Focus and Expected Impact of Rewards, Recognition and Incentives for Research Engineers and Scientists In Canadian Government R&D Laboratories

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Prepared for the Canadian Government Working Group on Rewards, Recognition and Incentives, *sponsored by* the National Research Council of Canada.

December, 1996

BACKGROUND

In response to concerns raised in the 1994 report of the Auditor General of Canada that dealt with the management of R&D personnel and projects, the Treasury Board of Canada commissioned a series of work groups to develop new policies and guidelines on the management of scientific personnel in the federal public service. One of the work groups is examining the area of rewards, recognition and incentives appropriate to motivate scientific staff to be both creative and productive.

For the purposes of this paper, the population of scientific employees being considered are those who are involved with the technological innovation process, i.e. those people who are involved in the process by which a technical idea is transformed into a new or novel product or process in the hands of the end-user. (e.g., research engineers and scientists in a laboratory setting, research managers, technologists who work with the research scientists and engineers, and the business development or technology transfer officers whose job it is to move the technology or know-how out of the government laboratory and into the adopting private sector organization for commercialization.) Not explicitly covered in this paper are those scientists or engineers who are mainly involved in policy, planning or regulatory activities.

This paper will discuss these systems and make recommendations as to what needs to be done to have effective systems in place. This paper will not, however, deal with salary systems, but focus more on non-salary reward and recognition approaches to motivation.

ROLE OF GOVERNMENT LABORATORIES IN THE 1990s

The primary generic role of government laboratories is to do that research and development (R&D) which either the academic sector or the private sector are unable, or unwilling to do.

Traditionally, this has resulted in the government laboratories being engaged in R&D in support of their internal mandates of policy development, regulation setting of health and safety standards, and national security. Involvement in R&D associated with commercialization and wealth creation tended to be limited to those areas in which very special, expensive facilities were needed that were beyond the ability of private sector organizations to finance, such as space exploration or nuclear science.

In the past decade however, government laboratories around the world are increasingly being viewed as an important player in their countries technological innovation system. As a result they are under pressure to play a more significant role in increasing the technological competitiveness of their nation's industry than they have in the past.

Thus the objectives of the individual government laboratories now consist of the following:

- to conduct excellent, world-class science or engineering required to support their mandates;
- to support wealth generation and job creation in their private sector;
- to maintain and improve the quality of life of their citizens through the conduct of , for example, longer-term medical and environmental research that the private or academic sectors are unable or unwilling to do; and
- compliment the training activities of the universities and colleges by providing facilities and mentors for the training of future scientists and engineers.

This paper will outline and summarize the various forms that reward and recognition must take to support each of these general laboratory objectives. As there is little or no distinction with a reward system that supports the conduct of world-class R&D, and one that supports R&D to improve the quality of life, discussion of these will be combined under the support for world-class R&D section.

Reward and Recognition System that Supports World-Class R&D

whether managers use a people oriented approach or a monetary one, the intensity of application of a reward system is tied to its effectiveness **, - Ellis et al, 1992**

The conduct of excellent, world-class research and development underpins the achievement of the other objectives listed above, and underpinning the conduct of world-class R&D is effective R&D management.

R&D managers must be trained to understand the important role they play in determining the work environment within which creativity and productivity must be supported. They must be

trained in the R&D management practices that support the bench scientists and engineers in their work, otherwise they can hinder achievement and reduce the organization's ability to reach its objectives.

Reviews of R&D management literature show quite clearly that non-salary reward and recognition systems play a major role in motivating scientists and engineers to be creative, productive members of the organization. The form that reward and recognition take, however, must match the form that provides the scientists or engineer with the greatest feelings of job or career satisfaction. For some, that is rewards and recognition that come directly from their employer and immediate colleagues, for others (especially research scientists) the rewards and recognition must come mainly from their scientific peers, both within and outside of their employing organization. For the latter, rewards or recognition is only meaningful if it comes from the scientific community at-large.

Moser and Morrissey (1984) believe that recognition systems can only be effectively employed in a well-managed R&D unit. They state that the key to providing effective achievement recognition is to implement reward and recognition systems that reinforce the values of the individuals who comprise the R&D unit. Among the values they mention are:

- the need for peer recognition;
- working on challenging, interesting projects;
- having clearly integrated R&D and business goals;
- recognition for new promising ideas;
- a work environment that supports growth and personal achievement;
- having good communications and supportive relationships;
- having effective performance and R&D project appraisals; and
- having support for risk taking, i.e., trying new approaches.

Echoing this theme, William Souder (1985) in his review of award programs for R&D personnel makes the point that a positive research climate is a prerequisite if an awards program is to promote increased R&D productivity, motivation and satisfaction.

John Koning Jr., (1993) in his review of R&D recognition and reward mechanisms notes that managers motivate their scientists and engineers by the work environments they create. He lists the following forms of recognition and reward in an R&D environment:

Recognition

Praise

- Feedback
- Private Praise
- Not taking scientists for granted
- Enthusiasm/support from top management
- Appreciation
- Company praise
- Public praise

More Responsibility and Authority

- Freedom to develop solutions
- Freedom from "red-tape"
- Increased responsibility
- Authority that matches responsibility
- Budget control
- Expense account
- New position

Professional Recognition

- Authorship on papers
- Association awards
- Fellows program
- Honours dinner
- Plaque or trophy
- Title
- Certificate

Work Situation

- Meeting personal goals
- Sense of accomplishment
- Challenging research
- Interesting/meaningful research
- Setting joint objectives
- Team membership
- Dual promotion ladder

- Personal interaction with upper management
- Special parking

Rewards

Income

- Salary
- Merit Salary
- Profit Sharing
- Promotion
- Performance based pay
- Bonus
- Patent royalties
- Bonus for patents
- Equity position
- Cost of living adjustment
- Stock purchase plan
- Gainsharing
- Stock options
- Cash awards

Improved Working Conditions

- Satisfying scientists' needs
- Flexible work schedule
- Adequate resources for projects
- Earned time off
- Personalized office redecorating

Professional Development

- Attendance at conferences
- Membership in professional associations
- Paid education

Benefits

- Fringe benefits
- Retirement plan
- Country club membership

The freedom from red-tape mentioned above is also a concern mentioned in an 1989 OECD study that examined **The Changing Role of Government Research Laboratories**. The study noted the, congenital problem of government research establishments [being] the incompatibility between, on the one hand, the public sector's administrative and financial rules etc. and on the other hand, the very nature of research activities. They also note that this incompatibility becomes even more detrimental when it is no longer merely a matter of conducting research but also of promoting its use within the economy and society. This would be a serious impediment to transferring technology or knowledge developed in a government laboratory to industry. The authors of the OECD report argue that, it is essential for government research establishments to be allowed greater autonomy in order for them to be genuinely integrated within the country's research system ... .

R&D organizations must provide their managers with the ability to draw from a pool of various forms of reward and recognition mechanisms and, in addition, provide them with the training necessary to ensure that they use the available mechanisms to the advantage of both the individual researcher and the organization.

Team Rewards and Recognition

It is much more common today for scientific or technical problems or projects to require the talents of people from different scientific disciplines and functions within the organization. This is especially true if the project involves moving an idea or concept along the technological innovation process. It is not enough, therefore, to simply reward or recognize the contributions of an inventor when many people are involved in moving the invention through development and marketing into the hands of the end-user; all should be rewarded and recognized in proportion to their contribution to the success.

Mower and Wilemon (1989) point out that an effective team manager will balance individual rewards for outstanding contribution with team rewards to encourage and to show appreciation for productive and creative employees. It would be expected that the team would include all the key players including the technologists and technicians. Mower and Wilemon suggest the following balance of team and individual rewards:

Rewards for Individual Members

- When someone has clearly gone "the extra mile"
- To encourage the less assertive
- To encourage a newcomer
- To thank someone who is leaving
- When someone's contribution has been ignored by the team

- To recognize a truly outstanding contribution
- To stir things up when group think is beginning to set in
- When team members vary greatly in the kinds of rewards they want

Rewards for the Team as a Whole

- At the start of a project
- To raise morale
- When destructive conflict breaks out
- To create team spirit and cooperation
- When a milestone has been reached
- When a tough problem is solved
- After a crisis
- To create solidarity in the face of trouble
- At the beginning of every meeting
- Throughout the final stages of a project
- To celebrate completion

It is clear from this list that timeliness of the rewards or recognition is as important as the reward itself. Recognition given long past the event, unless it is of a Nobel Prize stature, may have little impact, and in fact may de-motivate staff if staff believe that the delay was due to the need for the reward or recognition being of little or low priority to the organization. Reward and recognition actions that R&D managers can take to increase the motivation and job satisfaction of scientific employees are (Murphy, 1981; Dill, 1985): show interest and enthusiasm in a subordinate's work and problems;

- praise good work, preferably in public;
- reinforce the significance of the work that the subordinate is doing;
- encourage the subordinate to build and maintain contacts with other sources of information;
- encourage subordinates to attend professional meetings and conferences;
- encourage clients and customers of the R&D laboratory to write letters of praise to deserving staff;
- provide publishing opportunities;
- allow technical personnel to represent the organization at technical functions; and

- have technical staff represent the organization on task-forces or study teams dealing with both technical and non-technical matters.

Reward and Recognition System that Supports Wealth and Job Creation

the whole idea of increasing the commercial consciousness of the government laboratories must be treated with some caution, as there is a potential that the new enterprising entrepreneurial laboratories may lose their edge in basic research, or pre-commercial applied research **- Bozeman and Coker, 1992**

As noted above there is greater expectation today that government laboratories will play a significant role in the supporting the private sector in competing in global markets. The OECD report referred to earlier warn that, the legitimate importance of the function of transferring knowledge and know-how should not, however, be over-emphasized to the detriment of the research function proper. Knowledge and know-how have to be produced before they can be transferred, so the potential for high calibre research must be developed and maintained.

For this to occur, there must be in place, suitable reward and recognition systems that reinforce and encourage this objective. Traditionally, the reward and recognition system, at best, ignored contributions by government scientists and engineers to the strengthening of the private sector, or at worst penalized the government employee either for appearing to favour one firm over another with information or technology, or for failing to publish the expected number of papers due to being involved in non-publishing activities with a company.

Elements of this failure to reward behaviour that supports wealth and job creation still exists today. For example, in some departments, technology transfer activities are ignored at promotion time, or are only paid lip service, with the number of papers published in learned journals still commanding the most respect and attention.

There are various mechanisms to promote the movement of scientific knowledge or technology from government laboratories to the private sector (Clarke, 1996). They are:

- personnel transfer where government personnel involved in the technology/ knowledge development temporarily go to the adopting organization, or industrial personnel who will be involved in the adoption of the new technology work in the government laboratory prior to the transfer;

- publications produced by the government laboratory (e.g., technology awareness reports, media announcements) and other publications containing articles reporting on laboratory results (e.g. trade and learned journals, conference proceedings);

- workshop/seminars/open-houses conducted by government laboratory scientists or engineers to disseminate information on new or emerging technologies with possible applications to industry;

- laboratory visits by industrial technical personnel to share information and discuss technical problems with government personnel;

- industrial use of government facilities where unique government facilities exists (e.g., wind tunnels, particle accelerators, nuclear reactors);

- cooperative R&D where government and industry researchers work together to develop a technology or solve a problem;

- contracting-in where an industrial firm or group contracts with a government laboratory to conduct work for the firm or group;

- licensing where the government department licenses a technology it owns to a private sector firm;

- industrial shows, exhibits and trade fairs to provide a broad spectrum of potential industrial adopters with information about the technology or the expertise of the lab; and

- internet web sites that enable potential adopters to learn of technologies, facilities or expertise within a government laboratory that might be of interest to them.

It should be noted that conference attendance by government scientists and engineers has been shown to be an effective vehicle for government laboratories to identify potential adopters of their expertise or technologies.

The reward and recognition system must reinforce those mechanisms chosen by the laboratory to promote technology/knowledge transfer to the private sector. Without such reinforcement, scientists and engineers will not take on the extra burden required to successfully transfer the technology. In general that extra burden consists of preparing a disclosure statement about some intellectual property that appears to have commercial potential, assisting in the preparation of a patent application; spending time with visitors, or taking part in open houses, assisting in the negotiations with the potential adopter, and putting aside time to work with the potential adopter so that the transfer is a success.

Among the potential rewards and forms of recognition that can be made available to support the transfer activity are:

- royalty rewards to both the inventor and the development/commercialization team;

- share of the financial rewards to the originating laboratory;

- recognition at promotion time of successful technology transfer activities;
- organizational recognition through the placement in their hallways of plaques representing every patent received , along with a framed copy of the patent provided to the inventor(s);
- formal dinners/presentations to the inventor(s) and innovation team for successful commercializations.

Studies have shown that the existence of a meaningful incentive system for inventors does result in more disclosures of potential inventions. Staudt et al (1991) in their study of employee inventors, found that over 70% of the 522 people surveyed consider that inventor's compensation (in addition to salary) is very important to them. The authors report that, there is a positive correlation between satisfaction with the inventor s compensation and the number of inventions reported . The director of technology marketing at SRI International in Menlo Park, California states that, their royalty program plays a significant role in encouraging productivity .

Rewards and Recognition that Supports the Training of Future Scientists/Engineers

While not considered to be a major role of government laboratories, the unique facilities and expert personnel offered by some government laboratories provides a venue to graduate students that should not be undervalued.

Many government scientists or engineers hold adjunct professorships in local universities and become thesis supervisors for graduate students. This additional work mentoring and guiding the next generation of scientists and engineers should be recognized and suitably rewarded. Clearly, a researcher should not be penalized if in mentoring a student, he or she publishes slightly less than would otherwise occur.

CONCLUSION

Rewards, recognition and incentives are a necessary factor if an organization wishes to encourage and support particular behaviours among its professional staff. Staff need to know that their work and contributions are appreciated by senior management. Money is not enough.

Fundamental to reaching an organization s scientific or technical objectives is to have in place a reward and recognition system that supports world-class research. Even when the goal is to work with the private sector to encourage wealth and job generation, the government laboratories should be careful not to sacrifice a minimum level of independent reseach needed to maintain

their scientific potential and their capacity for renewal over the medium to long term on the alter of political or commercial expediancy.

Scientific organizations must provide their managers with the tools necessary to either directly reward and recognize outstanding work and contributions, or to enable the scientific staff to receive such rewards and recognition from outside peers and organizations.

The key to the implementation of an effective reward and recognition system is well trained R&D managers who understand how to use the various mechanisms of reward and recognition to motivate their staff to being both productive and creative.

Above all, the bench scientists, engineers and technologists must know that their senior management supports and appreciates their efforts and contributions; without this lower level managers will not be able to develop a work environment that rewards and recognizes good performance.

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