specific component into the program design and delivery. This would include having specific S&T Community sub-groups in CAP, Interchange Canada, the Management Trainee Program and La Relève.	24	0	25%	46%	25%	4%
Create a central information source (i.e., a web site or other easily accessible data base) that contains a listing of all jobs available in the science community government-wide. Employees could also apply for positions through the same database. Similarly, create a central information source containing all opportunities for assignments, secondments, rotational experiences, and other means to promote movement.	24	6	71%	25%	0%	4%

Option Description	# of Groups	# Times Selected as Best Option	Rated 1	Rated 2	Rated 3	Rated Other
Eliminate or reduce current barriers to mobility between classifications and levels; barriers including culture, attitudes, processes, programs and procedures	24	1	50%	38%	4%	8%
Promote and utilize diverse learning methods. For example: • S&T organizations set targets in their business plans for exchanges, secondments and other types of placements. • SBDAs through science managers review the level of coaching and mentoring of scientists in their organizations. • Emeritus scientists take a more active role in coaching and mentoring younger scientists.	24	4	46%	29%	8%	17%
Establish fora for the exchange of S&T learning information. For example, CCMD set up as a pilot, a series of armchair discussions on the management of science; SBDAs create a brokerage system to facilitate awareness and availability of specific courses.	22	0	18%	32%	32%	18%
Sensitize managers and employees to the importance of non-pay forms of recognition and rewards as a means of developing competencies and producing results.	21	6	38%	52%	10%	0%
Optimize usage and increase relevancy of immediate local awards for exemplary results. Authority to make these awards should be delegated to all managerial levels within the organization.	21	1	57%	33%	10%	0%
Public and peer recognition - opportunity to publish; newsletters and external media releases; formal internal awards; and formal internal processes for identifying staff for external awards.	20	4	80%	15%	0%	5%
Investigate the possibility of implementing a RES-type compensation system for all science workers.	20	5	55%	35%	10%	0%

At the time of the workshops and writing the report, the consultants made the following general observations, which remain in 2002:

In general, most of the options received a good reception. Options 13 and 14 (dealing with rewards and recognition) received high ratings. This parallels the many comments that the scientific community is particularly responsive to recognition, particularly for the calibre and expertise of their science work. Options 3 and 5 (both dealing with collaborative arrangements) also received high ratings and were also most frequently selected as the best option.

Another theme that is woven through out the entire participant feedback is the need for a regional perspective on the recommendations and regional involvement in implementation. Local implementation responsibility and initiative were raised in every workshop as a general overall comment.

The concept of central information sources/databases in all the various forms that this concept appears through all of the working group recommendations was vigorously supported no matter what the topic or use from recruitment to assignments to a compendium of the science projects being undertaken by each department.

While the promotional program to raise awareness of federal S&T activities (Option 1) appears on the surface to have been criticized, it is only the utilization of a promotional program in the context of recruitment that was rejected. The need for a promotional campaign and aggressively augmenting the public's knowledge of the science work done in the federal government was mentioned at all workshops. This can also be clearly seen in the comments.

Finally, the consultation process itself was viewed by the participants as being as important as the output. Many groups asked that this type of consultation become the norm for discussions and part of the overall communication process.

The "hot buttons" in the workshops were:

- Rewards and recognition
- Salary
- A desire for increased mobility but only in so far as the employee is able to return, with ease, to their original position (low tolerance for employment risk when taking rotational or temporary assignments)
- A strong desire for training in business skills related to ASD and all aspects of commercialization
- Career development plans and processes
- A desire for precision and reassurance around the role and direction of science in federal public service: what is going to be the role and niche in the worldwide community?
- Collaboration: the S&T Community is global
- Recruitment that is focused, targeted, planned and designed specifically for skills replenishment rather than solely filling positions.

Report #2 – New Options

After the existing options were examined, workshop participants were asked to brainstorm and describe new options on the topics of:

1. *Matching People and Work:* What recruitment mechanisms do you think would achieve the best results in attracting S&T employees to the federal government? What has worked the best for you?

2. *Mobility & Rejuvenation:* What are the best ways to generate mobility, exchanges and rejuvenation for the S&T Community?

3. *Mobility & Rejuvenation:* Mobility and rejuvenation are intimately linked with training and development. What training and development mechanisms, approaches and support do you need in the future to work in your area? What do you recommend?

4. *Sustaining the Workforce:* If you had to design a compensation package for the science community, what would it look like (e.g., one classification group, flexible benefits, cash incentives)?

As these are similar to the topics currently being studied by CSTA, the following information is summarized for consideration.

At the end of each workshop, when participants were at their "most knowledgeable" stage regarding the content and implications of the both the existing and new options, each working group was asked to think about what the most important recommendation would be. When reviewing this list, it is important to understand that the message from the participants is that, if only one recommendation can be implemented, these recommendations represent their choice.

- Government must identify a clear vision of "core science" to be done in departments. Define what science we want to be in and do not downsize randomly.

- Long term business plan with guaranteed financing for science work.

- Long term commitment for positions and resources to carry out science work.
- Making salaries competitive with the private sector.

- Competitive salaries between the public and private sectors.

- Develop a program reward system that provides monetary input to a program area based on merit, e.g., international travel, program support, sabbatical leave, post doctoral position or visiting scientists.

- Offer a pay/promotion/pension package that is keyed to market demands for science workers, to attract the very brightest and best.
- Interesting research projects.
- Attractive work environment: greater opportunities for professional development, i.e., conference attendance, employment equity, competitive salaries.
- Make the job more attractive: salary, benefits, work content.
- Early retirement package should be offered to all members of the S&T Community across the Board. Make retirement package open to those who choose, similar to industry.
- Employment options (alternate working arrangements such as: reduced time, flexible hours, job sharing, progressive retirement - emeritus program, reduced income leave, interrupted work or extended leave without penalty, telecommuting, entrepreneurial leave).
- Allow for rotational assignments and temporary mobility for training and experiential purposes.
- Identification and dissemination of broad based mobility programs (across departments); advertise all mobility opportunities using a web site which contains as much information as possible on opportunities, skills, abilities, people available.
- Opportunity to grow within a position..."climb the ladder" so to speak, with respect to pay and responsibilities without that necessitating a required move into management for professionals or into Scientific and Professional category for technicians.
- More input/control over professional career development; create explicit career paths.

Report #3 – Brainstorming Sessions

All workshop participants were divided into three sub-groups and each of the sub-groups was asked to brainstorm their ideas on one of the following three topics/questions.

Brainstorm Question #1: What will the future workforce look like?

Brainstorm Question #2: What do you think a science career should look like in the future? Are there multiple career paths? How many?

Brainstorm Question #3: What are the various mechanisms and approaches that can be used to reward, recognize and compensate S&T employees for exemplary performance?

Interested readers are referred to this report as there was no clear trend and a wide range of answers.

Most importantly, this reflects one of the supply and demand "problems": neither departments nor S&T workers had/have a clear picture of what the future workforce might be. Without the future projection, it is difficult to determine what sources of supply should be tapped, how many people are actually needed, and what the new core competencies might be.

Report #4 – Contingency Planning for Implementation

The workshops with S&T managers and employees included a contingency planning exercise. Essentially, all workshop participants were asked to think of factors/issues that could derail this initiative; and conversely to think of what must be in place to ensure successful implementation.

Workshop note-takers were asked to record all of the ideas/issues mentioned by participants. This report presents an analysis of this data and the findings can be categorized in the following eight thematic areas.

Subject Area	Examples of Findings Included Under This Topic
Clear Long-Term Vision and Planning	• the need for a clear, long-term vision and planning including the need for realistic, attainable goals/workable solutions
Funding/Resources	• the need for adequate resources/funds
Stakeholder Buy-in	• Comments re: the need for buy-in from stakeholders, employees, unions, all departments, HQ and regions - need for long-term commitment to the initiative
Communication	• comments re: the need for clear, consistent and on-going communication; objectives of communications efforts (educate and manage perceptions), messages to communicate, communication mechanisms to use, timing of communications
Implementation Issues	• issues and suggestions re: the actual process of implementation. e.g., the need for an action plan that is coherent, consistent and equitable across all departments; phased implementation; timing of implementation, monitoring progress • comments re: the need to implement - not just talk about it. "enough talk - more action"

Subject Area	Examples of Findings Included Under This Topic
Management Issues	• need for senior management commitment- long-term • need for delegation and empowerment of employees/local managers, bottom-up approach • strengths and limitations of current management practices, styles, behaviors, priorities • issues and suggestions with respect to the working environment, e.g., resource reductions/downsizing, central agency policies/ requirements, turf issues/ politics, workload pressures, cost recovery, administrative support
Staff Morale Issues	• comments re: factors causing/contributing to decreased morale and the resultant lack of trust, confidence, motivation
External Factors	• comments re: external factors such as change in government due to a general election, re-definition of the role of government in science, change in federal S&T priorities., change in economy

Report #5 – Demographic Analysis of Participants

This report summarizes the demographic characteristics of the 367 workshop participants (age, department, level, type of work, geographic location).

Report #6 – Service-wide Community Management

The workshops with S&T managers and employees included limited consultation on a fourth topic area: "Supporting the Service-Wide Workforce". They addressed two issues:

1. *Management* - including issues related to the management of S&T departments as a separate community with special needs; the need for an overall HR framework to address these special needs on a service-wide basis.

2. *Central Information Gathering and Analysis* - including the need to identify information bases and determine mechanisms to share this information on a service-wide basis among S&T departments.

The participants strongly supported the need for the S&T Community to have a Community Management Office with funding and resources as critical to their success in human resources issues.

Review of student focus groups and student fact sheets

One hundred and ten science students from across the country participated in focus groups and completed a short "Fact Sheet" survey to determine their interest in the federal government as an employer and to assess what the government could do to attract and recruit these students. The report was published in April 1997. The executive summary of the findings gives a good indication of the results. The detailed data tables contain a wealth of information.

Executive Summary of Student Report

Focus Group Discussions

- The data indicate that there is a willing pool of recruits from which the federal government may draw potential employees.
- Challenging work and a good work environment were considered most important when asked what criteria would *attract* students to an employer.
- The characteristics that *attracted* students to an employer were the same characteristics that would be required to *retain* students.
- Competitive compensation and comprehensive benefits were identified as the key strengths of the federal government as an employer.
- When asked for the perceived weaknesses of the federal government as an employer, a lack of job security was mentioned at more than half of the focus groups.
- Students seem to be aware of the federal government as an employer. They were able to identify most science departments and the types of S&T jobs available.
- Information on job duties/responsibilities and compensation should be made available to attract science graduates.
- Media advertising and Internet advertising were identified as the top means to disseminate information on careers with the federal government.
- When asked for one recommendation on how to make the federal government the employer of choice the top responses were:

  a) A need to ensure the continuity of research funding and a commitment to research;

  b) The need for greater awareness of jobs and opportunities; and

c) The need to make job opportunities available to recent graduates (including more COOP/Internship, or part-time work).

Fact Sheet Data

- Focus group participants generally were between the ages of 18 and 25 years old and currently enrolled in their first Bachelors program in a science field at university.
- Sixty-two percent of the participants never worked for the federal government.
- About half of the participants who worked for the federal government were employed in science related activities
- Students think they have a lack of knowledge about federal government S&T jobs. It should be noted that the focus group discussions revealed they were aware of science based-departments and the type of jobs available in the federal government.
- The "most favored" employer of participants were private companies followed by universities, then private companies abroad (the federal government ranked 5th).
- Only 16% of students consider the federal government as part of their desired career path.
- More than half of participants selected a minimum starting salary in the $30,000 to $39,000 range.
- When asked to rate the merits of an employment package, the most important component was job content (defined as interesting and involving multiple projects).

Section 3 - Additional Working Groups & Studies

This section reviews the reports from three additional Working Groups established in 1997 to handle specific issues in depth. They were:

1. S&T Management Development Program Working Group
2. Women in Federal Science and Technology Working Group (WFSTWG)
3. Recruitment, Retention and Diversity Working Group (RRDWG). Three sub-groups (Visible Minorities, Aboriginal people, Persons with Disabilities) and the above Women's Working Group prepared reports on Recruitment and Retention which were provided to the RRDWG for incorporation into their final report and action plan

In addition, This Section contains an overview of the initiatives that are currently underway.

S&T Management Development Program

Flowing from the work done by the Management and Scientific Development and Training Working Group (see Section 1) a second working group was struck in 1997 to design a S&T management development program.

The two basic questions to be answered by the team were:

1. What characteristics or attributes should be possessed by a manager of federal S&T?
2. What is the best way to nurture and develop these characteristics?

After an intensive best practices phase, the working group chose a competency-based approach and therefore developed the first generic *Competency Profile for S&T Managers in the Federal Public Service.*

The S&T management development profile had the following unique characteristics:

- The Competency Profile was intended to be generic enough to cover all levels of science management (from first level supervisor to ADM), yet detailed enough to be of use in defining training and development requirements.

- It contained a "technical" competency section, which was not normally found in other federal government management competency profiles. This is due to the unique nature of S&T managers where technical competency forms an integral part of their credibility and ability to manage.

- It has been mapped to the Public Service Commission's middle and senior management competency profiles point-by-point and can therefore maximize the utilization of testing and assessment techniques for the matched characteristics, if so desired by an individual department or manager.

- It has since been customized by departments for their own use and has had a positive reception and positive results.

- It was judged as being useful and thorough by the private sector firms who reviewed it. They expressed support and even asked permission to use portions of it in their own efforts to develop S&T competency profiles.

The 1997 consultation and validation of the Competency Profile with the federal government S&T Community provided a few general insights on what the community feels are priorities.

The ***Technical*** competency was consistently identified as being the most important. The type of technical knowledge possessed will vary across departments and agencies, but for a new manager, it is vital to possess demonstrated experience and competence in the conduct of S&T. As the management level increases, the requirement for technical breadth increases. Scientific conferences and memberships in professional societies, as well as individual efforts to keep technical skills up-to-date, are key to maintaining competence.

Management training is generally available for those areas that have been identified as priorities, especially when they cross all levels of management. ***Teamwork*** and ***leadership*** are identified as priorities for all levels of management yet very few specific courses are available. Both of these competencies are included in general management courses, rather than being treated separately, and are not necessarily oriented to a scientific audience.

Various elements have been identified as priorities for all levels of management, yet very few learning opportunities are readily available. ***Client & partnering management*** was consistently identified as a priority across all management levels, but only a few departments offer related training and development.

Importantly, according to the S&T Community members who attended the validation workshops, "personal integrity and ethical behaviour" (a sub-element) and ***responsibility to society*** were ranked as competencies required only for the most senior levels of public service management.

As part of the validation and consultation processes of the Competency Profile, participants were asked to brainstorm the top three training requirements that they felt were necessary for S&T managers. The following is the list of responses which was consistent with the private sector input as well as the literature and best practices:

- human resource and people management
- other "soft" skills (HR management, listening skills, development of staff, teamwork)
- nurturing, coaching and mentoring for new managers
- conflict of interest
- negotiation skills
- media training
- machinery of government and governance
- intellectual property management specifically for S&T
- finance and marketing
- ethics and economics with relation to the regulatory role
- partnering, influencing, negotiating, leveraging
- communication of science
- partnership building
- science role in government
- service to clients
- marketing and promotion of science
- leadership capacity and team building
- French language training

Finally, the initial study determined that, as regards training opportunities and vehicles, the issue is more the sheer mass of management training available. It is an enormous industry and the challenge is not to find a source or supplier, but rather to decide which one. Also, there appears to be a lack of management development programs (and even modules within recognized programs) that are *science specific* and that relate to and deal with the realities and challenges of the S&T workforce.

Therefore, Consulting and Audit Canada was contracted to do a comprehensive review of both the opportunities and suppliers. Their report was published in September 1999 in two volumes:

Volume 1 – Public Service Training in the Context of the Core Competency Profile
Volume 2 – Compendium of Available Training by Competencies and Management Levels

Volume 1 is strategic in nature while volume 2 provides an extensive list of training opportunities, suppliers and mechanisms. The following executive summary from the Consulting and Audit Canada report synthesizes their findings.

Executive Summary

This report examines, in two separate but interrelated volumes, the existence of management training for the S&T Community in the Public Service of Canada (PSC). Volume 1 presents the analysis of data gathered in interviews with twelve science-based departments and agencies (SBDAs), the PSC and the Canadian Centre for Management Development (CCMD).
Volume 2 presents a compendium of the close to 90 courses offered by those departments and agencies, individually and as correlated to each of three management levels. That volume also presents an overview of external training used by SBDAs, as well as an overview of comparative approaches used by Statistics Canada in the social sciences domain.

Strategic findings for the entirety (presented in volume 1) are synthesized under two broad analytical groupings: environmental scan issues, and issues related to training, competencies, and management levels. Gaps in these areas between the status quo and optimum training for the S&T Community (as illustrated by the *Science and Technology Blueprint for HR Management: Recommendations, Deliverables and Implementation Activities* and other reports) are summarized within sub-sets of the analytical groupings.

A total of six conclusions on gaps in the current system are noted, as follows:

1. Key S&T Issues with Implications for Training:

Findings suggest a strong need for a rationalized training framework within any SBDA with explicit correlation to the S&T Community (among other communities), and correlation to other training available within the Public Service and externally. This presupposes to some degree the existence of a continuing form of central co-ordination for required data, and if desired, analysis and facilitation.

2. Developments in HR Management with Implications for Training:

Findings suggest that S&T learning and development activities within an organization, should be responsive to 'corporate business objectives', with training regarded as an 'investment', for which there should be measurable returns to the organization. This presupposes that there exist:

- core competencies correlated to corporate objectives;
- pre-determined standards and measures of success;
- information management systems to provide required tracking;
- customized learning and development tools;
- a consulting capacity within the HR organization on learning and development;
- linkages between individual and corporate performance; and fundamentally, and
- HR management integrated into corporate business planning.

3. Major Trends in Learning and Development in the Public Service:

The sheer diversity of training approaches in evidence, as compared to obvious shortages of systems data, strongly suggest scope for improved central co-ordination and/or facilitation of desired outcomes. As a minimum, clear roles and responsibilities would facilitate desired linkages with business planning and development of associated 'return on investment' measurement systems and appropriate reporting standards.

4. Existing Training in the Public Service of Canada:

Although aggregated training courses indicate relatively comprehensive coverage of S&T core competency groupings, continuing access to customized management training for specific S&T communities is problematic. The situation suggests a need for improved correlation to central training policies, enunciation of clear roles and responsibilities by central training providers, continued sharing and co-ordination of training developments, customization of courses in practical fashions, and potentially, a more managed approach to career development, starting before first-level management.

5. Comparative Analysis - Competency Profiles:

As the S&T core competency profile developed to date is intended to serve as a basis for adaptation by various SBDAs, it is recognized that further development on a comprehensive basis might not be warranted. Analysis of other competency profile approaches, however, suggests that some simplification and clarifications could be beneficial to SBDAs looking to adapt the S&T core competency model, as could be the publication of basic background material and other S&T approaches.

6. Management Levels - Comparative Approaches:

The potential for successful implementation/adaptations of the S&T core competency profile by SBDAs, and the correlation of required training by SBDAs and central training providers, would likely be improved by the endorsement of functional descriptions of the three management bands to which the Profile relates. In the longer-term, reassessment of these definitions and related management development/training will likely be required in light of impacts of the UCS and developments in competency profiling generally.

Building on many of the best practices noted among SBDAs, central training providers, trends in learning and development, pedagogical and business practices, the Report concludes with a series of *18 possible options for redress, and 3 potential 'next steps', for consideration by the working group.*

Possible options for redress proffered for the Working Group's consideration are summarized in the following:

1. Key S&T Issues with Implications for Training:

a) Establishment by the TBS in co-operation with SBDAs and central training agencies of a continuing central forum for overseeing learning and development for S&T managers, and required support (e.g. best practices forum) for the S&T Community

b) Pre-determination of related terms of reference, including membership, funding requirements, reporting understandings, relationship(s) with other S&T initiatives/groups and other Public Service training initiatives/groups, and any sunset and assessment terms

2. Developments in HR Management with Implications for Training:

a) Publication on a web site, managed by the above-mentioned central forum, of available literature on competency profiling, including the S&T Core Competency Profile potentially with some modifications (reference Option 5), and those of other S&T organizations if those agencies concur (e.g. Canadian Food Inspection Agency, Canadian Space Agency, Environment Canada/Natural Water Research Institute, National Research Council).

b) Co-operative development, under the aegis of the central forum or in co-operation with other learning/development/training committees, of best practices related to integrating HR management of learning/development/training into corporate business planning, including required standards, measurement, techniques in customization and targeting groups, and linkages between individual and corporate performance.

3. Major Trends in Learning and Development in the Public Service:

a) Recommendation by the working group and/or steering committee that evolving roles of central players in learning/development/training (e.g. TBS, PSC, CCMD, PCO) be clearly defined and linked to all major standards, course development, reporting requirements and timelines.

b) Development of sample 'return on investment' measurement systems for publication, under the aegis of the central forum or in co-operation with other learning/development/training group(s).

4. Existing Training in the Public Service of Canada:

a) Publication of best practices in defining and funding centralized SBDA HR roles and responsibilities that support required development and management (including reporting/measurement).

b) Periodic but continuing updating/centralized sharing of training information (and potentially other learning and development practices if desired) among SBDAs and centralized training providers.

c) Increased use of customization techniques by centralized training providers and SBDAs, to ensure relevance of training to the S&T Community, among other communities.

d) New course development and/or adaptation of existing training courses/programs to address gaps in centrally-provided training (i.e, notably as regards Responsibility to Society and Client and Partnering Management, but also as regards gaps for various 2nd-level clusters of other competency groupings as noted in volume 2).

e) Examination, under the aegis of the central forum, of the feasibility of centrally-provided 'management awareness' courses), i.e., comprehensive 'pre-management' training.

f) Publication under the aegis of the central forum of best practices in 'managed career development', including bridging perceived barriers in mobility, and correlation to required/tracked investments in both developmental and operational training.

g) Development of 'armchair' sessions sponsored by CCMD, using S&T Community and specialized resources, to address topical issues which can impact the management of S&T and/or the perceived desirability of management careers for professional groups.

5. Comparative Analysis - Competency Profiles:

a) Simplification of the existing S&T Core Competency Profile through the elimination of elements beyond '2nd-level clusters', with publication as a basic model for adaptation by S&T communities (Option 6 also relates).

b) Limited re-assessment of the S&T Core Competency Profile to ensure no inadvertent incompatibility with accepted pedagogical approaches (i.e., incremental development) and/or oversights as regards other complementary profiles.

c) Accompanying publication of other S&T Competency information (reference Option 2).

6. Management Levels - Comparative Approaches:

a) Endorsement of generic, functional definitions for the three management bands[8] as a basis for adaptation as required by SBDAs, or portions thereof.

b) Periodic (e.g. annually) review to ensure continuing relevance of banding (and correlated training etc.) in light of UCS and competency profiling generally.

Potential next steps suggested include:

- working group consideration of the potential acceptability of any or all of the identified options for redress in given areas, and the feasibility of developing a comprehensive framework for implementation of options which it endorses;

- for areas exceeding the scope of this report and/or for which limited resources and timelines precluded in-depth review (illustrations are provided), working group consideration of means to effect any further data-gathering and analysis desired; and

- working group consideration of preferred methods to share this report with contributing SBDAs and central agencies, and potentially, and to effect any broader dissemination desired.[9]

Work on the Scientific Management Development Program is on-going and is described in this report under "Current Initiatives and Studies" at the end of section 3.

[8] The S&T Profile is built on the concept of three distinct levels ("bands") of management: first line manager, middle manager and director-level manager.
[9] Report to the Working Group Examining S&T Management Development, *Volume 1-Public Service Training in the Context of the S&T Core Competency Profile,* Consulting and Audit Canada, September 1999, pp. iii-viii.

Women in Federal S&T

This working group was the largest of the designated group[10] studies and was interdepartmental. Four major research studies were undertaken by this group and then utilized by all of the other working groups:

1. A demographic analysis of federal S&T workers
2. An exit survey to determine the reasons for departure
3. An analysis of the University Student Information System – data on university enrollment and graduation 1994-1997, Statistics Canada
4. A policy review of the human resource policies to determine if there was systemic discrimination inherent in the policy that would specifically affect women working in scientific fields.

While the outputs of this working group focused on women, all of the research was done using the entire S&T population as the comparative factor so that the information in all outputs of this working group contain data, conclusions and recommendations that apply to the entire S&T population. The data from the Women in Federal S&T Working Group (WFSTWG) were therefore used as the basis for all of the other designated group studies.

There is both a final report and a mini-report focusing specifically on recruitment.

As all of the findings and recommendations resulting from the research of the Women in Federal S&T Working Group are still applicable and relevant, a high level summary is presented below.

The Basic Demographic Picture (as of March 1998)

While CSTA has commissioned an up-date of the demographic profile, the following information provides a context to understand the other findings and until such time as an up-dated profile is available.

While S&T employees are located in 44 departments and agencies, seven science-based departments account for 74% of the S&T workforce and 72% of the female population. They are, in descending order of S&T population: Department of Fisheries and Oceans (DFO), Environment Canada (EC), Department of National Defense (DND), Health Canada (HC), Natural Resources Canada (NRCan), National Research Council (NRC) and Agriculture and Agri-Food Canada (AAFC). Of these, Health Canada has the highest female S&T percentage population at 56% due to their nursing staff. AAFC is second at 36%. DND is the lowest at 12%.

[10] The four "designated groups" under the Canadian Human Rights Act are women, persons with disabilities, aboriginal people, and visible minorities.

Whether due to historical or societal causes, there is no question that there is a representation problem with women (and all designated groups) in federal S&T. Pertinent highlights of the 1998 Demographic Profile include:

- Women are under-represented in federal S&T and comprise 25% of the workforce
- Women are under-represented in research and this under-representation is pervasive to all research groups and levels.
- The only exception to under-representation is in the nursing group. 85% of nurses are female. Three departments have high female representation rates due to their nursing staff: Health Canada, Correctional Services and Veterans' Affairs (56%, 68% and 77% respectively). If nurses are removed from the overall S&T representation equation, women comprise 21% of the remaining S&T workforce.
- 63% of the female S&T workforce is clustered in three categories: nursing, engineering and scientific support (EG), and general technical (GT). As a broad generalization, these are characterized as the more "junior" and "support" positions with some of the lower pay ranges. If these three classifications are removed from the representational statistics, women then comprise 18.6% of the core scientific workforce.
- There are fewer women at the top - 16% of all men are in the top two levels of their groups compared with 6% of women. Of the 2595 top two level positions in the federal government S&T Community, 89% are held by men and 11% by women.
- Women have fewer indeterminate positions. *Men* are 87% indeterminate, 10% term and 3% casual/seasonal. Comparatively, *women* are 69% indeterminate, 25% term and 6% casual/seasonal.
- 1% of men work part-time compared with 12% of women. The part-time workforce of 874 people is therefore 76% female and 24% male. In addition, there is a large female temporary, casual, and contract workforce that is without security and benefits and is not tracked and monitored by any official or comprehensive mechanism (the shadow workforce).

There has been much discussion on the so-called "shadow workforce": its impact on women, its usefulness as a recruitment pool and the difficulties of quantifying the actual S&T workforce due to the shadow workforce's fluid characteristics. Essentially, the shadow workforce is used to describe those S&T workers who are casual, contract, student, volunteer and other equivalent non-indeterminate workers. These workers are not described or counted in any of the demographic studies. In certain circumstances, term employees can also be considered part of this pool of resources.

Admittedly, there is a legitimate and important requirement for term employees. In effect, for many programs (e.g. Matching Investment Initiatives), term employment is the only appropriate way to staff as the funds and the project duration are time-limited and there is no indeterminate requirement for the resources.

On the other hand, the increasingly frequent use of term employees has become a management tool for handling the uncertain funding environment that has arisen since program review. These

term employees, many of whom have long tenure, specialized skills and are in an actual indeterminate position, are considered part of the shadow workforce.

Recruitment

- As a general statement, women are being recruited into the federal government S&T Community at a rate equal to that of men. Recruitment percentages for women in many disciplines are higher than the market availability percentage which indicates the federal government's capacity to attract and recruit women appears solid.

The real issues are found in more detailed analyses.

- On a percentage basis, women have high recruitment rates in three fields: nursing, chemistry and pharmacy. If these three categories are removed from the equation, women represent 40% of the recruitment in the other categories.
- In addition, when the recruitment trends are analyzed by job group, recruitment almost exactly parallels the historical and current representation of the workforce. The percentages have not changed for the past five years (as a minimum). The opportunity for a change in representational make-up has not been seized, as the hiring gender ration remains constant for each group.
- Young girls are not moving into science, particularly the hard sciences. The drop-off rate after high school is significant in some disciplines.
- There are few women in many of the scientific and professional recruitment pools (low market availability). Enrollment and graduation data clearly indicate that women are not moving into many of the scientific disciplines, other than medical and health sciences.

A review of the detailed Statistics Canada ***enrollment data*** for graduate programs and undergraduate programs in 69 selected science and technology fields indicate that women are in lower numbers in 39 of the disciplines. The fields with the lowest enrollment of women are:

- aeronautical and aerospace engineering (10% female enrollments)
- mechanical engineering (12%)
- electrical engineering (13%)
- mining engineering (16%)
- engineering science (16%)

The highest representation of female enrollments were in the health related fields including (in rank order):

- audio and speech pathology (93% female enrollments)
- nursing (92%)
- occupational therapy (89%)
- food, nutrition and dietetics (86%)
- health administration (74%)
- rehabilitation (74%)

A review of the Statistics Canada ***graduate data*** shows that women have risen to 49% of graduates, however the graduate profile is similar to the enrollment profile in that women are in the health sciences and not in the engineering and "hard" sciences.

There is an under-representation of women as post-doctoral researchers. This shortage has been attributed in part to the incompatibility of the way current postdoctoral programs work and the choices women are making regarding children, lifestyle and sacrifice (Smaglik, 1998, Helbing et al, 1998).

Report Findings

The biggest issues impacting women that were identified in the research were:

- The need to balance work and personal life
- The detrimental impact of leave (particularly extended leave for maternity or child care) on career advancement
- The limited or even lack of utilization of alternate work arrangements
- Insufficient career development and career management mechanisms

Note that *all* of these issues apply equally to men and women.

Report Recommendations

Recruitment

1. Undertake a government-wide study to identify the shadow workforce including a profile of term employees and establish a program that would ensure that this resource pool is tapped.

2. Implement an outreach program that targets young women for future S&T positions.

3. Take maximum advantage of creative and flexible recruitment mechanisms (many of which already exist in the federal "system").

4. Review the Natural Science & Engineering Research Council (NSERC) Postdoctoral Fellowships program and the Visiting Fellowships program from the perspective of financially supporting federal government laboratories and positions.

Retention

1. Review the relocation and childcare assistance provision in the Travel Policy and the maternity-related reassignment portion of the Leave Policy (note that these were the only two federal policies that were identified as being problematic in the Policy Review commissioned by the Working Group).

2. Design a government-wide tracking/monitoring program to assess the level of utilization of the various mechanisms (such as Alternate Work Arrangements) that are key to improving the balance of work and family life.

3. Incorporate the recruitment, retention and advancement of employees into S&T executives' performance appraisal process.

4. Prepare a training module for S&T managers on alternate work arrangements with emphasis on dealing with women and diversity in the workplace.

5. Implement measures to decrease the marginalization and isolation of women. This specifically includes regional science networks, mentors and increased visibility of women at workshops, conferences, seminars, courses, etc.

Exit Survey

Reasons for Departure

According to the official records, the number one reason both men and women left the S&T workforce over the four year period (March 1994-March 1998) was "end of specified term". Although women are 25% of the workforce, they were 50% of these departures due to the relatively high percentage of women who hold term positions.

The following chart summarizes all the official reasons for departure other than "end of specified term" and "other"

Reason for Departure[11]	Total S&T Workforce		Women		Men		Comparison by Reason	
	#	% Tot.	#	% Tot.	#	% Tot.	Women (25%)	Men (75%)
Resignation under the Early Departure Incentive /Civilian Reduction Program	2148	17%	322	11%	1826	19%	15%	85%
Retirement	1772	14%	263	9%	1509	16%	15%	85%
Early Retirement Incentive	1701	14%	145	5%	1556	16%	9%	91%
Transferred to NAVCAN	1556	12%	139	5%	1417	15%	9%	91%
Alternate Delivery Initiative termination	1419	11%	572	19%	847	9%	40%	60%
Resignation - personal reasons	1268	10%	655	22%	613	6%	52%	48%
Resignation - outside employment	1122	9%	374	13%	748	8%	33%	67%
Laid Off	1044	8%	310	10%	734	8%	30%	70%
Resignation - under the Workforce Adjustment Program or the Executive Transition Program	552	4%	179	6%	373	4%	32%	68%
Total	**12582**	**100%**	**2959**	**100%**	**9623**	**100%**	**24%**	**76%**

As can be seen in the official data, after "end of term", the most common reasons women left the S&T workforce were:

- personal reasons
- impact of Alternate Service Delivery (ASD)
- outside employment
- taking advantage of the Early Departure Incentive program

The reasons for the departure of men were:

- taking advantage of the Early Departure Incentive program
- retirement
- Early Retirement Incentive program
- transfer to NAV CANADA

Given these variances and, in particular, the elevated incidence of resignations and the citing of "personal" reasons in the female population, the WFSTWG decided to do a limited survey of a sample of men and women who left the public service to gather more precision on their reasons for departure and what could have been done to make them stay. The premise is that if those

[11] Note that there were several departure incentive programs during the period of time under review. These programs involved payment packages to assist employees who were leaving the government due to government downsizing and Program Review.

elements that cause individuals to leave can be remedied, then the retention rates will ultimately increase.

The survey was undertaken in February 1999. Sixty-eight interviews were completed. Given the sample size, it is important to note that the findings of this survey should not be interpreted as being statistically significant nor applicable to the entire S&T population. On the other hand, there are clear trends and messages in the data.

When asked to identify their top two reasons for leaving the federal public service, the exit survey interviewees stated:

Reason For Departure-Total Primary and Secondary	Total		Female		Male		Gender Comparison by Reason	
	#	%	#	%	#	%	Female	Male
Work loss or significant job change	25	22%	14	27%	11	18%	56%	44%
Work place and work environment issues	20	18%	12	23%	8	13%	60%	40%
Salary	19	17%	4	8%	15	24%	21%	79%
Promotion or career development	17	15%	6	12%	11	18%	35%	65%
Greater challenge/more interesting work	17	15%	7	13%	10	16%	41%	59%
Personal Issues	13	11%	8	15%	5	8%	62%	38%
The role of science in government	3	3%	1	2%	2	3%	33%	67%
Total	**114**	**100%**	**52**	**100%**	**62**	**100%**	**46%**	**54%**

This survey confirmed that women left the public service for workplace, environmental and personal issues more frequently than men. In the interviewees' words, these issues were expressed as:

Work place and work environment issues

- "Just had it": tired of bureaucracy, "games", the environment, "fed-up", wanted to get out, atmosphere bad, excessive workload due to cutbacks *(general malaise)*
- Lack of respect/feeling of inequitable treatment due to gender (salary, position level, work assigned) *(predominantly female respondents)*
- Can't get into the "Old Boys' Network" (*all female respondents*)
- Lack of goals, vision, direction
- Poor management/supervision (*predominantly male respondents)*

Personal Issues

- Conflict between work priorities and family priorities
- I/my spouse was relocated and my spouse/I couldn't move
- Health

Recruitment Reports

Two reports focusing on recruitment were undertaken. The first is entitled *Estimates of Hiring Potential, Scientific and Technical Community 1998-2002.* It is a predominantly statistical report using the Statistics Canada Personnel Simulation Model (PERSIM).

The second is titled *Resetting the Balance: Renewal, Recruitment and Employment Equity in the Federal Public Service Science and Technology Community, Draft June 21, 1999.* This report summarizes the recruitment issues affecting designated groups and was based on separate studies done of each designated group (women, visible minorities, people with disabilities and aboriginal peoples). While the report only exists in draft form, the primary finding is still valid: *the S&T Community has representation problems and recruitment problems with all of the designated groups.*

The following summary from these reports provides a good assessment of the identified recruitment issues still to be resolved by the S&T Community:

> The simulations have shown that the expected number of departures from S&T occupations over the next five years is significant. In the years beyond 2002, the rate of departures may be expected to increase rapidly as the bulk of S&T employees move into higher age groups.
>
> Replacing this volume of departures represents a challenge to departments, and to the federal Public Service as a whole. Among the issues to be resolved are:
>
> - **Competitiveness as an Employer.** Can Public Service career offerings compete with other employers in projected tight S&T labour markets? Considerations include quality of work environment, meaningfulness of work, likely career path, and expected compensation over the career.
> - **Employment Equity Strategy.** Methods for ensuring competitive and representative recruiting from employment equity designated groups.
> - **Gap in Level.** The implications of hiring young recruits. What are the implications for demands on management time and the number of managers required? Is there a role for transitional programs, such as mentoring?
> - **Terms.** The evolving role and numbers of term and other contingent employees.
> - **Impact on Hiring Model.** The implications of the above for the traditional Public Service hiring model, where the public servant is recruited at a junior level and offered the prospect of a life-time career. What are the implications for competitiveness as an employer if this model loses relevancy?
> - **Impact of Timeliness of Hiring Processes.** Does the length of time required for the Public Service to make an employment offer limit its ability to attract the best candidates?
> - **Shifting Department Missions.** The impact of shifting departmental missions on the need to replace S&T employees.

Current Initiatives and Studies Underway

The work in the S&T Community is on going and has moved from the earlier "study-mode" at the corporate or service-wide level to an "implementation-mode" at both the corporate level and in specific departments. The following is a list of the initiatives underway as at February 2002 that has their beginnings in the studies described in this report.

S&T Response to the Task Force on Modernization of Human Resource Management (August 2001 and up-dates on-going)

The S&T Secretariat, working with the Science ADM Advisory Committee (SAAC) has prepared their response to the Task Force. This response indicates the following priorities:

Recruitment – The S&T Community requires stability in funding, shared knowledge between the HR experts and the S&T Community, common objectives and effective communication to succeed.

Mobility – The S&T Community needs to be defined in the broadest possible terms (include all sectors: core public service, crown corporations, agencies, etc) and mobility supported through this expanded range of organizations.

Retention – To retain employees (and equally to recruit), the public service must have attractive and competitive compensation and working conditions.

Management Development – Many S&T workers do not wish to become managers yet there is an enormous need for S&T managers now and in the future with looming retirements. Therefore creative measures must be introduced to introduce succession planning and then allow employees to try out managerial positions with minimal risk. Impediments need to be removed.

Governance – An enduring HR management system that works for the S&T Community is needed.

A Revised Community Web site

A revised Community Web site is expected to be launched in February 2002. The objective of the site is to provide information under a single or community window, to managers and employees related to human resources; and to share best practices and market careers in federal S&T organizations.

Regional Fora

Following the success of the Ottawa Science Managers Forum held in December 1998, discussions between S&T ADMs recommended a series of regional S&T fora to provide the means for regional managers to network and share best practices. Therefore, the S&T Community in partnership with the Secretariat and Regional Councils now organizes and coordinates Regional Science Managers Fora held periodically in each major region of the country. These gatherings provide invaluable opportunities for science managers to expand their networks, discuss and address key issues affecting the science and technology community. For a in Quebec and Atlantic Regions are being held in February 2002. In addition, a National Managers Forum is being planned for the spring.

Graduate Opportunities Strategy

The Graduate Opportunities Strategy (GOS) is a pilot recruitment program aimed at attracting recent graduates to careers within the S&T Community. Developed by a senior working group of science-based departments and agencies, the program was launched in 2001 to identify key areas of need and recruit new professionals with specific skills. The program also selected departmental mentors to *ensure continuity by transferring knowledge from existing staff to new team members.* Through the GOS in its first year, 100 graduates were recruited into the community as Research Scientists (RES) and Technicians for Engineering & Scientific Support (EG). The funding necessary to continue the program has not been approved at the present time.

Aboriginal Youth Initiative

The Aboriginal Youth Initiative Memorandum of Understanding was signed by the seven participating departments at the Committee of Senior Official (COSO) S&T Sub-committee meeting of May 29, 2001. The seven departments are Environment, Fisheries and Oceans, Agriculture and Agri-food Canada, Indian Affairs and Northern Development, National Defence, Health, and Natural Resources.

Deliverables are:

1. Provide aboriginal students with information on available S&T educational programmes in post-secondary institutions, scholarship information, aboriginal support departments at post-secondary institutions, mentoring opportunities with senior aboriginal students or aboriginals employed in S&T occupations, and various employment opportunities with the Public Service.

2. Provide a summary of each aboriginal organization's membership including educational qualifications of the student members presented by region and S&T field.

3. Conduct an annual survey on attitudes towards Public Service employment to determine whether aboriginals are being adequately informed of careers in the Public Service and, if so, why such careers are sought or avoided.

4. Attract aboriginals students into S&T related employment in the Public sSrvice whether summer, contract, term or indeterminate. This will be accomplished using on-line recruitment, a National Aboriginal Career Symposium (NACS) and a student placement program.

Status:

The first survey of aboriginal students to determine their views of the federal government as an employer will be conducted at the NACS being held October 23 & 24, 2002. The S&T Community Management Secretariat will have a booth at the NACS to communicate the initiative, highlight career opportunities within the public service, and inform students on education requirements, sources and scholarship programs. A CD-Rom mapping federal S&T organizations in proximity to Aboriginal lands will be available to students.

S&T Community Management Development Program

Since 1997, the S&T Community Management Development Working Group has produced a number of studies, reports and recommendations on important issues relating to the present and future management of Canada's S&T Community. These include:

- An S&T managers competency profile linked to public service managerial profiles
- A set of S&T-related managerial case studies to enhance managerial programs for community members
- A format and guidelines for a S&T Community personal development plan

Most recently, the SMDP Working Group has developed two learning tools with the Canadian Centre for Management Development (CCMD):

1. Introduction to Life Long Learning (ILLL), and
2. Leading Scientific Teams (LST)

The services of a CCMD Learning Advisor have been instrumental in delivering a number of the *Introduction to Life Long Learning* workshops, recommending modifications, and in developing a sustainable implementation plan, which will be completed by the end of this fiscal year.

The pilot for Leading Scientific Teams was held in February 2002 and the evaluation will be done by March 31, 2002. Following modifications that will arise from the pilot, the program will become one of the programs delivered by CCMD for management development. The French version and pilot are scheduled for June 2002.

The Management Development Working Group has also built a strong relationship with the CCMD to realize these and other accomplishments.

Forward Learning Agenda

A standing sub-committee of SAAC is being established to address the ongoing and evolving learning needs of the S&T Community. It will include membership from science-based departments and agencies. This Learning Committee will be supported by the S&T Community Secretariat and a learning consultant from CCMD.

The mandate of the committee will be to promote learning in the S&T Community by developing the forward learning agenda and action plan as well as through the sharing of best practices, facilitation of joint ventures where appropriate and cost-effective, the identification of new and evolving learning issues and challenges and identification of potential community learning initiatives to SAAC. Additionally this committee would work with CCMD and other groups to promote the best interests of the S&T Community in matters related to learning.

The committee would be consultative and advisory in nature and provide guidance to SAAC in identifying: future learning agenda and action plans at a community-wide level, and working groups that would be tasked to address and implement community-learning programs. It is proposed that the Learning Committee would meet regularly as required during the year and provide an annual report on the progress of the forward learning agenda for the S&T Community. The Learning Committee would bring forward proposals for learning initiatives as required, including the requirement for working groups and any requirements for financial resources to support initiatives.

Research Community Advisory Committee

The general purpose of the Research Community Advisory Committee (RCAC) is to serve as Treasury Board Secretariat's (TBS is the "employer" of all public servants) integration point for all human resources management policy matters involving the Research Community that require consultation between Treasury Board, departments with employees classified in the Research Group (RES) and the Professional Institute of the Public Service of Canada (PIPSC). The committee provides integrated policy advice and risk analysis/assessment to the Policy Integration Committee Working Group (PICWG) in relation to the Research Group. The current focus is on UCS.

Section 4 – Analysis

CSTA has identified four major dimensions of the federal S&T human resources system.

1. Monitor and evaluate supply and demand conditions
2. Attract (recruit)
3. Maintain and honour (retain/rejuvenate)
4. Retire

The body of research described in the first three sections of this report consistently deals with the S&T human resource issues from similar parameters: recruit, retain, compensate, reward and provide training and development.

To assist the CSTA Sub-Committee on Federal Science and Technology Human Resources, they have requested an analysis of the common themes, challenges, issues and priorities that reverberate through the research in the reports.

As the reports and research were very consistent and as the same themes were repeated throughout, the "art" to this section is to pick the highlights without repeating all that has been summarized in the previous pages.

Community Definition

The definition of the "S&T Community" has a major impact when looking at human resources issues. The macro S&T Community is actually a community of communities, which have many commonalities but also notable differences, particularly from a human resource management perspective. While there is merit in using the larger community for broad discussions, human resource planning and targeted initiatives can vary dramatically amongst the groups. For example, in the reports reviewed, research scientists and the technicians and technologists both had recruitment, education and retention problems but their *issues,* perspective *and solutions* were different. The same is true for nurses and PhD biologists both working for Health Canada. These differences are woven throughout the studies.

When looking at the body of research as a whole, the following conclusion can be drawn: *when a human resource issue is pervasive enough to affect the entirety of the S&T population, then the issue is most likely a public service-wide issue rather than a unique S&T issue and could/should therefore be dealt with at the public service-wide level.* Examples would include the large retiring baby boomer cohort, budgetary restraints on recruitment, increased use of term employees, low representation rates for designated groups, lack of inter-regional mobility programs, lack of opportunities to take advantage of employment exchanges with the private sector, frustration with UCS, slow staffing processes, competition for the best recruits – in short many of the issues being studied by the Task Force on Modernization (led by Ranald Quail).

However, there are also issues that are specific to a *portion* of the S&T Community at any given point in time and these can best be resolved and managed at the Community level. Some can be handled horizontally across departmental boundaries (e.g. management training, technician and technologist recruitment problems, on-campus recruitment, science exchanges) and some may even be more appropriately handled at a departmental level where the majority of the employees of a given group are clustered in one department. Yet, the following conclusion can also be drawn: *when an issue is pervasive enough to affect an entire scientific occupation (e.g. technologists, nurses, research scientists, mathematicians), then the issue is potentially not unique to the federal public service community but rather affects the occupation as a whole across sectors (public sector, private sector, universities, etc.).*

Human resources issues that are specific and unique to the S&T population of the federal public service are, in all likelihood, rare and were not obvious in any of the research.

Monitor and Evaluate Supply and Demand Conditions

Messages common to all reports

The S&T Community understands the need to have and use demographic data and has consistently commissioned studies, done appropriate analyses and, to the extent possible, acted upon the identified trends.

Internal federal demographic data is available but is not up-dated with regularly scheduled reporting on a continuous basis. Demographic profiles and analysis are ad-hoc and report based. A central, standard, useable database is not available or actively used by S&T managers and human resource planners. At varying points in time the PSC, Statistics Canada, TBS, individual consultants and specific working groups have all done studies of the S&T population, but these are "one-of's". On-going monitoring has not been systematized, it is needed. This is a consistent message in all of the studies.

Data and databases that provide comparative information (between departments and groups, with private sector and professional organizations etc) on pay, benefits and rewards are not available. The Pay Research Bureau-type[12] analysis is a gap in the information available to managers and human resource planners.

The human resource supply side of the supply and demand equation is rarely analyzed. This type of analysis is not done on an on-going basis but rather on an as-needed and ad-hoc basis. There should be monitoring of the labour market as well as the university and educational production of graduates. The capacity appears to be available at both the PSC and TBS but does not appear to be tapped often nor proactively prepared and distributed by the central agencies.

[12] The Pay Research Bureau was an organization at TBS that gathered, analyzed and compared government salaries and benefits with other organizations and sectors.

The demand side of the equation is understood and quantified only from a turnover and retirement perspective. It is also based on the assumption that individuals will retire at age 55 or at the first opportunity for retirement without financial penalty. Recent studies have shown that this is not necessarily true and may not be indicative of up-coming trends.

In addition, S&T departments are still grappling with what type of workforce is needed in the future so that recruitment and human resource planning can be done from the perspective of obtaining the required future skills and competencies rather than simply replacing individuals one at a time as they leave. The variables in the demand side of the equation include questions of what type of science will the government be doing in the future, what roles will the individual departments play, what level of funding will be permanent and what level will need to be found in partnerships and business arrangements, what will the working relationships be with universities, industry and other countries? The answers to many of these questions, and the methodology to obtain the answers, are not clear in the studies to date. Note that there were recommendations on what the answers *might* be or *should* be, but nothing definitive.

None of the federal Public Service databases contain information on current employee education, experience or competencies that is complete, consistent and easily useable.

The shadow workforce has not been located, quantified, documented nor analyzed as recommended by the Workforce and Mobility Team. As term employment increases as well as other employment types (casual, contract, student, etc), knowledge on the make-up and location of these resources is vital.

A comprehensive workforce analysis is still needed.

While the databases and methodology may not always be identical, the major demographic red flags are consistent:

- There will be a large, potentially debilitating, retirement cohort in the very near future
- The on-site replacement feeder group is essentially the same age as the retirement cohort and therefore they are not a viable "replacement" pool
- Designated groups are not properly represented in the S&T Community
- Substantial hiring is occurring (e.g. 4000+ people in 2001) and, post-program review, the hires exceed the number of departures – the federal government is hiring
- There is an increased dependency on term employment – 90% of external new hires are brought in on term assignments
- The shadow workforce is not understood nor clearly identified
- The future demand has not been quantified other than by number of retirements and estimated departures. There is no solid information on the type, kind, number of people needed to replace those who are departing

Attract (Recruit)

The departure/hire catch 22

All of the studies clearly identify the need to recruit now to replace those who are going to be retiring. Replacements are being done on a one-at-a-time basis and the reports indicate a need for concerted effort, coordination, proactive outreach, and a sense of urgency. S&T workers are expressing concern that their experience, knowledge and corporate history will retire with them and that there is insufficient overlap, training, and knowledge transfer time.

Yet departmental representatives, student focus groups, and hiring statistics all indicate that finding, attracting and hiring S&T workers is not the major issue: the people are there. The single biggest impediment was consistently described as the lack money to actually bring them on board. In most cases, someone has to physically leave before the money becomes available for a new person to enter. This problem is compounded in the S&T Community because new hires require an extended period of time on the job, preferably overlapping with the predecessor, for the intellectual capital and corporate memory to be shared.

The demographics clearly indicate that the retirements and departures will occur. Sheer logic indicates that either the retirees must be replaced or the work they are doing must be terminated. There is a high level of anxiety regarding the situation that comes through in all of the research, but the creative solutions are not as easily identified.

The Government Opportunities Strategy was one example but its continued funding is apparently in question.

In department after department there are examples of entire groups of highly specialized experts who will be eligible to retire en masse within the next 36 months. This type of scenario was described in each of the reports reviewed - the multiplication factor is daunting.

Attracting and recruiting issues

The public sector does not sufficiently market the positions available and leverage the excellent work opportunities that could be offered. For example, the research indicates that that once a student works for the federal government in any capacity (e.g. co-op, summer student), they are very likely to consider the federal Public Service as a future employer.

The slow staffing process with its lack of flexibility, red tape, bureaucratic processes are cited by all reports as being a major impediment to getting people in a timely fashion. This process is cited as one of the contributing factors (along with unstable budgets and the inability to terminate a non-performing indeterminate employee) for the increased use of terms, casuals, and temporaries. These alternate methods allow for speedy staffing and a chance to "try out" the person before committing.

Most recruitment information and comments in the reports focus on graduating students and on-campus recruitment. The demographic and quantitative analyses also target this recruitment/supply pool. The research has minimal information on mid-career departures and hires. Only 41% of new hires are under age 30 therefore even accounting for the time taken to obtain advanced university degrees, a large percentage of the new hires are not found as new grads resulting on-campus recruitment. They have related work experience. Again, S&T managers often say, anecdotally, "We can find them. We know who they are. We know where they are. We just need the money/space/equipment to bring them in."

Note that the many designated group studies and Statistics Canada population data indicate that the recruitment supply pools are somewhat limited in certain designated groups (aboriginal people, persons with disabilities) and in certain occupations (women research scientists, male nurses) and that more outreach must be made to attract these individuals.

Recruits of all levels carefully research and analyze their future employers. They are looking for a good working environment, interesting and challenging work, competitive salary, progressive and well-trained management, high caliber colleagues, a creative and reasonable rewards framework, opportunities for learning, career advancement potential, job security and excellent equipment and facilities. The studies all indicate that there is room for improvement in these areas.

Maintain & Recognize (Retain/Rejuvenate)

It is important to note that the factors required to retain employees are, in most cases, identical to those necessary to recruit employees. As mentioned above, a good work environment, interesting work, stable funding, good equipment, appropriate compensation, balance of work and family life - the reports all state that this must be in place for employees to stay.

The average age of people leaving the S&T workforce is currently 38 years old therefore efforts are needed to stop the mid-career drain. It will be very difficult to maintain the S&T capacity in departments if they are dealing with a large retirement cohort, heavy competition for new resources and a high mid-career departure rate.

Classification and Rewards

The current classification system, with its many groups and levels, is considered cumbersome, outdated, and a serious impediment to mobility, transfers, interdepartmental and inter-group movement. It definitely needs to be "fixed". However, no decision has been made on the implementation of the **Universal Classification System (UCS)** at the time of writing this report. The pressing issues for the federal S&T Community are:

- It was felt that the implementation of the UCS would resolve a large range of human resources issues from facilitating movement within the government to actual salaries and pay ranges. The fact that the entire implementation of UCS is under review and that the final configuration of the system is not yet known causes a major problem for the federal S&T Community. If UCS is not going to be the vehicle for resolution of the wide range of problems associated with the current complex classification system, then the S&T Community must find alternate solutions. But, until a decision is made, no action is possible and the public service has been left in limbo.

- There is no answer on whether UCS can actually handle person-based as well as job-based pay.

- There is no decision on which jobs and types of work should remain or become person-based and which should be job-based.

Much work still needs to be done to resolve the classification and compression issues of the S&T Community. The decision on UCS is required before they can move ahead.

In addition, the majority of the **rewards and recognition** recommendations has not been implemented and would need to be dealt with by TBS or in collective bargaining - this again is an outstanding issue of great importance.

Career Advancement and Training

The two major areas suggested for improvement are:

1. The need for solid, well-trained, knowledgeable management. This is a make or break factor for retention as well as for implementation of all of the human resource management recommendations. Managers DO the human resource management – they are the primary key to success or failure of the entire initiative.

2. Rotational assignments and access to training (in the broadest sense, including conferences, courses, assignments in other departments and industries etc) is a key retention factor.

Management and Infrastructure

- The existence of an S&T Community Office and Secretariat is essential to the community's success. Without it, all of the work done over the past eight years would falter and implementation would return to being departmental based.

- A Senior Advisor Committee, as in the Science ADM Advisor Committee (SAAC), must remain. Additional short term or ad-hoc working groups are still needed when an initiative crosses departmental boundaries.

Retire

Who is leaving, how many and when?

Retirement was addressed primarily from a quantitative perspective in the studies under review: numbers of up-coming retirees and anticipated retirement dates. Thirteen percent of the S&T population is 55 and older; twenty percent (4348 people) are "eligible"[13] to retire now or in the next five years. The large retirement cohort is not unique to the S&T Community or to the federal public service.

Yet even the demographic assumption that S&T workers will actually retire at age 55 or at their earliest no-pension-penalty date may be faulty. The demographic review of the S&T workforce indicates that S&T workers tend not to retire at age 55. More recent research indicates that the 50+-year-old baby boom generation is healthier and more interested in continuing with their work career. As reported in the Globe and Mail, in a 1998 survey of boomers, sponsored by the American Association of Retired People, 80% said they would keep on working beyond traditional retirement age. This may be particularly true of S&T workers who have spent enormous time and energy in perfecting their expertise and profession. For example, seven percent of the current population (1 497 people) is eligible to retire now and they have chosen to stay. Therefore we know that there is a large retirement cohort looming in the future, but when and who may be insufficiently identified to enable good and strategic human resource planning.

Knowledge transfer

Another theme attached to retirement is knowledge transfer from departing employees to replacements and the potential loss of corporate history and intellectual property.

Retirement incentives were described in the rewards report but, to date, these do not appear to have been put into effect.

The whole range of issues around retirement may need more study and focus; the CSTA questions are open for more discussion:

- How do we maximize the opportunities for retired S&T personnel to contribute to federal S&T (mentoring, emeritus roles, part-time work, "ambassadors", etc.)?
- How can we capture the knowledge as retirees leave? How can we smooth the transition to minimize the loss of institutional capacity?

These questions still remain. There are suggestions in the reports but they need a more fulsome analysis, feasibility studies for implementation and practicality, and implementation plans in departments where this need is seen as essential to maintaining their S&T capacity.

[13] As a general rule, individuals who have the number of years of service and age that equate to being eligible for a full pension without actuarial penalty

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