Differences in Occupational Commitment amongst Scientists in Indian Defence, Academic, and Commercial R&D Organizations

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Occupational commitment is referred to as the psychological link between an individual and his occupation that is based on an affective reaction to that occupation. Thus a person with higher occupational commitment strongly identifies and has positive feelings towards his occupation. It has been observed that R&D professionals have a very distinctive nature in their career orientations, value systems, and reward preferences. In R&D organizations, due to complexity of tasks, the employee and the employer often do not understand the nature of the job performance and therefore commitment to occupation is seen as an important contributing factor. Hence, this study addresses the following research questions:

- How does occupational commitment differ with the different types of R&D organizations?
- How do personal demographic, job satisfaction, and personality variables influence occupational commitment of different types?

This study empirically examines the relationship among the personal characteristics of R&D scientists across three types of R&D organizations:
- A government commercial organization
- A government defence organization
- A government academic organization.

The objective is to find out the influence of age, occupational tenure, job satisfaction, and occupational commitment on the five factor model of personality. A questionnaire of job satisfaction followed by the neo five factor personality inventory and occupational commitment questionnaires were administered on a sample of 126 R&D professionals. The results of the analysis revealed that:

- Occupational commitment of scientists does differ in these different R&D organizations.
- Occupational tenure is much higher for the scientists of the government commercial R&D organization and the government academic R&D organization compared to the scientists of government defence R&D organization.
- Job-satisfaction is the highest amongst the scientists of the government defence R&D organization followed by the scientists of the government academic R&D organization.
- Personality scores of the scientists also differ across these three organizations.
- Occupational tenure and age are not related to personality.
- Affective commitment is shown to have a positive and significant relationship with conscientiousness for scientists of the government academic R&D organization.
- Affective commitment is explained by occupational tenure and extraversion while continuance commitment is explained by job satisfaction and agreeableness in the government commercial R&D organizations.
- Extraversion (factor of personality) emerged as the strongest predictor of affective commitment in the presence of conscientiousness, agreeableness, and neuroticism.

For managers of R&D organizations, it is important to note that in the information-enabled world of today, occupational commitment rather than organizational commitment is likely to be the key variable in deciding whether to stay or leave.

KEY WORDS
Occupational Commitment
R&D Professionals
Job Satisfaction
Extraversion
R&D Management requires a critical re-look today. Greater investments in R&D and a planned management of R&D professionals or knowledge workers are imperative in this competitive world. Due to the lack of empirical studies on R&D professionals, management generally adopts human resource management systems developed in other contexts. However, management processes are not universal; they are dependent on various factors like organizational focus, ownership of the organization, and personal characteristics including personality type and various structural variables of the job situation. Considering the person-organization fit theory (Cable and Judge, 1996; Kristof, 1996), the characteristics of individuals must fit the management systems of their organization for higher performance. It is thus necessary to periodically revisit and assess factors in which individual characteristics must fit or be matched to produce favourable attitudes towards job and technical performances in organizations. Personal characteristics and attitude towards one’s job are critical success factors for R&D professionals (Akhilesh and Mathew, 1995). According to past research, R&D is self-motivated and is carried out by professional knowledge workers. The perception of work climate, namely, job satisfaction and supervisor can affect one’s motivation and effort that results in productivity. All these factors have been the focus of considerable amount of research over the past decades, contributing to the success of R&D. However, not many studies looked into the organizational goals and focus and commitment moderated by personality. The present study was designed to address empirical research on commitment, job satisfaction, personality, and certain demographic variables in the context of varying organizational R&D goals.

LITERATURE REVIEW

Commitment can come in different forms and have different foci. Becker (1992) views the different foci in terms of commitment to the organization, top management, supervisors or the work group. Allen and Meyer (1990) viewed it in terms of affective attachment. An individual’s commitment is demonstrated by loyalty to the work organization, which leads the individual to accept a certain amount of voluntary obligation to the organization, identification with the values, and goals of the organization (Becker, 1960) and the potential to act in concert with the goals of the organization. Just as research proliferated in the area of organizational commitment, there has also been considerable interest in occupational commitment.

Occupational Commitment

Occupational commitment has become an increasingly important construct for researchers (Blau, 2003). Due to recent changes in business situations including uncertainties in the future, job rotation, organizational restructuring, employee resizing, job insecurity perceptions, and contingency workforce growth (Cappelli et al., 1997; Hall and Moss, 1998; Nollen and Axel, 1996), several scholars (e.g., Handy, 1994; Johnson, 1996; Meyer and Allen, 1997) have suggested that employee commitment may be shifting from the organization to one’s occupation.

According to earlier studies, occupational commitment refers to a person’s belief in and the acceptance of the values of his or her chosen occupation or line of work, and a willingness to maintain membership in that occupation (Morrow and Writh, 1989; Ritzer and Trice, 1969; Sorensen and Sorensen, 1974). Thus prior research has defined occupational commitment as the “psychological link between an individual and his/her occupation that is based on an affective reaction to that occupation” (Lee, Carswell and Allen, 2000). Thus, an individual with higher occupational commitment would strongly identify with his occupation and have positive feelings towards it (Blau, 1985). Meyer, Allen and Smith (1993) gave empirical evidence for a three-dimensional view of occupational commitment based on their three-dimensional structure of organizational commitment. They are affective, normative, and continuance dimensions of organizational commitment. Meyer and Allen (1991) described three forms of organizational commitment, all of which have implications for the continuous participation of individuals in the organization. These forms are:

Affective commitment: Affective commitment refers to a psychological attachment to the organization (i.e., individuals stay with the organizations because they want to).

Continuance commitment: Continuance commitment refers to the cost associated with leaving the organization (i.e., individuals stay with the organization because they need to).

Normative commitment: Normative commitment refers to the perceived obligations to remain with the organ-
ization (i.e., individuals stay with the organization because they feel they should).

Extended to occupational commitment (Meyer, Allen and Smith, 1993), affective commitment is a person’s emotional attachment to his/her occupation; normative commitment is a person’s sense of obligation to remain in the occupation; while continuance commitment involves the individual’s assessment of the costs associated with leaving his/her occupation. The definition of occupational commitment is one-dimensional and may be measured by modifying the organizational commitment questionnaire (OCQ) (Mowday, Strees and Porter, 1979; Meyer, Allen and Smith, 1993). Using confirmatory factor analyses on samples of student nurses and registered nurses, Meyer, Allen and Smith (1993) found these three dimensions of occupational commitment to be distinguishable.

Why Study Occupational Commitment?

Individuals were viewed as psychologically attaching themselves either to the occupation or the organization, and an increase in attachment in one area was accompanied by a decrease in attachment in the other area (Vanderberg and Scarpello, 1992). But this perspective developed later into a view that the two forms of commitment were completely independent, exerting unique influences on work-related attitudes and behaviours (Greene, 1978; Miller and Wager, 1971). The commitment of occupational members to the organization depends in part on the realization of their occupational values and expectation within that employment setting (Bartol, 1979; Kerr, Von Glinow and Schriesheim, 1977; Lachman and Aranya, 1986). This process is facilitated also by the fact that high occupationally committed individuals tend to seek employment in setting that reward and encourage them to behave according to the occupational value system (Frese, 1982; Mortimer and Lorence, 1979; Rynes, 1987; Taylor, 1979). Thus, according to Vanderberg and Scarpello (1994), there is an even greater chance that the individuals’ values fit with those of the organization. From this set of discussion, it is evident that it is realistic to study the differences of occupational commitment across different organizations.

Occupational Commitment and Job Satisfaction

Job satisfaction is a complex construct and is often measured as a global attitude of an employee towards his or her work. The employee can be either satisfied or dissatisfied with the job (Spector, 1997; Agho, Muller and Price, 1993). Research using structural equation modeling shows that organizational commitment has relationship with job satisfaction (Schaubroeck, Cotton and Jennings, 1989). A moderate and consistent relationship has generally been found across various samples between greater job satisfaction and the propensity to remain in the organization (Brayfield and Crockett, 1955; Herzberg, et. al., 1957; Porter and Steers, 1973; Vroom, 1964). According to person-organization fit (P-O fit), employees’ work attitudes and behaviours are functions of individual and situational characteristics (Chatman, 1989) Thus it is justified to extend the relationship of job satisfaction to occupational commitment in the study of R&D organizations.

Occupational Commitment and Personality

Personality structure and value orientation influences the decisions of men and women regarding how significant different functions of work are to them. Personality influences attitudes (Naquin and Holton, 2002). Thus, to know how occupational commitment is distributed over a particular population, one must study differences in individual behaviour. The appeal to use neo personality inventory is high since the appeal of the neo personality is three-folded. It integrates a wide array of personality constructs, thus facilitating communication among researchers of many different orientations. It is comprehensive, giving a basis for systematic exploration of the relations between personality and other phenomena. It is efficient, providing at least a global description of personality even with few scores.

The five-factor model can be profitably used in most applied settings, as Tupes and Cristal (1961) noted long ago and as other practitioners are beginning to realize.

Occupational Commitment and Demographic Variables

Research demonstrates that occupational commitment (Parasuraman and Nachman, 1987) co-varies with demographic variables like age and occupational tenure. According to Dhawan (1991), various attitudinal variables like job satisfaction and commitment differ with age and occupational tenure among Indian scientists. Based on a similar body of literature, the need to see the impact of age and organizational tenure on different sets of occupational commitment and their differences among three groups of scientists is felt.
Why Study Commitment, Job Satisfaction, and Personality among R&D Professionals?

Ever since the seminal work by Gouldner (1957), it has long been recognized in advanced countries that R&D professionals have a very distinctive nature in their career orientations, value systems, and reward preferences (Allen and Katz, 1986, 1992; Badawy, 1988; Pelz and Andrews, 1966; Von Glinow, 1988). Compared to other members of the organization, they are more likely to have technical expertise, prefer autonomy and flexibility, have strong commitment to their profession, feel professional ethics, and maintain collegial standards (Miller, 1986; Raelin, 1985; Von Glinow, 1988). As a consequence, distinct human resource management systems such as dual ladder, symbolic recognition, discretionary organizational practices, and other professional rewards have been implemented for them (Kim and Cha, 2000). The multi-practice approach of occupational commitment can also be treated as a distinct human resource management system for the R&D professional. Since all the three forms of commitment might be related to an individual’s likelihood of remaining in an occupation, the nature of the person’s involvement in that occupation might be quite different depending on which form of commitment is predominant.

There exists an empirically demonstrated consequence of low commitment (Angle and Perry, 1981; Larson and Fukami, 1984; Mowday, Streess and Porter, 1979; Steers, 1977). It has been seen in many research studies that low commitment relates to tardiness (Angle and Perry, 1981) and absenteeism (Fukami and Larson, 1984; Mowday, Streess and Porter, 1979; Steers, 1977). Commitment is a valid predictor of job involvement (Misra and Kalra, 1981).

Following the definition of commitment itself, we can expect that highly committed employees would be willing to spend considerable effort on the occupation. In some cases, such effort may become translated into superior job performance (Mowday, Streess and Porter, 1974) while in other cases, the relationship may not be so simple. However, actual performance is a joint function of several variables in R&D organizations. Employee’s effort or motivational level is one of these variables. When employers lack the requisite abilities or misunderstand the nature of the assigned tasks, such efforts may not be sufficient to ensure good performance. It is a common phenomenon in R&D organizations that due to complexity of the task, the employee and the employer often do not understand the nature of the job performance. Commitment to occupation is seen as an important contributing factor to this situation. It results in potential job performance. Keeping all the above in mind, this paper makes an effort to study commitment, job satisfaction, and personality amongst R&D professionals.

**RESEARCH QUESTIONS**

Though occupational commitment is regarded as an important factor with respect to knowledge contribution, not much research is done on organizations with varying R&D goals and occupational commitment. This led us to an important research question:

- How does occupational commitment differ with the different types of R&D organizations?

Individual personal factors and job satisfaction influence commitment not only differently, but the degree of their relative influence is not likely to be uniform on the three types of occupational commitment. This brings us to the second research question:

- How do personal demographic, job satisfaction, and personality variables influence occupational commitment of different types?

**RESEARCH METHODOLOGY**

This study empirically examines the relationship amongst personal characteristics of R&D scientists. These characteristics are occupational commitment, demographic, job satisfaction, and personality.

The above framework assumes a contribution of demographic variables, job satisfaction, and personality traits to three components (affective, normative, and continuance) of occupational commitment. It also assumes that there will be differences among three R&D organizations in terms of scores on the variables and commitment, linear relationships, and positive influence on variations. It is the objective of the present study to empirically validate these assumptions using certain predefined proposition. The occupation considered here is “research and development”; however, the nature of work is moderated by varying goals of the R&D organizations.

**Sample**

The data was collected from three different R&D organizations located in different parts of India. These were (a) a government commercial R&D organization, (b) a government defence R&D organization, and (c) a gov-
ernment academic R&D organization. It is assumed that
the three R&D organizations differ in goals of R&D in
terms of the way they address external customer-centric
R&D, national security-related R&D, and personal goals-
centric R&D. Hence the pressure from customers, speed
to deliver, and productivity are moderated by external
goals in the case of the commercial R&D organization.
In the case of defence R&D organization, again the goals
are to access and develop technology to achieve national
security. In academic organizations, the pressure from
customers and speed to deliver are lower and professors,
mainly scientists, are motivated from within via person-
al goals to achieve and be recognized. Government own-
erness is a constant for all the three organizations.

The sample consisted of 126 (42 from each organi-
zation) R&D professionals. They were randomly selected
from a population of, on an average, 100 per organiza-
tion, working in these organizations located in different
parts of India. The selected subjects did not differ sig-
ificantly from the total employee population of each
organization on demographic variables. The age in years
of the scientists, ranged from 27 to 54, 25 to 41, and 36
to 66 for the government commercial R&D organization,
the government defence R&D organization, and the gov-
ernment academic R&D organization respectively.

Variables
In the present study, demographic variables like age,
gender, qualification, occupational tenure, job satisfac-
tion and personality variables such as neuroticism,
e extraversion, openness to experience, agg re ableness,
and conscientiousness are considered as independent
variables and occupational commitment is considered
as the dependent variable.

Measurement
The following tools are used to test the research ques-
tions in the present study:

Information Schedule
The information schedule was framed to get information
on background variables for each individual. The informa-
tion schedule contained information on age, gender,
occupational tenure, and educational qualification.

Occupational Commitment Questionnaire
This inventory was developed by Allen and Meyer in
1991 in the context of nursing profession. The inventory
was edited for validity in the research occupation. It
included three dimensions having a total of 18 items
where each dimension comprised six items. The Cron-
bach α (internal consistency) for our data reported for
ACS (Affective Commitment Scale) is 0.82; CCS (Con-
tinuance Commitment Scale) is 0.76 and NCS (Norma-
The Neo Personality Inventory, developed by Costa and McCrae in 1992, includes five dimensions and a total of 30 adjectives having 240 items. Each dimension has the same number of items. The Cronbach $\alpha$ for five factor scales calculated for our sample were 0.81, 0.75, 0.79, 0.85, and 0.86 for neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness, respectively.

Overall Job Satisfaction Scale

Job satisfaction was measured with an instrument developed by Brayfield and Rothe (1951). It has 18 items on a five-point rating scale ranging from strongly agree to strongly disagree responses. These are scored between 1 and 5 and summed up, the possible range of scores thus being between 18 and 90. The Cronbach $\alpha$ for this measure is 0.87. The Brayfield and Rothe Job Satisfaction Index reported good reliability (Cronbach’s alpha = 0.87).

Analysis

For comparing the variables among three organizations, we used descriptive and inferential statistics. We used correlation analysis to measure the linear relationship between dependent and independent variables. Multiple regression analysis was used to identify the combination of variables, namely demographic variables (age, occupational tenure), job satisfaction, personality variables (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness) that explains highest variation in the outcome variables (affective commitment, continance commitment, normative commitment). Various assumptions surrounding the casual processes being examined are upheld. These included the assumptions that the structure of the causal relations remain constant over time, there are no instantaneous causal effects and the time lag between the variables were the same. SPSS was used for all analysis.

Results and Discussion

The major thrust of the present investigation was to provide a comparative study of the characteristics of R&D professionals working in three different research organizations (hence having different organization goals) on the variables already mentioned. The following is the discussion on the results obtained from the study.

Comparison amongst the Three R&D Organizations

In order to check for differences amongst the R&D professionals of government commercial R&D, government defence R&D, and government academic R&D organizations, pair-wise $t$-test was used on variables listed in Table 1.

From Table 1, it is clear that the age of the R&D professionals of the government academic R&D organization is more compared to the other two groups, i.e., from the government commercial R&D and the government defence R&D organizations. One reason may be that the retirement age is higher for scientists of government academic R&D organization than the other two groups of scientists. Occupational tenure is much higher for the scientists of the government commercial R&D organization and the government academic R&D organization compared to the scientists of government defence R&D organization. This is due to the fact that the government defence R&D organization is relatively new compared to the other two organizations in that region.

Job-satisfaction score is the highest among the scientists of the government defence R&D organization followed by the scientists of the government academic R&D organization (Table 1). The job-satisfaction score is the lowest among the scientists of the government commercial R&D organization. Many researchers (Blegen, 1993; Spector, 1997; Agho, Muller and Price, 1993) believe that employee’s level of satisfaction varies with the specific aspect of the job, and there are numerous variables underlying these concepts. These variables broadly are nature of the work, autonomy, responsibilities, reward, pay, coworker’s age, policies, working conditions, and self or individual differences (Blegen, 1993; Locke, 1976; Spector, 1997; Agho, Muller and Price, 1993; Cook,

Looking at the age variation, we found that the standard deviation (sd= 4.43) for the age is less among the scientists of the government defence R&D organization compared to the scientists of the government commercial R&D (sd=6.67) and the academic R&D (sd=10.97) organizations. For professionals of the government defence R&D organization, the potential to feel at ease with their colleagues is higher since age variation is not very obvious. Hence, relationships with the co-workers can be more satisfactory in the government defence R&D organization. There is a considerable amount of age differences in the other two groups, reducing the interpersonal contact between them. This finding is similar to the findings of McCloskey, Bulechek and Donahue, 1998, where it was found that the nurses with low social integration reported low job-satisfaction. Hence, while the nature of the government defence R&D job has high job satisfaction potential, the low age variation also contributes to the higher scores on job satisfaction.

From Table 1, we note that five personality variables from the neo personality inventory measured on the R&D professionals of the three organizations. Each personality variable is further discussed.

Neuroticism concerns the degree to which the individual is insecure, anxious, depressed, and emotional versus calm, self confident, and cool. Neuroticism is average for all organizations and is the highest among the scientists of the government commercial R&D organization (92.21, Table 1) followed by the scientists of government academic R&D and government defence R&D organizations. According to the neo personality inventory, scores of 96 and above are rated high and 72-95 is rated average. The sample in the study follows the average band. Among them, however, there are differences. The $t$-value between the government defence R&D organization’s scientists and the government commercial R&D organization’s scientists, and the government commercial R&D organization’s scientists and the government academic R&D organization’s scientists is significantly different as reported in Table 1. However, there are no significant differences between the government defence R&D organization’s scientists and the government academic R&D organization’s scientists. This implies that the scientists of the government commercial R&D organization are more prone to neurotic attributes compared to scientists of the government defence R&D and government academic R&D organizations. The reason may be also attributed to their job dissatisfaction and higher customer pull. Neurotic individuals experience more negative life events than other individuals (Magnus, et. al., 1993) in part, because they select themselves into situations that foster negative affect (Emmons, Diener and Larsen, 1985). To the extent that such situations occur on or with respect to the job, one expects diminished levels of job satisfaction (Judge, Heller and Mount, 2002). Similarly, individuals scoring high on the neuroticism dimension are vulnerable to stress, prone to feeling inferior, self-conscious, and uncomfortable around others (Costa, McCreave and Dye, 1991). In the case of these Indian R&D scientists, neuroticism is not high.

Extraversion measures the extent to which individuals are gregarious, assertive, and sociable versus reserved, timid and quiet. According to the neo personality

Table 1: Comparison among Government Commercial R&D, Government Defence R&D, and Government Academic R&D Organizations

<table>
<thead>
<tr>
<th></th>
<th>Government Commercial R&amp;D Organization (Group 1)</th>
<th>Government Defence R&amp;D Organization (Group 2)</th>
<th>Government Academic R&amp;D Organization (Group 3)</th>
<th>$t$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Mean Standard Deviation</td>
<td>Mean Standard Deviation</td>
<td>Mean Standard Deviation</td>
<td>Gp(1,2) Gp(2,3) Gp(1,3)</td>
</tr>
<tr>
<td>Age</td>
<td>44.20</td>
<td>4.67</td>
<td>6.67</td>
<td>32.21</td>
</tr>
<tr>
<td>Occupational tenure</td>
<td>10.30</td>
<td>7.29</td>
<td>6.19</td>
<td>9.57** 2.60** 9.30**</td>
</tr>
<tr>
<td>Job satisfaction</td>
<td>45.78</td>
<td>7.54</td>
<td>55.47</td>
<td>11.90** 7.51** 6.50**</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>92.21</td>
<td>10.13</td>
<td>76.90</td>
<td>110.21</td>
</tr>
<tr>
<td>Extraversion</td>
<td>104.76</td>
<td>10.50</td>
<td>120.00</td>
<td>11.17** 8.53** 1.60</td>
</tr>
<tr>
<td>Openness to experience</td>
<td>101.30</td>
<td>8.55</td>
<td>121.67</td>
<td>11.90** 7.51** 5.20**</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>110.64</td>
<td>9.89</td>
<td>120.00</td>
<td>11.90** 7.51** 6.50**</td>
</tr>
<tr>
<td>Affective commitment</td>
<td>24.00</td>
<td>3.65</td>
<td>24.42</td>
<td>11.90** 7.51** 3.23**</td>
</tr>
<tr>
<td>Continuance commitment</td>
<td>19.62</td>
<td>5.44</td>
<td>13.57</td>
<td>11.90** 7.51** 4.81**</td>
</tr>
<tr>
<td>Normative commitment</td>
<td>17.71</td>
<td>4.71</td>
<td>24.40</td>
<td>11.90** 7.51** 3.23**</td>
</tr>
</tbody>
</table>

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ality inventory, a score of 119 and above is high and 99 to 118 are average for the extraversion personality type. Extraversion as reported in Table 1 is almost the same for both the government commercial R&D organization’s scientists (104.76) and the government defence R&D organization’s scientists (104.79) but relatively higher for the scientists of the government academic R&D organization (111.38). There is a significant difference between the government defence R&D organization’s scientists and the government academic R&D organization’s scientists and again the government organization’s scientists and the government academic R&D organization’s scientists with respect to their t-value on extraversion (Table 1). It implies that scientists of the government commercial R&D organization and the government defence R&D organization are less gregarious, assertive and sociable, talkative, aggressive and enthusiastic compared to government academic R&D organization (Barrick and Mount, 1991; Costa and McCrae, 1992; Digman, 1989). Costa and McCrae (1992) showed that extraversion is strongly correlated with Holland enterprising type of personality. The extraversion personality type is described as being motivated by a desire of economic gain (Hogan and Cheek, 1983). Hogan (1983) test manual also lists statistically significant correlation between dimensions of extraversion and personal motives. People scoring high on extraversion reported stronger affiliation, power, recognition, and commercial motives. Similarly, Cattle (1957) found the assertiveness component of extraversion to be strongly associated with a desire to increase salary and status. It is hence interesting that scientists of government academic R&D organizations show higher levels of extraversion compared to the scientists of the government commercial R&D and the government defence R&D organizations.

"Openness to experience" defines individuals who are creative, curious, and cultured versus practical with narrow interests. Openness to experience is related to scientific and artistic creativity (Feist, 1998), divergent thinking, low religiosity and political liberalism (McCrae, 1996). According to the neo personality inventory, a score of 121 and above is high and 102 to 120 is average for openness to experience. Openness to experience is the highest (121.67, Table 1) among the scientists of the government defence R&D organization, followed by the scientists of the academic and the government commercial R&D organizations. There are significant differences with respect to t-values (report in Table 1) among all three groups. This implies that scientists of the government defence R&D organization are more creative, curious, and cultured versus practical but with focused interests. The degree is less for the scientists of the government academic R&D and the government commercial R&D organizations.

Agreeableness concerns the degree to which individuals are co-operative, warm and agreeable versus cold, disagreeable and antagonistic. According to the neo personality inventory, a score of 137 and above is higher and a score of 121-136 is average for agreeableness. The component agreeableness is highest among the scientists of the government academic R&D organization followed by the scientists of the government defence R&D and the government commercial R&D organizations. The reason may be attributed to several factors such as the type of research they are involved in, the environment of their workplace, and the level of personal interactions. Findings indicate that ‘agreeableness’ is positively related to the performance in jobs involving considerable interpersonal interaction, either with customer or with other employees (Mount and Barrick, 1995). The scientists of the government academic R&D organization interact with their students along with their research work. These scientists always establish themselves as a bridge between the students and the organization. As a result, they have to take care of various aspects of the institution that demand warm, agreeable, and a co-operative nature. Organ and Lingl (1995) apparently agreed, commenting that “agreeableness involves getting along with others in pleasant, satisfying relationship.” This is an interesting finding for three types of organizations.

Conscientiousness measures the extent to which individuals are hardworking, organized, dependable, and persevering versus lazy, disorganized and unreliable. According to the neo personality inventory, the score of 133 and above is high and 113 to 132 is average for consciousness. The last component of personality “conscientiousness” is the highest (125.87, Table 1) among scientists of the government defence R&D organization followed by the government commercial R&D and the government academic R&D organizations. There is a significant difference with respect to their t-values only between the government defence R&D organization’s scientists and the government academic R&D organization’s scientists. Studies indicated that conscientious-
ness is more strongly related to those criteria that are substantially determined by motivational effort or “will do” factors rather than by ability or “can do” factors (Mount and Barrick, 1995). It reveals that how knowledgeable and expert the person is about the work situation always depends on the person’s drive to meet the expected goal. The nature of the job in government defence R&D organization demands systematic and meticulous behaviour and leads to general work involvement tendency, hard work, and job satisfaction (De Neve and Cooper, 1998).

Affective commitment is found to be the same among scientists of the government commercial R&D organization and the government defence R&D organization but less for the government academic R&D organization. But there is no significant difference between any of the groups. It implies that scientists of these three organizations feel roughly the same level of psychological attachment to the occupation. Affective commitment results from identification with the attitudes, values, and goals of their occupation. Education level also plays an important role in building affective commitment towards their occupation among these three groups of scientists. Many researchers support this result (Katz, 1964; Mowday, Strees and Porter, 1982; Etzioni, 1961; Gould, 1979; Kelman, 1958). Research suggests that on-the-job experiences early in one’s tenure (Irving, Coleman and Cooper, 1997; Meyer and Allen, 1991) play a significant role in the development of affective commitment. Certain dispositional characteristics (internal locus of control) might lead to higher level of occupation (Irving, Coleman and Cooper, 1997). These findings rest upon the premise that occupational commitment starts prior to organization entry. From the findings of our study and other research examples, we can conclude that affective commitment component of occupation commitment may be influenced more by personal characteristics than organizational work situation.

Continuance commitment is found to be the highest among the scientists of the government commercial R&D organization (19.62, Table 1) followed by the scientists of the government academic R&D organization and the scientists of the government defence R&D organization. There is a significant difference between the scientists of the government commercial R&D and the government defence R&D organizations and the scientists of the government defence R&D and government academic R&D organizations with respect to their continuance commitment (reported in Table 1). Lack of an alternative opportunity to work in other organizations in the same place could be the reason for high continuance commitment among the scientists of the government commercial R&D and the fear of wastage of time and effort may be the reason for high continuance commitment among the government academic R&D organization. This result is similar to the result of the study done by Allen and Meyer, 1990. However, age factor plays an important role for continuance commitment of scientists working in the government defence R&D organization. The average age of scientists from government defence R&D organization is 32.2, which is not a hindrance to shift their occupation or the workplace.

Normative commitment is the highest among the scientists of the government defence R&D organizations (24.40, Table 1) followed by scientists of government academic R&D and government commercial R&D organizations. There is a significant difference with respect to their t-values (reported in Table 1) for all the groups. Normative commitment may be derived from an individual’s culture or work ethics causing them to feel obligated to stay with an occupation. Normative commitment is distinguishable from affective and continuance commitment in that it does not reflect a need to associate with the occupational goals or mission, and that there is also no explicit extrinsic exchange involved in relationships. The sense of loyalty and duty underlying an employee’s normative commitment influences the individual to remain with the occupation because they feel as though they ought to do so (Clugston, 2000). During data collection, it was observed that the socialization process of the scientists of the government academic R&D organization emphasizes the value of loyalty resulting in normative component of commitment.

Relationship between Commitment and Other Variables among Scientists of Three R&D Organizations

Having understood the organizational differences within the variables, an effort was made to understand the relationship between commitment and all other variables (demographic, job satisfaction, and personality). These relationships, based on Pearson correlations are reported in Table 2. The relationships are based on three propositions that are reported in the results.
Proposition 1:
There is no relationship between types of commitment (affective commitment, continuance commitment, normative commitment) and demographic variables (age, and occupational tenure) among the government commercial R&D, the government defence R&D, and the government academic R&D organizations.

Pearson product moment correlation revealed that none of the demographic variables are correlated with the three components of commitment (i.e., affective, continuance, and normative) for all the three groups (Table 2). Though in many studies, age and occupational tenure would be positively associated with affective commitment, our result did not support this.

Proposition 2:
There is no relationship between types of commitment (affective commitment, continuance commitment, normative commitment) and job satisfaction among the government commercial R&D, the government defence R&D, and the government academic R&D organizations.

Job-satisfaction score is positively correlated with the affective component of commitment for scientists of the government defence R&D organization (Table 2). The reason can be attributed to the higher job satisfaction. This group of scientists gradually begin to identify with their occupation, which in turn translates into an affective component of commitment. This result is supported by other findings. Meyer, Allen and Smith, (1993) found that job-satisfaction was positively related to affective and normative commitment. A moderate and consistent relationship has generally been found across various samples between greater job satisfaction and the propensity to remain with the organization (Brayfield and Crockett, 1955; Herzberg, et.al., 1957; Porter and Steers, 1973).

Proposition 3:
There is no relationship between types of commitment (affective commitment, continuance commitment, normative commitment) and personality variables among the government commercial R&D, the government defence R&D, and the government academic R&D organizations.

Interestingly, only affective commitment is shown to have a positive and significant relationship with conscientiousness for scientists of the government academic R&D organization (Table 2). None of the other personality variables are related to affective commitment in other groups. Thus, it can be expected that conscientiousness and affective commitment correlated for the scientists of the government academic R&D organization. This finding is supported by the findings of researchers such as Steers (1977) that all the factors of “conscientiousness” may be expected to create situations intrinsically conducive to the development of affective commitment.

Commitment Explained by Demographic, Job Satisfaction and Personality Variables in Three Different R&D Organizations

As the relationship discussed so far is only bivariate, we cannot make any definitive statement about the relative contribution of various sets of variables in influencing commitment. For this purpose, we need to make use of multivariate analysis. Results that have a significant F statistic are reported.

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Table 2: Correlation Coefficient of Variables for Groups 1, 2, and 3

<table>
<thead>
<tr>
<th>Affective Commitment</th>
<th>Continuance Commitment</th>
<th>Normative Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt. (Gp1)</td>
<td>Def. (Gp2)</td>
<td>Acad. (Gp3)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.38</td>
<td>-0.28</td>
</tr>
<tr>
<td>Occupational tenure</td>
<td>-0.40</td>
<td>-0.30</td>
</tr>
<tr>
<td>Job satisfaction</td>
<td>0.17</td>
<td>0.43</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>-0.13</td>
<td>-0.07</td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.23</td>
<td>0.04</td>
</tr>
<tr>
<td>Openness to experience</td>
<td>0.03</td>
<td>0.14</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>-0.35</td>
<td>-0.33</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-0.28</td>
<td>-0.21</td>
</tr>
</tbody>
</table>

**0.01 level significance,  **0.05 level of significance

Gp1 (Government commercial R&D organization)
Gp2 (Government defence R&D organization)
Gp3 (Government academic R&D organization).
Usually, human behaviour is complex and results from a combination of interacting factors. The purpose of multivariate analysis therefore is to identify that combination of variables, which explains the highest variation in the outcome variable (occupational commitment).

Proposition 4:
Demographic variables (age, occupational tenure), job satisfaction, and personality variables (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness) have influences on three types of commitment (affective, continuance, and normative) in the government commercial R&D organization.

Proposition 4 predicts the influence of age, occupational tenure, job satisfaction, and personality factors on three types of commitment (affective, continuance, and normative) in the government commercial R&D organization. Tables 3 and 4 show results of a stepwise multiple regression equation explaining the influences of these variables on three types of commitment only for the government commercial R&D organization. Affective commitment is explained by occupational tenure and extraversion while continuance commitment is explained by job satisfaction and agreeableness in the government commercial R&D organizations. However, the amount of variation explained by these variables on these three types of commitment is considerably low for government commercial R&D organizations. For this reason, we have not taken them into further discussions. There are no variables found to have significant impact on the normative commitment in the government commercial R&D organizations.

Proposition 5:
Demographic variables (age, occupational tenure), job satisfaction, and personality variables (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness) have influences on three types of commitment (affective, continuance and normative) in the government defence R&D organization.

Our next proposition in the context of stepwise multiple regression predicts the influence of age, occupational tenure, job satisfaction, and personality variables (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness) on three types of commitment (affective, continuance and normative) in the government defence R&D organizations. As Tables 5 and 6 show, in the government defence R&D organization, affective commitment is influenced by job satisfaction and normative commitment is influenced by agreeableness and extraversion personality type. There is no significant influence of any other variable on continuance commitment. However, these variables could not explain a significant proportion of variation for any type of commitment in government defence R&D organization.

Proposition 6:
Demographic variables (age, occupational tenure), job satisfaction, and personality variables (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness) on three types of commitment (affective, continuance, and normative) amongst the commercial government R&D organization. Tables 3 and 4 show results of a stepwise multiple regression equation explaining the influences of these variables on three types of commitment only for the government commercial R&D organization.
have influences on three types of commitment (affective, continuance, and normative) in the government academic R&D organization.

Proposition 6 predicted that age, occupational tenure, job satisfaction, and personality variables have significant influences on three types of commitment in the government academic R&D organization. Table 7 provides the result of stepwise multivariate regression of age, occupational tenure, job satisfaction, and personality variables on three types of commitment for government academic R&D organization. Out of the nine factors (age, occupational tenure, job satisfaction, occupational commitment, neuroticism, extraversion, openness to experience, agreeableness, conscientiousness) mentioned above, extraversion (factor of personality) has emerged as the strongest predictor of affective commitment that explains over 60 per cent of the variance in the presence of conscientiousness, agreeableness, neuroticism, and extraversion for government academic R&D organization (Table 7). None of the other variables appears to be significant for continuance and normative commitment for government academic R&D organization.

This is an interesting finding, which gives considerable inputs for further R&D management research. From the result of stepwise multiple regression, we can infer that there must be variables other than age, occupational tenure, job satisfaction, and personality, which has significant influence on three types of commitment in government commercial R&D organization, government defence R&D organization, and government academic R&D organization.

Finally, the above discussion is based solely on the responses of the sample. It is an explorative study and therefore should only be taken as indicative of a possible trend. More extensive research needs to be conducted before we can draw any broad generalization in the context.

CONCLUSIONS AND IMPLICATIONS
Any research is much more meaningful if it has some practical applications. It is assumed that occupational commitment does not vary in these government R&D organizations since it is personal to the scientist’s occupational experience, and one expects low organizational influence; however differences are found in our study. We have obtained conclusions and implications that can be of use both in the academic world and for R&D management practitioners. Research has largely focused on the association between individuals’ psychological attachments to occupation and organizational value systems (Gouldner, 1957; Lachman and Aranya, 1986) with respect to occupational concerns and orientations. It was already mentioned that normative and continuance component of occupational commitment differ with different types of organizations. It is possible that in this era of outsourcing, rightsizing, changing organizational structures, and virtual corporations (Davidow and Malone, 1992), a major shift in organizations’ relations with their employees has occurred. Hence, individuals may focus their attachment more on their occupation than the organizations for which they work. Thus three-component model of occupational commitment may allow us to better understand commitment towards their occupation and the variables contributing to its formation in various organizational settings.

The differences in the nature of R&D organizations in the work reported here is reflective of differences in the variables used in the study. Results show that the scientists from government defence R&D organizations are more committed to their occupation than the government commercial R&D and government academic R&D organizations, where two types of commitment are concerned. The scientists in the government defence R&D organizations show higher psychological attachment to their occupation. They also have higher perceived obligation to stay in the occupation than others. On the other hand, for scientists from the government commercial R&D organization (non-defence), the perceived cost of leaving the occupation is high. Thus, scientists of the government commercial R&D recognize that it is beneficial to stay in the job than leave the job, which in itself requires further cultural investigation. It may imply that those opportunities outside do not beckon, resulting in an exit, the way it does for the scientists of defence and academics. Interestingly, the neurotic score is also higher for this group of scientists. The high cost of leaving the occupation is possibly associated to job security coupled with less job accountability. Whilst job security is also high for both the government defence R&D and the academic organizations, continuance commitment is lower in both these groups.

Defence scientists also show higher job satisfaction implying that their task has greater motivating potential. Although unexpected, it was seen that extroversion has a role in the normative commitment of academic
scientists. Occupational tenure has an influence on the affective commitment of the government commercial scientists. However, age was not significantly related to any form of commitment.

Occupational commitment is an important outcome of occupational life. Personality and job satisfaction are useful predictors of occupational commitment. It is in the interest of every organization to have a committed workforce. On the basis of the present study, the affective component of commitment can be explained by the personality profile of the academic scientists and by job satisfaction of the defence scientists. Personality, however, has a dominant role amongst academic scientists in explaining their psychological attachment to their occupation.

As managers of R&D organizations in a changing world that is information technology enabled, it is important to note that occupational commitment rather than organizational commitment is likely to be a key variable in deciding whether to stay or leave. Personality and job satisfaction assessments are important to understand potential occupational commitment especially in terms of psychological commitment. This may not, however, result in the scientist remaining in the same organization. Hence organizational commitment may require the design of other variables in the organizational system.

Further research can also examine the consequences of the three forms of occupational commitment with that of organizational commitment for R&D scientists and other work professionals.

REFERENCES


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