CHAPTER- I
INTRODUCTION AND DESIGN OF THE STUDY

1.1 INTRODUCTION

Employee performance appraisal is an inevitable aspect of organizational life. Performance appraisal is the systematic process of evaluating current and/or past performance of an employee in the organization as well as his potential for growth and development.

Performance appraisal remains a widespread and common practice in the organizations in India. Success of any organization depends on performance of its employees. Therefore, every progressive organization lays stress on an effective performance appraisal system as an important tool for sustaining and enhancing performance of its employees. Evaluation of the success of a performance appraisal system is recommended as part of the system implementation and management process.

The traditional research themes of rater accuracy, psychometric measures and technical consideration have recently been expanded to include organizational acceptance, employee attitude towards the organization and the performance appraisal system and employee satisfaction as key indicators of performance appraisal efficacy (Tziner et al. 2001). Murphy and Cleveland (1995) suggest that employee reaction to appraisal is a class of neglected criteria that should be considered in evaluating the success of a system. Bernadin and Betty (1984) also suggest that employee reactions to a performance appraisal system are usually better indicators of the overall viability of a system than the more narrow performance indices. Thus the effectiveness of a system is particularly contingent on the attitudes of the system users, both raters and ratees. The literature indicates that there are...
many factors to consider in the evaluation of performance appraisal including employee attitudes towards variables such as perceptions of fairness. Bretz et al. (1992) indicate that the most important performance appraisal issue faced by the organizations is the perceived fairness of performance review and performance appraisal system. Their findings suggest that most employees perceive their performance appraisal system as neither accurate nor fair. Descriptions of fairness are generally drawn from research and literature in the area of organizational justice.

Organizational justice, as a socially constructed dimension, seeks to explain employees’ attitudinal and behavioral reactions. As performance appraisal has implications for individual award, employee perceptions of justice are especially considered (Erdogan 2002) as they can form effective criteria of performance appraisal.

Organizational justice has basically two subjective perceptions, procedural justice (the fairness of procedures used to decide outcome distributions) and distributive justice (the fairness of outcome distribution). When employees feel unfairly treated they are likely to react by changing their job attitudes (Vigoda, 2000), especially with respect to employee satisfaction (Taylor et.al. 1995). Perceptions of procedural justice have also been shown to affect organizational outcomes. Distributive justice is concerned with perceived fairness of the outcomes in allocations those individuals in organizations receive (Nurse 2007). In performance appraisal, individuals compare their efforts with the rating they received and the fairness of that rating to reach an individual perception of distributive justice. A third type of justice is often referred to as “interactional” justice. Bies and Moag (1986) defined interactional justice as the fairness of personal treatment that one receives at the hands of an authority figure during enhancement of organizational processes and distribution of outcomes. The interactional justice concept has been included as an
interpersonal aspect of procedural justice and also as a distinct construct along with procedural and distributive justice (Skarlicki and Folger 1997).

Murphy and Cleveland (1991) claim that performance appraisal is unlikely to be effective unless those involved in the process perceive it as fair. It follows that within performance appraisal process the appraisees need to be considered as salient shareholders.

Evaluating appraisal system using a theoretical foundation drawn from organizational justice offers opportunity to examine how the fairness of different aspects of performance appraisal may affect the ultimate success of such organizational system.

1.2 IMPORTANCE OF THE STUDY

The economic development of the country depends significantly on the progress of science and technology. After independence, the central government played a pivotal role in establishing large scientific research and development organizations in India. This has resulted in broad based and extensive network of research organizations in government sector. Performance of these organizations heavily depends on performance of scientific personnel. Majority of the study of employee performance appraisal system in the recent past are focused on manufacturing, business, industrial or service organizations.

Nature of work of scientific personnel of research and development organisations involves not only creativity and innovative research but also development of latest technology and products. Scientists in government research organizations in India do not carry out work anymore with a limited mandate in this era of globalization. They also face challenge of technological obsolescence in the face of fierce competition. Traditional approach of performance appraisal of scientific personnel may not suffice. Though every government research organization in India
follows a performance appraisal practice, there is limited knowledge about the efficacy and effectiveness of the appraisal system.

Therefore, it is very important to study the perception of scientific personnel of performance appraisal system and their satisfaction with the said system as perceived by them, and the factors influencing the appraisal system prevalent in government research and development organizations in India. This will help to improve effectiveness of the appraisal practices and system and thereby enhance performance of scientific personnel in government research and development organizations.

1.3 STATEMENT OF PROBLEM

Review of literature on performance appraisal of scientific personnel indicates that appraising performance of scientists and engineers is difficult. Traditional approach of appraising the performance of scientific research and development (R & D) personnel by functional managers may not be effective when they are assigned to project team and because of nature of their creative and innovative work. The metrics useful for helping appraise them may be combination of both qualitative and quantitative. Since there are differences in the goals and aspirations of engineers/scientists, the concept of employee contribution needs to be differentiated. R&D work is complex and doing any one thing well is unlikely to provide a clue to the total performance. As many R&D organizations in public sector in India are non-profit organizations, output/outcome measures are usually subjective and non-quantitative. Quantitative measures for output elements are usually in different units, thus defying precise comparison between different quantitative outputs. A multi dimensional array of indicators combined into aggregate units which could then provide trends, indicators, and patterns of the individual outcome/ output. Notwithstanding obstacles
viz. difficulty of defining output or contribution made by the individual, matching inputs to outputs/impact within a time frame, measures of quality dimension of the contribution, almost all R&D organizations have devised instrument for appraising performance of their scientific personnel. In India, many public sector R&D organizations have their own performance appraisal process to evaluate performance of scientists and engineers. Performance appraisal instruments play pivotal role in performance management system of any organization for their employees. It is known under different nomenclature viz. performance appraisal report, confidential performance report, Annual Review of performance, Annual Performance Assessment report and so on, in the Indian R&D organizations. Does the appraisal format so designed captures and measures contribution of R&D personnel effectively? Appraisal formats have undergone changes in only one or two organizations during the last two decades. Otherwise most of the organizations follow the appraisal formats designed by them before a long time in the past without any significant change. In view of rapid changes and increasing demands on R&D personnel in fast changing science and technology scenario and their role in the economy of the country, the appraisal instruments need a relook. Performance appraisal system has a significant impact as concern and motivation of scientists and engineers. Even recently introduced performance based incentive scheme in some state owned scientific research organizations hinges on merit rating reflected in the appraisal/assessment report. Of late, approach to performance appraisal system in government sector including government R & D organizations has undergone a paradigm shift. During the recent period between May 2009-July 2009, Department of Personnel and Training, Government of India issued guidelines introducing annual performance assessment for all civilian government employees. The notable changes are as follows:
1. Annual confidential report is substituted with Annual Performance Assessment Report (APAR). The full APAR including overall grade and assessment is to be communicated to the concerned assessee (change from confidentiality to transparency in the appraisal practices). 2. The assessee has been provided opportunity to make any representation against the entries and the final grading. (A mechanism of appeal against rating in the appraisal process introduced) 3. The overall grade on a score of 1-10 is based on 40% weightage on assessment of work output and 30% each for assessment of personal attributes and functional competence. (Performance rating criteria modified).

Accordingly, the government R & D organizations have undertaken exercise to modify the process and grading of performance assessment of scientific personnel. Despite growth of private sector, government funding continues to account for nearly ¾ of India’s R & D spending (Source: Department of science and technology: Science and Technology system in India). The Central Government is the chief patron of scientific and industrial research. Among major scientific agencies, percentage share of central government research and development expenditure is highest (around 8000 crores annually) in Defence Research and Development Organisation (DRDO). DRDO also employs a strong scientific manpower pool. There is dearth of comprehensive academic study undertaken on the performance appraisal system of scientific personnel in government R & D organizations in India. A number of studies that are available in this area are mostly related to industrial, manufacturing and service sector organizations. Thesis database of INFLIBNET and VIDYANIDHI, repositories in India, as accessed during the period June 2008-April 2009 and literature review also indicate the same. Therefore, the study of performance appraisal of R & D personnel in central government science and technology organizations has
assumed importance, more so after the introduction of change in the process and performance criteria of performance appraisal. A diagnostic study was undertaken among the scientific personnel of DRDO with respect to their perception of the existing appraisal system. A general view on the lack of fairness of and satisfaction over the appraisal practices among the scientific personnel in the said organisation was observed. Effectiveness of performance appraisal of the system/practices is measured by perception and satisfaction of the employees. In this context, the present study of perception of fairness of and satisfaction with performance appraisal system in Defence Research and Development organisation, a premier national scientific R & D organisation, will fill the gap to a certain extent and reveal perception of fairness and satisfaction of scientific personnel over the performance appraisal system and practices in the selected organization and other central public sector R & D organizations in general in India.

Therefore, it is important to take a study of perception of fairness of and satisfaction with performance appraisal system for scientists in Defence Research and Development organization, one of the largest government funded organizations in public sector.

1.4 RESEARCH OBJECTIVES

The following are the objectives of the present study:

1. To analyze the perception of fairness of scientists towards the existing system of performance appraisal in DRDO.
2. To determine satisfaction with performance appraisal system currently being used as perceived by the scientists of the selected research and development organisation.
3. To understand the factors significantly influencing effective performance and level of satisfaction of scientists of DRDO over the present appraisal system.
4. To ascertain development orientation in and impact of open appraisal on performance appraisal system for scientific personnel in the selected organization.

5. To suggest better ways and means for effective appraising of scientists of DRDO.

1.5 RESEARCH METHODOLOGY

The methodology of research indicates the general pattern of organizing the procedure of gathering valid and reliable data for the purpose of investigation. This study includes the description of the research design, population, sample size, sampling technique, development and description of analytical tool, data collection procedure and method of analysis.

The validity of a research depends on the systematic method of collecting data and analyzing them sequentially. In the present study, extensive uses of both primary and secondary data collected were made systematically. For collecting primary data, survey through questionnaire method was used among scientific personnel of the selected organization. First-hand information pertaining to perception of and satisfaction with existing performance appraisal system, factors influencing performance appraisal and opinion on developmental appraisal and open appraisal process in the area of study were collected from the respondents.

1.5.1 POPULATION

The target population of the present study are defence research and development scientists of DRDO of the grades of Scientists – B, Scientists – C, Scientists – D, Scientists – E & Scientists – F. Scientists above grade of scientists F such as Scientists G, outstanding scientists and distinguished scientists are few in number. Therefore, population of the study is restricted to five grades of scientists. Scientists from the grade B to up to grade F constitute primary scientific workforce and about 95% of scientists of the organisation fall within these grades. Performance assessment report format are the same for the scientist B/C/D/E/F with slight
variations in criteria for performance rating. The study aimed at scientific personnel who had experienced at least two annual appraisal processes. Those, who had completed two years or more, would have two annual performance appraisal reports generated and as such would be in a better position to provide meaningful response to the questionnaires and interview related to the study. As on June 2010, grade wise population of scientists completing two years or more are approximately 5000 with the percentage in each grade: Scientists B and Scientists F in the population are about 16% each and that of scientist D is just 17% whereas percentage of scientist E is about 15%. Scientists C constitute about 36% of entire population.

1.5.2 SAMPLING METHOD

The sample size was determined using Cochran’s (1977) sample size determination formula for continuous data. Information used in this formula included (i) a five point Likert – type scale (ii) a two percent margin of error (iii) an estimate of population standard deviation of .833. A five percent risk that true margin of error may exceed the acceptable margin of error was utilized.

Sample size formula for continuous data:

\[
\frac{(t)^2 \times (s)^2}{(d)^2} = \frac{(1.96)^2 \times (.833)^2}{(5 \times .02)^2} = \frac{(3.8416) \times (0.6938)}{(0.1)} = 266.530
\]

Where \( t \) = value for selected alpha level of 0.25 in each tail = 1.96

\( s \) = estimate of standard deviation in the population= .833 [estimate of variance for 5 point scale calculated by using 5 (inclusive range of scale) divided by 6 (number of standard deviations that include almost all, approximately 98% of the possible values in the range)]

\( d \) = acceptable margin of error for mean being estimated =0.1 (0.02 x 5 point Likert type scale)

\( n_0 \) = Unadjusted sample size
\[ n = \frac{n_0}{1 + \frac{n_0}{N}} = \frac{267}{1 + \frac{267}{5000}} = 253.4649 \]

\( n \) = adjusted sample size, \( N \) = Population size

Therefore, the required sample size is 254.

Sample of 500 scientific personnel of defence research and development service of DRDO, about double the number of the required sample size, were selected based on the convenience of the researcher by adopting stratified random sampling method. Stratified random sampling technique was adopted as the laboratories/establishments of the selected organization was geographically scattered throughout the country and some of them are not accessible due to its remote location and security reasons. For the purpose of sampling, the entire organization was divided into eight technological clusters as found in the website of the organization. There are eight strata spread across all over the country encompassing all the laboratories / establishments / units. These eight strata are as follows: (1) Aeronautics (2) Armaments (3) Combat Vehicles and Engineering (4) Electronics and Computer Sciences (5) Missiles (6) Materials (7) Naval (systems) (8) Life Sciences. Stratified random sampling method was applied while selecting the respondents across the technological clusters so that adequate number representations would be available in the sample from scientists, both from science and engineering background.

1.5.3 SOURCES OF DATA COLLECTION

Primary data

Primary data was collected through questionnaires and un-structured interview. For the sake of data collection, Questionnaires were distributed through various means: (i) directly handing over to the individual respondents (ii) contact points in different locations (iii) individuals through the mails. A cover letter explaining entailed study
and specifying the voluntary and anonymous nature of the participation in the present study was sent along with the questionnaires. All contact persons were explained the purpose of study. Since questionnaires were sent all across the country, reminders were sent later to the contact persons for completion and collection of data and targeted population. Based on sample size requirement, questionnaires were sent to 500 people. 330 questionnaires returned duly completed. Return rate is around 66%. A few incomplete and unusable feedbacks were eliminated. 328 response sheets were finally considered for the study. Data were collected from the sample scientific personnel of varying nature with respect to their designation/grade, years of service in the organization, years worked in the present job/assignment, age, gender, highest level of education and role as appraisers/appraisees.

Secondary Data

The primary data were supplemented with secondary source of data. Secondary data pertaining to the study were gathered from the text books, journals, magazines, research reports, thesis data base of INFLBNET and VIDYANIDHI in India, well equipped libraries of universities/ institutes in Delhi, Cochin and Coimbatore as well as dailies and websites. Data about the organization under study, its function, activities and systems were collected through various websites in the net including that of the said organization, publications of the organization, newspaper reports and year books.

1.5.4 DISCUSSIONS AND INFORMAL INTERVIEWS

Un-structured and informal interviews and several rounds of discussions were conducted with a cross section of scientists of the organisation to understand the appraisal system and practices practically followed in the organization and gain insight into the various influencing factors related to the appraisal and their preferences to an effective performance appraisal mechanism.
1.5.5 TOOLS FOR DATA COLLECTION

From data collected from the research survey as well as data from secondary sources and presented in the present report, descriptive and empirical approach through analytical research was considered as most appropriate for this study. The suggestions offered in the final chapter of the present research report emerged from the inferences drawn from the sample respondents’ information about their perception of and satisfaction with performance appraisal system as practiced in the organization under study. The research used ‘closed’ and ‘open-ended’ questions in the questionnaire to collect the primary data.

1.5.6 SURVEY INSTRUMENT - QUESTIONNAIRE USED FOR THE STUDY

A questionnaire was used to collect data from eligible scientific personnel required to participate in the annual performance assessment system of the organization.

Part – I of the survey contains biographical questionnaire. Biographical questionnaire were developed to obtain designation (grade), age, years of service in the organisation, years of service in the present job, gender, highest level of education, additional qualification, if any, of the participants. Participants were also required to furnish their status as appraisers (as Initiating officer / Reviewing officer) and as supervisors.

Part – II of the survey includes nine scales containing items measuring perception of fairness of performance appraisal.

The seven scales utilized in study to measure perception of fairness of performance appraisal were adopted from perception scales developed by Marie Burns Walsh (2003) with due modifications to various items of the scales in R & D context in India. Seven scales are (1) setting performance standard, (2) rater confidence, (3) providing feedback, (4) accuracy of rating, (5) explaining rating
decisions, (6) seeking appeals and (7) concern over rating. Some items of all these seven scales were deleted and some items were added in the scales to make it usable and applicable to the target population under study.

Two scales of the fairness perception, namely, self appraisal / assessment and performance review discussion were developed by the researcher. The content development was derived from theoretical conceptualization in the organizational justice and performance appraisal literature (Adam, 1963, Folger and Cropanzano, 1998, Leventhal, 1980 and Greenberg, 1993) and empirical research on justice perceptions and effectiveness of performance appraisal (Gabris and Irhke, 2000, Greenberg, 1986, Keeping and Levy 2005).

The content validity of the scales in this study was further verified through participants in the pilot study conducted for the purpose. Wordings and questions were modified as appropriate and suitable to the organisation. The nine scales designed to measure perception of fairness included 52 items. Perception of fairness were measured on five point scale with 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree 4 = agree and 5 = strongly agree.

(i) Procedural scales

Procedural justice scales primarily based on Leventhal’s (1980) procedural justice model, concern perceptions of performance appraisal procedures that determine how decisions on appraisal ratings and other outcomes are determined. These represent ratee’s concerns regarding the system’s consistency in procedural aspects and in addressing employee concerns regarding performance expectation. Self assessment / appraisal by the appraisee is one of the important steps that provide feedback to the accomplishment, progress and environment related to work and jobs of the employee. Feedback furnished as a process of self-appraisal by the appraisee is purposed as a veritable database for performance appraisal. Abilities,
skills and knowledge of job to accurately rate performance of the employee are included. Provision of the system to allow ratee to appeal a performance appraisal rating is also assessed in these factors. Scales considered to this factor include:
(a) Setting performance standard; (b) Self appraisal / assessment
(c) Rater confidence; (d) Seeking appeal
Leventhal suggests that procedures will be considered fair if they are free from bias; are accurate; correctable; representative of all concerns and are based on accepted ethical standards. Fogler and Cropanzan (1998) recognize the relevance of setting performance standard and Murphy and Cleveland (1998) suggest that systems will be perceived as more fair if job dimensions are highly relevant. Walsh Scale of ‘Setting Performance Expectations” was renamed as “Setting Performance Standard”. Items 2, 3, 5 & 6 of the scale with modifications were retained. Two new items “Performance assignment and targets are set for me in specific, measurable and realistic term” and “APAR process allows to set fair standard of performance according to my potential” were added by the researcher. Modifications / additions of items were made to make it usable and relevant for the organisation.

Literature suggests self assessment / appraisal is involved with the issue of clear targets and standards of performance against which individuals can be assessed (Armstrong and Baron 2007 and Rao 2004). The process generates greater understanding about the appraisee and is used as a step for further discussion and action in the performance appraisal procedure. The only way an appraiser can get a good deal of information about the appraisee and his performance is by asking him. Data provided by the appraisee through self-appraisal serves this purpose. Extending opportunity to the appraisee to assess his / her “self” is part of procedural fairness. All six items of the scale “Self-Assessment / Appraisal” were prepared by the researcher. Examples of the scale include “Self-appraisal process
allows me to express my views freely on the job assigned and suggest designed change in the nature of work”, “I freely comment on constraints and limitation faced in my self-appraisal report”, “Achievement / shortfall against set target is always indicated honestly in the self-appraisal” etc.

The assignment of appraisers who have sufficient knowledge of the appraisees’ job, their level of performance and appraisal system knowledge was found to influence perception of fairness by Murphy and Cleveland (1991) and Tang and Sars Filed – Baldwin (1996). Five items of Walsh scale “rater confidence” with minor modification were adopted for the study.

The provision and opportunity to appeal against rating which is considered unfair and inaccurate is cited in the literature as being important component of ensuring perception of procedural fairness (Murphy and Cleveland 1991). “Seeking Appeal” scale has six items adopted from scale developed by Walsh (2003). Examples of the items in the “Seeking Appeal” scale include “I have ways to appeal a performance rating that I think is biased as inaccurate”, “I am comfortable in communicating my view and feelings of disagreement my ratings” and “I know that I can get a fair review of my performance rating if I request one”.

(ii) Distributive Scales

Distributive justice deals with the fairness of the allocation of an outcome on reward and is firmly grounded in equity theory that states that one’s rewards should be proportional to one’s inputs with regard to one’s referent group (Adams 1965). In the study of employee performance appraisal, performance appraisal and ratings can be considered as outcome itself or input from decision for promotion, performance incentives / performance related pay, training and career opportunities. Distributive justice perceptions can be applied to employee performance appraisal by taking into account the way / process in which rating / grade is awarded by the rater focusing on
the criteria of accuracy and equality of ratings and the consideration of elements of bias influencing the raters. Two scales “Accuracy of rating” and “Concern over ratings” were considered under distributive scales.

Tang and Sars Filed-Baldwin (1996) used Price and Muller’s (1986) Distributive Justice Index as the basis for equity norm indicator. The scale “Accuracy of ratings” reflected perceptions of equity of ratings based on modified version of the Distributive Justice Index (Thurston, 2001). All five items of “Accuracy Rating” scale shown by Walsh (2003) have been used for this study. The sixth item “APAR ensures uniformity / consistency in rating equally competent appraisers of different disciplines” was added to the scale by the researcher. Other items of the scale mainly deal with quality, quantity of the job accomplished and efforts put by the appraisee.

Biasness of the rater on norms of the organisation may influence the rater to award rating / grades that are not in consonance with equity norms and, therefore, be dubbed as unfair. Walsh (2003) adopted a subset of the 25-items instrument designed by Tziner et al. (1997) to measure rater’s goals as related to political considerations to study organizational political influences. The subset is included in seven itemed scale ‘Concern over Ratings” The fifth item “My performance appraisal is based on quality and quantity of work and not my personality or position” was modified to “My Performance Appraisal is based on achievements / accomplishments and not on my personality or position”

The seventh item of the scale “Supervisors give same rating to all their subordinates in order to avoid resentment among them” was deleted while applying scale for this study. Instead, the item was replaced with question on forced distribution of appraisees at the time of rating as prevalent in the selected organisation.
(iii) Interactional Scale

Bies and Moag (1986) define interactional justice as being concerned with the quality of treatment received from decision-makers. Interactional justice is also concerned with the extent that the formal decision-making procedures are properly enacted. The three interactional scales include providing (performance) feedback, performance review discussion and explanation / justification of decisions by the appraiser to the appraisee. Two scales “Providing Feedback” and “Explaining rating decision” as designed by Walsh (2003) were adopted for this study with modification / addition / deletion. “Performance review discussion” scale with six items was designed by the researcher.

Only five items of the scale “Providing Feedback” were utilized. The item “My rater lets me know how I can improve my performance” has been deleted as the respondents in the pilot study pointed out to be redundant for the reason that similar item has already been included under the scale ‘performance review Discussion’. Rater in the questions was qualified with words “IO (Initiating Officer)” / “RO (Reviewing Officer)” as and where applicable. Items of the scale were designed to measure the quality and quantity of feedback provided by the appraiser to the appraisee.

Performance Review Discussion (PRD) connotes a formal discussion between the appraiser and appraisee on the latter dyadic performance for a given period of time to identify the factors that have positively or negatively affected their performance and to prepare action plans to improve the performance using performance equation (Rao 2004). It is a systematic review of performance of the appraisee by the appraisee concerned and his appraiser. Since it is done in a formal interactive way, perception of interactional fairness was measured with six items designed by the researcher. Items of the scale deal with perception of respondents on the following
aspect of PRD: (a) facilitating free and open discussion, (b) facilitating effective communication in a climate of acceptance, mutuality and openness, (c) adequate time for PRD, (d) sensitivity of the appraisee, (e) appraiser as facilitator / guide rather than arbitrator / judge (f) amount of support and guidance received from the appraiser.

Only four items of the scale “Explaining rating decisions” as designed by Walsh (2003) was applied to this study. First item out of five items “My rater gives me clear and real examples to justify his/her rating of my work” was deleted. Instead, the item “Justification of rating is clear in APAR itself when shown to the assessee after final grading” was added as the first item. The words “IO / RO / Final Rater” were used after the word rater in the items as applicable to bring clarity to the respondents as relevant to their organisation. Items of scale deal with rater’s role in explaining decision on rating / grading and his justification thereof. The scale is composed of five items.

Part III – Satisfaction of scientists of the selected organisation with Annual Performance Assessment (APA) was measured by their reactions of the recent performance rating, reactions to the APA system and reactions towards supervisor. Walsh (2003) designed items of these three scales using items modified from previous studies (Tangs and Sars Filed – Baldwin, 1996 and Taylor, 1995) and these are considered indicators of satisfaction with employee performance assessment. Reactions were measured on a five point scale with 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree.

All the four items of the scale “Reactions to recent performance rating” were adopted. The item “I am satisfied with the process of awarding of final grading after initiation / review” was added as the first item of the same scale. The scale is composed of five items eliciting response on the fairness, accuracy, satisfaction over the recent performance assessment rating.
Out of seven items of the scale “Reactions to the APA” (Walsh, 2003), six items were used. One item “I would want to participate in the PPR even if it were not required” was deleted. Four new items measuring (a) satisfaction with objectivity and effectiveness of appraisal (APA), (b) reactions of the process as open participative system without controlling people, (c) relevancy and weightage assigned to performance dimensions (attributes) in rating scale and (d) reactions to the manipulation of the facts and figures in APAR were added to the scale. The scale for the study was composed of ten items.

The scale “Reactions toward your supervisor” with five items reflecting overall perceptions of the supervisor as developed by Walsh (2003) was adopted for the purpose of this study.

Part – IV of the survey was designed to understand level of satisfaction over influencing / impacting factors for performance related to the present appraisal system, ascertain development orientation in and impact of open appraisal process on the performance appraisal system for scientific personnel in the selected organization.

(i) Based on available literature and practice followed in organization under study, twelve important factors were identified which play significant role on effective performance of scientific personnel in the organization and eventually influence performance appraisal system. These are mentioned as follows: (1) proficiency challenging assignment (2) support / guidance (3) overall work environment (4) periodic assessment of individual performance (5) communication and interpersonal relationship (6) objectivity in performance rating (7) competency and potential assessment (8) systematic training and development (9) promotion and career progression (10) pay, allowances and perks (11) performance incentives (variable increments) and (12) awards / recognition. Reactions of scientists to each factor were
measured by level of satisfaction indicated by them on 5-point scale: 1 = highly
dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied and 5 = highly satisfied.

(ii) Next component of part – IV survey is the scale of “Assessee’s development”.
The scale was designed with five items for the present study. Development appraisal
is an integral part performance review discussion carried out formally in the selected
organisation. During the process of discussion, appraiser and appraisee identify
training and development needs to bridge skills and knowledge gaps for improvement
of performance. Items of the scale include focus on the process of bringing out
demonstrated aptitudes, recognizing strengths and weaknesses, identification of
training and development and its subsequent follow up and potential development.
The items are measured on five point scale: 1 = strongly disagree, 2 = disagree, 3 =
neither agree nor disagree, 4 = agree and 5 = strongly agree.

(iii) Upon transition from confidential annual performance assessment to open
annual performance assessment in the selected organisation from 2009, transparency
has been brought in to the process of performance appraisal of the scientists.
Transparency is still debated upon among the appraisers as well as appraisees.
Disclosure of grading and entire assessment report to the appraisees has thrown
open a new challenge to the appraisal process. Six items were developed to study
the opinion of the respondents. Items include opinion as benefits of transparency, its
impact on improving the present system, creating a conducive and healthy working
relationship, performance grading and motivation. The items were measured on five
point scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 =
agree and 5 = strongly agree.

(iv) An open ended comment on annual performance assessment system was
invited at the end of Part IV survey.
1.5.7 PRE-TEST

The questionnaire meant for scientific personnel were pre-tested with thirty respondents. After pre-testing, necessary modifications were made in the questionnaire to fit in the track of the present study.

1.5.8 ANALYTICAL FRAMEWORK

The present study focused on perception of fairness of scientific personnel and their satisfaction with the existing performance appraisal system, factors influencing performance appraisal, developmental appraisal and openness of the appraisal process. Therefore, the study centered on dependent variables viz. perception of fairness of performance appraisal, satisfaction with the performance appraisal, level of satisfaction of factors influencing performance appraisal, performance review discussion as the process of developmental appraisal and openness of the appraisal process, and its relationship with selected independent variables.

Perception of fairness of performance appraisal system was studied by measuring participant’s response based on three constructs of organizational justice theory. These three constructs consist of nine scales. On the other hand, satisfaction with appraisal system was measured by reactions to three scales. Level of satisfaction over twelve identified factors which play significant role on effective performance of scientific personnel in the organization and eventually influence performance appraisal system was examined by reactions of the respondents to each factor.

Developmental appraisal aspect was determined by one scale ‘Assessee’s development’. Transparency of the appraisal process was assessed by studying the opinion of the respondents on the single scale. Statistical analytical tools viz. two way tables, percentage analysis, content analysis, averages, standard deviation, chi-square test, factor analysis, bivariate correlation, analysis of variance, two independent samples test, Kruskal- wallis test, signed rank test and multivariate tests.
were applied for the study. SPSS (version 11) was used to carry out statistical analysis. The different tools of analysis and the variables studied are as follows:

Factor analysis
To summarize the findings from the item responses on each scale, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was applied to determine whether factor analysis is appropriate for the data. Then factor analysis procedure was carried out to determine if the items assigned to the individual scale were components of a common construct. Principal component factor analysis was used for each scale with the specification that all items be forced into a single factor. Factor loading of each item of the scale indicated whether item could be a part of a single construct. The Cronbach’s alpha internal consistency co-efficient was worked out to evaluate reliability of the scale.

The factor analysis as an analytical tool helped to find out whether the items of each scale measured a single construct so that an overall score of items in the scale was calculated as the mean of scores. Procedural, distributive and interactive justice scales were subjected to factor analysis.

Cluster Analysis
Cluster analysis was used to define the structure of the data and identify the most similar observations relating to variable of perception of fairness of performance appraisal system to place them into groups. Hierarchical method of agglomerative clustering with average linkage (between groups) was used. Cluster analysis determined internal homogeneity i.e. similarities between different groups of respondents or items by using squared euclidean distance and external heterogeneity i.e. the differences between different groups of respondents or items. Level of perception of fairness of the performance appraisal system of different clusters was known from the analysis.
Discriminant Function Analysis

The objective of Discriminant analysis is to classify people or objects into two or more groups. The discriminant analysis reveals the specific variables that account for the largest proportion of intergroup differences. It is a simple scoring system that assigns a score to each individual or object. This score is a weighted average of the individual’s numeric value of the discriminating variables. This analysis was used to find out the variables which significantly discriminate the ‘outstanding’ and ‘very good’ performance rated respondents. The individual is assigned to the ‘most likely’ category on the basis of the score. The model is represented as:

\[ Z = a_0 + a_1X_1 + a_2X_2 + \ldots + a_nX_n \]

Where, \( a_0 \) - constant and \( a_1, a_2, a_3, \ldots, a_n \) - Discriminant Function coefficients of the discriminating variables \( X_1, X_2, X_3, \ldots, X_n \) respectively.

Bivariate correlation

Relationship between the dependent variables of nine scales of perception of fairness and independent variables of demographic characteristics including designation, age group, gender, and tenure of service in the organization as well as in the current job, highest level of education, additional qualification, and supervising responsibility of appraiser/rater were determined by applying appropriate statistical procedure of correlation. Relationship between three reaction scales of satisfaction and independent variables of said personal/professional characteristics was measured by statistical procedure of correlation. Kendall’s Tau correlation co-efficient was used for the purpose. Analysis of strength of relationships between scales measuring perception of fairness as allotted to three constructs of organizational justice scales and three scales of satisfaction were conducted by statistical procedure of Karl Pearson product moment correlation.
Two- Independent samples -test

Two-independent-samples-test is used to judge the significance of the mean of difference between the two related samples. The relevant test statistics is calculated from the sample data and then compared with its probable value based on t-distribution (to be read from the table that gives probable values of t for different values of significance for different degrees of freedom) at a specified level of significance for concerning degrees of freedom for determining significance.

Two independent sample test procedure was applied to ascertain difference, if any, between appraisers and appraisees in the perception of scales of fairness. The same test and procedure was used to ascertain differences, if any, among appraisers and appraisees in their perception of “assessee’s development” scale.

Analysis of variance (ANOVA)

One way ANOVA procedure is used to test for differences among the means of the populations by examining the amount of variation within each of these samples, relative to the amount of variation between the samples. Two estimates of population variance viz. one based on between samples variance and the other based on within samples variance are to be made. Then the said two estimates of population variance are compared with F-test.

\[ F = \frac{\text{Estimate of population variance based on between samples variance}}{\text{Estimate of population variance based on within samples variance}} \]

The value of F is to be compared to the F-limit for given degrees of freedom. If the F value is equal or exceeds F-limit value as per F-tables, it may be said that there are significant difference between the sample means.

The analysis of variance procedure was used to determine whether differences existed in nine perceptions of fairness scales of performance appraisal system by the categories of variables viz. designation of five groups of scientists, four levels of
education of the respondents. The analysis of variance procedure was also used to determine if differences existed in the three satisfaction scales of performance appraisal by the categories of variables viz. four levels of education of respondents. ANOVA was conducted to ascertain differences of opinion on open appraisal process by designation of respondents as categories of variables.

Wilcoxon Matched-pairs Test (or Signed Rank Test)

Signed Rank test is used in the context of two related samples i.e. case of two matched pairs. While applying the test, differences of each pair of values are found and rank to the differences from the smallest to the largest without regard to signs is assigned. The actual signs of each difference are then put to corresponding ranks and test statistics T is calculated which happens to be smaller of the two sums viz. the sum of the negative ranks and the sum of the positive ranks. Calculated value is compared with table value at a specified level of significance to determine significance of difference between the two samples.

Signed ranks test was conducted to measure the difference, if any, between expected rating of the participants and the actual rating received by them.

Chi Square Test

The independent variables pertaining to the respondents influencing their levels of satisfaction over factors impacting performance appraisal system are respondents' as appraisers and appraisees, gender and tenure of job.

In order to identify the factors influencing the respondents and their level of satisfaction of factors related to performance appraisal, Chi square test was used.

Formula for chi square test is furnished below:

$$\text{Chi square}=\sum \frac{(O-E)^2}{E}$$

with Degree of freedom (D. F.)=\((c-1)(r-1)\)
Where, $O=$ observed frequency, $E=$ Expected frequency

$c=$ Number of columns

$r=$ Number of rows

Chi-square test was also adopted to ascertain the differences, if any, of perception of factors of development appraisal between appraisers and appraisees.

Kruskal-wallis Test

The Kruskal-Wallis test (or H Test) is used to test the null hypothesis that ‘$k$’ independent random samples come from the identical universes against the alternate hypothesis that the means of these universes are not equal. The test statistic is $H$ for this test which is worked out as follows:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3(n+1)$$

where $n=n_1+n_2+\ldots+n_k$ and $R_i$ being the sum of ranks assigned to $n_i$ observations in the sample. If the null hypothesis is true that there is no difference between the sample means and each sample has at least five items, sampling distribution of $H$ can be approximated with a chi-square distribution with $(k-1)$ degree of freedom. Null hypothesis is rejected at a given level of significance if $H$ value calculated exceeds the concerned table value of chi-square.

Kruskal-wallis analysis of variance test procedure was applied to compare difference of satisfaction between selected categorical variables viz. designation, tenure of service, education, age and level of satisfaction of factors related to performance appraisal and open appraisal process.

Content Analysis

Content analysis is the process of studying and interpreting descriptive data available in structured or unstructured form. This study provided opportunity to the respondents
to express their views/comments on the performance appraisal system in the organization. Their comments were mainly divided into six issues related to the performance appraisal as follows: (1) task/job assignments, (2) method and process of appraisal, (3) performance rating, (4) appraisal biases, (5) application/use of appraisal system and (6) overall appraisal system as practiced in the organization. These comments were subjected to content analysis to bring out important facts related to the performance appraisal for consideration.

1.6 HYPOTHESES

Based on the objectives of the study, the hypotheses are stated as follows:

1. $H_0$: There is no positive relation between perception of fairness of scientific personnel of the selected organisation as measured by interactional justice scales and their satisfaction with the performance appraisal measured by the scale “reactions toward supervisor”.

   $H_a$: There is positive relation between perception of fairness of scientific personnel of the selected organisation as measured by interactional justice scales and their satisfaction with the performance appraisal measured by the scale “reactions toward supervisor”.

2. $H_0$: There is no positive relation between perception of fairness of scientific personnel of the selected organisation as measured by distributive justice scales and their satisfaction with the performance appraisal measured by the scales “reactions to the recent performance rating” and “reactions to the APA”.

   $H_a$: There is positive relation between perception of fairness of scientific personnel of the selected organisation as measured by distributive justice scales and their satisfaction with the performance appraisal measured by the scales “reactions to the recent performance rating” and “reactions to the APA”.

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3. \( H_0: \) There is no positive relation between perception of fairness of scientific personnel of the selected organisation as measured by procedural justice scales and their satisfaction with the performance appraisal measured by the scale “reactions to the APA”

\( H_a: \) There is positive relation between perception of fairness of scientific personnel of the selected organisation as measured by procedural justice scales and their satisfaction with the performance appraisal measured by the scale “reactions to the APA”

4. \( H_0: \) There is no positive relation between perception of fairness of scientific personnel of the selected organisation as measured by procedural, distributive and interactional justice scales and their satisfaction with the performance appraisal measured by the scales “reactions to the recent performance rating” “reactions to the APA” and “reaction toward supervisor”.

\( H_a: \) There is positive relation between perception of fairness of scientific personnel of the selected organisation as measured by procedural, distributive and interactional justice scales and their satisfaction with the performance appraisal measured by the scales “reactions to the recent performance rating” “reactions to the APA” and “reaction toward supervisor”.

5. \( H_0: \) There is no close association between gender and level of satisfaction perceived by the respondents with the existing performance appraisal system.

\( H_a: \) There is close association between gender and level of satisfaction perceived by the respondents with the existing performance appraisal system.

6. \( H_0: \) There is no close association between tenure in the current job and level of satisfaction perceived by the respondents with the existing performance appraisal system.
Hₐ: There is close association between tenure in the current job and level of satisfaction perceived by the respondents with the existing performance appraisal system.

7. H₀: There is no close association between respondents’ position as appraisers/appraisees and level of satisfaction perceived by them with the existing performance appraisal system.

Hₐ: There is close association between respondents’ position as appraisers/appraisees and level of satisfaction perceived by them with the existing performance appraisal system.

8. H₀: There is no significant difference between respondents’ satisfaction and financial benefits such as pay and allowance, and perks among the scientists of different designation/grades.

Hₐ: There is significant difference between respondents’ satisfaction and financial benefits such as pay and allowance, and perks among the scientists of different designation/grades.

9. H₀: There is no significant difference between respondents’ satisfaction over financial benefits such as pay and allowance, and perks among the scientists with different tenure of service in the organization.

Hₐ: There is significant difference between respondents’ satisfaction over financial benefits such as pay and allowance, and perks among the scientists with different tenure of service in the organization.

10. H₀: There is no significant difference between respondents’ satisfaction over objectivity in performance rating among the scientists with different tenure of service in the organization.
\(H_a\): There is significant difference between respondents’ satisfaction over objectivity in performance rating among the scientists with different tenure of service in the organization.

11. \(H_0\): There is no significant difference between respondents’ satisfaction with overall work environment among the scientists with different educational qualifications.

\(H_a\): There is significant difference between respondents’ satisfaction with overall work environment among the scientists with different educational qualifications.

12. \(H_0\): There is no significant difference between respondents’ satisfaction with periodic assessment of individual performance among the scientists with different educational qualifications.

\(H_a\): There is significant difference between respondents’ satisfaction with periodic assessment of individual performance among the scientists with different educational qualifications.

13. \(H_0\): There is no significant difference between respondents’ satisfaction over assessment for promotion and career progression among the scientists with different educational qualifications.

\(H_a\): There is significant difference between respondents’ satisfaction over assessment for promotion and career progression among the scientists with different educational qualifications.

14. \(H_0\): There is no significant difference between respondents’ satisfaction over work environment of the organisation among the scientists of different age group.

\(H_a\): There is significant difference between respondents’ satisfaction over work environment of the organisation among the scientists of different age group.
15. $H_0$: There is no significant difference between respondents’ satisfaction over systematic training and development programmes for bridging gap in skills and knowledge among the scientists of different age group.

$H_a$: There is significant difference between respondents’ satisfaction over systematic training and development programmes for bridging gap in skills and knowledge among the scientists of different age group.

16. $H_0$: There is no significant difference between respondents’ perception between appraisers and appraisees on performance review discussion (PRD) being considered as ritual exercise and its outcome is not stressed.

$H_a$: There is significant difference between respondents’ perception between appraisers and appraisees on performance review discussion (PRD) being considered as ritual exercise and its outcome is not stressed.

17. $H_0$: Inflation of performance ratings by (Initiating/Reviewing) appraisers due to open performance appraisal process is independent of appraisers

$H_a$: Inflation of performance ratings by (Initiating/Reviewing) appraisers due to open performance appraisal process is dependent on appraisers.

1.7 SCOPE OF THE STUDY

The study will bring to light perception of fairness of the respondents of and their satisfaction with existing performance appraisal system, factors influencing significantly performance and performance appraisal, opinion on developmental appraisal and recently introduced open appraisal process in the selected government scientific research and development organization.

The study will provide directions for the effectiveness of performance appraisal system presently practiced in the selected organization. Appropriate suggestions have also been made for improvement of the performance appraisal system so as to enhance performance of the scientific personnel of the organization under study.
1.8 PERIOD OF STUDY

The literature review on the performance appraisal and performance appraisal system and practice in government funded R&D organizations in India and abroad was carried out between the periods from June 2008 to May 2009. Later, development on the area of research was also studied. Data collection from various Govt. R&D organizations was carried out starting from September 2008. The organizations in India were approached with request letter to furnish literature relating to their performance appraisal practices. Some organizations were also followed up for the purpose. It took about six months to collect data from different government and public sector R&D organizations in India. Journals, books and other literature and the repositories of thesis data base were accessed online in India as well as abroad during the period through website search engines. The libraries of university/Institute in Delhi, Cochin and Coimbatore were visited as often as possible during the years 2008 and 2009 to collect information on the topic of study. Data on the performance appraisal system and practices of the selected organization were collected by unstructured interview with the respondents during the last two quarters of the year 2009. Questionnaire was prepared to conduct study during the first quarter of the year 2010. Performance appraisal format of the selected organization was modified during the period as the process of disclosing assessment report duly completed and grading awarded by the rater was introduced. Questionnaire was modified to make it understandable and appropriate for the current system. A pilot study was conducted after the modification of the questionnaire. Questionnaire was further amended as per suggestions/feedback from and discussions with the respondents during the pilot study. Data collection was undertaken during the period June 2010-January 2011 and thereafter data were subjected to analysis for the study. Based on the analysis,
a rough drafting was made and presented in final form which took about eight to nine months.

1.9 OPERATIONAL DEFINITIONS

Performance: Performance is what is expected to be delivered by an individual within a time frame. What is expected to be delivered are stated in terms of results/achievements and tasks/assignments/projects.

Performance Appraisal: Performance appraisal is the process of obtaining, analyzing, recording information, measuring and improving actual job/tasks/assignments/projects against the set targets and also the future potential of the employee.

Performance Appraisal System: Performance appraisal system is formal documented process of evaluating performance of employees within the macro human resource frame work of the organization.

Annual Performance Assessment (APA): Annual performance assessment is the process of evaluating/appraising performance of the employee against the set targets of assignments/jobs/projects and determining and reviewing potential of the employee.

Annual Performance Assessment Report (APAR): APAR is an instrument of performance appraisal for documenting/ recording data of annual performance of the employee and making use of data for optimum utilization of human resources.

Note: The scientific personnel in the organisation under study are more familiar with the term ‘Annual Performance Assessment Report’ (APAR) than the term “Annual Performance Assessment’. Therefore, both the terms APA and APAR have been used interchangeably in the questionnaire and the present study.

Initiating Officer (IO): Initiating Officer (formerly Assessing Officer) is the immediate supervising officer responsible to initiate annual performance assessment (APAR) of subordinate Scientist.
Performance Rating: Score, grade or marks awarded to the assessees on their appraisal of performance during appraisal process as recorded in the performance appraisal report.

Reviewing Officer (RO): Reviewing officer is generally the next level assessor in the hierarchy, usually higher in position/rank to the IO. He has overview of work and conduct of the assessees. RO is responsible to review performance assessment of the assessees.

Self assessment/Appraisal: Self assessment/self appraisal is a process of self recording by the employee concerned on achievements/accomplishments and shortfall against set targets of projects/assignments and commenting on work environment, job satisfaction, desired/suggested changes in the nature of work presently handled, constraints and limitations of the appraisal system.

Appraiser/Assessor/Rater: The supervisor who conducts and evaluates formal annual Performance assessment of subordinate employee.

Appraisee/Assessee/Ratee: The employee whose performance is formally evaluated/assessed by his superior periodically - at least once a year.

Performance Review Discussion (PRD): Performance Review Discussion is a systematic review of performance of the assessees through formal discussion between assessees (scientist to be reported upon) and the assessor (Initiating officer) for a given period of time to identify facilitating factors/impediments to performance and prepare action plan for identifying demonstrated aptitudes and training and development needs and improving personal attributes of the assessees. Performance targets related to projects/assignment are also set for the assessees during performance review discussion.

Assessee’s development: Assessee’s development is the development oriented appraisal focused on identifying potential and career development needs of the
assessee and following up with systematic training and development programme for bridging gap in skills and knowledge for effective performance.

Performance Management: Performance management refers to comprehensive approach of ensuring linkage between efforts of individual employees with vision and goals of the organization to achieve excellence in organization on one side and satisfaction and growth of employees on the other side.

Forced Distribution: Forced distribution refers to categorization of pre-determined/fixed percentage of appraisees of the particular grade into specified overall performance rating grade/scale during performance appraisal either at the unit level or at organization level.

1.10 LIMITATIONS OF THE STUDY

1. Since the organization is under administrative control of Ministry of Defence, all the documents relating to the topic of study were not accessible.

2. Due to engagements of most of the scientists in projects, number of respondents could not be increased.

3. Due to cost constraints and restricted entry, visit of the researcher for data collection to different laboratories/establishments spread all over the country was limited.

4. The study was conducted among the scientific personnel of Defence Research and Development Organization fully funded and controlled by the central government in India. Hence, the results derived from the study may or may not be applicable to other state owned and private scientific research and development organisations.

1.11 CHAPTER SCHEME OF THE STUDY

The present study has been divided into five chapters.

Chapter-I - The first chapter deals with the introduction and design of the study:
This includes introduction, statement of the problem, broad objectives, hypotheses, scope and significance of the study, research methodology, data collection procedure, statistical tools used for data analysis, period of study, operational definitions, limitations of the study and chapter scheme of the study.

**Chapter-II** – The **second chapter** presents a review of available literature relating to the problem/area under investigation. Broadly, an overview of literature on performance appraisal in general, performance appraisal for scientific personnel in research and development organizations and literature on perception of fairness of and satisfaction with appraisal system were discussed.

**Chapter-III** – The **third chapter** gives a short profile of Defence Research and Development Organisation (DRDO). Performance appraisal practice and system prevalent in the organization and related issues are narrated in general terms.

**Chapter-IV** – The **fourth chapter** presents data analysis and interpretation of the present study.

**Chapter-V** – In the **fifth chapter**, the key findings are recapitulated. Based on these findings, a few suggestions have been made. At the end of the chapter, conclusion has been derived.