REVIEW OF LITERATURE ON REWARDS AND RECOGNITION

FOR R&D PERSONNEL

FOR

WORK GROUP THREE

Prepared by

Thomas E. Clarke, M.Sc., M.B.A.

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STARGATE CONSULTANTS LIMITED

P.O. Box 995, Station B
Ottawa, Ontario
K1P 5R1

(613) 224-2940
stargate@inasec.ca

P.O. Box 2010
Nanaimo, B.C.
V9R 5N9

(604) 755-3066
stargate@island.net

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Reward and recognition for scientists and engineers has been a popular topic for many years (Clarke and Reavley, 1995). The alignment of an organization's reward and recognition system with corporate objectives is critical if the organization is to achieve those objectives in a timely and cost effective manner.

Alignment of the reward and recognition system with the motivational needs of the scientific staff is equally important if it is to be effective in improving morale and productivity.

MOTIVATIONAL/REWARD ORIENTATION OF SCIENTISTS AND ENGINEERS

Early research into the management of scientists and engineers found that some scientists and engineers are oriented more towards their profession (called Cosmopolitans) and others are more oriented or sensitive to rewards from the organization that presently employs them. (called Locals).

The characteristics of a professional with a cosmopolitan orientation are that they:

- are low on loyalty to their employing organization;
- are high on commitment to advancing knowledge in their professional field; and
- look for rewards from their peers in their professional community at large.

The characteristics of a professional with a local orientation are that they:

- are high on loyalty to their present employing organization;
- are relatively low on their commitment to advancing knowledge in their professional field; and
- look for rewards from their immediate employer.

Badawy (1971) in a study of role orientations of scientists and engineers found that scientists consider themselves to be different from engineers in terms of their work goals, needs and job attitudes. Badawy concluded that the goal orientation of scientists was towards:

- advancement of knowledge for its own sake;
- establishing a reputation through publishing;
- research achievements that will bring professional recognition; and
- advancing and moving ahead as specialists in their field.

While, in general, scientists tend to rate higher on measures of cosmopolitan orientation, while engineers rate higher on measures of local orientation, managers should not assume that all scientists have a cosmopolitan orientation and engineers a local orientation. The determinant of the orientation is most likely influenced by the educational level and the work being done by the professional. A Ph.D. or masters degree level engineer doing research work is more likely to have a cosmopolitan orientation while a Ph.D. or lower degree level scientist doing very applied work is likely to have a local orientation.

The key aspect to keep in mind is to determine the reward seeking orientation of the professional and then provide a suitable form of reward or recognition that fits their orientation. For example, providing a cosmopolitan oriented professional with the opportunity to have dinner with the organization's CEO as a reward for good work will not be as motivating as giving them the opportunity of giving a talk about their work to their peers. Dinner with the CEO would, however, be very motivating for a locally oriented professional be they scientist or engineer.

This goal/reward seeking orientation also affects the persons choice of career path; either up a scientific/technical, or a managerial ladder.

DIFFERENT FORMS OF RECOGNITION AND REWARD

Jauch (1976) in his article which calls for customizing incentives to meet the needs of scientists at various stages of their career divides incentives for scientists into two broad categories as follows which fit into the cosmopolitan/local concept described above.

Organizationally Oriented	Professionally Oriented
Merit salary increases	Encouragement to publish
Promotions within career ladder	Time off for professional meetings
Stock options	Paid transportation to professional meetings
Profit sharing	Dues paid in professional organizations
Rewards for suggestions	Greater freedom to come and go
Rewards or royalties for patents	Better technical equipment
Improved office space	Sabbatical leave for education
Increased technical or clerical assistance	Tuition paid for education
Increased challenge in job assignment	Participation in company seminars
Special recognition and/or monetary reward for superior performance.	

Souder (1985) in his review of award programs for R&D personnel found the following types of rewards in use:

- A "Nobel Prize" type of award for outstanding achievement
- Awards for ideas that have significantly impacted the firms financial position
- Patent awards
- Awards for creative or innovative ideas
- Awards for publications
- Year-end bonuses
- Large merit raises
- Lump sum cash awards
- Plaques, trophies and certificates
- Company-wide notices, press releases and publicity
- Public praise from senior corporate officials
- Confidential, unpublicized cash awards

- Citation from the company president

- Work-related gifts such as briefcases, books, computers.

Souder concludes that a successful awards program must be carefully tailored to the needs and the culture of the host organization. He also 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. Souder considers that a positive research climate is characterized by opportunities for the technical personnel to participate in the overall project selection and planning of the technical work, to be involved in the organization's business decisions, to have fair and meaningful performance appraisals, and to obtain adequate career guidance. "Award programs can augment but not substitute for these qualities".

Moser and Morrissey (1984) also 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 which reinforce the values of the individuals who comprise the R&D unit. Among the values mentioned are the need for peer recognition, working on challenging, interesting projects, having clearly integrated R&D and business goals, recognizing new promising ideas, having a work environment that supports growth and personal achievement, having good communications and supportive relationships, having effective performance and R&D project appraisals, and supporting risk taking.

John Koning Jr. (1993) notes that, "managers motivate their scientists and engineers by the work environments they create". An important element in the shaping of a creative work environment is the reward and recognition system. Reward and recognition can take many forms in an organization as can be seen in his following list. In an R&D organization some of most powerful motivators for scientists and engineers involve recognition which does not incorporate any large, direct financial payments to the employees.

Koning Jr. goes on to warn that rather than having a motivated work force, resentment among the professionals can result if they perceive that they have been unfairly recognized and rewarded for their contribution. This resentment can result in the loss of good people, poor quality research, minimal effort, and restricted communications.

Recognition	Rewards
Praise	**Income**
Feedback	Salary
Private praise	Merit salary
Not taking scientists for granted	Profit sharing
Enthusiasm/support from top mgmt	Promotion
Appreciation	Performance based pay
Company praise	Bonus
Public praise	Patent royalties
	Bonus for patents
More Responsibility and Authority	Equity position
	Cost of living adjustment
Freedom to develop solutions	Stock purchase plan
Freedom from red tape	Gainsharing
Increased responsibility	Stock options
Authority that matches responsibility	Cash awards
Budget control	Incentive award
Expense account	
New position	
Professional Recognition	**Improved Working Conditions**
Authorship on papers	Satisfying scientists' needs
Association awards	Flexible schedule
Fellows program	Adequate resources for projects
Honours Dinner	Earned time off
Plaque/trophy	Personalized office redecorating
Title	
Certificate	
Work Situation	**Professional Development**
Meeting personal goals	Trip to meeting
Sense of accomplishment	Membership in prof. association
Challenging research	Paid education
Interesting/meaningful research	**Benefits**
Setting joint objectives	
Team membership	Fringe benefits
Dual promotion ladder	Retirement plan
Personal interaction with upper management	Membership in country club
Special parking	

Source: Koning Jr., 1993

Koning Jr concludes that it is important to properly select the recipients, and properly select and present the recognition and/or reward. Properly done, it should lead to a vibrant, high quality, productive organization with high morale.

Staudt, et al (1991) found that a majority of employee inventors in their study of incentive systems considered staff development incentives such as opportunities for further training and attending seminars, etc. to be very important.

In their review of reward strategies for R&D, L.W. Ellis and S. Honig-Haftel (1992) found the following to be the eighteen most frequently used reward systems: (in order of frequency of use)

Increased recognition
Salary
Small monetary rewards
Accelerated promotion
More autonomy
Patent award program
Informal or unpublicized award program
Variable bonuses based on issue of patents
Fixed bonuses for milestone achievements
Increased research budget
Options in parent company equity
Award for published papers
"Nobel-type" award program (inventors club)
Large monetary awards
Equity in the new venture
Options in the new venture
Royalty payments from licenses
Participants share in venture return

In analyzing the effectiveness of these rewards in encouraging patenting activities, they found that large monetary awards, informal or unpublicized award programs and variable bonuses based on issue of a patent were the most effective stimulators of patent activity. They quote an earlier study of large firms that showed, "that small per-patent or per-application payments were of little value as incentives, while larger monetary awards and recognition have positive effects" on increasing patents (Smayling, 1987).

Ellis and Honig-Haftel conclude that, "whether managers use a people oriented approach or a monetary one, the intensity of application of a reward system is tied to its effectiveness". In the case of monetary awards, "the value of the reward and its method of application also need to be large enough to gain the attention of the scientific and engineering staff".

REWARDING THE R&D TEAM

In their review of rewards for technical teamwork, Mower and Wilemon (1989) describe the following team recognition rewards:

Publicity in newspapers, company publications and other corporate media
Commendation at a company gathering
Plaques and certificates
Letters of praise
Gifts or honourific titles
A night "on the town"
A trip to a conference
Dinner with the CEO
Vacations with spouses
Grants to charities of the team's choosing
Scholarships in the team's name

Mower and Wilemon point out that the above extrinsic awards may not appeal to all members of a team. Some people value intrinsic rewards that come from within; from professional pride in a job well done. For that reason, they suggest that organizations must also put in place the following team awards that appeal to intrinsic motivations:

Being asked to take on difficult challenges
Increasing scope of team assignments
Increasing the variety of the work
Seeking team advice on problems
Top managers showing interest; visiting the team
Increased freedom and flexibility
Use of team outputs
Using one team as consultants to other teams
"Leadership" shared by team members
Opportunity to master new technologies
Working in a professionally stimulating environment

In North America, individual rewards are still the norm. Mower and Wilemon suggest that effective team managers balance individual rewards with team rewards to encourage and to show appreciation for productive and creative employees. They suggest the following balance of team and individual rewards:

Reward the Team as a Whole	Reward Individual Members
At the start of a project	When someone has clearly gone "the extra mile"
To raise morale	To encourage the less assertive
When destructive conflict breaks out	To encourage a newcomer
To create team spirit and cooperation	To thank someone who is leaving
When a milestone has been reached	When someone's contribution has been ignored by the team
When a tough problem has been solved	To recognize a truly outstanding contribution
After a crisis	To stir things up when groupthink is beginning to set in
To create solidarity in the face of trouble	When team members vary greatly in the kinds of rewards they want
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 is as important as the reward itself. A reward given too late may be considered a cynical gesture and result in de-motivation.

ROYALTY BASED COMPENSATION REWARDS

In a review of royalty compensation programs, Shari Caudron (1994) believes that by sharing the commercial rewards that come from a successful product, firms will retain, and more effectively motivate their creative scientific staff to be involved in new product development.

In her article, she describes the royalty compensation programs of several organizations. She states that the Battelle Pacific Northwest Laboratory in Richland, Washington has had a royalty compensation program in place since 1989 partially in response to the 1986 U.S. Federal Technology Transfer Act which calls for a minimum 15% royalty payment to federal employee inventors from licensing income their government laboratory receives, and also from a desire to encourage staff to work harder at transferring technology to private clients. At Battelle, key researchers are entitled to share a pool of funds worth 10% of gross royalties or other proceeds derived from licenses and sales of intellectual property. From 1990 to 1992, Battelle paid out approximately $200,000 to key contributors, and in the first six months of 1993, payouts exceeded the payouts for all of 1992.

In their review of incentive systems for employee inventors, Staudt, et al (1991) report that over 70% of the 522 employee inventors responding to their survey consider that inventor's compensation (separate from salary) is very important to them. The authors go on to report that "there is a positive correlation between satisfaction with the inventor's compensation and the number of inventions reported.

At another government contractor run organization, SRI International at Menlo Park, California, a royalty based compensation plan has been in effect since 1978. There, scientists share a pool of funds worth 25% of license and royalty fees. One of their scientists who developed software to enhance ultrasound imaging has earned over one million dollars in royalties. The director of technology marketing at SRI stated, "The royalty program plays a significant role in encouraging productivity". An additional feature of the SRI royalty program is that 35% of funds from royalties and license fees go to the department where the technology originated. This money is used to buy additional equipment, etc.

Despite the apparent success of royalty based compensation, a 1992 survey of industry by William M. Mercer, Inc. showed that only 7% of U.S. firms offer such compensation packages. According to a survey by the Hay Group, 76% of high-technology companies have some kind of special pay policy, including bonuses, for key technical people,. At Texas Instruments, in Dallas, Texas, an inventor can receive up to $175,000 in bonuses for a single patent. John McMillan, managing director of William Mercer, Inc., who supports royalty compensation programs, notes that the lack of wide spread use of such programs is due in part to organizations having to answer some important questions in applying them. The questions include: What are we trying to encourage?, What percentage of profits should be returned to the employees?, How do we determine who is eligible?, and What kind of message will this send to employees who don't receive royalties? McMillan believes that by "basing an incentive not on an invention's technical elegance, but on its commercial acceptance, you get the developer to focus on what the customer really wants". He believes that this focus will speed up the technology transfer process.

In a recent review of commercialization of technology from U.S. federal laboratories, Elie Geisler and Christine Clements (1995) found that financial incentives were not as important as non-financial incentives in facilitating technology transfer. Generally, non-financial rewards, such as recognition awards to outstanding employees, were viewed by the laboratory managers as more effective. The employees themselves were not surveyed. Other factors that facilitated technology transfer were senior management

support for technology transfer through policies and resources, and personal contacts between the government laboratories' scientists and those in industry.

SALARY SYSTEMS

In the Canadian public service, two salary systems operate side-by-side for scientists and engineers; the position-based system for scientists in the non-RES categories and engineers, and the person-oriented system for RES, DS and NRC employed scientists. This can lead to inequities in compensating scientists and engineers for their contributions to organizational objectives.

This review was not intended to look at salary systems per se but noted reference to a study conducted by Thomas Atchison and Wendell French in 1976 which investigated and compared three salary systems (classification, maturity curve, and time span of discretion) from the point of view of the job holder's perception of what his or her job should pay relative to others. Atchison and French "recommended that time span of discretion to be a more attractive approach for establishing salaries for scientists".

Arthur Chester (1995) describes a results-based compensation system used at the central laboratory of GM Hughes Electronics in Los Angeles. It calls for bonuses for non-management employees (professionals, technical and administrative support) based on measures of overall laboratory performance. Managers bonuses are also dependent on the overall laboratory performance. If the non-managerial employees receive a zero-bonus, so do the managerial employees. The measures of performance are technical excellence, performance against business unit objectives and meeting general management objectives.

Gomez-Mejia et al (1990) in their comprehensive review of rewards for technical employees warn of difficulties when there are many levels in salary structure. They point out that successful R&D firms have special bonuses or incentives for their key R&D personnel, as well as bonus schemes tied to overall team or corporate performance. They recommend that in developing a reward system for technical employees, that an organization:

- price the person, not the job, when rewarding a technical employee;
- provide a menu of pay incentives that takes into account both personal and corporate performance; and
- remove the professional reward system from the hierarchical structure.

Ledford, Jr. (1995) argues that most organization's pay systems are far too rigid , cumbersome and complex to support organizations need for employees that can respond quickly to rapidly changing economic conditions and competition. He suggests that organizations adopt:

- broadband pay structures that reduces the number of pay grades;

- bonus-based, skill-based pay plans which reward the skills needed today, and not the skills needed yesterday;

- performance management processes that involve more effective performance appraisals and 360-degree appraisals which provide performance feedback from managers, peers, subordinates and customers; and

- variable pay programs that reward individuals or teams for reaching financial or performance targets.

In another article, Ledford, Jr. (1995) argues strongly for competency-based pay systems (skill-based) for knowledge workers which pay employees for their skills, knowledge and competencies rather than for their jobs. He believes that a competency-based pay system is more in line with an organization's need to maintain existing and develop new core competencies which are at the heart of the organization's present and future success.

CAREER PATHS

Along with the motivational or reward seeking behaviour of scientific professionals, employers must also take into account their career orientation. In many R&D organizations, professional staff have the option of promotion up a scientific or technical ladder, in addition to the more traditional management ladder. The availability of this option is an important aspect of customizing the reward and recognition system to meet the motivational needs of the professionals.

Recent studies have identified a third career path that appears to exist in government laboratories that are trying to have greater involvement and interaction with the private sector. Turpin and Deville (1995) believe that the increased emphasis on government laboratories operating in a more "business-like" manner with increased efforts being made to commercialize government developed technologies has resulted in the need to "develop a whole new set of skills and behaviours that were previously quite foreign to many scientists". As a result of their study of the changes

that have been taking place at the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO), they have identified three career or occupational streams within CSIRO:

Science Stream built on the core value of scientific excellence (i.e. a scientific or technical promotion ladder)

Science Management Ladder built on the core value of industrial relevance (i.e. an R&D management promotional ladder)

Commercial Stream built on the core value of generating financial returns to the organization (i.e. a scientific entrepreneur or marketing ladder)

Thus promotion decisions must take into account the ladder that is most appropriate to the needs and interests of the professional.

To these three career orientations must be added a fourth, called the **Project Orientation.** To date this orientation has only been detected among older engineers. Allen and Katz (1986) describe project oriented engineers as being not as concerned about external technical reputation as their scientific ladder oriented colleagues but seem more influenced by the intrinsic nature of the task. They are not particularly excited by the prospect of promotion up either the technical or managerial ladder. They are, however, motivated by the prospect of a continuing flow of interesting challenging projects. McKinnon (1987) who refers to these engineers as "steady-state people" suggests that R&D organizations that offer only the reward of promotion up either a technical or managerial ladder are ignoring a valuable segment of their employees. He argues that, "interesting and challenging assignments should no longer be considered only as a means of moving toward organizational advancement, but should be regarded as rewards in and of themselves".

ACTIONS THAT CAN BE TAKEN BY R&D MANAGERS

Several authors deal with reward and recognition from a more personal, hands-on perspective.

Dill (1985) suggests the following reward and recognition actions on the part of lower level R&D managers that will increase the motivation and job satisfaction of the technical employees:

- show interest and enthusiasm in a subordinate's work and problems (i.e. management by walking around);

- 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 groups that might be helpful;

- encourage subordinates to attend professional meetings;

- encourage clients or customers of the R&D lab to write letters of praise to deserving staff; and

- use annual performance appraisal to focus on personal development and the setting of personal goals.

At the more corporate level Murphy (1981) suggests that senior management of organizations should use the following recognition techniques to improve the level of motivation of scientists and engineers. Among the techniques recommended are:

- providing publishing opportunities;

- providing awards for outstanding performance in the year;

- having staff represent the organization at technical functions;

- having staff represent the organizations on task forces or study teams dealing with both technical and non-technical matters; and

- senior management showing a positive interest in the activities of the laboratory through more visits.

SUMMARY

In summary, the literature on reward and recognition for creative scientists and engineers tends to emphasize intrinsic rewards over direct financial incentives. Scientists, with a more cosmopolitan orientation, want the opportunity to work on challenging projects that are adequately funded and that will result in some meaningful output that will be recognized by their scientific peers. Whether this output is a scientific paper and/or a new product depends on the culture in the organization and the reward structure. The reward and recognition system must encourage creative employees to take the extra steps needed to ensure new product or process development takes place. That system must be

valued by the employees, not just by management. Recent evidence suggests that royalty based compensation programs, although not widely used in industry, can have an effect on the technology transfer performance of scientists or engineers.

It is clear, however, that half-measures in either financial or non-financial rewards will be ineffective, and may backfire. Small financial rewards may be viewed as grossly inadequate where an organization has major earnings as a result of an invention, while limited non-financial recognition efforts may be viewed as insincere.

Because of the desire for recognition, extrinsic rewards such as pay and promotion, that an organization gives, can motivate researchers. However, they will operate as a motivator of performance only if they are seen to be obtainable through good performance, at either the individual, team or organizational level. The authors reviewed in this report have a preference for a person-oriented pay system for knowledge workers rather than the more traditional job-oriented system.

The bottom line is that effective reward and recognition systems must be flexible and meet the needs of both the professional employee and the organization. What you reward is what you will get, therefore your reward and recognition system must reinforce those competencies and activities that lead to successful performance of the organization both now and in the future.

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