

A STUDY ON STRESSORS AMONG SCIENTISTS AT ISRO WITH SPECIAL REFERENCE TO AHMEDABAD CENTRE

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ABSTRACT

In the field of space technology scientists and research fellow are continuously overburdened with organizational and structural constraints. Specifically, this research field always attracts fellow research to come up with lot of dreams, ideas and to find something new. This study reveals the major stressors and the factors behind those stressors in the field of science & technology specifically related to space technology. This research is based on primary and secondary data. Findings of this research shows that major stressors are high workload, lack of support from superior, healthy competitive environment. The major factors behind these stressors are time bound space mission, unrealistic deadlines, involvement of government rules & regulations in Indian space technology and improper allocation of work to the employees. Finding also support the fact that when scientist started doing their work they will find so many hurdles whether knowingly or unknowingly. This study has a limitation of time constraint and limited sample size, apart from it In India space organizations have high security, which make difficult for employees to give their opinion without any bias. This study also has some prospects for further research in terms of direct comparison between perceived stress and actual stress along with this; stress may have direct impact on attitude, working efficiency and employee morale.

Keywords: Meticulous Work, Scientific Fraternity, Aspired Scientist, Stressors

Introduction of Space Technology and ISRO

Space technology has become an essential part in transforming life of each Indian, India has come a long way and it is not only confined to narrow areas of simply launching satellites for the study of planets and stars. Whether it is urban development, Smart Cities program, real-time monitoring of railway tracks, tele-education, telemedicine or agriculture sector using soil testing, space technology is making its presence felt in every field. Due to such meticulous work the utmost stress of the job can be seen in the employees specifically who are related to scientific fraternity

Researchers have tried to identify the stressors among scientists at ISRO centre, Ahmedabad. Along with that the focus has been made multiple factors associated with the working conditions, recruitment as well as job demands which leads to stress and even emotional exhaustion.

Researchers have focused on secondary data and for that they have studied various report and survey from the different sources. And from the available information they have provided some findings and conclusions.

ISRO (SAC) centre

Starting from the time of Dr. Late Vikram Sarabhai, Dr. Satish Dhawan & many other, Indian Space Research Organisation has contributed very well in the area of space science. ISRO is the only one player in this field in India. It has become one of the sixth largest space agency in the world. ISRO is under Government of India, Department of Space. The total approved sanctioned strength of the Department as on 01.03.2016 is 16,902, out of which 12,300 are in Scientific and Technical (S&T) category and 4,602 is under administrative category. (Source- Annual Report 2017-18)

The existing welfare measures such are housing, medical, canteen, schooling for children, etc. are extended to the employees of ISRO under various approved institutional schemes. Life insurance coverage from accidents in the work place is provided to the employees by schemes such as VISWAS and SAFE, a special scheme for assistance to families in exigency, at a relatively low premium through internal trusts. Key importance is laid to the competency requirements of the individuals, required for contributing effectively and efficiently towards realisation of the organisational goals and resulting achievements. Hence stringent recruitment process is adopted to ensure quality personnel are inducted into the system and greater importance is attached towards continuous development of the human resources, periodically in tune with the programmatic requirements.

- **Centralized** recruitment of Scientist / Engineers with degree in engineering and is continued during the year. Online applications are invited through ISRO website and selections / inductions are completed through the process of written test and interview on an all India basis.
- Also, Centralized recruitment process is continued for recruitment of Officers in Administrative area, Office Assistants and Junior Personal Assistants during the year.
- Further, specialized recruitments, based on the Centre's requirements, are made by respective Centers / Units. In order to induct quality manpower into the systems, the campus recruitments at IITs (fifteen campuses) has been revived and selections are under process.
- ISRO / DOS has been absorbing bright graduates from the Indian Institute of Space Science and Technology (IIST) on successful completion of the B. Tech programme, meeting the benchmark set. The sixth batch of students, who were admitted to B. Tech during September 2012 at IIST have graduated during June 2016. A total of 96 eligible students are inducted in all DOS / ISRO Centers
- **Promotion system** is time & performance based for scientist category & officially it is on every 4 years, after 4 years there is basic screening process (some time one will get eliminated for one year for the screening process) once they are done with initial screening they will face interview which is very technical. Again, there are category in promotion if one has very excellent interview and excellent work they will be immediately promoted if one is good in interview they will get 6-month delay promotion and last is status quo for which one has to appear next year for the whole process. So, the whole promotion process is very strict, and work based
- There are various Centre of ISRO and the environment is very academics – friendly. Most of the centers have their library, free subscription to IEEE and other paid journals without paying a single penny. Sometimes scientist & JRF are sent to different workshops held at various IITs & IISc being sponsored by organization. Apart from these externals seminars & Workshops, ISRO arrange internal seminars & meetings with collaboration of other space agencies in world (NASA, JAKSA etc.)
- **R&D** -One will get to know space science & technology closely. Computer science people will generally work in launch vehicle software development which are used either directly or indirectly on- board of a flight. Real Time software development, Customized system tools. Electronics people basically work on designing & fabricating designing framework, Scientist with mechanical background work on launch vehicle, the whole of launch vehicle designs is realized by their ideas. A smallest bug present in software or a minor error in work can cause a mission to fail and leading to wastage of 500- 600 crore INR to Government of India.

The overall working environment and technical work is very demanding for space scientist which sometimes increase their stress level at the workplace and effect their efficiency, personal life and health of the employees. Hence this research study has following objectives:

- To find out major stressors among space scientist and scientific assistants.
- To find out factors behind those stressors and impact of stressors on working efficiency

REVIEW OF LITERATURE:

Corinne Post, Nancy DiTomaso, George F. Farris & Rene Cordero (2009) have studied work family conflict and turnover intentions among scientists and engineers in Research & Development. The main purpose behind this study was the direct and indirect effects of work interference with family (WIF) and family interference with work (FIW) on turnover intentions. Along with this turnover intentions are also analyzed from two perspectives, one is leaving Research & Development for non-Research & Development work within the same organization and leaving one's organization for another. Work overload and work dissatisfaction are directly and positively correlated with turnover intentions to change organizations. The study did not find any positive relations between family interference with work (FIW) and turnover intentions. But it may be possible to have indirect effect of family interference with work (FIW) on thoughts of changing organization which primarily by increasing work dissatisfaction. The sever limitation of this paper leads to only interrelationship between work interference with family (WIF) and family interference with work (FIW) and turnover intentions. Rather the focus has not been made on working conditions or stress which leads to work dissatisfaction.

Dara L. Woerdeman, Yana van der Meulen Rodgers (2006) have studied work styles, attitudes and productivity among scientist with special reference to comparison between male and female scientists in Netherlands and the United Kingdom. This study indicates that the women scientists reports greater ability

in terms of team-work and communication. Along with this they are relatively good in terms of supervising people and more productive in racially-diverse settings. Both male and female scientists were facing difficulties in balancing work and family responsibilities. The findings of this study also show that women scientists can keep pace with their male colleagues in terms of overall productivity despite more family responsibilities as compared to male counterparts. But the limitation stands for not having any stress related variables which have been studied among scientists.

Kenneth S. Law & Chi-Sum Wong & Guo-Hua Huang & Xiaoxuan Li (2007) examined the effects of emotional intelligence on job performance and life satisfaction among research and development scientists in China. 102 employees from a Chinese computer company in Beijing were selected as a sample for this study. This study demonstrates the effect of Emotional Intelligence on Job Performance is also valid for a job position which requires a very high GMA score. Through in-depth analysis it also shows that General Mental Ability (GMA) battery, and Emotional Intelligence may have independent effects on job performance. Findings revealed incremental predictive validity of the Wong and Law Emotional Intelligence Scale (WLEIS) on job performance but not of the Mayer, Salovey, Caruso Emotional Intelligence Test (MSCEIT). This study provides evidence for the validity of Emotional Intelligence to predict job performance. The study limits in terms of homogeneous jobs where test has been conducted and there is nowhere the effect, impact or relationship of job performance with stress have been studied.

P Ramesh (2017) studied the agricultural research services area by focusing on scientists. This study highlights the relationship between emotional intelligence and perceived stress. With the help of 238 respondents, the study collected data by administering EI test and Perceived stress scale. In the present study, female research scientists are found to have higher perceived stress than their male counterparts. Higher percentage of males (23.3%) reported 'low' level of perceived stress than females (17.2%), whereas higher percentage of females reported 'moderate' to 'high' level of perceived stress than the males. This high level of stress may be attributed to individual differences in EI. The participants who scored high on EI are better at managing the emotions evoked by the demands of their occupations and therefore, experienced less stress. This study finally reveals that female scientists have higher perceived stress as compared to Male Scientists. But similar gender differences were not found with respect to Emotional Intelligence parameter. The limitation of this study which creates research gap is that the study only reflects perceived stress with respect to EI. In future study can be explored to various factors or reasons = behind actual stress among scientists.

Shelley A. Adamo (2013) studied the field of Biological sciences where women attrition has continuously increased, and the effect of motherhood, workload and other factors related to this study was the major factor highlighted in this study. Through literature, this study highlights the factor that even with high stress, and high workload sector, i.e., medicine, women stays to the fields and do not leave it. While the same is not with medicine science where women attrition increases due to factors of high stress as well as high workload as well as motherhood etc. This study also talks about difference between the attrition of academic scientists and physicians. Academic scientists generally do not get their specialized area due to oversupply of graduates, while few females who stick to medicine field and until and unless they became physicians they will surely get their specialized area to work for due to less number of people opt for this career. In Canada, women get more tenure after they land their first faculty position, even with children in comparison to married male with children. While, in Unites States, married women and women with child are less likely to get tenure in comparison to married male and male with children. This study only looked for cross country differences between female academic scientists and physicians. The study does not look for factors like stress, job dissatisfaction responsible for attrition.

Namrata Gupta & Arun. K. Sharma studied issues related to gender inequality with special reference to women academics' scientist in India. In their study they find out how women are facing dual burden of balancing home & work, Indian sociology is more focused towards Patrilocality which directly influenced the education of women. Researchers have studied about women scientist in elite academic institute in India in which they found that major problems faced by women scientist are male dominance over workplace, feeling of isolation & role conflict of being a women and scientist both. Academic women scientist see more involvement in research field when they are in their older age group because at that time their responsibility of family and child is less in comparison to younger women. This study is majorly focused on women scientist, in India, it ignores the aspects related to stress which affecting the overall community of scientist irrespective of their gender.

Overview of Stress

Stress, (*Selye*), “is not something to be avoided. Indeed, it cannot be avoided, since just staying alive creates some demand for life-maintaining energy. Even when man is asleep, his heart, respiratory apparatus, digestive tract, nervous system and other organs must continue to function. Complete freedom from stress can be expected only after death.”

Other definitions, reviewed in detail by Selye in his *Stress in Health and Disease* (1976), include the following:

1. In behavioral sciences, stress is regarded as the “perception of threat, with resulting anxiety discomfort, emotional tension, and difficulty in adjustment.”
2. In the group situation, lack of structure or loss of anchor “makes it difficult or impossible for the group to cope with the requirements of the situation, and the problem of leadership and interpersonal behavior becomes one of evolving or supplying a structure or anchor and of supplying the expertness for coping with the demands of the situation.”

Pressure to perform well academically, to manage finances and relationships, and lack of time are just some of the stressors students face. Stress can be a good thing when it acts as a motivator, helping you to accomplish your goals. Success, in turn, builds confidence in your ability to manage even more stress in your life. However, too much stress or stress that is not managed effectively can be detrimental to your wellbeing and your ability to focus on achieving your goals.

Stress is an interaction between an individual and the emotional strain which affects a person’s physical and mental condition which is created by environment. Stress is a pattern of emotional and physiological reactions or response to demands from internal or external or both sources. Stress is unfavourable situation for any individual and when any individual is facing unfavourable situation at their work place or due to work place it is known as occupational stress or work and work-related stress. Due to high level of competitive edge occupational stress is increasing among employees. Occupational stress can be arising from different reasons of work place which include salary, targets, promotions, performance appraisal, behaviour of seniors, etc.

Stressor: -

Any demand, either physical or psychological in nature, encountered during living is a stressor. Stressor can be an event, thing or person which leads to stress in individuals. Any factor which leads to an individual getting stressed is known as stressor. It is not necessary that only event or factors only provide stress, but any individual can also be a stressor for any other individual.

Charlesworth and Nathan (1984) have presented an informative list of type of stressor:

- Environmental
- Commuting
- Physical
- Change
- Family
- Disease
- Social
- Pain
- Work
- Financial
- Exam
- Conflict
- Job’s demand
- Sexual Harassment

(Source: *Stress Management*, bywaltSchafer, 4th Edition, Cengage Learning, P.no.5)

ISRO centre, basically invite all those aspired people who want to have creative and innovative aspect in their respective field. This study tried to identify those stressors that affects the lives of scientists and scientific assistants working at SAC. The major stressors identified through this study are like; institutional factors, structural implications, role ambiguity and role conflict, long tenure for promotion, non-friendly work environment, assignment of different research work, work allocation to different projects which does not come under the specialization or interest purview of scientists and scientific assistants.

Work Stressors and Stress Experienced: -

Those stresses that emerge from work related activities are known as work stress. Work stress is generated at organization. Organizational sources provide different impact and effect to employees. These organizational sources are targets, workload, work place conflicts, demands, interpersonal relation issues, role ambiguity, working conditions and working environment. For this all employees react differently as per their perception, personality, attitude and ego states.

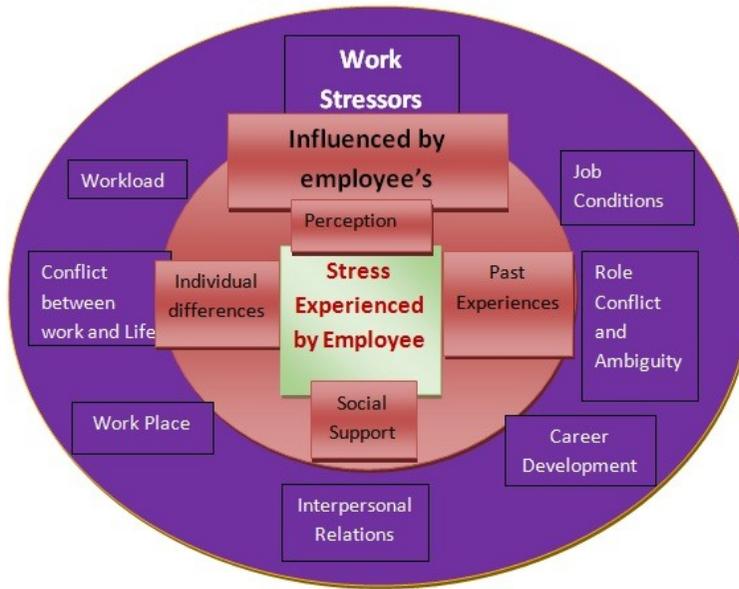


Figure-1 (Source: Fundamentals of Organizational Behaviour, by Slocum/Hellriegel, 2007, Cengage learning, P.no.453)

Stressors and Outcomes: - Different stressors have different outcomes. Stressors are may be from individual level, group level, organizational level and extra- organizational level and it has outcomes like, behavioural, cognitive and physiological. The following chart shows the various stressors and outcomes.

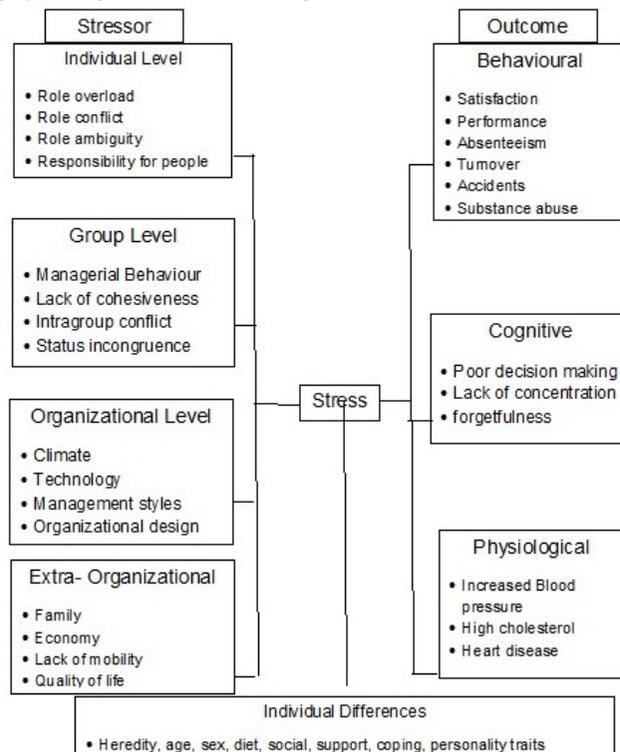


Figure-2 (Source: Organizational Behaviour – new look concept, Theory and cases by Dr. Niraj Kumar, Himalaya Publishing House, P.No. 460)

Data Analysis

For primary data researchers has taken a sample size of 50 from ISRO centre Ahmedabad which include Scientist/Engineers, Research Scholars & Scientific Assistant. In questionnaire researches has mainly focused on Major Stressors in space organisation which include feeling of heavy workload pressure, feeling of injustice, unfair distribution of work, underutilisation of skill, lack of support from superior, timebound space mission, over control or interference of government.

Researchers found that most of the employees who are the part of study are Scientist/Engineer working in different area of organisation, As different areas have different objectives perspective of employee changes according to their departmental goal and superiors.

Work pressure can be seen less at time of joining organisation but as the experience of employee increases more work involvement will be there subsequently leading to more work stress.

Around 70 percent of Scientists feel that they feel Very heavy workload with repetitive & boring work is causing problem to them. As most of the Scientist are coming from elite institutes few believes that there is underutilisation of their skill. They believe that there is less science work & more of repetitive designing & testing of machineries. Very few believe that unsupportive superior and less or no appreciation is causing problem to them.

Table-1

| Variables | Minimum | Maximum | Mean | Std. Deviation |
|------------------------------------|---------|---------|--------|----------------|
| Age | 1.00 | 4.00 | 2.0385 | .87090 |
| Workingenvironment | 1.00 | 7.00 | 2.4615 | 1.17408 |
| StresspreventionMethod | 1.00 | 5.00 | 2.7692 | 1.58260 |
| Stress due to project Deadlines | 1.00 | 5.00 | 2.2692 | 1.07917 |
| Stress due toperformanceevaluation | 1.00 | 5.00 | 2.8077 | 1.16685 |

Source- SPSS

For measuring stress due to working environment Researchers made a scale from 1 to 5 which has range from highly satisfactory to highly dissatisfactory In Table 1, Mean for working environment is around 2 which shows that most of the scientist found working environment satisfactory.

For measuring stress due to mission or project deadlines which has range from strongly agree to strongly disagree & mean is 2.5 around which shows that most of scientist feel stress due to mission deadlines.

For measuring Stress at the time of performance evaluation researchers made a range from Strongly Agree to Strongly disagree & mean is 2.8 around which shows that few respondents feel stress at the time of performance appraisal while few are neutral at that time.

For stress prevention method Researchers found that most of the respondents find realistic goal setting & better time management can be solution of the stress

Stress due to Project Deadlines

With the increased number of launching per year

Table-2

| Planned Year | Number of Satellite launched by ISRO |
|--------------|--------------------------------------|
| 2016-17 | 6 |
| 2017-18 | 7 |
| 2018-19 | 8 |
| 2019-20 | 8 |
| 2020-21 | 10 |
| 2021-22 | 12 |
| 2022-23 | 14 |

Source- ISRO

With increasing number of launch the pressure of work is also continuously increasing, researchers found 51 percent of respondents consider project deadlines as source of stress wherein as they need to deliver best result within specified time limit

Concluding Remarks

Employees workplace environment will have direct impact on their work if their work environment have less stressors then only they will be able to achieve their goals on proper time. How well employee perform is all depends on workplace stressors and conducive environment.

From the finding of the above research it can be concluded that major stressors among scientist/engineer of ISRO are workload with repetitive work, project deadlines as well as work environment. Through Proper distribution of work and giving more emphasis to Research & development; stress level can be reduced. Though working at Space application centre gives pressure and burden but study found that still most of the employees can plan their own work with little control of superior. Human resource training programme or other stress management programme can be recommended to reduce the burden of stressors among employee, which is still lacking somewhere in Indian space institutions.

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