

**“A STUDY OF HR PRACTICES IN AUTOMOBILE
INDUSTRY IN PIMPRI-CHINCHWAD
INDUSTRIAL AREA, PUNE WITH SPECIAL
REFERENCE TO HEALTH, SAFETY AND
WELFARE”**

(For the period 2004-05 to 2009-10)

**A thesis submitted to
TILAK MAHARASHTRA VIDYAPEETH
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**In the subject
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JUNE-2013

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I hereby declare that the thesis entitled

**“A STUDY OF HR PRACTICES IN AUTOMOBILE
INDUSTRY IN PIMPRI-CHINCHWAD
INDUSTRIAL AREA, PUNE WITH SPECIAL
REFERENCE TO HEALTH, SAFETY AND
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(For the period 2004-05 to 2009-10)

completed and written by me has not previously formed
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upon me of this or any other University or examining
body.

Place: Pune

Research Student

Date: 06/04/2013

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which is being submitted herewith for the award of Degree of Vidyavachaspati (Ph.D.) in Management of Tilak Maharashtra University, Pune is the result of original research work completed by Shri: Rajeshwar Wamanrao Hendre under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis of the award of any Degree or similar title of this or any other University or examining body upon him.

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Date: 06/04/2013

Research Guide

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TERMS AND DEFINITIONS

- 1. Awareness:** The knowledge about HSW activities in the organization and rules thereof.
- 2. Completely Satisfactory:** The opinion expressed when implementation of provisions is highly cared by the management to the world class standard and there is no need of further improvement in the near future.
- 3. Demographic variables:** Age, Marital status, Education, Years of service, No. of dependent family members, nature of the job and income level which have impact on satisfaction.
- 4. Derived Awareness Level:** The awareness level derived from the extent of operator's participation, training, functioning of the safety and welfare department and activities of regulatory structure in the form of committees and communication.
- 5. Frequency Severity Incident:** The combined measure which takes into account frequency and severity of the accident/injury.
- 6. Government:** Directorates of Industrial Safety and Health under the ministry of Labour.
- 7. Hazard:** It is potential of an incident in causing physical or chemical harm to people.
- 8. Health:** It includes Sections mentioned in the Factories Act, 1948 (Chapter III, Section 11 to 20) and Rules thereof determining physical and environmental condition in a shop. Provisions and maintenance of these Sections will have impact on Health of employees.
- 9. Highly Dissatisfactory:** The opinion expressed when implementation of provisions is uncared by the management for a long time or absence of that.
- 10. Implementation Level:** The dynamic mechanism of Communication, Compliance of suggestions, Regulatory framework, Involvement of employees and Supply of necessary assets for the improvement in Health and Safety of employees in the factory.

11. Inspector: Assistant and Deputy Directorates of the government who are responsible for the monitoring and enforcing health and safety related provisions in the factories.

12. Less Satisfactory: The opinion expressed when implementation of provisions is at lower level in a specific period or at all times.

13. Macro Level: The organizational level

14. Micro Level: The shop/Block/Department level

15. More Satisfactory: The opinion expressed when implementation of provisions cared by the management and maintain its standard for a long time.

16. Occupational Health and Safety: The science of anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment (ILO).

17. OHSMS: OHS management System is a way of application of theories of management for controlling workplace accident/injuries, health hazards, diseases and unfavourable working conditions.

18. OSHA: The Occupational Safety and Health Act 1970 is a comprehensive Act of USA to ensure workers and workplace safety for all including manufacturing, service and self employed sectors.

19. Risk: It is a combined measure of probability of hazard-related incident occurring and severity of harm or damage that could result.

20. Rules: The Maharashtra Factories Rules, 1963 under the Factories Act, 1948 as per powers conferred to the States.

21. Safety Officer: The responsible officer appointed by company (vide Rules, 1982) for continuance of activities relating to Health and Safety of employees.

22. Safety: It includes Sections mentioned in the Factories Act, 1948 (Chapter IV, Section 21 to 41) and Rules thereof determining information, working condition and behaviours of employees. Provisions and maintenance of these Sections will have impact on 'Safety'.

23. Satisfaction Index: The numerical value established by combining the employees' opinions towards implementation of the provisions of statutory Health, Safety and Welfare.

24. Satisfaction: It is an intrinsic and subjective state of mind or his/her opinion about an item based on perceived level of knowledge by which a person can respond: "Highly dissatisfactory", "Less satisfactory", "Satisfactory", "More satisfactory" and "Completely satisfactory".

25. Satisfactory: The opinion expressed when implementation of provisions relating to health, safety and welfare at workplace is as mentioned in the Act and Rules but not more or less than that.

26. Shop: It is a part of factory/plant devoted for carrying out specific type of work/activity/process according to plant design. Nature of work carried out in the shop creates different environmental and physical conditions which have impact on Health, safety and Welfare of employees. It is also called Blocks, Division or factory.

27. Welfare Officer: The responsible officer appointed by company (vide Rules, 1966) for continuance of activities relating to welfare of employees.

28. Welfare: It includes Sections mentioned in the Factories Act, 1948 (Chapter V, Section 42 to 49) and Rules fulfilling basic and humanistic needs of employees. Provision and maintenance of these Sections will have impact on 'Welfare'.

29. Worker/Operator: Worker/Operator is a person employed directly or by and through any agency and involved in any manufacturing process directly or other work relating to manufacturing process or any kind of work near machinery on the shop floor.

30. Working Conditions: The employee's experience about the quality of work environment usually created by implementation of Health, Safety and Welfare related provisions at the workplace and affecting on his/her physical, mental and social state.

ABBREVIATION

AM- Arithmetic Mean

BBS- Behaviour Based Safety

CPE – Common Protective Equipments

DBT – Dry Bulb Temperature (usually referred as air temperature)

DGFASALI- Director General Factory Advice Service and
Labour Institute

DISH- Directorates of Industrial Safety and Health

EU- European Union

F.A. - The Factories Act, 1948

FR- Frequency Rate

FSI- Frequency Severity Incidence

GOI- Government of India

H & S: Health and Safety

HJR: Healthy Job Relationship

HR- Human Resource

HRM-Human Resources Management

HS&W or (HSW) - Health Safety and Welfare

HSWSOI - Health, Safety and Welfare Overall Index

IEQ- Indoor Environment Quality

IIPP – Illness and Injury Prevention Program

I_{level} : Implementation Level

ILO- International Labour Organization

IR- Injury Rates

N- Sample size or Number of observations

OEMs- Original Equipments Manufacturers

OHS- Occupational Health and Safety

OSHA – Occupational safety and Health Authority

PCIA – Pimpri Chinchwad Industrial Area

PPE – Personal Protective Equipments

RH- Relative Humidity

RHT – Risk Homoeostasis Theory

RMV-Respiratory Minute Volume (minute 6 lit/min)

Rules- The Maharashtra Factories Rules, 1963

STDEV/ SD – Standard Deviation

SEU – Subjective Expected Utility

SEZ- Special Economic Zone

SHE – Safety, Health and Environment

SR- Severity Rate

TU- Trade Union

WBT – Wet Bulb Temperature

WHO- World Health Organization

CHAPTER No.1
INTRODUCTION

OBJECTIVES	<ol style="list-style-type: none">1. To link theories of HRM with OHS management2. To illustrate historical background and provisions in the F.A.3. To describe OHS scenario and researches4. To introduce the intention of the present study
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1.1 Introduction

Human resource is one of the most valuable and unique assets of an organization having dissimilar in knowledge, skills, creative abilities, talents and capacity as well as values, attitudes and beliefs of individuals involved. Its management is one of the most complex and challenging field in the modern days. The functions of human resources management (HRM) can be classified into five major groups namely:

1. People resourcing,
2. Employment and HR development services,
3. People rewarding,
4. Employee relation and
5. Health, safety and Welfare¹

Nickson Denis describes three broad aspects of HRM cycle: employee resourcing, maintaining and developing.² By adopting best HR practices, employees' commitment can be enhanced. This leads to improved organizational performance and ultimately higher level of productivity and profitability.

According to WHO, Health is a complete physical, mental and social well-being and not mere an absence of disease. Similarly, safety is not limited to fulfillment of statutory requirement or freedom from accidents and injuries. It is a continuous process of coordinated efforts of all stakeholders through the mechanism of communication and implementation. Occupational Health and Safety (OHS) is generally defined as the science of anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general

environment.³ Our former President V. V. Giri defined welfare in a very broad view encompassing intra-mural and extra-mural health and safety elements.

Management of Health and Safety at workplace includes following activities:

Table 1.1 Activities of OHS Management			
1	Developing Health and Safety policies	5	Training
2	Conducting risk assessment	6	Creating awareness
3	Auditing and Inspection	7	Recording and reporting
4	Implementing OHS programs	8	Preventing accidents & injuries

1.2 Principles of Management and OHS⁴

OHS management is an essential component of HRM, technology management and environmental management. Hence principles of the scientific management (Frederic W. Taylor) and administration (Henry Fayol) are applicable to it. Elton Mayo (1880-1949) showed that workers' satisfaction is non-economic. Communication and teamwork are major contributors in satisfaction related to the working conditions. Frank B. and Lillian M. Gilbreth (1868-1924 and 1878-1972) collaborated on fatigue and motion studies and focused on ways of promoting the individual worker's overall welfare. Edwards Deming (1900-1993) states that "there is kinship between quality and safety management". Herzberg' states that, "satisfaction with the working condition is a hygienic or maintenance factor which cannot be completely fulfilled; however, its absence or lower level of maintenance would result into dissatisfaction."

1.3 Factors Affecting on OHS Management

It is also well recognized at government level that providing and maintaining higher level of OHS will require cost; which adversely affects on the competitive advantage of the organization.⁵ However a study conducted in different cultural and institutional environment revealed the fact that HRM-firm performance is highly related to firm's economic performance.⁶ Hence, in the long run this cost in HRM practices will turn into returnable investment.

Some guiding theories in HRM can be explained on the backdrop of HSW practices.⁷ Human capital theory believes that investment in the maintenance of human capital shall not be assumed as 'costs' but are 'returnable investment'. Better health and safety standard is influenced by various social, technical and economic factors.⁸

A study measured HRM practices in seven domains consisting of 71 items revealed that workplace with limited implementation of HRM practices initially meet on average or sometimes negative responses in terms of organization culture and intrinsic job satisfaction.⁹ However, this tendency becomes positive with the extensive implementation of HRM practices. This supports the basic contention that companies intending to improve employee satisfaction have to implement HRM system strongly.

A two year research study conducted in London in the spectrum of size and sectors of organizations (N=753 to 771) shows that, 35% of HR managers felt that they have lead role, 42 % felt that they have joint role and 22 % did not felt their responsibility in the maintenance of H&S practices at workplace.¹⁰ Health, Safety and Welfare (hereafter referred as "HSW") is one of the functions of HRM which has been implemented through separate departments in major organizations.

Since 1980's there has been a massive rise in popularity of HRM but OHS function is least developed and thought. It also receives minimal coverage or none at all in key HRM texts and journal. Recently, the contributory role of OHS in organizational performance has come into vogue because of upward trend in occupational injuries & illness, costs associated with it and effect of globalization. As employees are most important assets, it is expected that OHS should occupy high priority in HRM.¹¹

OHS is a multidisciplinary issue comprising of knowledge of number of subjects including management science, HRM and health science resulting risks at individual, occupational, economic, societal and environmental level.

A list of factors beneficial and detrimental for higher level of implementation of OHS from the perspective of workers, trade union and management has given below.¹²

Table 1.2 Factors affecting OHS implementation (Worker's perspective)		
S.N.	Beneficial factors	Detrimental factors
1	Unionization and statutory support	Job security, growing unemployment
2	Information explosion	Lack of skills and OHS education
3	Improvement in communication system	Increased automation of services
4	Speed in redressal of labour issues	Poverty and lack of opportunity
5	Statutory in-plant structural support	Lack of knowledge related to rights
6	Availability of in-plant communication	Beliefs and values

Table 1.3 Factors affecting OHS implementation (Trade union perspective)		
S. N.	Beneficial factors	Detrimental factors
1	Legislative support	Small unions, poor finance- not viable
2	Right of prosecution and defense for protecting worker's rights	Low degree of unionization
3	Settling of disputes at plant level	Political interference
4	Publication of periodicals	Multiplicity of unions
5	Open to take outside support	Unscrupulous outside leadership

Table 1.4 Factors affecting OHS implementation (Management perspective)		
S.N.	Beneficial factors	Detrimental factors
1	Globalization/internationalization	Lack of capital
2	Growing recognition of Indian products in global market	Cut throat competition put forth by domestic and non-domestic firms
3	Opportunity to advertise on the basis of safety standards	Outdated technology and machinery
4	Reputation on inclusion of social issues	Lack of technical support
5	Growing demand of quality raised safety standards	Ample availability of manpower
6	Increased awareness on the part of workers and Government	Lack of OHS education and training.

1.4 WELFARE

1.4.1 Definition

Labour sector addresses multi-dimensional socio-economic aspects affecting on labour welfare, productivity, living standards and social security. Welfare in the context of social system is providing situations for satisfying people's needs, safety, security and human development.

Welfare differs with time, region, industry, country, level of education, social customs, political system and degree of industrialization & general standard of socio-economic development of the people.¹³ Therefore labour welfare has been defined in various ways. Welfare is means to perform work in healthy and congenial surroundings (ILO), higher efforts of employer for benefiting employees over and above the Act and social legislations (N. M. Joshi) and all labour laws are pieces of welfare (V.V. Giri). The Report of the Committee on Labour welfare (1969) defines welfare: Such services, facilities and amenities as adequate canteens, rest and recreation facilities, sanitary and medical facilities, travelling to and from work, accommodation and social security measures contributing to improve the conditions under which worker are employer.

Our definition of welfare: Such services provided by the organization as washing facilities, Facilities for storing & drying clothing, Facilities for sitting, First aid appliances, Canteen, Shelters, rest rooms and lunch rooms and Welfare officers as mentioned in the Factories Act and Rules.

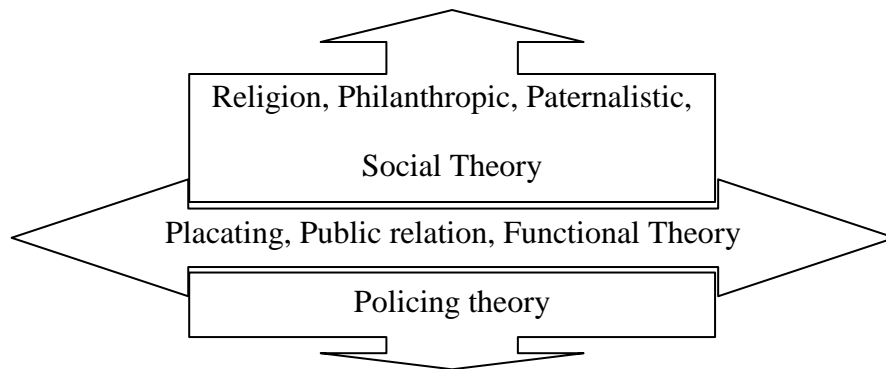
1.4.2 Approaches to Labour Welfare

There are many theories of welfare based on different beliefs in the books of HRM.¹⁴ Here, we will try to name these intrinsic and extrinsic forces behind these welfare theories.

S.	Theory	Intrinsic force	S.	Theory	Extrinsic force
1	Religious	Belief	5	Policing	Greed
2	Philanthropic	Affection/pity	6	Placating	Fear
3	Paternalistic	Moral	7	Functional	Mutual cooperation
4	Social	Moral	8	Public relation	Proud

On the understanding of these welfare theories the following diagram is developed by assigning higher, intermediate and lower levels to the background philosophies.

Figure 1.1 Levels of Welfare Theories



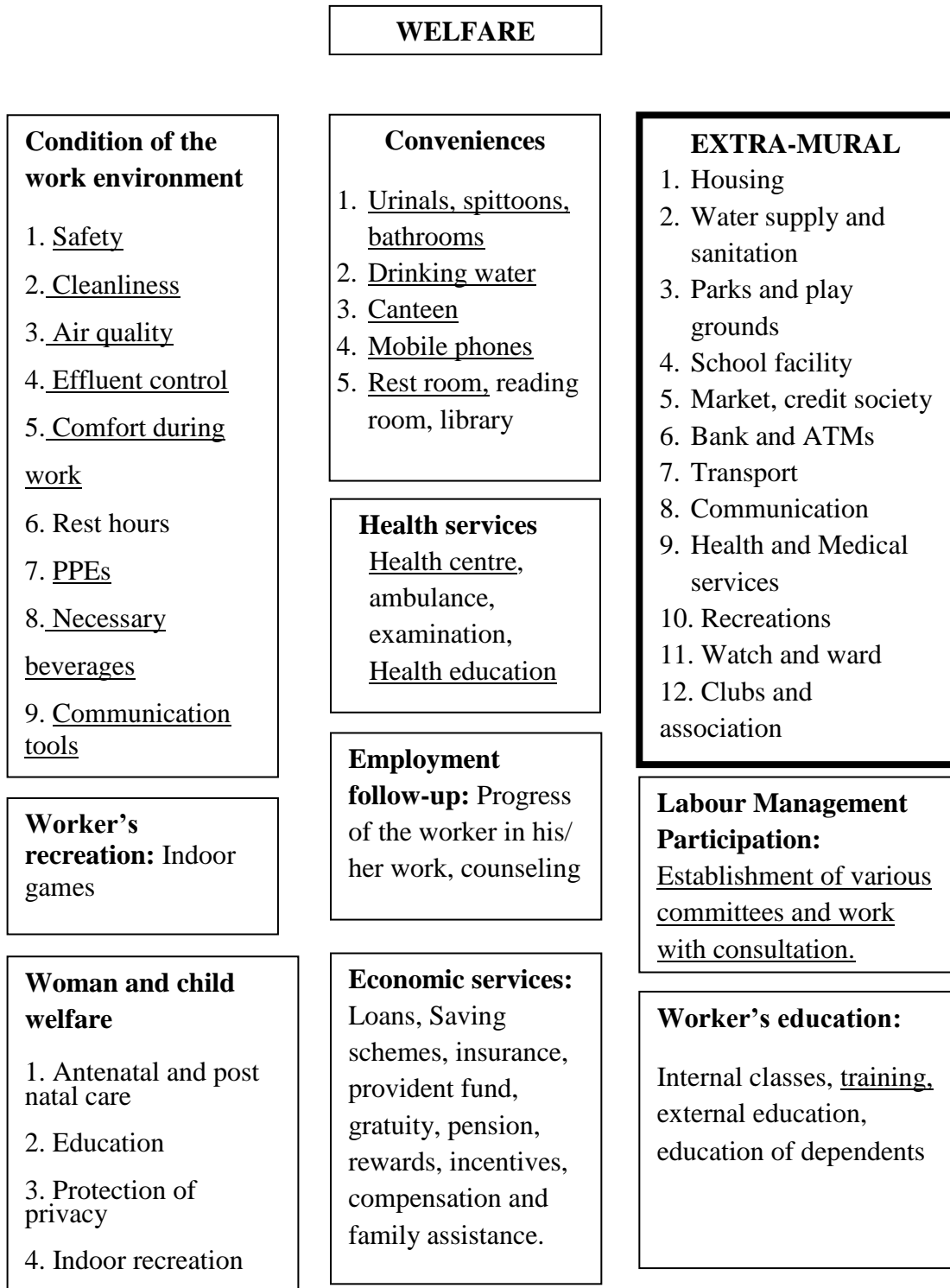
1.4.3 Principles of Labour Welfare¹⁵

1. Employer should not bargain welfare as a substitute for wages and incentives.
2. Proper co-ordination, harmony and integration of all welfare activities.
3. It should be administratively viable and development oriented.
4. It should allow co-operative and participative intervention of unions and workers
5. A continuous feedback mechanism shall be introduced for evaluation and improvement.

1.4.4 Significance and Activities of Labour Welfare

Welfare schemes are significant for workers to improve their morale, efficiency, satisfaction, skills and real income; establishing cordial relationship and to reduce absenteeism & turnover.¹⁶ However, labour welfare has both positive and negative facets. It exposes positive side when it deals with developing worker's personality but it is at the cost of industry and community at large is its negative side.¹⁷ Labour welfare activities influence sentiments of workers. It is classified as statutory facilities, voluntary facilities and mutual facilities.¹⁸ A comprehensive list of intra-mural and extra-mural welfare activities given by M.V. Moorthy in his monumental work has presented below.¹⁹

Fig 1.2: A Comprehensive List of Welfare Activities



(Underlined facilities are considered in this research)

1.4.5 Labour Welfare Centers

There are 253 labour welfare centers across the Maharashtra State out of which 13 are in Pune district including 2 (Vallabhanagar and Udyognagar) at Pimpri Chinchwad Area. These centers execute welfare schemes for employees and their family members in educational, social, sports and cultural areas. For the membership, present rates of yearly contribution from workers, state Government and employer are in the ratio of 1:2:3 amounting to Rs. 24:48:72 respectively. Apart from this yearly membership fees for employees, employee's family and eligible others are Rs. 15, 20 and 25 respectively.

1.5 Motivation Theories in the Context of HSW

1. Maslow's need hierarchy theory: In most cases, problems related to physical safety and health are more basic and immediately threatening than those concerned with mental health and well-being. Put crudely, inhaling silica in the workplace will kill a worker much more quickly than experiencing demeaning racial harassment will, although both are very unhealthy.²⁰
2. Herzberg's two factor theory: It suggests that hygienic needs are concurrent and never completely satisfied but its absence or lower level would result in dissatisfaction. Mere satisfaction of hygiene factor will do little for superior performance.
3. McClelland's learned need theory: The active participation in the H&S programs will offer operators to learn. The positive power achieved by this can be utilized to meet safety goals. Involvement in the H&S related activities is a noble work to become a cause for betterment of large group.²¹
4. B. F. Skinner's Reinforcement theory: People will repeat the desired behaviour if a pleasant consequence or positive reinforcement is attached with it. Positive reinforcement includes verbal praise, reward or recognition.²²
5. J. S. Adam's Equity theory: People become demotivated and express their dissatisfaction when they get (from the job) equal as their counterparts and have to sacrifice more comfort on account of inherent characteristics of the job. This may be the reason why workers in casting or welding section are less satisfied than that of workers in assembling or paint section.²³

6. Alderfer's ERG theory: Frustration- regression principle states that if higher level need remains unfulfilled the person may regress to lower level of needs.²⁴
7. Roger's Protection Motivation Theory: According to this theory main factors playing behind protection motivation are:
 1. Severity and probability of the disease or injury
 2. The effectiveness of the recommended behavior
 3. Performing the recommended behavior or obedience.

This theory is developed to establish relationship between fear drives and cognition, attitude and behavioral intentions related to health.²⁵

All above theories put across different psychological aspects of people. Knowledge of motives behind OHS is useful for its effective management. Motivation strategy to achieve worker's participation, obedience and reducing risk taking behaviours or unsafe acts shall be based on power, social need and reward. The book 'Freakonomics' illustrates in detail the number of cases how reward system in safety management leads to cheating. There are three basic flavours of incentives: economic, social and Moral. Very often a single incentive scheme will not include all three varieties.²⁶ Therefore, it feels that safety rewards are appropriate at operator level only.

1.6 HISTORICAL BACKGROUND OF THE FACTORIES ACT

In the South Asian countries the origin of several existing laws lie in the British system of common law which was received in the region, beginning with the Charter Act of 1726 and then modified under the principles of "equity, justice and good conscience." By the middle of the nineteenth century, British colonists established their dominance over much of present day India, Pakistan, Bangladesh and Sri Lanka. The Law Commission set up in 1856, led by Lord Macaulay drafted a series of laws for this region, the Factories Act, 1948 of India is based on it.²⁷

In the 1850, when the economic conditions of labor were poor, the industry was dominated by the Capitalism, and the industrialists were more concerned about the productivity. Long working hours, Low wages, poor living conditions and exploitation by the management were common conditions in the industry. In 1875, the first committee

appointed to inquire into the conditions of factory work favoured legal restriction in the form of factory laws. The first Factories Act was adopted in 1881. It was urged by a combination of English and Indian humanitarians and Manchester mill owners and applied only to manufacturing establishments using mechanical power, employing more than 100 persons and working more than four months in the year. The Act of 1891 extended its coverage to factories employing more than 50 persons.²⁸ Restrictions on hours of work and on the employment of women were the chief gains of this legislation. The Act was subsequently revised and its coverage extended in 1911, 1922 and 1934. The statutes limited first the working hours and days of children (also setting minimum age for their employment), then of women and finally (in 1911) of males. A report of Royal Commission on Labour 1929 contains health and safety in several occupations. It had recommended appointment of factory inspector, policy of 'safety first', celebration safety week and establishment of safety committee (Royal commission report, 1929). As increasing numbers of plants went to II and III rd shift working in 1930s and 1940s only men could be employed and this automatically reduced the proportion of women.²⁹

The Factories Act 1934 was applicable for factories where twenty or more workers were working with aid of power. The advent of provincial autonomy in 1937 brought the necessity of having uniform labour code to eliminate disparities in different provinces and that between British India and the Indian states. The efforts were also made to bring legislation of India comparable to the other countries.³⁰ In the 1930-1940 several chemical, hazardous and toxic substances had come up. This brought a train of problems of industrial safety and occupational health hazards. Hence, the main object of the Act was to ensure adequate safety measures and to promote the health and welfare for workers.³¹

The Factories Act 1948 (hereafter referred as "F.A.") came into force on the 1st day of April, 1949. It consists of 11 Chapters and 120 Sections and 3 Schedules. The Chapter III, IV and V of the Act encompass the provisions relating to "Health", "Safety" and "Welfare" respectively.

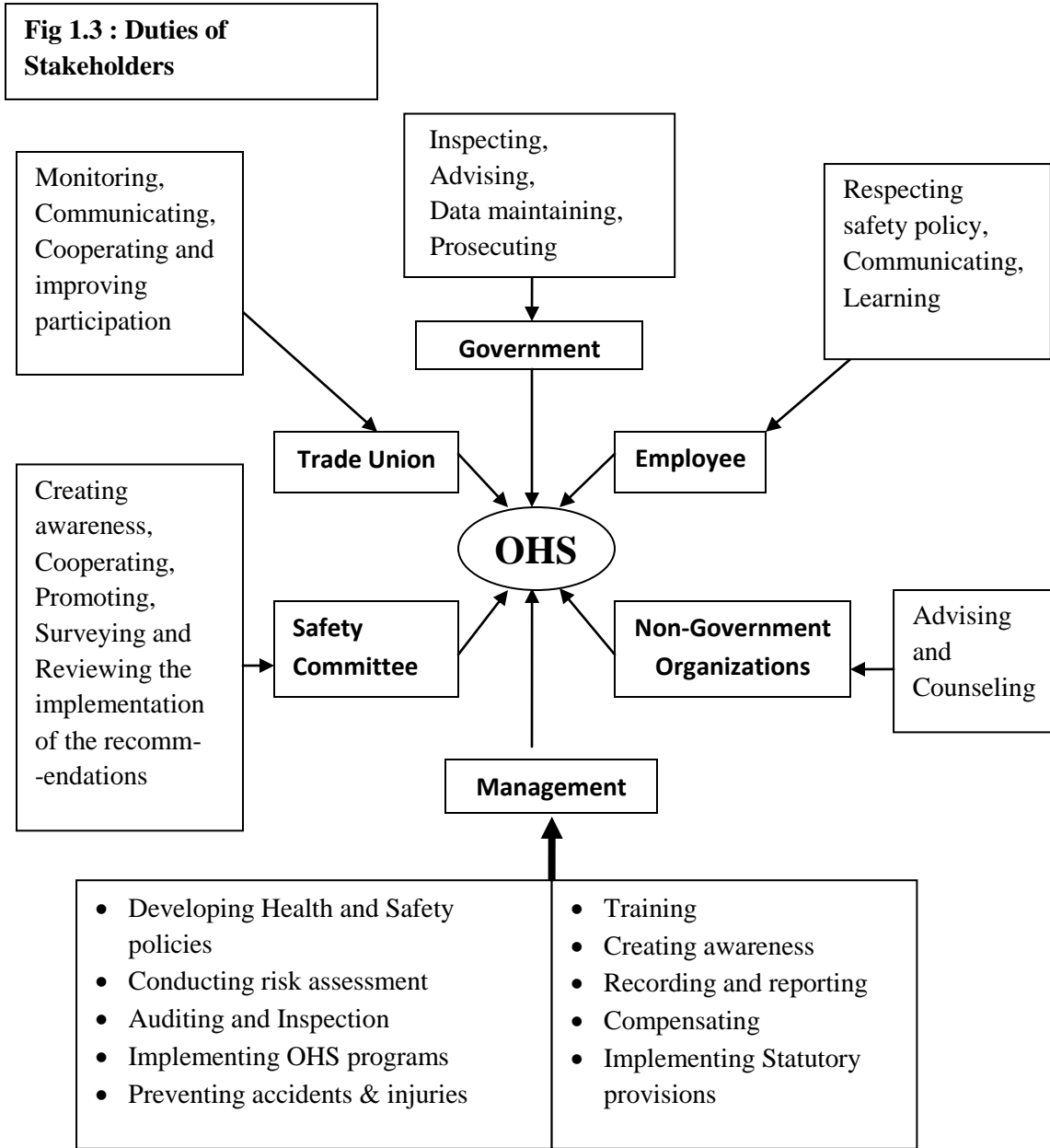
1.7 The Factories Act, 1948 and Responsibilities of Stakeholders

The Factories Act Section 7A describes duties of occupier towards providing healthy and safe workplace, risk free handling of articles and substances, adequate maintenance of the facilities, compensating for accidents/injuries and training employees. Management is also responsible for recording and reporting the statutory health, safety and welfare provisions mentioned in the F.A. to the government. The welfare officer shall be appointed wherein 500 or more workers are employed. The occupier shall appoint a qualified safety officer wherein 1000 or more workers are ordinarily employed. These officers have legal responsibilities for establishment of healthy and safe workplace. Raising employees' awareness and training are the primary responsibilities of the occupier. As per Section 111 (A) every worker is responsible for obeying instructions related to safety. If zero accident is a goal, 100% involvement is necessity.

Safety Committee shall be established in every factory, wherein 250 or more workers are ordinarily employed; or in case of hazardous process more than 50 workers are ordinarily employed. These committees shall work for assisting and cooperating with management in achieving safety goals. Trade unions in factories have functional responsibility to improve health, safety and welfare of workers.

All the offices dealing with labour matters fall within the administrative control of the Industries and Labour department of the Government of Maharashtra. Directorate of industrial safety and health (DISH) is responsible for safety and health of workers in the factories. The office of Joint Director DISH of Pune region is situated at Swargate, Pune; it is responsible for enforcement of provisions in the F.A. in 2100 factories in Pune region.

The duties of key stakeholders namely: Management, Trade union, Workers, Government, NGO and Safety Committee at workplace on the basis of F.A. are summarized in the following figure.



1.8 The Occupational Health and Safety (OHS) in India and Maharashtra

(a) INDIA³²

In India there were 3, 32,761 registered factories out of which 2, 70,294 (83.2%) were in working at the end of year 2009. The total employment in factories was 13.10 million consisting of 86.56 % men and 13.44% women workers. The safety officers appointed were 2642 (98.8 %) against requirement of 2675 and welfare officers were 3096 (94.3%) against 3282 needed. The major accidents hazards factories were 1920 in year 2009.

The total injuries were 33090 out of which 1509 (4.56%) were fatal. The highest 27.07% of fatal injuries occurred in the chemical industries, 23.16% occurred in Food Products industries and 9.60% of total injuries occurred in the Basic Metals and Alloys industries. The industry-wise analysis in 23 industries shows that among non-fatal injuries highest 31.05% of the accidents were in the Cotton textiles industries followed by 10.53% in the Basic Metals and Alloys manufacturing industry and 7.93% were in the industries manufacturing Transport Equipment and Parts.

In India “Everyday 110 employees are injured out of which 5 are fatal injuries.”

Indian firms are lagging far behind in the employment of full time medical officers and provision of ambulance as required by the F.A. The sanctioned posts of factory inspectors were 938 out of which 64% were filled. Government machinery had inspected 38% of registered factories including 56% of hazardous factories. The survey carried out by labour bureau mentions “Due to lack of proper attention by management of small factories the standard of cleanliness was not found satisfactory. Disposal of waste and effluent, need of humidification and maintenance of hygrometer were not proper.”³³

(b) MAHARASHTRA

In Maharashtra there were 43, 261 registered factories out of which 41,201 (95%) were in working at the end of 2011. The total employment in factories was 20.86 lakh consisting of 85 % men and 15% women workers.³⁴ Some key features of OHS situation in Maharashtra are summarized as below:³⁵

1. Only 50% posts of factory inspectors are in position; 50% are vacant.
2. About 20% factories are inspected per year.
3. Only 58% factories have declared safety policies required by the F.A.
4. Only 67% factories established safety committee required by the F.A.
5. Only 56% factories have appointed full time medical officer required by the F.A.
6. 81% of factories have ambulance vans required by the F.A.

1.9 Global OSH Scenario

According to ILO statistics, more than 125 million workers worldwide are victims of occupational accidents and diseases in a single year. Of these approximately 2, 20, 000 workers die and about 10 millions are seriously disabled. From these figures it can be realized the importance of emphasizing health and safety of employees at workplace. A number of legislations have been passed in the interest of H&S; however, legislation alone cannot ensure an accident and hazard-free industrial environment.

1.10 OHS SCENARIO OF SOME COUNTRIES

In the Bangladesh it is revealed in the survey that low enforcement of existing labour law (BLA-2006) at workplaces, weak labour inspections, lack of awareness, lack of decent wage and defective industrial relations were some of the key causes for growing occupational accidents, workers rights violations and labour unrests in the country (Bangladesh OSHEF). In *Pakistan the standards of ILO are not being followed in Pakistan, number of labour laws either winded or restricted. Almost 80% laborers have been afar from many basic provisions.* China's occupational health and safety (OHS) has increasingly drawn national and international attention as it has not kept pace with its globalization of production and trade. The majority of workplace accidents and injuries are due to unsafe working conditions instead of the unsafe work practices of employers.³⁶

USA has a well-developed infrastructure to monitor and coordinate occupational health and safety activities, the occupational safety and health Act (OSHA) of 1970 lays down in clear detail the rules to be followed for different occupations. A special characteristic of this act is the provision of free construction assistance to employers funded by OSHA. The aim of workers' compensation in USA is to remove the burden of

an employment-related injuries or deaths and the worker's family should get benefit of insurance cover.³⁷ In the Germany the Reich insurance code the accident prevention regulations are adopted by the accident insurance funds. In Canada every province as well as the federal government has its own occupational health and safety legislation. The OSH is based on the principle of Internal Responsibility System; where every worker has responsibility for his own as well as co-worker's safety. The Joint Health and Safety Committee is an important aspect of OSH infrastructure in Canada. In Sweden the Swedish Working Life Fund provides grants to employers for the development of better working environment, reforms in work systems and rehabilitation of employees, research and development and information and training. Compensation to an injured worker is paid regardless of blame for the injury. In United Kingdom the "Health and Safety at Work etc. Act 1974" and regulations made therein covers general provisions.

1.11 OHS INFRASTRUCTURE

A. INTERNATIONAL LABOUR ORGANIZATION (ILO)³⁸

India is a founder member of the International Labour Organization (ILO), which came into existence in 1919. At present the ILO has 175 Members. A unique feature of the ILO is its tripartite character. At every level in the Organization, Governments are associated with the two other social partners, namely the workers and employers. India has so far ratified 43 ILO Conventions and 1 Protocol. The unratified Conventions of the ILO will also be reviewed at appropriate intervals in relation to our National laws and practices. It has always been the practice in India that we ratify a Convention when we are fully satisfied that our laws and practices are in conformity with the relevant ILO Convention.

B. National Safety Council³⁹

National Safety Council (NSC) was set up by the Ministry of Labour, Government of India (GOI) on 4th March, 1966 to generate a voluntary movement on Safety, Health and Environment (SHE) at the national level. It is an apex non-profit and tripartite body, headquartered in Navi Mumbai. It works through 18 councils in different states. Its activities include organising and conducting specialised training courses, conferences, seminars & workshops, conducting consultancy studies.

The main objective of Social Accountability 8000 is to provide a standard based on international human rights norms and national labour laws that will protect and empower all personnel associated with a company. Safe and healthy workplace, regular and effective instructions and involvement of workers and trade union are some provisions observed.⁴⁰

D. British Health and Safety at Work etc Act 1974: Salient features

1. It is applicable to all workplaces in all sectors
2. Emphasis on self regulation. People working in organization should practice well.
3. Standard of 'Reasonable practicability' where employer must judge decision regarding OHS at workplace. Flexibility rather than imposing rules. Weigh up seriousness of risk with cost.
4. Written statement of OHS policy should be published by employer having 5 or more employees.

E. The Occupational Safety and Health Act, 1970 (OSHA)

The Occupational Safety and Health Act 1970 is a comprehensive Act to ensure workers and workplace safety for all including manufacturing, service and self employed sectors. The Act also created the National Institute for Occupational Safety and Health (NIOSH) as the research institution. OSHA is a division of the U.S. Department of Labor that oversees the administration of the Act and enforces standards in all 50 states.

F. National Policy on Safety, Health and Environment at Workplace⁴¹

The Government of India has declared a National Policy on Safety, Health and Environment at Workplace on 20th February, 2009.

- (i) It recognizes safe and healthy working environment as a fundamental human right.
- (ii) It aims at enhancing the well-being of the employees and the society at large by eliminating work related injuries and diseases.
- (iii) It enumerates the goals to be achieved and brings into focus the objective of continuous reduction in the incidence of work related injuries and diseases.
- (iv) It describes the action programme with nine key strategies i.e. Enforcement,

Development of National Standards, Compliance, Awareness, Research and Development, Skills Development, Data Collection, Practical Guidance and Incentives.
(v) It also directs to review the H&S situation in India once in five years.

1.12 Occupational Health and Safety Management Systems: Some Studies

Structured approach in OHS is necessary for the identification of hazards, their evaluation and control of risks in the organization. For this purpose Bureau of Indian Standards has formulated IS 18001:2000 Occupational Health and Safety Management Systems an Indian Standard on OH&S management systems. The new OHSAS 18001:2007 is a globally recognized system which provides an organization with a structured approach to planning, implementing and managing. It can be integrated with ISO 9001 and ISO 14001 for environmental management systems.

Health, Safety and Environment are responsibilities related to HRM at organizational level. The workplace level responsibilities of the employer are identifying H&S needs of employees, supervising H&S personnel, promoting safety committee activities, training, managing needs of special employees, recognizing unsafe behaviours and allocation of responsibilities at all level.⁴²

1. Injury and Illness Prevention Program (IIPP) is a proactive process helping employers to identify and locate workplace hazards before workers are hurt. OSHA reports in United States of America IIPP has it lowered injury and illness incidents by 9% to more than 60% in eight states.⁴³

2. Christian Van Stolk et al. (2012)⁴⁴ have explored in their research that the size of establishment, industry and location (country) are the variables most strongly associated with a broader scope of OSH management. The research also revealed that OHSMS declines the work related injuries and related costs, working hours lost and finally improves productivity.

3. “Accident costs are unnecessary and are covered within worker’s compensation” and “Accidents are unexpected and difficult to calculate costs and not worth tracking”. Many researchers challenged these assumptions and proved it is wrong.⁴⁵

4. A study concluded 95% of business executives reported that workplace safety has a positive impact on company's financial performance. 86% felt that workplace safety provides a return on investment.⁴⁶

5. A study in the 58 construction companies in Malaysia revealed the fact that adoption of OHSAS-18001 has reduced accident costs in 81% of companies and 28% of them have increased overall profit.⁴⁷

6. Integrated management system of quality environment, health and risk management as well as corporate responsibilities is workable with cooperative approach of stakeholders.⁴⁸

7. Stress and fatigue, machineries and tools, design of workplace and training have moderate association with workplace accidents.⁴⁹

8. OHSAS 18001 adoption has a positive impact on fashion and textiles-related company's sales performance. Nevertheless, the OHSAS 18001 adoption has a negative impact on the company's 'return on investment' performance.⁵⁰

9. The integration of quality and safety in M/s Shirke Construction Company has resulted into zero accident. Company practices planning of work with discussion, providing required safety equipments, strict implementation of rules and adequate welfare provisions at work site.⁵¹

1.13 PRESENT RESEARCHES IN OHS

Many researches and surveys in the safety management conclude that 80% accidents and injuries are attributed to unsafe human factor and remaining 20% to the technological factors and working conditions.⁵²

The ILO Global Research Agenda covers quality of the job and social security topic.⁵³ Similarly National Studies and Surveys had undertaken by DGFASLI to ascertain the status of working conditions, safety and health in factories and docks. State level eight studies and surveys had undertaken in certain priority areas to ascertain status of SHE at work place.⁵⁴ National Policy of Labour recommends conducting the researches in the field of safety, health and environment at workplace based on the social and psychological factors.⁵⁵

Our research is devoted for finding out implementation of HSW provisions as mentioned in the F.A. and Rules in automobile industry situated in Pimpri Chinchwad Industrial Area.

Many previous researches in abroad are related to measure HSW situation on the basis of risk assessment. In this research we have used 5 point Likert type scale for measuring satisfactions of employees about various Sections in the F.A. In the present study the satisfaction level relates to a group of individuals engaged in any one particular shop (micro level) and in all shops of the company taken together (macro level).

All above referred researches and many others (Kumbhar P.B., 2000; Nor Azimahchew Abdullah et al.; Cheyne A. Oliver, J.M. Thomas Cox, 2002; Dawal S.Zaviah & Taha Zahari,2006; European Foundation, 2007 and 2012; Abuduani Wubuli, 2009; Singh K.K. and Pathak Anita, 2009; A Sabarirajan, T. Maharajan, B. Arun, 2010; Buck Consultants Survey, 2011) **have measured macro level situation of HSW in organizations. The researcher has not yet found a single research measuring micro level situation of HSW in an organization. In this regard this research is unique.**

As per provisions made under BIS-2007, Section 8, the organization shall through appropriate means obtain employee feedback relating to workplace to monitor and measure continual improvement.⁵⁶

1.14 Extract of Research Objectives of This Study

Awareness is a dynamic in function of workers' participation, training, functioning of the safety and welfare department and activities of regulatory structure in the form of committees and communication system. Government machinery is responsible for enforcement of statutory HSW provisions in the factories hence, it is obvious that its efficiency affects significantly on the implementation. The reliability of the research methodology depends upon independence of satisfaction on demographic variables hence the same is proposed to test. The impact of satisfaction as well as HR practices on the accidents/injuries has tested in this study.

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CHAPTER No.2

PROFILE OF AUTOMOBILE INDUSTRY

OBJECTIVES	<ol style="list-style-type: none">1. To introduce the presence of automobile industry in the world and India2. To outline the profile of sample companies3. To present salient features of the location
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2.1 Global Scenario of Automobile Industry

The global auto industry is a key sector for the every major economy in the world. The industry has recorded overall 30% of growth over the past decade. The global automobile demand will continue to raise and auto sales volumes will likely to climb 6% year-on-year in both 2012 & 2013 after rising 4% in 2011. Total global demand for four-wheeler and two-wheeler is 45 million and 43 million units, is expected to increase to 70 and 76 million units respectively by 2020. ¹ Auto industry is also getting a helping hand from increased auto lending across the globe- especially in emerging nations, where loan growth is approaching 40% y-o-y growth. Global auto job growth is 2.0% y-o-y, in BRIC countries job creation in auto industry is 4% y-o-y basis.²

Total Sales	North America	Western Europe	Eastern Europe	Asia	South America	India	China
1.25	0.93	0.82	1.57	2.10	1.89	2.30	2.99
Analysis of given sales							

Worldwide auto industry employs 9 million people directly and about 41 million indirectly. It is observed that the GDP per capita increases with motor vehicle sales (excluding two wheelers). The production contribution of China in global production is 23%, which is about 9% more than that of the both USA and Japan. The majority (78%) of vehicles are cars. General Motors, Volks-wagon, Toyota, Hyundai and Ford are five major auto producer companies in the world. India's Tata Motors (18th), Mahindra (33rd) and Ashok Leyland (49th) are among 50 key auto –makers.

Auto industry is also major innovator in the world, investing over 84 billion Euros in Research and Development and production innovations. It also plays key role in the technology improvement level of the other industries also. The global government revenue contribution is about 400 billion Euros.

2.2 Indian Automobile Industry

Automobile industry is globally one of the largest industries and a key driver of economy. Owing to its deep forward (finance, insurance, oil, roads, after-sale-service, retailing) and backward (Components, basic material) linkages with other sectors in the economy, automobile industry has a strong multiplier effect on the national economy. The salient features of Indian Automobile Industry are⁴:

1. India surpassed France, UK and Italy and became 6th largest vehicle manufacturer.
2. Today it is the largest manufacturer of tractor
3. Second Largest Manufacturer of two wheelers
4. Fifth largest Manufacturer of Commercial Vehicles and
5. Fourth largest Passenger Car market in Asia

With the gradual liberalization of automotive industry since 1991, number of plants and companies has grown progressively. In 1985-1995, entry of Maruti Udyog Limited in passenger car segment with collaboration of Suzuki of Japan made a spectacular impact on this sector. The share of industry in national GDP is around 6.0%. Since 2009-10, 100% FDI is permissible in this sector. Presently there are 54 manufacturers striving in this sector⁵.

As a result of tough competitions, product cycle has become shorter which creates a crowded market place with newer and fresher products. Research and development expenses are rising on account of increasing technological complexity of the product as well as tougher safety and environmental regulations. Innovation and quality are potential issues for car makers. ⁶ The R&D expenses of some world class companies ranges between 3.3% to 5.6% of the sales.

Some Key Factors inhibiting the growth are infrastructural bottlenecks, inadequate availability of skilled labour and pending reforms of labour laws. The opportunities for growth are: Road development, 64% working population, growing consumer culture and rural market growth. However, hardening of interest rates, rising fuel prices, rise in input cost, global competitions, political instability are some risks that auto industry has to face.

Automobile Industry in Maharashtra

Maharashtra accounts for approximately 33% of the country's output of automobile vehicles by value. It is largest base of local OEM players supported by strong vendor base. The automobile industry spread over four major clusters in the states: Pune, Nasik, Aurangabad and Nagpur.

Table 2.2 : Installed Capacity and Investment			
S.N.	Region	Installed Capacity	Investment in Crores
1	India	113.04	82760
2	Maharashtra	18.10 (16% of India)	23350 (28% of India)
3	Sample Companies	12.30 (68% of Maharashtra)	13350 (57% of Maharashtra)
Source: Report of Working Group on Automotive Sector for 12 th Five Year Plan, GOI, pp.14-16			

Pimpri Chinchwad Industrial Area is manufacturing base of following original equipment manufacturers in which this study has conducted.

- A) Premier Limited
- B) Tata Motors
- C) Mahindra Vehicles Manufacturing Company
- D) Force Motors
- E) Bajaj Auto Limited

Profile of sample companies and Pimpri-Chinchwad area based on Annual Reports of year 2004-05 to 2009-10 and information collected are presented in the Appendix-X.⁷

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3.1 OHS MANAGEMENT AND THEORIES

OBJECTIVES	<ol style="list-style-type: none">1. To familiarize with theoretical aspect of safety2. To undertake review of literature about “Awareness”3. To summarize the functioning and efficiency of the government machinery4. To explore the association of demographic variables with satisfaction
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This section tries to explain the overall role of causative factors leading to workplace accidents/injuries. As per Henrich 88% of accidents are due to unsafe acts, 10% are due to unsafe working conditions and only 2% of all accidents are associated with acts of God. OHS management is appropriate application of theories of management for controlling workplace accident/injuries, health hazards, diseases and unfavourable working conditions. It involves assigning roles and responsibilities, enhancing workers’ awareness, auditing, compliance, recording and informing about situation to the stakeholders. It is a continuous and collaborated process of setting objectives, taking corrective actions, measuring performance and integration with other systems.

THEORIES OF ACCIDENT

3.1.1 Definition

Accident is an unplanned, unexpected and uncontrolled event that leads to injure human body or no injury or property damage or both. It may result into disease or even near-miss. It does not need result into bloodshed. From the viewpoint of accident control, incident has equal importance of accident. As per definition of the F.A. when an injured person returns to work immediately or within 48 hours it is called non-reportable accident. Fatal means an accident leading to death within a period of one year from the day of occupational accident; whereas, non-fatal accidents are those accidents which prevent workers from work for 48 hours or more.

Lack of knowledge, skills, commitment, interest, efficient regulatory framework and unsafe work conditions are various causes responsible for accidents or unplanned

events.¹ Safety is the first and foremost concern and foundation of all activities. Safety and man- hour reduction are not contradictory but, the approaches of the two are actually identical.² Wastes, uneven and unreasonable movement results into injury to the worker.

The theories of accidents are based on following four basic axioms:

- 1) All accidents are incidents
- 2) All incidents are not accidents
- 3) All injuries result from accidents and
- 4) All accidents does not result into injury

3.1.2 Theories of Accident Causation

There are several theories of accident causation, each of which has some advisory and prognostic value. Some of these are briefly explained below (Seyyed S. et al.).³

1. Henrich’s Domino Theory

Heinrich highlighted the third domino of unsafe acts or conditions as Key domino. As unsafe acts are 88% responsible for accidents/injuries, HR practices such as training, rules and regulation, awareness, rewards, employee participation, programs, and inspections play key role. The technological solutions improve working conditions contributes only 10%. Heinrich propounded accident proportion as, “Out of 330 accidents due to unsafe actions and conditions, 300 are no injury accidents, 29 are minor injury accidents and one is lost time accident.”

2. Ferrell’s Human Factor Model

Ferrell’s model incorporates multiple causes and being the result of an error by an individual. He recognized general causes of accidents as below:

- 1) The emotional state of the individual such as unmotivated and agitated.
- 2) The physical and educational background, training and even genetics play a part in accident causation. Situational factors such as exposure to drugs, pollutants and job related stressors are also responsible to accidents.

3) The load on the individual which includes the difficulty of the task, the negative or positive effects of the environment (noise, lighting, ventilation etc.) and even the danger level of the task.

3. Peterson's accident/incident model

Peterson believed that there are two major causes of the accidents namely unsafe acts and unsafe working conditions.

4. Multiple causation theory

Each of the cause has its branch back to reach the root cause of the accident. It is also known as 'Fault -Tree-Analysis'.

5. Bird's updated theory

Bird's Accident Ratio is most widely applied in the industry. He gave accident proportion as below:

Fig 3.1.1: Bird's Accident Ratio



This theory emphasizes the higher concentration should be given to near-miss accidents. Takala J.⁴ mentioned the proportion in his presentation: 70000- near miss, 5000- first-aid injuries, 1200 - 1-3 day's absence injuries, 1200- 3 or more day's absence from work and 1 fatal injury.

6. The Swiss Cheese' Model

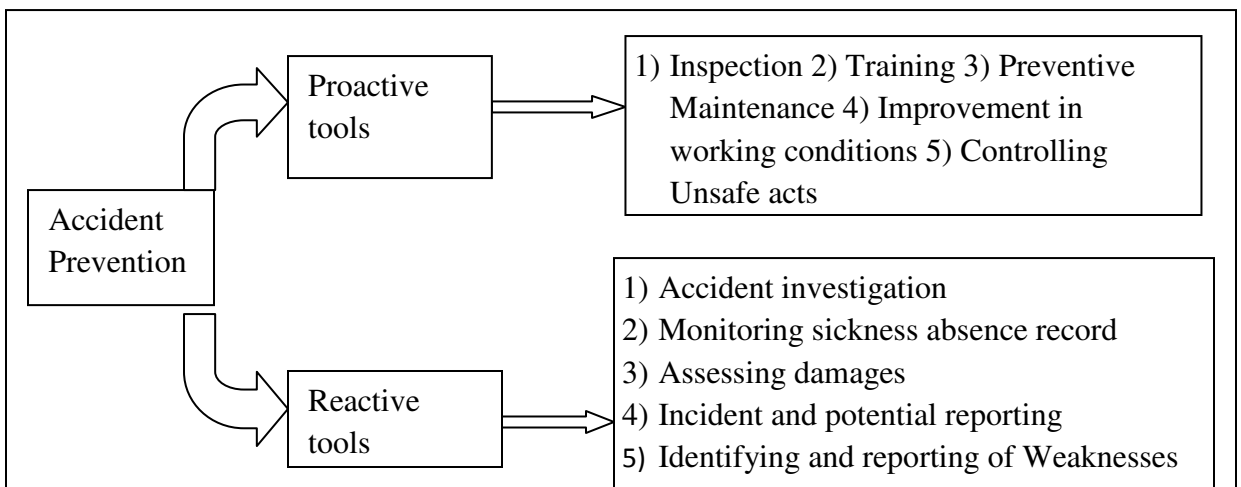
It is developed by James Reason (1970-77). He mentioned that, "with higher level of protection company will not be commercially profitable and if the protection level is less then accidents are susceptible and lose business opportunities. There must be equilibrium for commercial survival of the business".

Accident Prevention

A popular assumption holds that increased investment in safety produces improved safety performance. This relationship shows that accident loss will be reduced when investment in safety is increased. While initial investments have the greatest impact which results in large decrease in accident losses.⁵

For effective accident prevention John Ridely suggests amalgamation of three basic arguments: Legal, humanitarian and economic.⁶ The economic argument has great impact on management and also supports legal and humanitarian argument.

Fig 3.1.2: Accident Prevention Tools



(Figure developed from John Ridely (1986) and Arto Kuusisto (2000))

In this research we have covered all five proactive tools to devise implementation level of HR practices and tried to investigate its relationship with the frequency severity incident (FSI).

3.1.3 HSW from the Perspective of Machine Maintenance

Maintenance keeps machines functioning in safe state and preserves it from failure or decline. Poor repairs, inadequate maintenance can increase the amount of breakdowns which in turn increase the risks associated with equipment failure, personnel accidents and creates unsafe working conditions for operators and public.⁷

A study conducted on safety parameters and maintenance indicates that there is inverse relationship of moderate strength between injury frequency index and maintenance audit score ($\rho = -0.336$). This finding supports the fact that better maintenance (based on audit score) is associated with lower injury.⁸ Thus, improved plant maintenance enhances safety at the workplace.

There are various situations such as inadequate lighting, training and poor equipment design, maintenance, faulty layout and improper tools and operating procedures that may be on account of human error or result of haphazard maintenance procedure or lower level of maintenance level which affect adversely on the safety and system reliability.⁹

Maintenance cost without inspection system will be less than maintenance cost with inspection system plus cost of inspection system up to certain initial period. However, after that it will become vice versa. A study indicates, maintenance cost of an industrial building is 18% and cost of fuel and attendance for lighting and cooling or heating is 30% of the life cycle cost which are associated with H&S of employees.¹⁰

The major repairs, modifications should be based on safety, profitability, environment, capital, time available, payback and operational necessity.¹¹

3.1.4 MEASUREMENT OF SAFETY PERFORMANCE

1. Introduction

The logic 'what that cannot be measured cannot be controlled' is applicable to injury control also. The historical data would be used as a forecasting tool to predict future incident rates given the level of safety intervention activities.¹² Several qualitative and quantitative approaches have identified for assessment of hazards, the final requirement is an honest efforts to fill the gap between 'unknown and known' and then between 'controlled and uncontrolled' situations.¹³

Safety performance criteria are necessary for carrying out comparisons, estimating forecasts, conducting trend analysis, evaluating safety improvement program, identifying problem areas and optimal allocation of resources for improving safety performance. It should possess two characteristics i.e. reliability and validity. Basically

there are two measures of safety performance. The first is based on 'outcome indicators' i.e. Incident Rate, Frequency Rate and Severity Rate which are blamed to be 'negative' or passive measures. Positive or Service or Active Performance Indicators include number of safety audits conducted, training, corrections and inspections.¹⁴

2. Controversies in Approach

A low incidence of injury does not necessarily mean that adequate safety systems and controls are in place. According to Dr. Andrew Hopkins lost time injury rates are entirely unsatisfactory as measures of safety performance for at least three reasons:

1. They are very sensitive to claims and injury management processes
2. Injuries are likely to be due to chance, rather than due to any change in the levels of safety; and
3. They give no information about how well the most serious safety hazards are being managed.¹⁵

Another study by Carder Brooks¹⁶ revealed that recordable events can vary from company to company. Thus there is great deal of variability and places a significant limitation on the reliability of accident counts. Manuele and Peterson have shown that accident counts have been proven to be poor predictor of catastrophic events. The relationship between incidence rates and high probability high consequences events is far from statistical significance.

H&S management should not be limited to the engineering or material changes, but it also take into account personnel, organizational structure and processes. HSE¹⁷ recommends best practice checks: technical adequacy, legal requirement and human factor. The performance shall be measured at initial design phase, after changes and if situation demands. It shall be by direct observation, getting information from people or examining records.

Sullivan Rory¹⁸ states, "Qualitative approach does not necessarily preclude the use of more refined assessment techniques at latter stage. Frequently qualitative risk assessment can be used to have a general indication of the level of the risk and to assist in deciding whether further more detailed studies are required." Its aim is to assist in

determining action priorities. He used five point rating scale which finally resulted into action priorities are given as below.

1. High: Immediate action by management
2. Significant: Management shall develop action plan within six months.
3. Moderate: Management shall develop action plan within twelve months.
4. Low: Revised after next 12 months as no short to medium actions are required.
5. No: Excellent.

According to Stranks Jeremy,¹⁹ H&S review shall be undertaken at a regular interval of 6 months or one year. The key components of performance should be ranked according to their significance based on past accident experience, pending legislations, identified risks and potential areas of loss. He considered the Workplace, People, Procedures/ systems and Environmental factors and welfare facilities for measuring HSW culture. He also recommends using range of measurements techniques to draw conclusion about organization's health and safety culture and the level of performance. Attitude survey endeavor of only workers not necessarily give totally accurate result. It should be combined with senior and line management opinion, commitment, documented risk assessments, safety rules and procedures, work stressors and pressures on individual workers in their task. In this research the underlined areas have covered.

Diekemper & Spartz (D&S) have developed a qualitative model for measuring the level of the efforts applied to control industrial accidents in 1970. This model covered three parts: a) Activity standard b) Rating form and c) Summary sheet to calculate the final activity score. Total 29 OHS activities have covered areas: 1.Organization and administration, 2.Hazard control, 3.Industrial hygiene, 4.Training, motivation & supervisory participation and 5.Accident investigation. All these have rated on a 4-level scale (poor, fair, good and excellent). Method for Industrial Safety and Health Assessment (MISHA) is a newly audit tool developed by Kuusisto.²⁰ It concluded that MISHA will show more reliability among users even if the auditor is untrained. If trained experts are involved then D&S method would be better.²¹

3.1.5 SAFETY OUTCOME INDICATORS

Measures of Safety Outcome

ILO Resolution, 1998²² has recommended four measures for comparison and reporting of safety performance: Frequency Rate (FR), Incident Rate (IR), Severity Rate (SR) and Days lost per new case. As per IS 3786 : 1983 and the ILO Code of Practice of Recording and Notification of Occupational Accidents and Diseases the analysis should be done industry group-wise, cause wise, agency wise, nature of injury wise, location of injury wise, sex and age wise.

The following rates are calculated during the reference time.

(a) **The frequency rate of new cases of occupational injury (FR):**

$$FR = \frac{\text{Number of new cases of occupational injury} \times 1,000,000}{\text{Total number of hours worked by workers}}$$

(b) **The incidence rate of new cases of occupational injury (IR):**

$$IR = \frac{\text{Number of new cases of occupational injury} \times 1,000}{\text{Total number of workers}}$$

Incident indicators have been subjected too much criticism mainly because they are a measure of failure, discouraging the safety in-charge, does not allow extrapolation of trends and conclusions. Underreporting of incident may occur if it connected with some kind of reward for staffs.²³

(c) **The severity rate of new cases of occupational injury (SR):**

$$SR = \frac{\text{Number of days lost in occupational injury} \times 1,000,000}{\text{Total amount of time worked by workers}}$$

Severity can be measured on the basis of compensation i.e. cost in dollar as well as days lost on account of injury. But cost in dollar changes with space, time and also case to case and thus it cannot be considered as a common base. Hence, common parameter 'time lost' is acceptable.

(d) **Days lost per new case of occupational injury:**

Median or mean number of days lost for each new case of occupational injury during the reference period has its own merits and demerits. In our viewpoint for

controlling occupational injury the mean is effective, as it indicates the performance of safety department. Median indicates ‘all is well’ situation.²⁴

(e) Frequency Severity Incidence (FSI):

While comparing safety performance by FR/SR ratio one difficulty may arise that FR may high and SR may low or vice versa. Therefore FR and SR calculated separately do not reflect true picture of the safety performance. FSI calculated by combining both ratios will serve as better tool.

$$FSI = \sqrt{SR \times FR / 1000} .$$

The FSI of foundry may be higher than that of machine shop. In industry it is accepted that value of FSI shall be up to 1. We have taken into consideration FSI as a measure of accident/injury.

(f) Safe-T-Score²⁵

Every factory and shop/block/plant in the same factory has its intrinsic characteristics which exerts different hazardous situation. Hence, its comparison with other plant cannot be justifiable. However, it may be preferred to compare safety performance with its own historical record. Safe-T-Score serves this purpose in order to assess safety performance of middle management.

$$\text{Safe - T - Score} = \frac{[FR(now) - FR(past)]}{\sqrt{\frac{FR(past) \times 1,000,000}{\text{Manhours worked(now)}}}}$$

A positive score indicates inferior whereas negative score is a sign of improved performance over the past. The score ± 2 can be interpreted as variation is insignificant.

Some Sophisticated Measures for calculating Safety Performance Indices

1. Occupational injury/illness cost index
2. Westinghouse Hanford Conduct of Operations Event Index
3. Eastman Kodak safety Performance Index
4. Average of performance Relatives
5. Justification formula developed by Dan Petersen

3.1.6 Rationale behind adoption of FSI Parameter

In the sample organizations under study, mandatory injuries/accident records are well maintained. But, it is not discussed in the safety meetings. In the Com A, C records

of injuries (IR, FR and FSI) are displayed on the notice board. Other companies have displayed the chart in safety department. No single company use ‘sophisticated method’ as mentioned above because of its complex nature and its association with cost. We have considered FSI as a quantitative parameter of HSW (as individual IR/FR do not reflect true picture) which is supposed to be associated with overall satisfaction index. Considering probabilistic nature of injuries it would not be appropriate to take into account FSI of any one year (2010); hence, three years FSI has aggregated. We have assigned weightage of 60:30:10 for year 2011, 2010 and 2009 FSI respectively as there may be higher influence of immediate injury on the satisfaction. Plant of Company C had started its operation in year 2010 hence the weightages 0.70 and 0.30 have assigned for FSI of year 2011 and 2010 respectively. It is proposed that there would be significant negative correlation between HSW satisfaction index and the FSI rates. However, here we have tried to attempt the relationship between the former variable which cannot be measured strictly and the latter one which is quantifiable.

3.1.7 HAZARD ANALYSIS METHODS

Risk control strategies are classified into four main areas: Risk avoidance, Risk retention, Risk transfer and Risk reduction.

Table 3.1.1: Strategies and Types of Decision Under it	
Strategy	Decision
Risk avoidance	1.Decision to replace a hazardous chemical by one with less or no risk potential 2.Change in technology, avoidance of risky activities
Risk retention	The risk is retained in the organization with or without knowledge for which any consequent loss is financed by the company.
Risk transfer	It refers to legal assignment of costs of potential incidents from one party to another party e.g. Insurance against fire and accidents.
Risk reduction	Implementation of loss control programs to protect organizational assets.


Hadden’s 10 strategies are helpful in reducing the damage from all kinds of hazards²⁶; most of these we have considered in evaluating HSW satisfaction index. These are: installing barriers to transfer of energy, restricting speed, separation of machineries,

use of PPE, emergency care, repairs and maintenance and behavioural intervention of employees.

Various hazard analysis methods are developed to study, examine, evaluate, analyze and review the Health and Safety conditions in a plant. A brief account of some has presented below:

1) HAZOP study

The Hazard and Operability (HAZOP) study is a structured and systematic examination of a planned or existing process or operation in order to identify and evaluate problems that may lead risk to person or equipment or prevent their efficient operation. It is process of identifying deviation from normal (safe and planned) operation, its causes and the optimal and agreeable remedial action. As it involves multiple scientific concepts, it is performed by a multidisciplinary team.

S.	Priority	Control	Example
1	Long term	Eliminate hazard at source	Elimination of particular chemical or acts by technological change
2		Reduce hazard at source	Use of specially designed tools or alternative materials
3		Remove employees from hazardous places	Application of robotics, transfer of employees after some period
4		Reduce hazards by enclosure in container	Carrying out painting in booth or closed conduit.
5		Reduce employee's exposure to hazard	Reduce time of contact, change in operation time
6	Short term	Use of PPEs	Compulsion on use of hand gloves or safety goggles while welding

2) Safety Audit

It is an effective tool used for measuring company's safety performance. Auditing is an on-going process which takes into account of different aspects such as company's policies, attitude training, design, layout, operating procedures, emergency plan, PPEs and accident records. The final report of audit recommends action plan for

improvement in safety. Safety audit is not detailed measurement of chemical/physical hazards. It only broadly locates the area where attention is necessary.

3) Job Safety Analysis

It is a procedure to make a job safe by recognizing the hazards or potential accidents associated with each step of the job for safe practices or activities.

4) Hazard Assessment and Evaluation

This assessment takes into account legal, social and economic considerations along with frequency, potential severity and worst possible damage (WPD) that might occur. Hazard Rating = Frequency x (Severity + WPD + Probability). Numerical scales for assessing above parameters should be developed and finally urgency of remedial action is then determined on the basis of hazard rating ranges.

5) Safety Survey

A safety survey is a detailed examination of critical area identified in the safety audit or specific common problem. It is conducted by a team of experts. Its recommendations are for action purpose.

6) Plant Safety Inspections

It is shared responsibility by those concerned – safety offices, line management, senior plant management, first line supervisor, maintenance engineers, safety representatives and workers. There are four types of inspection according to period:

1. Periodic, 2. Intermittent, 3. Continuous and 4. Special.

W. Edwards Deming outlined management theory suggesting 14 point of management in the book ‘Out of the Crisis’. These principles and practices can be directly applied in the successful hazards management. With the permission of author the word ‘quality’ has replaced with ‘safety’ in the following sentences.²⁷

“Only management can initiate improvement in safety. Workers are helpless to change the system. As workers are not making decisions on the subjects such as plant layout, lighting, heating, ventilation, process selection, work methods and materials why should they be held responsible for safety? Safety is a continuous improvement process.”

3.1.8 AWARENESS

Awareness can be defined as: having knowledge, understanding or familiarity with the subject¹ or knowing about situation or fact². It is consciousness about something; opposed to inertness. It manifests in all forms of perceptions and knowing; which is object-specific. A research concluded that employers and employees have different perception of awareness.²⁸ It is an amorphous term with no clear-cut definition in the practice. For the purpose of this research it is “the knowledge about HSW activities in the organization and rules thereof”.

Review of Literature on Awareness

A study²⁹ recommends improvement in information of workers, motivation to use PPEs and continuous training of workers and H&S leaders are primary and cost effective measures which shall be adopted by the employers. Ciochetto Susan’s³⁰ research paper focused on the process of measuring awareness about lead-based hazards. The researcher has used true/false/don’t know scale and analyzed data on the background of education, family income and race. Sudman and Bradburn³¹ suggest that framing a knowledge question in terms of rating scale (soft format) instead of asking direct questions reduces the risk of getting false answer. This is an indirect way but it reduces the number of question and indicates the effort level necessary to achieve higher awareness.

The knowledge about H&S is workplace specific (different in paint and weld shop). Also being its active nature employee should keep abreast and alert through the mechanism of communication to remember and use it when needed.

Ten principles of the Du Pont Corporation, a world leader in the field of Health and safety at work includes:³²

1. Safety awareness does not come naturally – management must teach, motivate and sustain employee’s safety knowledge to eliminate injuries.
2. Management is directly responsible for preventing injuries and illness.
3. It is good business to prevent illness and injuries as it involve high direct and indirect costs.

¹ thefreedictionary.com

² Oxford English Dictionary

PACE³³ awareness training includes broad issues: systems of safety, tackling toxic chemicals, indoor air quality improvement, reducing RSIs (Repetitive Stress Injuries), noise control, and safety committee strengthening. The H&S education and training should enable employees to identify mechanism to eliminate or identify hazards. With this knowledge and information employees become able to interact with management and take active part in OHS management is the ultimate objective of the training. A study³⁴ shows regardless of sector, SMEs in Turkey have flaws in OHS management: 1) Lack of awareness of OHS practices in the company 2) Improper training 3) Not being able to appoint safety representatives 4) Not documentation of health and safety policy.

Court Fiana suggests the five elements to get public participation: 1) Inform, 2) Consult, 3) Involve, 4) Collaborate and 5) Empower.³⁵ This implies employee's participation can be improved through effective communication system which is prerequisite for these elements. Downward as well as upward communication vehicles and formal and informal ways shall be used appropriately.

Michael Salomon³⁶ states that employees' attitude towards dissemination of information appears to be satisfaction within skepticism about the process. It is observed that information given by management of the company is often biased to show only the manager's side (Hussey & Marsh). Majority of employees agreed to believe on other channels of getting information such as grapevine. Minority agreed that management is very frank and honest about giving information. In this case it feels that employee feedback or upward communication are under- utilized. Speak out programs, suggestion schemes and meetings have important role in employee involvement.

The researcher during interviews also observed that many operators had not provided safety training in the last ten years. In another reputed pipe manufacturing company in Pune, engineers having 15 years experience did not have knowledge about functioning of fire extinguishing equipment. The basic reason behind it is a belief that H&S training does not improve economic output. Bendale Shilpa recommends low-cost-solution about communication that virtual HR relies on technology ranging from personal computer to voice response communication systems bring employees into direct contact

with their organization's human resource system more effectively than legacy HR.³⁷ In the manufacturing sector intranet and other IT facility can be professionally used to inform employees and raise their knowledge and awareness at nominal efforts and cost. The same can be used for dissemination of OHS information. OHS information is dynamic and always associated with goals and sub-goals of the organizations. It relates to how information is integrated and delivered. The way in which information is acquired can vary widely between individuals and over the time.³⁸ This is the reason why organizations are using various channels of communication. In the sample companies' notice board information, flex boards, sign boards, instruction boards, posters, meetings, speak-out programs, training, OHS certificate courses, competitions, safety participation award, magazine, leaflets and counseling are used for communication purpose.

The key to achieving a high level of awareness in OHS is effective communication.³⁹ Internal and external resources can be involved for circulation of information at all levels. OHS performance parameters should include, but not be limited to: implementation of OHS policy, risk control measures, lessons learnt from past events, awareness, training, communication, inspection and record keeping. Time spent on improving organization's H&S could provide financial return in terms of reduced accidents and medical expenditure, reduced stress and greater productivity, reduction in likelihood of paying legal costs and compensations.

Mittal A.⁴⁰ has opined practically difficult way of obtaining information: RTI Act should be used as a tool to gather the desired information i.e. related to health effects of particular work, safety procedures and equipments, exposure assessment data, injuries, accidents, workplace sickness, absenteeism, deaths, welfare schemes etc. If not provided by the employer, this can be sought under the RTI Act.

Relating to awareness it has found that the majority 56% of workers have seen health and safety information relating to their job. Knowledge of health and safety matters was gained from their employers- 23%, trade union-22% and safety officer-19%.⁴¹ The questions in this regard have incorporated in the research to know the source of information.

It has noted at the Government level also that increase in awareness on Safety, Health and Environment at workplace through forums consisting of employers' and employees' representatives will result in maximizing gains from the substantial investment. Eventually the impact of increased awareness and information will enhance national productivity. Continuous enhancement in awareness regarding Safety, Health and Environment increase their expectations and reduce hazards; which is the objective of the National policy. Government also recognized that improved safety and Health of workers has a positive impact on productivity, economic and social development.⁴² ILO stressed the importance of developing a communication strategy to raise awareness and inform public about upcoming revisions and its possible impact.⁴³ A study by Kaila H.L. based on 1750 executives and 713 workers in 57 organizations during 1997 to 2009 showed that more than 52% behaviors (at home, work place & on the way) are unsafe.⁴⁴ It also emphasized the need of awareness programs on BBS for management staff at all levels. NHS Employers observed that knowledge about good occupational health practices of medical professionals also is patchy and therefore implementation is poor. Health promotion, education and training strategies are necessary for Government Prosecutors and their staff.⁴⁵ HSE training helps to develop H&S culture, managing better H&S at workplace, imparting skills and knowledge needed for people to do their job in safe and healthy way.⁴⁶

Safety information is dynamic. It changes with time and process. Hence, frequency of training and information shall be maintained. It is observed that majority of organizations do not share OHS related data i.e. accident analysis and IR/FR with the safety committee. Yonsei Safety Information Management System proposes operation in five major subsystems: human knowledge, safety history, process and business information for raising awareness.⁴⁷

3.1.9 Training

Safety training may be divided into two areas: general and specific depending upon type of training to be given. Training should be carried out in following areas.⁴⁸

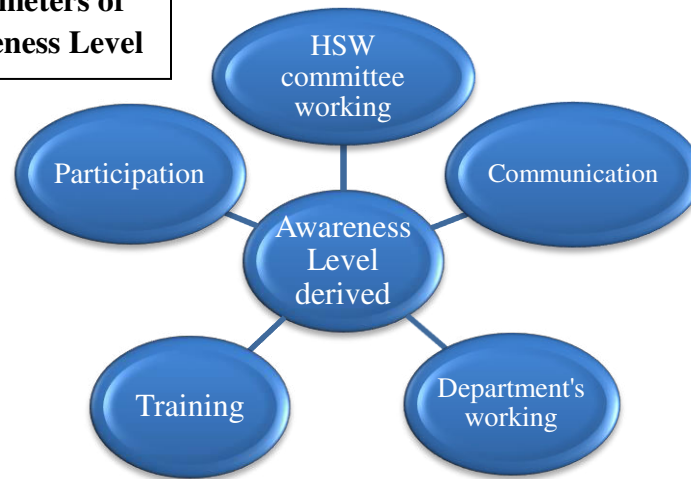
1. Safe system of work for particular operation, 2. First aid training 3. Specific item of plant or equipment training (Driving, press machine operation) 4. Use of PPEs 5. Fire protection training and 6. Safety inspections techniques for identifying risks.

Delivery method of training shall be given importance to have richer mode of communication. Field visits, assignments, conference, seminars and projects should be designed to develop theoretical as well as practical base. The effect of various training method, its practicability and suitability should be taken into consideration before selection of training method.⁴⁹

3.1.10 Summary and Hypothesis No.1

At this moment we have sufficient literature that the awareness level is a dynamic function of the operators' participation, training, functioning of the safety and welfare department and activities of regulatory structure in the form of committees and communication. The question is 'how to measure the awareness level?' The first answer could be by asking them directly: "What extent you are aware with the HSW activities in the company?", "How do you get this information?" and "By whom you get it?" These are direct questions. However, one may rate higher than his/her true awareness to glorify his/her image. This would be self reported level of awareness (*Awr*). 'In a research it is found that self rated knowledge was overestimated by intensive care nurses in New Zealand.'⁵⁰ The awareness level can be derived by combining effectiveness of its components as we have looked into. This would be derived level of awareness (*Awd*) which is the function of following parameters. We feel that, $Awd < Awr$.

Fig 3.1.3: Parameters of Derived Awareness Level



H1: The most of the workers in automobile companies under study are significantly aware about the provisions of Health, Safety and Welfare.

3.1.11 GOVERNMENT MACHINERY – A BRIEF NOTE

Organizational Setup

Director General Factory Advice Service and Labour Institute (DGFASLI) is technical arm of Ministry of Labour and Employment Government of India. It was setup in year 1945 with an objective of advising central and state Governments on the administration of the F.A.1948 and coordinating the factory inspection services in the states. The workforce with the organization comprises of 129 technical officers and 81 technical staff.³

The objective of ‘Safety of Workers in Factories’ has assigned 49% weightage which includes organizing and conducting specialized studies, surveys & audits and technical services with approximately equal weightage.⁵¹

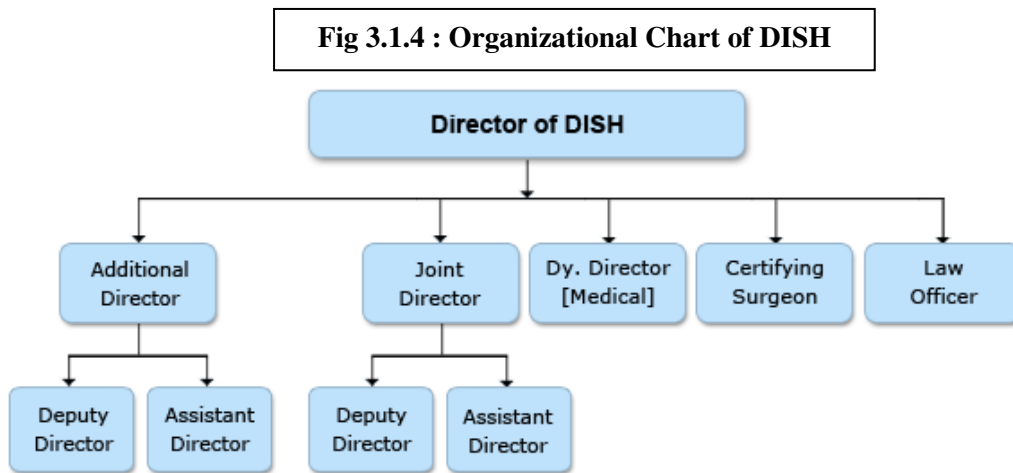
The Central Labour Institute (CLI), Sion, Mumbai is situated in the premises of DGFASLI. The main objective of the institute is to improve work methods and working condition to improve health, safety and productivity of industrial workers. CLI works with the state factory inspectorates, employer’s association, trade unions and professional

³ Official website of Ministry of Labour Maharashtra, Directorate, Industrial Safety and Health, <http://mahashramm.in/dish> and www.dgfasli.com

bodies to deal with the matter. Various divisions with CLI comprises of Industrial safety, Hygiene, Medicine, Physiology, Training, Psychology, Productivity, accident control and Communication.

Directorate of industrial safety and health (DISH) is responsible for the enforcement of HSW provisions mentioned in the F.A and Rules in the factories. The main activities involved to achieve goals of HSW are:

- 1) Privatization of technical services.
- 2) Improvement of awareness among workers and other stakeholders.
- 3) Promoting mutual Aid Response Group (MARG) and
- 4) Disaster management and crisis Group.



Health and Safety Scenario

The office of the Directorate of Industrial Safety and Health (DISH) is situated at Swargate, Pune. As per opinion of the Joint Director they require 10 directors for field inspection and prosecution of cases. However, there are only 3 assistant directorates in charge of 2100 factories registered under the F.A. Presently the directorates are overloaded by four times than the norms.

The department has not provided any instrument to measure various parameters mentioned under various Sections of the F.A. and Rules. As well non-availability of vehicles adds difficulty in inspection work. The nature of inspection is mostly in general, advisory and suggestive and in some cases legal action is taken against the employer. As there is no staff to handle legal cases, directorates have to handle it. Therefore, the inspection work is further hampered and companies are visited at most once in a year.

Total registered factories in Maharashtra state were 43,261 engaging about 20.86 lakh employees including 15% females in year 2011. This is 12% of the factories registered in India and 14% of employment in factories. Maharashtra has highest number of working factories and employment. There are 4944 (about 21% of India) hazardous factories engaging about 2.5 lakh employees.

There are 134 sanctioned posts of factories inspector out of which 67 (50%) are in position and 67 are vacant; this percentage is lower than India's overall percentage (64%) of availability. Factories in Maharashtra are lagging behind in declaration of safety policy, establishment of safety committee, employment of full time medical officer. However, its performance is good in appointment of safety officer and welfare officer, implementation of emergency plan (for major accident and hazardous units) and providing ambulance.

Factories inspections are constantly reducing since 2006. In 2006, 61.5% of units were inspected whereas in 2010, only 30% units were inspected and only 20% factories were inspected in year 2011. Total nonfatal accidents have reduced to 2449 in year 2011; but fatal accidents were fairly stable in this period hovering around 183.⁴

3.1.12 Review of Literature on Government Machinery

In the book '*The Age of Discontinuity*', Drucker advocated privatization on the grounds that the purpose of government was to govern, not to "do", and that the two roles were incompatible.

In the Section 5 of Draft Labour Policy⁵² it is clearly mentioned that, there is dearth of manpower with the department and emphasized an urgent need of right

⁴ Source: Official web site: www.dgfasali.nic.in

deployment of directorates in terms of number, place and need for the next 5 years projections.

An example can be given, while describing policies adopted by the national government on pension reform, cut in social sector expenditure, Nair and Thajudeen argued that government relinquished its constitutional obligations to protect workers by adopting anti-labour and pro-capitalist policies.⁵³ In this department we also see the similar situation.

In the developing countries, poor working conditions are not driven by the lack of regulation but its low compliance on account of mild enforcement from government. When compliance is lower, policy makers are more likely to be confronted with a demand from population to increase enforcement.⁵⁴

Whereas, in Britain also case is not so encouraging as reduction in the expenditure on H&S, left it with fewer resources for inspection visits.⁵⁵

In India, overburdening, lack of skill, old equipment and rampant corruption have lead to poor implementation of legal provisions. There is urgent need to separate H&S provisions from other provisions of the Act and bringing them under one comprehensive Act on the line of OHS Act of USA, HASAWA of UK and WE Act of Denmark. After 60 years of the implementation the Act has remained very poor. It has not been influential in reducing accidents and diseases.⁵⁶

The labour inspection is woefully disregarded in various countries. As found in New Zealand, under-resourcing of the inspectorates limits the ability to ensure workplace accountability for compliance of OHS standards. The general survey on labour inspection 2006 by ILO brought forward that inadequate material and human resources become hurdles in the effective workplace inspection. Insufficient staffing, inadequate transport facilities and equipments and lack of specialization were the common points.⁵⁷ South Africa in its new labour policy had created 1150 new posts of inspector but it had been difficult to fill half of it on account of qualified persons (ILO, 2009 Survey). A study of Sub-Saharan Africa revealed the fact that socio-political situation was largely responsible

for reducing system of labour administration; which resulted into poor performance , lack of considerations for the functions of labour administration and weak motivation of its staff. ⁵⁸

Many studies have argued that inflexible labour laws are largely the reason behind the organized employment remains abysmally low. A 2004-05 survey showed 26 million employed in organized sector against 433 million in the unorganized sector where wages were low and work conditions were bad. Acknowledging that some labour laws have not yielded the desired results, Prime Minister Manmohan Singh said while inaugurating the 43rd session of Indian Labour Conference (Delhi), “There is a need to revisit some of them which have hurt the growth of employment on account of rigidity”⁵⁹

The Government’s responsibilities apart from enactment, in maintaining HSW at workplace are:

- 1) Enforcement of legislation
- 2) Collective agreements between the social partners (management of employees)
- 3) Periodic reviews, inspection, information and advice

The theory behind the legislation is ‘probability of being inspected’ and ‘size of expected penalty’. In developing countries like India the first fear is significantly low and second is manageable. ⁶⁰

Most authorities including industry agree that the employer is fundamentally responsible for controlling and eliminating SHE hazards from the workplace. In the practice, stick of regulatory framework and carrot of self regulation both are equally important. ⁶¹

In Feb-1997, a survey revealed the following facts:⁶²

- 1) 89% of HSE inspectors have given useful or practical advice.
- 2) 94% did not think that inspectors took action over trivial matters.
- 3) 97% thought that HSE control should be based on the risk

Deosthali Hemant has conducted a study in Pune region in 11 Multinational Corporations (MNCs) and 7 Indian Corporations (ICs).⁶³ In this research awareness of

Factories Act provisions among leaders was 27% and 29% in MNCs and ICs respectively. The statistics show some controversial results in case of IC and MNC's response. Factory inspectorate's regularity and usefulness of visits are assessed as below:

Response	MNCs	ICs	Both
Yes	36%	86%	56%
No	64%	14%	44%

Response	Leader's response	Manager's Response
Useful	22%	82%
Not useful	45%	18%
No idea	33%	-

Response	MNCs	ICs	Both
Satisfactory	82%	17%	59%
Unsatisfactory	18%	83%	41%

In case of Indian Corporations the research concluded that Factory Inspectorates' visits were regular but their usefulness in improving the working environment was unsatisfactory. Similarly, managers' response on usefulness of visits was favourable whereas leader's response was unfavourable.

11th Planning Commission of India has mentioned that Labour and Factory Laws had created problems for medium and small scale enterprises units in terms of number of inspections.⁶⁴ Hence they shall be allowed to give option to get their regulatory compliance certified by accredited agencies. Once such certificate has been obtained; the unit would be exempted from routine inspection except on receipt of credible complaints. Accordingly, as per the F.A. Section 2ca competent persons have authorized to do so. There were 188 competent persons authorized in Maharashtra out of which 24 situated in Pune district. At the same time a web of authorized certified surgeons, first-aid-training institutes and expert services has created to assist DISH.

Table 3.1.4: H&S authorized services in Maharashtra and Pune

Particulars	Maharashtra	Pune District
Competent person	188	24
Authorized certified surgeons	103	21
First-aid- training Institutes	10	0
Experts in safety	51	4 (Panvel-15)

3.1.13 Summary and Hypothesis No. 2

Now we intend to assess efficiency of the supervisory mechanism of the government in monitoring the HSW situation in the sample companies which may have gained due to the policy decision of privatization.

H2: The supervisory mechanism of the Government is inefficient to monitor various provisions of the Factories Act relating to Health, Safety and Welfare.

Their efficiency can be measured by asking extent of agreement or disagreement on the 5-point rating scale regarding:

1. Adequacy of the inspections of Government officials to monitor HSW
2. Usefulness of the suggestions given by them
3. Involvement of supervisors and managers during visits

As these questions are not related to workers/operators, manager's and supervisor's opinions are considered to assess the efficiency of Government machinery.

BEHAVIOURAL ASPECT

3.1.14 Subjective Expected Utility (SEU) Theory

This theory introduced by Naumann and Polister is widely employed by many authors to study risk taking behaviours of employees. From the viewpoint of managers, designers and regulating agencies employees' perceptions of the risks are primarily important as they are predictive of behaviours. Karni Edi has shown that whether or not actions are observable by second party, decision makers are aware of the actions they

should take. However, they may not be aware of all relevant effects of actions.⁶⁵ Decision making under risk and uncertainty includes incomplete beliefs. As actions (Choice between alternative) taken by decision makers are based on their beliefs which can be complete or incomplete.⁶⁶ Operators are taking decisions for the use or not use of PPEs and behave in the way of operations which they perceive or believe safe. Further, we feel that basis of their belief or perception can be drawn from training they received and involvement in the activities of the H&S. However, operator's actions may not be strictly the function of their own belief but it may have influence of communication system and regulatory framework existing at the place. Theories of choice of action lie at the very heart of economics; but the data in a study show that choice of behaviour is complex in even very simple contexts.⁶⁷ It necessitates identifying association of the compensation system and health practices in the company with the injury rates.

Risk Homoeostasis Theory (RHT)

It has close connection with SEU theory. As environments are made safer the perceived probability of injury is reduced and thus the expected utility of risk behaviour is increased, it may become self defeating.⁶⁸ Similar result has obtained in a study (N=151) conducted by David DiLillo and George Tremblay in USA, on the backdrop of, '13000 children had unintentional injuries in 1996'.⁶⁹ Mothers who viewed the stimulus materials depicting the use of safety precautions reported significantly higher level of tolerance for risky behaviour on the part of their children than did mothers without the safety precautions. The risk compensation theory states 'If individuals use safety belts, they will drive in a more risky manner than if they do not use safety belts due to increased perception of safety'. However, the experiment failed to prove this theory as perceived risk depends upon individuals to compare the sensation using a safety belt with those not using.⁷⁰ Any system which aims to increase safety on the roads might be less effective as expected or even may lead to more accidents. The greater the engineering effect, the more likely is behavioural adaptation to arise.⁷¹ This emphasizes the need to change in the psychology of operators' (Behaviour Based Safety) alongwith changes in the physical atmosphere. Many researchers (Elton Mayo, Ward Gardener et al. 1975, Petra et al. 2005, Kaila H. L. 2011) have substantiated this proposition.

Incentive system for accident free operation has been shown to be very powerful method for reduction of injury rates. Many studies have observed injury rates reduction ranging from 10 to 90% with the implementation of reward system.⁷²

Implementation level of HR practices relating to HSW = f (Communication, Regulatory framework, Involvement)

FSI is a quantitative measure of injury/accidents and might have significant inverse correlation with the implementation level and also worker's level of satisfaction. The latter are qualitative measures and cannot be strictly quantified.

3.1.15 SATISFACTION

Theoretical Account

Satisfaction word is derived from Latin words 'satis' and 'facere' meaning 'enough' and 'to do' respectively. Hoppock Robert⁷³ theorized that job satisfaction is a worker's physiological, psychological feeling and environmental circumstances that cause a person to say honestly 'I am satisfied with my job'. Employees are able to balance the specific satisfactions with the specific dissatisfactions and arrive at a composite satisfaction with the job as a whole.

According to Locke's 'Discrepancy Theory' satisfaction is an inverse function of the difference between what is expected or desired to what is actually experienced across number of discipline. The dissatisfaction will occur when a person receives less than what he/she expects. Expectancy-reality gap is the perceived gap between what one actually has or receives and what one wants to have.⁷⁴ Job satisfaction is inversely proportional to the differences between the actual outcome the person receives and expected outcome.⁷⁵ Satisfaction represents an attitude rather than behaviour based on expectancy-reality gap.⁷⁶

Job satisfaction is a bi-dimensional concept comprising of intrinsic and extrinsic satisfaction dimensions.⁷⁷ Intrinsic sources of satisfaction depend on the individual characteristics of the person and these are symbolic or qualitative facets of the job. Extrinsic sources of satisfaction are situational and depend on the environment, such as material rewards of a job. Both extrinsic and intrinsic job facets are equally important in a composite measure of overall job satisfaction.

Review of Literature on Satisfaction

High performance work organizations have both direct and indirect effect on the employee's job satisfaction through the indirect effect on non-monetary characteristics such as work related health and occupational accidents.⁷⁸ This indicates the high performance of organizations use HSW as an indirect way to improve employees' satisfaction.

A research based on sample size 885, 44 items to measure satisfaction on 5-point Likert scale revealed that two employee groups with the same job and pay have different level of job satisfaction.⁷⁹ This indicates job satisfaction is psychological element.

The opponent process theory proposed by Landy suggests that the primary reaction through the immediate emotional response combined with the secondary reaction through the afterward emotional response create a stabilized equilibrium which results in job satisfaction.⁸⁰ Thus the responses received from various channels of data collection may be different and the one with the help of questionnaire is more reliable.

The satisfaction level of workers have been a matter of great concern for researchers, industrial managers, Government administrators, the policy makers at the Government level or the decision makers at the corporate level. This is because of the fact that employee's satisfaction level has significant impact on the performance outcomes in long term. The employee- employer relationship is a not only the function of pay but also the conditions under which it is earned. The implementation of HSW provisions has crucial role in determining these relationships.

Dissatisfied employees might choose to maintain performance levels (due to control mechanisms) and neglect to inform supervisors important information over the time that would result in lowering organizational effectiveness or efficiency. In sum, available theory supports the contention that the satisfaction level of employees (as a whole) may relate to performance at the organization level.⁸¹

Employees' overall job satisfaction is on average correlated ($r=0.30$) with their work performance.⁸² Michael Argyle found that the correlation between job satisfaction and productivity was only +0.15 in the more than 100 studies till 1985.⁸³ Eight of these studies produced correlation of +0.44 or above of all supervisory or professional workers while it was below 0.15 in the bottom level. In a study by Petty et al. 1984, the overall

correlation was +0.23, it was +0.31 in supervisors and above and +0.15 in workers. A study by Seoul government substantiates the same result that job satisfaction levels do affect organizational performance.⁸⁴ Despite higher levels of work pressure, employees in self-directed jobs and teamwork found more satisfied⁸⁵; indicating that the conditions under which work has performed are more important than the work load. A study carried out by Karen Sedatole⁸⁶ in Michigan showed that productivity and profits are highly correlated with bonuses to employees whereas penalties lose the trust in supervisor and because of that employees became less productive.

In recent times there has been a convergence of interest on the efforts by organizations to examine conditions that foster greater satisfaction of employees. The basic reasons behind it are first, it is their moral responsibility and second, the behavior of satisfied workers will make positive contribution to the organization.⁸⁷

Marchington Mike et al. divide components of job satisfaction into three levels i.e. high, medium and low. The physical working conditions, immediate boss and employee–manager relationship come under medium level of component. While attention paid to suggestion is low level of component.⁸⁸ A study uncovered the fact that most of men's job satisfaction is affected by working conditions, occupations, type of business and for women it is by wage and working years.⁸⁹

Judith M. Tanur⁹⁰ documented two dimensions of satisfaction the first one is "job satisfaction" (that is, attitudes towards the day-to-day activities in the workplace), and second is "employment satisfaction" (attitudes towards company's broader policies such as those concerning pay and benefits). The former are within the sphere of influence of local management while the latter are not. HSW issues are largely within the sphere of local or plant level management; so we have not included questions in the purview of top management in order to avoid its effect on responses. In the whole questionnaire we have tried to focus respondent's attention on the local issues. This is the reason why question related to 'income level' has placed at the end of the questionnaire.

Leat Mike observed job satisfaction parameters as: sense of achievement, scope for using initiative, influence over job, training, pay, job security, work itself and involvement in decision making.⁹¹ He used incidence of strikes for measuring the 'quality

of employee relation'. However, other quantitative indicators are labour turnover and absenteeism rates. If there no strikes it does not indicate that the relationship is good. Another study concludes, failing to provide safe environment on the job is one of the fastest ways to lose good employees.⁹² It is also found that generic job satisfaction scale is related to various variables external to the workplace. This indicates crises at work may cause disruption at home and later a crisis at home might cause disruption at work.⁹³

Harzbergian pattern of results of satisfaction is due to ego-defensive processes, the result would be defensive attribution or self presentation. Good events are said due to one's own achievement while bad events due to failure. There are more than 249 satisfaction scales developed by various researchers.⁹⁴

Meagan Scott et al., have mentioned various controversial results of influence of age, marital status and education on the job satisfaction.⁹⁵

1. *Age was not related to any of the job satisfaction constructs. This conclusion is consistent with other studies by Andrews, 1990; Cano & Miller, 1992a; Cano & Miller, 1992b; Castillo & Cano, 1999; Castillo et al., 1999. However, several studies have shown a relationship between age and job satisfaction, indicating that older workers are more satisfied with their jobs than younger workers; Berns, 1989; Bowen et al., 1994; Griffin, 1984; Herzberg et al., 1957; Nestor & Leary, 2000.*
2. *Marital status was not related to any of the job satisfaction constructs. This conclusion is consistent with other studies by Herzberg et al., 1957. However, several studies have shown a relationship between marital status and job satisfaction, indicating that married or divorced agents are more satisfied with their jobs than remarried, never married, or widowed agents Bowen et al., 1994; Fetsch & Kennington, 1997.*
3. *Education was not related to any of the job satisfaction constructs.. Other researchers have found this same conclusion by Bowen et al., 1994; Cano & Miller, 1992a; Cano & Miller, 1992b; Castillo & Cano, 1999; Castillo et al., 1999;Griffin, 1984; Herzberg et al., 1957. Even so, some studies do indicate that increasing one's educational level increases his or her level of job satisfaction: Andrews, 1990; Berns, 1989.*

In their own research it is found that age, marital status and education have no significant relationship with job satisfaction.⁹⁶

The research carried out in Turkish pharmaceutical companies (sample size 268) concluded that there is no significant correlation between age and job satisfaction ($r=0.066$, $p<0.05$). There is no positive correlation between income and job satisfaction

($r= 0.106$, $p<0.05$).⁹⁷ Dennis M⁹⁸ in building metal manufacturing company (Sample size=37, Mean age =36.1 years) at Missouri also found that years of employment cannot be used to predict job satisfaction ($r=-0.127$, $p=0.45$). Similarly, age or sex could not be reliable to predict job satisfaction.

“Contingent workers are slightly more satisfied with their jobs than permanent workers. Temporary agency workers are less satisfied than direct hire workers.”⁹⁹ This indicates job satisfaction may have relationship with the nature of the employment. Worsening quality of job and physical health problems may have factors behind satisfaction of permanent workers is closer to that of temporary workers.¹⁰⁰ “Job and environmental factors are significantly related to job satisfaction. The effect of age, work experience and marital status is insignificant on the job satisfaction.”¹⁰¹ Temperature, Humidity, noise and light significantly affect job satisfaction. These are different from company to company hence the satisfaction related to it also change accordingly. Another research in Benin City of Nigeria¹⁰² N=9418 in service sector found that marital status, experience, academic qualification and also relationship with superior officers had no significant effect on the job satisfaction of women in Benin City. Andrew Clerk et al.¹⁰³ concluded the existence of U-shape relationship between age and job satisfaction. This indicates lower the age higher will be job satisfaction, higher the age higher will be the job satisfaction and middle age employees have lower job satisfaction.

3.1.16 Summary and Hypothesis No.3

In the present study we have attempted the satisfaction related to HSW which is an essential and fundamental component of overall job satisfaction. However, our HSW parameters are limited to statutory provisions as mentioned in the F.A. On the basis of above discussion we have considered age, marital status, number of family members, education, work experience in years, nature of service and income in the opening part of the questionnaire which's influence on the satisfaction level has found controversial. Considering HSW parameters as it relate to basic (physiological, safety and biological) needs, it feels that the operator's level of satisfaction would be independent on these demographic variables. High degree of association between demographic variable and

satisfaction level will make the measurement technique invalid and it is difficult to draw inferences about HSW climate based on satisfaction level. Thus, acceptance of this hypothesis would make our study reliable.

H3: Workers' satisfaction related to Health, Safety and Welfare is independent on the demographic variables: age, marital status, number of family members, education level, work-experience, nature of job and income level.

3.2. STATUTORY FRAMEWORK AND HR PRACTICES (HSW)

OBJECTIVES	<ol style="list-style-type: none">1. To enumerate duties of various stakeholders relating to HSW1. To find out the elements of implementation level2. To recognize the significance of statutory Health, Safety and Welfare provisions in Healthy Job Relationship
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3.2.1 THE FACTORIES ACT: A BRIEF VIEW

A brief view of the Factories Act-1948 and Maharashtra Factories Rules, 1963 made thereunder is presented in table form in Appendix-XI for reference. The F.A. came into force on the 1st day of April, 1949. It is distributed over 11 chapters, 120 Sections and 3 schedules.

Schedule I enlists the hazardous industries and processes. In the automobile industry following processes are hazardous.

Sr. No. 3: Foundries- casting & forging, cleaning, smoothing/ roughening by sand or shot blasting,

Sr. No. 14: Painting operation,

Sr. No. 16: Electroplating,

Sr. No. 23. Grinding or glazing of metals and

Sr. No. 24: Manufacturing and handling of Asbestos and its product

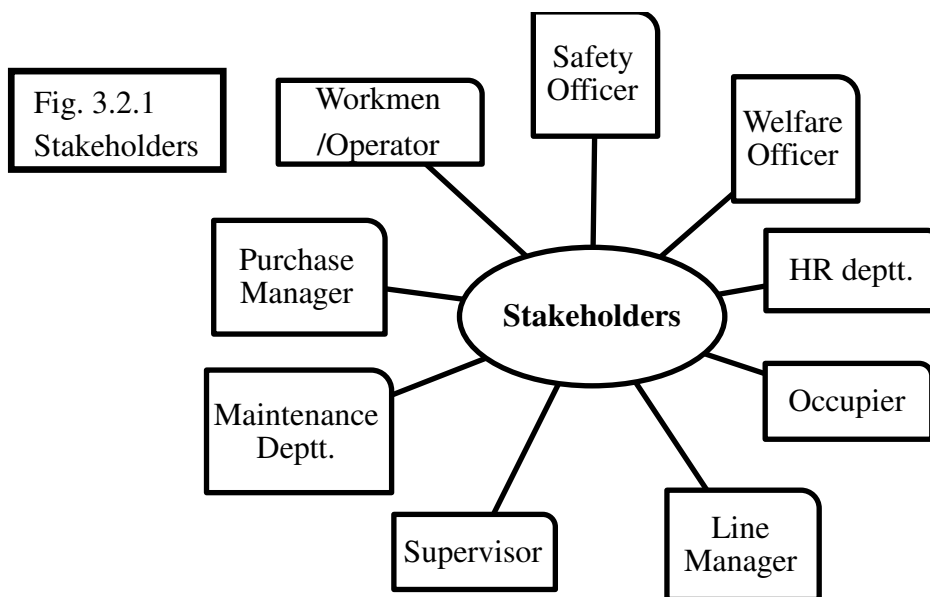
Schedule III gives notified diseases and illness. Some of the diseases relating to automobile industry are Silicosis (12), Oil acne or dermatitis due to mineral oil and its base (18), Asbestosis (20) and Noise induced hearing loss (22).

As per the Act organizations have to submit annual reports in the prescribed format to the Department of Industrial Safety and Health at the end of every calendar year.

As per the Act and Rules thereunder various duties of stakeholders are listed below. Observing these duties at workplace would form a part of HR practices.

3.2.2 DUTIES OF THE STAKEHOLDERS

All employees are responsible for the maintenance of HSW in the premises. Their 100% involvement is necessary for zero accidents. The duties and responsibilities relating to HSW as mentioned in the F.A. of stakeholders namely: Safety Officers, Welfare officers, HR manager, Occupier, Line managers, Supervisors, Maintenance department, Purchase department, Security and workmen are enlisted below. These duties will form the basis for implementation of HR practices relating HSW. In the brackets the variable numbers have mentioned which represent the question.



A) Duties of Safety Officers¹⁰⁴

Safety Officer is responsible for:

1. Planning and organizing effective measures to control injuries (V12);
2. Detailed job safety studies of selected jobs (V12/V13);
3. Examining actions taken or proposed to prevent personal injuries(V12/V13);
4. To ensure quality and supply of PPEs (V22);
5. Carrying out plant safety inspections (V14);
6. Maintenance of physical conditions of work and the work practices and procedures and advice on measures to be adopted for removing the unsafe physical conditions and preventing unsafe actions by workers (V10);

7. Reporting and investigation of industrial accidents and diseases (V15);
8. Investigating selected accidents and dangerous reportable occurrences (V12).
9. Records keeping of accidents, dangerous occurrences and industrial diseases(V12);
10. Establishing and promoting activities of safety committees (V6)
11. Organizing campaigns, competitions, contests to develop interest of workers (V19); and
12. Safety related training and educational programmes (V20).

B) Duties of Welfare Officer Relating to Health, Safety and Welfare¹⁰⁵

1. To bring to the notice of the factory management, the grievances of workers, individual as well as collective, with a view securing their expeditious redress(V2)
2. To advise and assist management in the fulfillment of obligations and to establish liaison with the Factory Inspector and the Medical Service, concerning medical examinations of workers, health records (V21), supervision of safety committee(V6), systematic plant inspection (V14), safety education(V19/V20), investigation of accidents, maternity benefits and workmen's compensation(V7);
3. To encourage formation of safety and welfare committees and supervise (V6);
4. To advise and assist management in making provision for amenities, such as canteens, shelters for rest, crèches, adequate latrine facilities, drinking water (V22),
5. To advice employees for training and education.
6. To define the duties of worker leading to the discipline, safety and protection (V1/V2)

C) Duties of Personnel or Human Resource Managers and Officers¹⁰⁶

- 1) The functioning of medical department (V21).
- 2) Liaison with government authorities with respect to safety and reporting.
- 3) Sending information regarding industrial injuries, accidents and mishaps
- 4) Conducting and documenting periodic employee medical examination (V21).
- 5) Proper placement/ rehabilitation of physically affected or challenged employees.
- 6) Participate in the working of safety committee meetings and in all the industrial relations related safety issues and advice on the desired policy (V5).
- 7) Train a sufficient number of first aides so that a minimum of two well-trained first aides are made available per shift on each of the shop floor units (V20).

- 8) Ensure that the services of a Dispensary Room Attendant, trained first aides and adequate ambulance arrangements are available round the clock (*V21*).
- 9) Ensure that first aid boxes are replenished periodically (*V21*).
- 10) Designing and conducting suitable training programmes (*V20*).
- 11) Ensure that newly recruited employees are trained in safety (*VB10b*).

D) General Duties of the Occupier¹⁰⁷

- (1) To ensure periodically the health, safety and welfare situation of all workers (*Regf*)
- (2) Provision and maintenance of plant and systems for safe working (*Sup + Comp*);
- (3) Risk free use, handling, storage and transport of articles and substances (*Cmn + Regf*);
- (4) Establishing system for information, instruction, training and supervision (*Cmn + Invol*);
- (5) Provision and maintenance of adequate facilities and arrangements (*Sup + Comp*).
- (6) Periodically update the company's safety policy and objectives (*Comp*)

E) Duties of the Line Managers¹⁰⁸

1. Familiarize themselves with provisions in various Acts, Rules policies and procedures.
2. Proper corrective action for non-occurrence of accidents.
3. Review periodic accident reports and implement action plan in order to correct it.
4. Ensure that all machines have provided safety locks, tags and protective measures.
5. Ensure supply of appropriate standards of PPE and observing its usage.
6. Assist in technical aspect of maintenance of H&S at the workplace
7. Promote safety related awareness programs

F) Duties of Supervisors

1. Train each worker how to perform his/her job safely by demonstration. Inform risks associated with job and precautions to be taken in order to eliminate or minimize it.
2. Observe that safety rules and regulations are followed at the workplace and prompt corrective action in case of dishonor.
3. Ensure that rules and regulations are sufficient and in the place for maintaining safety standards.
4. Get trained and familiarize with the statutory compliance to be fulfilled periodically and in case of accidents. Accident investigation and reporting.
5. To ensure the preventive maintenance of machines from safety point of view

6. Take prompt action whenever unsafe working condition and acts are noticed specifically at workplace and in the premises in general
7. Careful inspection of workplace condition from safety point of view and take corrective action to improve the same.

G) Duties of Maintenance Department

1. Maintain the equipments, machines and tools in safe working condition based on their experience and as per demand of line/safety managers.
2. Maintenance of the common protective equipments so as to operate at its full efficiency (V10).
3. Maintenance and repairs of civil structure such as walls, roofs, flooring etc.
4. Preventive maintenance to avoid break downs or situations leading to accidents such as oil leak.
5. Instruct operators about precautions to be taken while operating machines (V4).
Calibration of various measuring equipments.

H) Duties of Purchase/ Material Managers

1. Procurement and maintenance of PPEs and safety wears (V23).
2. Communicate genuine complaints of PPE users to the manufacturers and follow up
3. Ensure quality of machines, materials and spare parts

I) Duties of Security Manager

1. Conduct training on fire safety, rescue operation and fire emergency (V20).
2. Conduct regular demonstration of use of firefighting equipment/ apparatus
3. Strictly observe incoming workers that they have wore safety shoes/aprons.
4. Conduct periodic mock drills to keep fire fighting crew well trained and prepared

J) Duties of Workmen/Operator¹⁰⁹

1. Inform the supervisor in case of any unsafe working condition or unsafe act
2. Undergo prescribed medical examination and tests
3. Participate in safety training programs, contests and suggestions
4. Maintain orderliness at workplace, use and keep provided PPEs safe
5. Use machines, equipments and tools in safe manner and according to instructions
6. To provide feedback on the effectiveness of safety measures implemented

Now, we will take review of Trade union, who has functional role in the implementation of HSW related issues in any organization.

3.2.3 Effect of Trade Union Involvement

A 'Trade Union' means any combination, whether temporary or permanent, formed primarily for the purpose of regulating the relations between workmen and employers. The functions of trade union are important for overall development of workers, organization and society. Following are functions of trade union related to implementation of HSW provisions:

- Improve working and living conditions of workers,
- Provide them educational and training facilities,
- Cooperate and facilitate technological advancement,
- Help them in improving levels of production, discipline and high standard of living
- Promote individual and collective welfare.

However, in public and private sectors casualization of workers becomes a common feature not only in India but all over the world. As casual labours are not unionized; it leads to decline the trade union membership and their activities. Also, new measures adopted by employers to reduce permanent employees are utilization of ancillary units, recruitment of unprotected labours, shifting production units where labour is cheap and unorganized and signing agreement. The number of casual workers has been increasing year by year that is from 22% among the total workers in 1972 to 31.4% during 1999-2000.¹¹⁰ Over the past two decades, the collective human voice view has been challenged as researches broadened to include direct voice mechanism within a variety of non-union settings.¹¹¹ Similarly, multiple unionism is a product of the political desire to increase their influence by establishing unions of their own. It makes industrial relations unstable. As industrial work is characterized as heavy, repetitive and harmful to health, it negatively affects on attitude of employees towards work; hence, presence of union in a factory is important.¹¹²

A study¹¹³ observed responses on “effect of unionization on working conditions in the factory”: 15% said no effect, 37.50% said to ‘a great extent’, while 46.1% said to

some extent. “Whether unionization affects safety measures in the company?” the responses were: to great extent - 39.50%, Some impact - 52.0% and No impact at all - 8.20%. The result of the survey confirmed that unions positively affect working conditions and safety measures in a factory.

The productivity has increased by 20% in unionized organizations over its counterparts non-unionized organizations. Although, available evidence at that time suggested that unionism had reduced profitability.¹¹⁴ Lloyd G et al. found that quit rates were invariably lower among union workers typically by about one third. A study showed that quit rates were above 40% lower in union workers when other things had equal. The lower quit rate can be attributed partly to union voice on working conditions.¹¹⁵

A survey (5-Point Likert Scale) of 1366 major organizations and about 3.30 Lakhs workers conducted by Carmen and Emilio¹¹⁶ concluded that, “higher the trade union influence higher is the rate of absenteeism”. They also found that there was no relationship between trade union influence and training activities in an enterprise. It found in 2007, that 44% of enterprise had no system in place to allow staff to suggest ideas and 58% enterprises had not conducted satisfaction survey of employees about their expectation and satisfaction with working conditions and environment. In 1997, 22% of enterprises had conducted such survey.

3.2.4 HR PRACTICES RELATING TO HSW

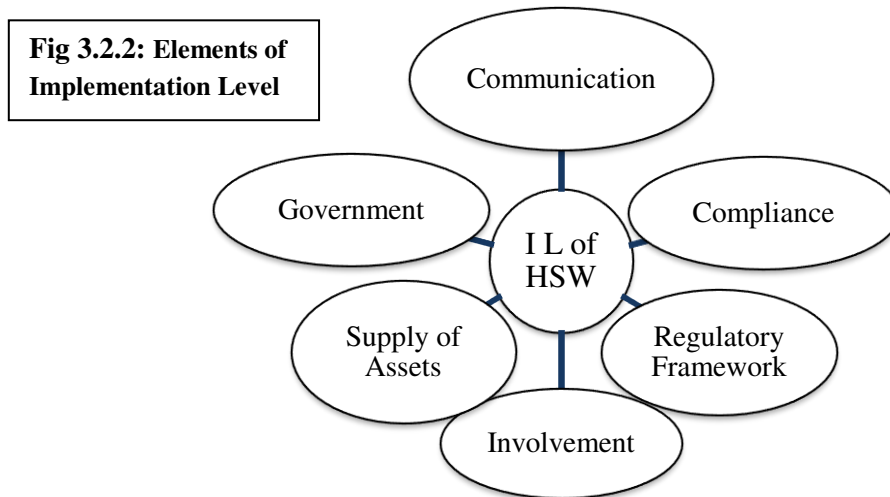
HR Management has to play key role and statutorily responsible for implementation, recording, reporting and compensation of HSW provisions as mentioned in the F.A. On the basis of critical analysis of duties of various functional heads as mentioned above HR practices related to HSW can be categorized into following major classes. The level of implementation of HR practices will be hereafter referred as the “**Implementation Level (I_{level})**” and these classes are referred as “**Elements**”. It can be quantified on the basis of responses of supervisors and managers.

Major classes of HR practices relating to HSW or Elements of Implementation of HSW at Workplace

1. Communication : upward and downward

2. Compliance of suggestions of safety committees
3. Regulatory framework i.e. observation of rules and regulations at workplace
4. Involvement of employees
5. Supply of necessary assets related to HSW

The theoretical review of these has taken in the subsequent sections. The variable number in the bracket indicates the basis of question framed under above elements.



3.2.5 COMMUNICATION

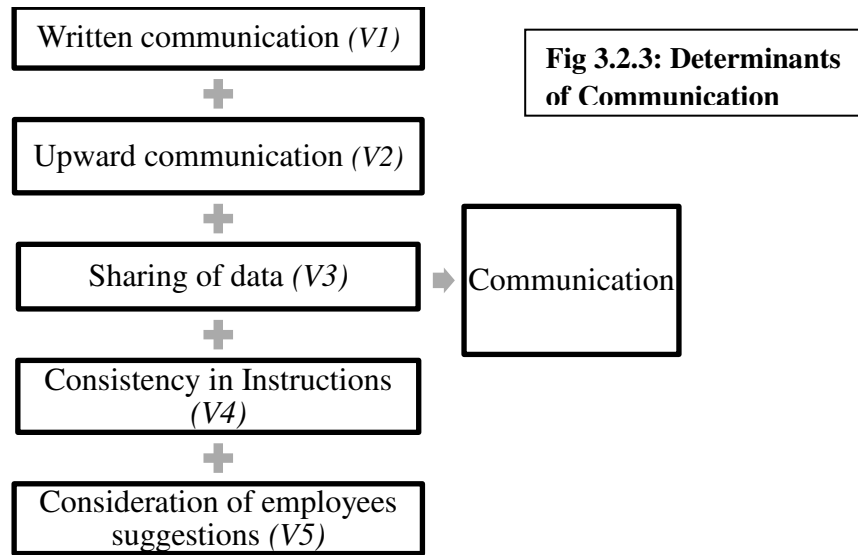
‘Communication represents the very essence of the human condition’, ‘Within the corporate arena, nothing happens in an organization without communication’ and furthermore, ‘Communication lies at the heart of effective management’¹¹⁷ indicate significance of communication in the organization.

The information must be received and understood in the same context and contents. Transmission of message from sender to the receiver who interprets it depends upon the choice of words, the way of interpretation and channel of communication. The ‘media richness theory’ by Daft et al.¹¹⁸ states that the appropriate choice of communication channel (medium) contributes significantly, along with the words, to the success of a message. However, theory of ‘media synchronicity’ proposed that effective communication is influenced by matching the media capabilities to the need of the fundamental communication process and not aggregate collection of these processes.¹¹⁹ Face-to-face communication is not always the richest medium of communication.

OSH performance of a workplace depends entirely on the quality of communication between management and employees. It is 'Right to know' of the employees and on the other hand duty of the management to provide information, instruction, training and supervision to ensure the HSW.¹²⁰ Written arrangement includes notice board, Instructions, Board at workplace, Stickers, Instruction for machine operations, warning signs, posters, News-letter, well displayed safety policy (V1).

Employee suggestion scheme is the formal employee involvement method established by Eastman Kodak in 1898. It was used for the purpose of cost saving and improvement in HSW (V2). Upward communication vehicles include suggestion box or speak-out programs.

Majority of members (66.8%) said that medical records (V3) were not shared with the safety committee¹²¹. The researcher also found that, in company-B, the data about accidents/injuries are displayed on notice board at each shop and are discussed in the quarterly meetings of safety committee. While in other companies it was displayed on the notice board at safety office; but had not been discussed with. The data were displayed in the technical terms which found difficult to understand by workers. Sharing medical reports, injury/accident data with the supervisors, managers and safety representatives, finding out solution and implementing the recommendations is a basic planning process applicable for improvement in H&S at workplace. As its compliance requires substantial investment, we feel that this may be unique reason behind non-sharing. Hence, we feel that sharing (communicating and asking suggestion) is an indication of management's commitment (V5) to improve HSW at workplace. It is prime responsibility of supervisor and manager to issue work specific H&S instructions to the workers. The 80-90% of reasons of injury / accident is assigned to unsafe working conditions and unsafe work behaviours which can be changed with consistent instructions (V4). The summary of the above discussion has displayed in the following figure.



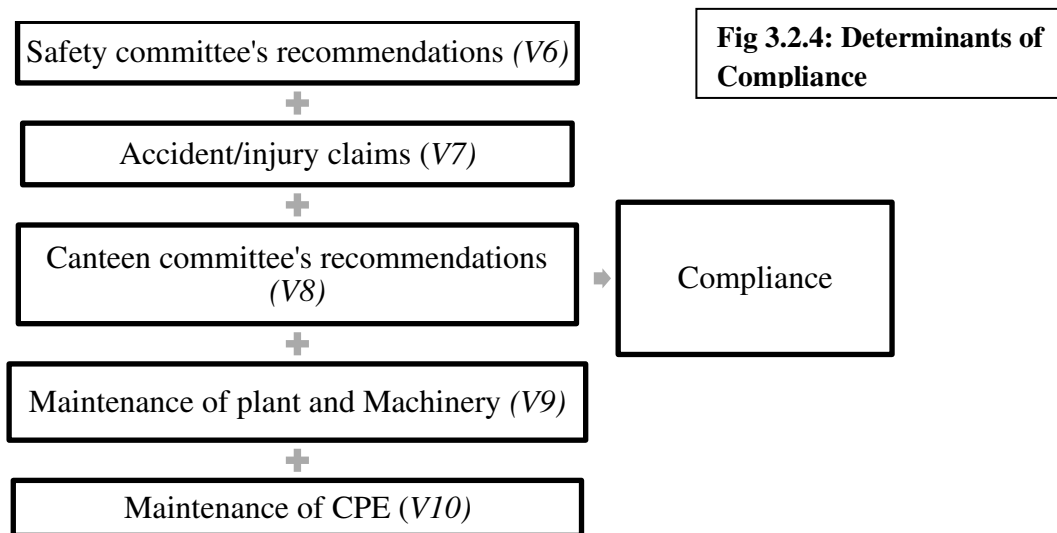
3.2.6 COMPLIANCE

The dictionary meaning of ‘compliance’ is the act of complying with a wish, request or demand. It is ‘Acting according to certain standards’ or ‘action taken in conformity with law, custom or practice’.¹²² In the context of our subject it is fulfillment of statutory compliance and demands, suggestions or recommendations came up through the regulatory framework in an organization.

Safety Committee is a responsible body dealing with H&S situation in an organization. However, it is often criticized as ‘Tea-biscuit party’ among the workers’ community.¹²³ Its effectiveness shall be improved by educating, involving members in the decision-making and considering their recommendations for implementation (V6).

Accident/injury claims shall be settled appropriately and in time on the statutory and humanistic ground (V7). It will create good image of the management in the minds of the employees and they may remain committed with the organizational goals. Another, canteen is a very sensitive issue among general welfare policies, the quality of the canteen facility and amount of subsidy are most likely to affect relationships. Even minor issues relating to canteen are taken by people very personally. The joint committee shall be established to monitor functioning of the canteen (V8). Many researches showed that contract-run-canteen had provided substandard food quality (Jerome Joseph 1991, M. S. Krishnan, 1991, Gartenberg Indira and Bandekar Supriya, 2011).¹²⁴

For creating healthy and safe environment the maintenance of plant and machinery (V9) shall be done optimally. As many researchers have found there is significant inverse relationship between machine maintenance scores and accident/injury rates (Steve Mason, 1995, Paul S. Ray et al, August 2000, B.S. Dhillon et al., 2006).¹²⁵ Similarly, common protective equipments such as fans and blowers shall be properly maintained to operate at its full efficiency (V10). These equipments create internal physical environment and convenience for ease in carrying out work and to have richer life at workplace, which must be maintained at an acceptable level (The F.A. Section 11-20). The following figure shows items included in the compliance.

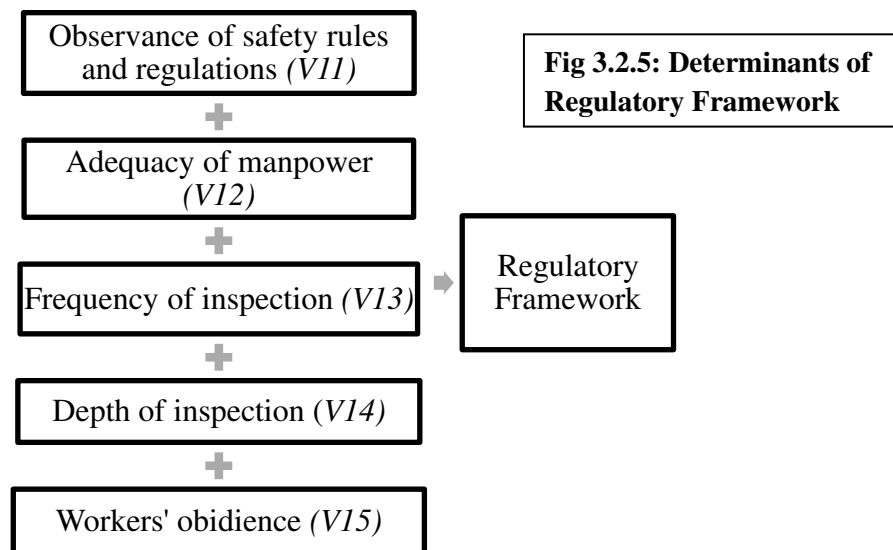


3.2.7 REGULATORY FRAMEWORK

Mere provision of equipment and compliance are not sufficient, but unsafe behaviours of employees should be controlled for achieving better safety performance. Rules and regulations in the company shall be adequate and specific to the work. Also, it shall be strictly monitored by the management people or authorized person or any other employee who notice it (V11). Safety is everybody's responsibility; it requires 100% involvement of employees. As per F.A. safety officers shall be appointed by the concern factories wherein 1000 workers are ordinarily employed. Our sample Company- A and E had no safety officers. Due to resignation of the first, it was vacant for more than one year. Since then personnel manager was in-charge of the safety. While other companies (B, C & D) have separate Safety Department with adequate manpower (V12).

Experienced safety professionals needed for full time as achieving H&S at work place is a complex, multidisciplinary and continuous activity.¹²⁶

Again, mere number of safety officers available with a company is not sufficient; they must be given adequate responsibility and power to have effective functioning. For this, questions based on frequency of inspection (VI3), depth of inspection (VI4) which also shall include inspection reporting have incorporated. Workers' obedience and respectful behaviour to the rules and instructions of superiors (VI5) is the key factor determining a situation of regulatory framework in the organization. The following figure shows the summary.



3.2.8 INVOLVEMENT

Employee involvement (EI) is a term which refers to process of enhancement in individual's attachment to both organizations and their jobs.¹²⁷ As employees are far from organizational goals; it is a practice to aware them about presently why and in the future what they will have to do. Achieving workplace related HSW goals is not only impracticable but impossible without active involvement of employees (VI6). EI includes those practices which have initiated principally by management for the purpose of improvement in knowledge and commitment to work.¹²⁸ In the other words EI is providing knowledge and motivating workers to strive for attainment of goal.¹²⁹ Participation in important group decision, contribution to group performance and sharing

award of group accomplishment is social involvement and we feel that it is latent motive. Hence, internal motivation and job involvement can be alternative sources of meaning and identity (N=500).¹³⁰

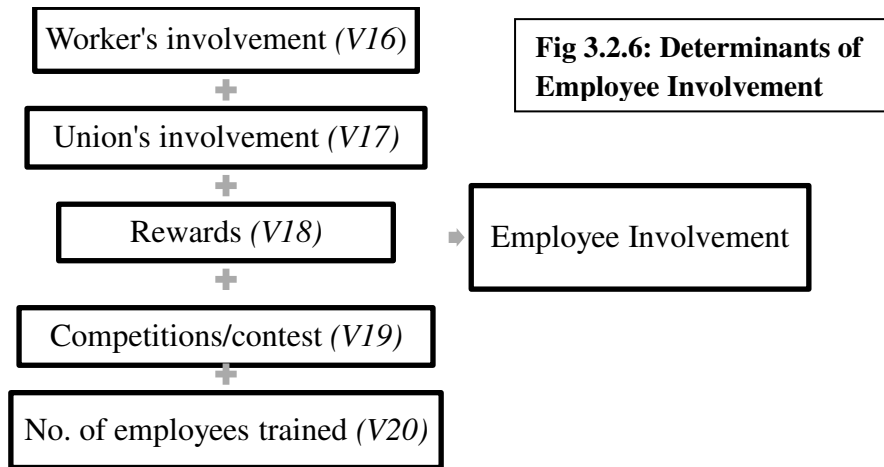
Maximizing employee involvement/engagement is fourth main objectives of the HR function. The first three are: 1) Recruitment/retention 2) Developing competencies and 3) Developing the way of performance management.¹³¹ Involvement consists of a range of processes designed to engage the support, understanding and contribution of all employees in an organization with their commitment to achieve goals whereas, participation is a process of employee involvement. Involvement is an individualistic and unitarist concept; whereas participation is pluralist/collective concept.¹³² EI practices involve sharing of powers, information, knowledge through training (V20) and rewards for performance. We have considered training and rewards as determinants for assessment of EI. Lawler and Ledford¹³³ have found that “Employee Involvement and TQM can be highly influenced by innovative reward practices (V18)”. Joel Light¹³⁴ has considered the same four determinants for defining EI in his Ph.D. thesis. He concluded that, Employee involvement is related to employee empowerment, which is ultimately related to employee satisfaction. It also depends on information and power.

A study¹³⁵ conducted in service and manufacturing organizations in Ghana (N=500) concluded that management should involve employees in decision making on matters which affect the workers and organization as a whole. It is also emphasized that unions should be involved to improve participation of their members (V17). Where unions were weak or not in existence workers found it difficult to consult with management on their concerns. In our case the union situation has found diverse in each case. Hence, it feels that the level of EI could have impact of unionization. In the above study about 54% of respondents indicated that performance improvement was high when workers were involved in decision making. In another report it was concluded that, majority of safety committee members belong to some trade union (69.2%)¹³⁶, this indicates that unions play a major role in the formation and functioning of H & S in an organization.

Etzioni¹³⁷ proposed different types of involvement: moral, calculative and alienation. Individuals are morally involved, if they accept and identify with organizational goals; Calculatively involved, if an individual perceives an exchange agreement with the organization. Alienated Involvement is adopted when there is negative feelings and attachments with organization. In this regard we feel that, provision of HSW at workplace is statutory obligation hence employees shall be involved morally. Also management may involve employees with prior knowledge of their expectations. Finally, as improvement in HSW improves living standard of employees hence it may reduce negative feeling.

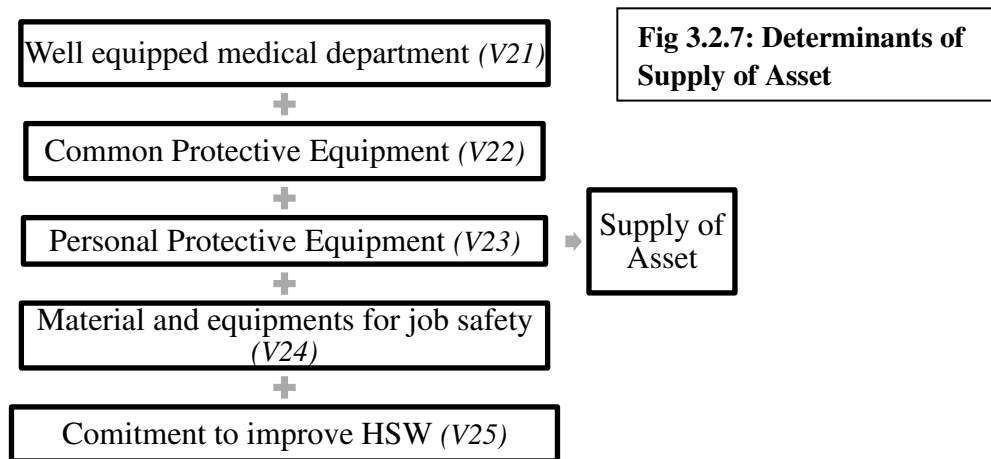
Berry Skip¹³⁸ found that employees' suggestion had resulted into cost reduction, improved safety and greater production efficiency in few medium sized firms. Rewards improved employee involvement (*V18*). Hence, it may be analogous in large automobile organizations also. In another study of 56 companies over a period of 3 to 15 years, it is affirmed that initiating participation can bring significant improvement.¹³⁹

A study of first-line supervisors' responses to employee involvement programs shows that although 72% of the supervisors saw the programs as good for the company and 60% saw them as good for employees, only 31% saw them as good for themselves. Managers should pay attention to these findings because the programs need the support of supervisors if they are to succeed.¹⁴⁰ Non-management and non-executive employees have expertise that through involvement process it can be exploited. Supervisor also have vital role in the delivery of the HSW services to the employees. On the basis of above literature we define the involvement as below:



3.2.9 SUPPLY OF NECESSARY ASSET RELATED TO HSW

Supply of adequate facilities, equipments and tools for HSW is responsibility of management. It requires huge capital investment, which shall be taken as a part of the primary cost and not additional cost.¹⁴¹ As per insights into duties of occupier and safety officer, Supply of Asset for Health and Safety of employees can be conveniently classified into following five categories. **It is assumed that supply of these alongwith commitments to supply additional if any required in future for ensuring H&S of employees at workplace will determine the ‘Supply of Asset’.**



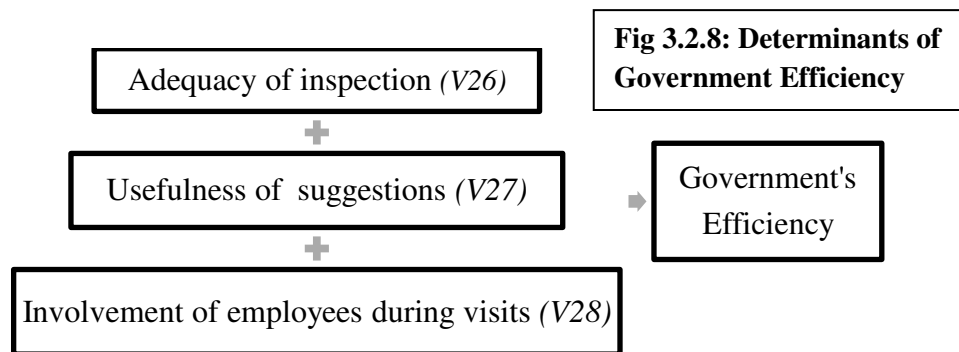
3.2.10 Efficiency of Government Machinery

In the literature review we have taken detailed account of government machinery and it is found prima fascia that the inadequate manpower and resources have reduced its efficiency. However computerization, self certification, privatization and new policies

may have resulted into improvement of their efficiency. Following table represents the researchers and their findings in brief regarding efficiency of Government machinery. We hereby assume that efficient government machinery will influence on enforcement of HSW provisions at higher level which will affect on the satisfaction level of employees.

Table 3.2.1: Various Findings about efficiency of Government machinery	
Researchers	Findings in Brief
Deosthali Hemant, 1993	Factory inspector's visits were regular (56%) and useful (86%)
Patel Jagdish, 1999	Inefficient staff and inadequate resources
Beck, M. and Woolfson, C. , 2000	Governments curbed the expenditure on H&S leaving it with fewer resources for inspection visits.
Nair V. Surendran and S. Thajudeen, 2007	National government has been adopting anti-labour and pro-capitalist policies
Ronkoni Lucas, 2010	Mild enforcement from government resulted into low compliance
Kaila H.L., 2011	89% of HSE inspectors have useful or practical advice (in India)- Feb. 1997 massive survey report.
A. Phillippe ,2011	Inadequate resources and manpower lowered visits of factory inspectorates (ILO survey)
Source: Ch. Review of Literature, Section 3.1.12	

The efficiency of the Government machinery has assessed on the basis of supervisors' and managers' responses on the following area.



3.2.11 Discussion and Hypothesis No. 4

Unsafe acts and unsafe working conditions are mostly responsible for near miss which leads to the accidents/injuries. Hence, the protective measures of improvement in HSW related services such as inspection, training, maintenance, improvement in working condition and reduction in unsafe acts will reduce occurrence of accidents and injuries. The elements of implementation of HR practices: Communication, Compliance,

Regulatory framework, Involvement and Supply of assets and government intervention are key factors to control the accidents.

Dikemper and Spartz, 1970; Stranks Jeremy, Philip and Lynda, Sullivan Rory have suggested and many researchers as mentioned in the research methodology have adopted qualitative Likert type scale for the measurement of working condition. We have measured the employees satisfaction related to HSW situation at the workplace as mentioned in the F.A. One or two representative questions based on applicable Sections of the F.A. have framed which will represent the concerned Section. Satisfaction to this is assumed as satisfaction to towards whole section. It feels that there may have positive relationship between satisfaction level and implementation of HR practices or in other words employees' satisfaction relating to HSW can be maneuvered by parameters regulating to it. Further we are interested in finding out the effect of higher satisfaction level and implementation level on the accidents/injuries. It is again mentioned that for measuring accident/injuries we have taken into account FSI (frequency severity incident).

Here we state the hypothesis:

H4a: The shop specific satisfaction level of employees depends upon implementation of HR practices relating to HSW.

H4b: Lower level of satisfaction relating to HSW results into higher accidents/injuries.

H4c: Lower level of implementation of HR practices relating to HSW results into higher accidents/injuries.

Now, we will take review of safety committee which is statutorily established bipartite body in the organization.

3.2.12 Safety Committee

ILO conventions 155 and 161 emphasize workers' active participation through the operation of occupational safety committees. In every factory, wherein 250 or more

workers are ordinarily employed or which carries any dangerous or hazardous process or operation (under section 87 and 2 (cb) of the Act) and employs more than 50 workers; there shall be a Safety committee. The workers' representative on this Committee shall be elected. It is a bipartite body of not more than 12 members, comprising equal representatives from management and workers (Clause 41.4). The tenure of the committee shall be two year. The specific provisions in the Act are:

1) Safety Committee shall meet as often necessary but at least once in every quarter. The minutes of the meeting shall be produced to the inspector on demand.

2) Functions and duties of the Safety Committee shall include: assisting and cooperating with management in achieving safety goals, helping to arrive practicable solutions to problems encountered, creating awareness, undertaking H&S promotional activities and survey and looking into complaints.

Effective safety committees provide one of the best means for ensuring occupational safety at workplace. Other steps are award/reward for suggestions received from workmen, contests and campaigns on safety related subjects. **Raising awareness among workers is the first step for improvement of OHS hazards followed by reducing unsafe work practices and conditions.**¹⁴² For effective working of safety committee there should be free communication between management and committee and between committee and employees; speedy implementation of the committee's recommendations and involvement of supervisor.¹⁴³

Greater employee participation has the potential to deliver benefits for employees, employers, nationwide economies and the social fabric of the union as a whole.¹⁴⁴ As per a research published by GOI and ILO in 1999, management consults on safety issues with the members- frequently (58.5%), occasionally (34.5%), Never (2.4%), Not available (4.6%). Involvement of safety committee in risk assessment was satisfactory (66.8%). However, a majority of members (66.8%) said that medical records were not shared with the committee.¹⁴⁵ In case of safety committees in all the 11 major ports factors responsible for underdevelopment were: lack of clarity of roles, goals and awareness of members regarding HSW and environmental related issues¹⁴⁶.

Locally practicable improvements in the multiple technical areas can be resolved by using participatory methods and trainings.¹⁴⁷ As safety is not merely concept or a practice but a tool for recognizing the dignity and beauty of human life. Hence, active participation of workers in H&S management programmes is not only essential but key success element of any enterprise.¹⁴⁸

3.2.13 Towards Healthy Job Relationship

Higher level of implementation of HSW provisions would lead to higher level of workers' satisfaction; which would go a long way for the betterment of job environment in any setting. On the basis of interrelatedness of the elements of implementation, satisfaction and healthy relationship we hereby state the following hypothesis and the theoretical explanation in the subsequent section.

H5: Higher level of implementation of provisions related to Health, Safety and Welfare would lead to form a basis for healthy job relationship.

Definitions

Health is a complete physical, mental and social well-being and not mere an absence of disease. Safety is the state of being protected against physical, social, spiritual, financial, psychological, or other types or consequences of failure, error, accidents, or harm. Welfare is a multi-dimensional, socio-economic, time and space specific concept. It includes all statutory and non-statutory activities in the well-being of the employees.

According to the WHO, a healthy workplace is one where workers and managers collaborate to use a continual improvement process to protect and promote the health, safety and well-being of workers based on identified needs and considering the following:¹⁴⁹

- Health and safety concerns in the physical work environment;
- Health, safety and well-being concerns in the psychosocial work environment
- Personal health resources in the workplace; and
- Ways of participating in the community to improve the health of workers, their families and other members of the community.

In our hypothesis the word ‘job’ refers to ‘day-to-day activities at the workplace’ and the ‘relationship’ is ‘between workers and supervisors/managers’.

Elements of sound industrial relation system from the perspectives of HRM policies and practices are: Employee involvement/participation, Communication, quality of working life (health and safety and job satisfaction) and training. Effect of lower health and safety and job satisfaction is absenteeism, grievances and quits.¹⁵⁰ This can be regarded as symptom of unhealthy industrial relation.

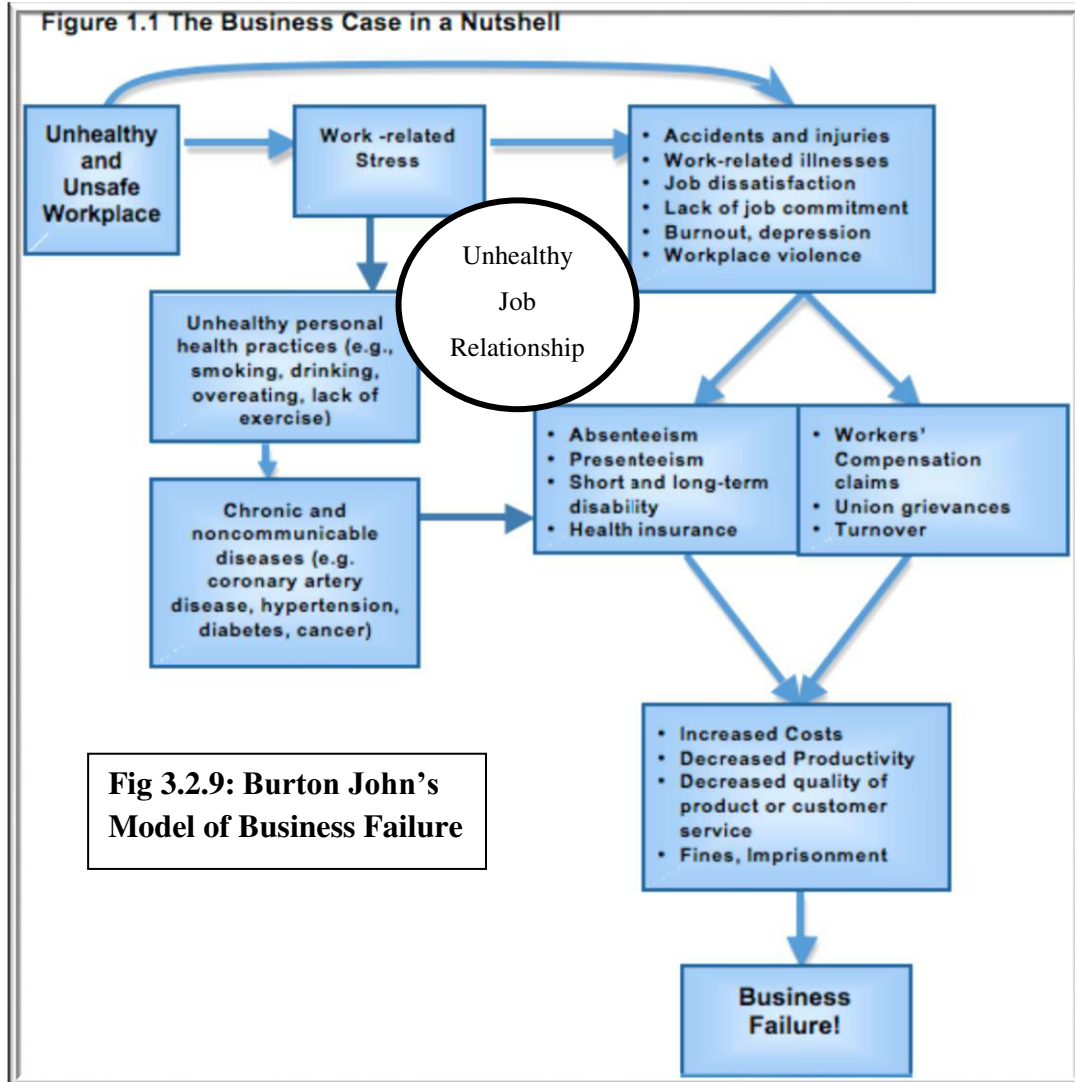
Healthy relationship can be viewed at individual level, group level and organizational level. At individual level it is feeling, opinions or experience about object, practice or environment. The degree of relationship can be evaluated on the basis of their opinion on the elements of healthy relationship. At group level it is fairness of interactions between two departments or groups such as maintenance and production department; it is based on fulfillment of needs. At organizational level it is assessed with the application of policies and procedures of HRM that affecting on majority of employees. At all levels trust, mutual respect, mindfulness, welcoming diversity and open communication are elements of good relationship. Here, we feel that communication is the starting point.

3.3.14 Theoretical Construct Supporting Hypothesis No. 5

1. Primary objective of the labour-management relations is to bring out good and healthy relation between labour and management. Any accident/injury to the operators stops the work suddenly; coworkers move towards the injured person. This adversely affects on the production where management people are not in position to resume the work. It creates high dissatisfaction, blaming and may also erupt violence at the workplace.
2. OHS is a continuous process of coordinated efforts of all stakeholders through the mechanism of communication and implementation. It is not merely absence of disease or injury (WHO). Occupational health service is a practice and preventive service rather than a treatment service aiming to prevent occupational ill health and injury by hazard identification, risk assessment, elimination or control and audit with

- effectiveness. It requires coordination, communication and commitment of the top management.
3. Statutory HSW provisions are related to satisfy basic needs and improve quality of work life of employees. Though it cannot be completely fulfilled, its absence or lower level would result into dissatisfaction. Motivation theories state that HSW provisions are basic physiological needs (Maslow), hygienic factors (Herzberg) and supported on the ground of equity theory (J. S. Adam).
 4. Dependency theory emphasizes human as an invaluable resource and any investment in the maintenance of the human capital shall not be assumed as 'costs' but 'returnable investments'. Higher level implementation of HSW provisions at workplace is returnable investment as it improves efficiency and contributes to improvement in production and productivity in long term.
 5. Placating theory of welfare assumes inadequate welfare measures will make the workers to unite and become troublesome. Welfare measures are provided in order to keep them peaceful and concentrate into their job. Health and safety are also covered under broad perspective of welfare (Giri V.V., Murthy M.V.). Hence, adequate HSW measures will appease workers; which would improve their moral and further benefits the organization as a whole.
 6. Theories of accident causation concludes that human part is responsible for more than 80% of injuries and accidents; hence training, rewards, employee participation, inspection, obeying rules & regulations and awareness improvement should be given high importance. If 'zero accident' is the objective then 100% involvement of employees is the necessary requirement. As per Ferrell's human factor theory, accident/injury is result of an error by an individual; hence, it needs high level of participation. The HSW sections of the F.A. are applicable to all employees irrespective to their nature of employment.
 7. Failure to comply H&S procedures and breaches to comply company's policy or law will adversely impact on the employment relationships.¹⁵¹ Obeying company's policies or superiors' instruction is duty of workers. It shows respectful behaviours which develops healthy relationship between workers and management people.

8. Interdependence is a foundation of relationship between workers and employers. It demands cooperation based on mutual understanding from both sides. If employer is making unjustified advantage of workers' inabilities then performance improvement, work commitment and creativity which are essential elements of any successful business cannot be expected from them. Workplace well-being and performance are dependent and are complementary and dependent component of a financially and psychologically healthy workplace.¹⁵²
9. Worker's protection is intrinsically associated with employment relationship. As it covers wide range of statutory, business, human, financial and psychological factors its adverse consequences are lack of productivity, injuries and accidents, environmental risks and financial loss.¹⁵³ Implementation of HSW provisions as it looked from statutory requirement, it significantly influence on business, human, financial and psychological factors also. All these factors are inclusive and not exist in isolation. Its affects adversely not only on healthy job relationship but whole business also.
10. The following business case given by Burton John¹⁵⁴ shows how the lower level of implementation of health and safety would lead to business failure. The unhealthy and unsafe workplace in the primary stage is responsible for various factors which adversely affects on the healthy job relationship. Hence, we have inserted unhealthy relationship oval in the diagram.

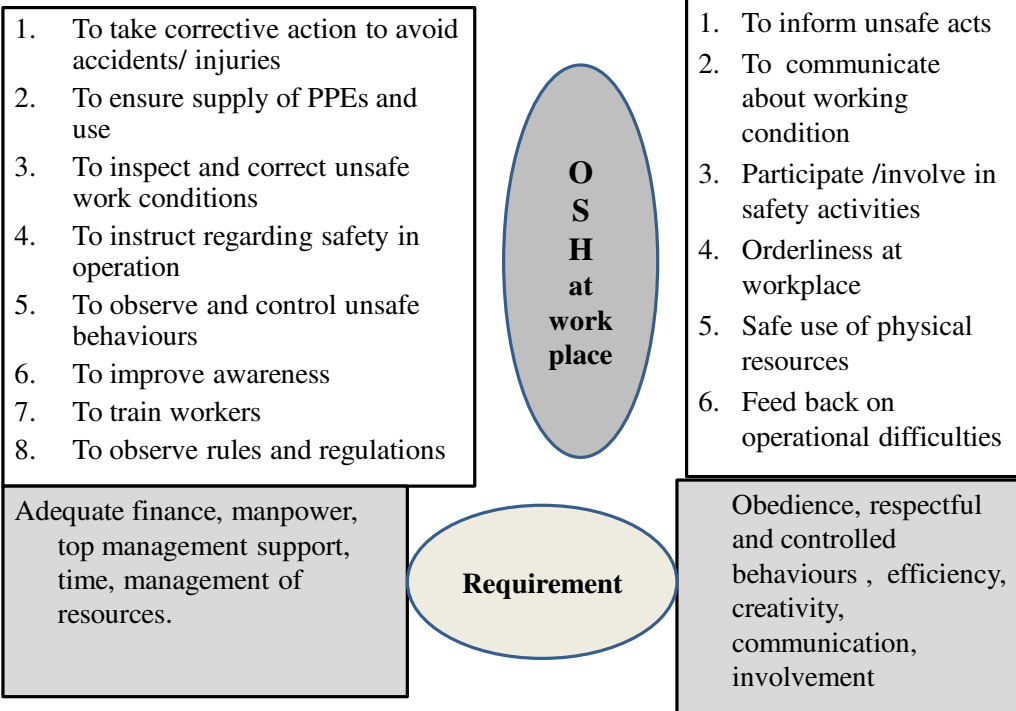


The ultimate goal of business is to produce socially beneficial products or offer services. The supervisor/manager is a person who instructs, directs and controls workers to performance their duties. In the execution of these roles both groups have some responsibilities. The mutual understanding, cooperation, communication and commitment thus become crucial part of the business. If there is any lacuna in the fulfillment of the necessary requirement from management side on account of finance, manpower, top management support, time and management of resources, it will create stress and its recurrence eventually tends to unhealthy relationship between management and workers. The following figure explains their H&S related responsibilities and requirements for the both groups.

Fig 3.2.10 : Health and Safety related Responsibilities

Supervisors / Managers

Operators /Workers



3.3 REVIEWS OF PREVIOUS RESEARCHES AND FINDINGS

OBJECTIVES	1. To review the previous researches relating to specific provisions of Health, Safety and Welfare and working conditions
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3.3.1 Introduction

As mentioned in the F.A., all employees irrespective to their conditions of employment shall be provided health and safety measures in the factory premises. Provisions in the F.A. Chapter III-Health refers to maintenance of environmental factors such as; cleanliness, disposal of wastes, dusts and fumes, controlling- ventilation, temperature, humidification, lighting and facilities – drinking water, latrines, urinals and spittoons. Chapter IV takes account of safety at workplace such as: separation of dangerous machinery from working, precautions to be taken from safety point of view in layout, design and activities of inspections, maintenance and training. Chapter-V includes washing and clothes storing facilities, First-aid-box, Canteen, lunch rooms and crèches. The safety officers and welfare officer are responsible for continuance of employees' health and safety related activities in the premises.

Following factors promote negative H&S practices in an organization:¹⁵⁵

1. A philosophy that says “Comply with the law, but no more”
2. Inadequate communication, employees who raise H & S issues with management are perceived as ‘trouble-makers’.
3. Mere lip service to requirements such as risk assessment, safety monitoring, accident investigation and the operation of the safe system at work.
4. A stressful working environment such as excessive temperature, noise, poor maintenance and bad layout.

HEALTH PROVISIONS

3.3.2 Cleanliness

All work sites must be clean, orderly and slip-resistant.¹⁵⁶ Slips and trips are third reason in major injuries at the workplace. Also it contributes to about half of all reported

injuries at the public places.¹⁵⁷ Hence, HSE has incorporated special chapter on this issue. In India ‘stepping, striking and struck against’ was single largest area contributing for 20.33% of fatal injuries whereas it accounts for 10.68% nonfatal injuries.¹⁵⁸ The Factories Act 1948 Section (hereafter referred as Section)11 includes cleaning of floors, painting of walls, ceiling and other structural parts regularly with appropriate shades. It also improves illumination and reduces sick building syndrome. Bright colours (white/yellow) appeared nearer than dark colours (blue and black nearer). Some colours have been called ‘warm’ and others ‘cool’. No such temperature, pulse rate or heart beat rise appeared in subjects (Sample size was less) where people exposed to different colours; hence, it is psychological one.¹⁵⁹ However, it is well known fact that, some colours are good reflector of light (white, yellow) whereas others are not (black, grey). The refractive power of eye during far vision (R) and that during near vision (P); the difference between these two (P-R) is called amplitude of accommodation, which is expressed in diopter. This diopter reduces with growing age. At year 20 – it is 9.5D, 30-7.5D, 40-5.5D.50-2.0D and 60-1.2D.¹⁶⁰ Age and light needs: The need of light at age 10, 40 and 60 years for a particular type of work is in proportion of 1/3:1: 5 respectively.¹⁶¹

3.3.3 Lighting

Effect of illumination on different types of work is a complex undertaking which must take many factors into account; several investigations including some psychologists have questioned conclusion that increased amount of light always improves task visibility. However, as it requires high power consumption, the unnecessary high illumination shall be avoided. It also under certain conditions reduces visibility and increase eye strain and fatigue. The study of the effect of different lighting conditions on human performance presents many methodological problems. Hawthorn Effect on the other hand can be interpreted, if employees attitude can be improved by slight increase in illumination such changes may be justified on those ground alone. Tinker 1954, has demonstrated that subject’s choice of preferred illumination level depends upon existing visual adaptation.

Not only intensity affects visual efficiency but degree of uniformity of illumination also affects visual efficiency. Poor distribution of light is likely to produce

glare which may cause discomfort, visual fatigue, poor performance and accidents. The effect of glare creates ‘phototropism’ which is the natural tendency of the eye to turn towards source of light or other bright spot in the visual field. Muscular effort is expended to turn eye back and forth between fixation points as well as in the accompanying convergence and accommodation changes. Thus 75FC of appropriate lighting provide for better visibility than did 650 FC of general diffuse lighting.¹⁶²

Standards of lighting in factories premises (intensity of illumination in Lux) has specified in the Maharashtra Factories Rule 35 depending upon the type of work and discrimination involved.

A model of lighting quality given by Veitch J. A. consists of three factors: individual well-being, Architecture and Economics.¹⁶³ Good lighting is contextual. There is a need to integrate lighting in a pleasing way with architecture and economics.

Fig 3.3.1: Individual well being at workplace		
1. Visibility 2. Activity 3. Social and Communication 4. Mood & comfort 5. Health and Safety 6. Aesthetic Judgment		
<u>Economics:</u> 1. Maintenance 2. Installation 3. Operation 4. Energy 5. Environment		<u>Architecture:</u> 1. Form 2. Composition 3. Style 4. Building codes and standards

3.3.4 HAVAC System

Physical and environmental factors are affecting on physical work capacity of human. Environmental factors consist of humidity, ventilation and air conditioning (HAVAC system). To obtain correct assessment of a thermal environment four parameters require to be measured together:

1. The air dry bulb temperature

2. The air wet bulb temperature
3. The radiant temperature and
4. The air velocity

Standards of these are included in Sections 13 and 15 of the F.A. Some of the physical factors are age, body weight, gender, training, nutritional status and motivation whereas environmental factors include: atmospheric pollution, indoor air quality, ventilation, altitude, noise and excess heat or cold. The ability to work at high rate is associated with individual's capacity to utilize oxygen (aerobic capacity) which is known as VO_2 Max. With age VO_2 Max declines. Women have a lower VO_2 Max than men.

Many researchers concluded that, "under ordinary indoor conditions during the heating season, variations in humidity are relatively unimportant" and that "practically all physical, physiological and psychological tests have proved to be negative or inconclusive." The effect of variation of humidity (humidity 20% to 90%) on the rise in temperature of body, it was found that, the rise in temperature over the trunk was slight but on the extremities there was an increase of 2 to 3°C.¹⁶⁴ The humidity of PCMC and Pune is 20% to 80% during the year.

3.3.5 Humidity

Humidity is the key player in the atmosphere. Too low humidity can make cracks in skin and decreases the effect of epithelial barrier but too high can breed mold, root paste and micro-organisms and makes damage to human health. It is observed that there is a positive association ($r=0.91$) between environmental minimum relative humidity and human mortality in the coastal cities of Japan, Sanin. The observations were carried out in 14 to 20% humidity.¹⁶⁵ Relative humidity should be between 30 to 70%. It is amount of moisture present in air expressed as a percentage of that which would produce saturation. Drying of throat & nasal passage are effects of low humidity. High humidity produces sensation of stuffiness' and the rate at which body moisture (sweat) evaporates is reduced, thereby reducing the effectiveness of the body's thermoregulatory system.¹⁶⁶

Bridger R.S.¹⁶⁷ states, "Air speed of less than 0.1 m/sec will cause a sensation of staleness and stuffiness even at relatively low temperature. Greater than 0.2 m/sec may be perceived as drafty. In hotter condition, with temperature more than 24⁰ C and air speed

of 0.2 to 0.5 m/sec will aid body cooling, particularly when the relative humidity is high. Low relative humidity (less than 30% at office temperature) causes bodily secretions to dry up. Under these conditions the occupants may complain of dry, blocked nose and eye irritation. The threshold at which air is perceived as stuffy begins at a relative humidity of 60% at 24⁰ C and 80% at 18⁰ C temperatures. Dehumidifiers can be used to lower the relative humidity at acceptable level. Temperature 19 to 23⁰ C at relative humidity between 40 to 70 % (preferably 50-60%) is recommended for sedentary work.”

3.3.6 Temperature

Temperature as high as 140⁰F is tolerable at 10% humidity. On the other hand, when humidity reached to 80% a temperature of 110⁰F was proven intolerable. Similar interactions of temperature and humidity had been found when ability to carry on physical work was the criterion.¹⁶⁸

If the air temperature is below 36⁰C increasing air movement (for example by fans) will cool the workers; above that temperature it will heat them further. High temperature and or humidity occur in combination with protective clothing or high work rate. The fitness of the clothing for the condition of the work shall be assessed. Estimation of heat stress on working men based on the wet bulb temperature is satisfactory under most conditions. Physiological measurement and sweat rate shall be taken into consideration for determining suitability of protective clothing.¹⁶⁹

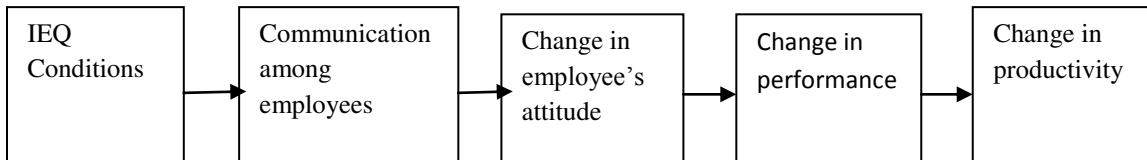
Thermal comfort is a ‘subjective satisfaction’ with the thermal environment. The affective dimension of thermal sensation depends on the subject’s internal state. The thermal stimulus feels: Unpleasant (U), Indifferent (I) or Pleasant (P) depending on body core temperature.¹⁷⁰

Table 3.3.1 : Thermal Satisfaction			
Internal State	Stimulus		
	Cold	Neutral	Warm
Hypothermia	U	I	P
Normothermia	U	I	U
Hyperthermia	P	I	U

3.3.7 Ventilation

An organizational pathway of indoor environment quality (IEQ) conditions to productivity:¹⁷¹

Fig 3.3.2: Effect of IEQ on Productivity



It is observed that between 21-25°C range for which productivity decrements are negligible. Above 25°C the performance decrements are 3.67% per °C and below 21°C it is 4.33% per °C.

Comfort ventilation is assessed on the basis of the number of complete air changes per hour during summer and winter months. Recommended comfort ventilation rates and temperature ranges are as below:¹⁷²

Table No. 3.3.2: Recommended Comfort Ventilation Rates and Temperature Ranges					
Comfort ventilation rates for different locations				Temperature ranges	
S	Location	Summer	Winter	Location	Temperature
1	Offices	6	4	Sedentary work/ Office work	19.4-22.8°C
2	Production areas with heat producing plant	20	20	Light work	18.3 °C
3	Production areas (Assembly, finishing works)	6	4	Comfort range	15.5-20 °C
4	Workshops	6	4	Heavy work	12.8-15.6 °C

Derec, Clements-Croome, established the equation of productivity: Productivity= Motivation x Ability x Opportunity. The built environment provides physical and social ambiance which affects motivation. An attitude survey carried by Eden Brown in 2000 revealed following factors affect on the productivity. 1) Nice people to work with-85%, Job security-80%, Money-77%, Opportunity-74% and comfortable working conditions- 73%. The relationship between perceived indoor air quality and self-assessed productivity was strong (p<0.001).¹⁷³

Temperature and air movement (Rule 22-A) recommends the limits of Dry bulb (DBT) and wet bulb temperature (WBT) as below:

Table No. 3.3.3: Limits of Ventilation and Temperature

Dry bulb temperature	Wet bulb temperature
30 degree C to 34 degree C	29 degree C
35 degree C to 39 degree C	28.5 degree C
40 degree C to 44 degree C	28 degree C
45 degree C to 47 degree C	27.5 degree C

Rule 22 to 32 are related to specifications, maintenance and recording of the hygrometer at a workplace. DBT usually referred as air temperature indicates air property. WBT is always lower than DBT except when there is 100% relative humidity (RH). RH is the amount of water vapour present in the air expressed in relation to full saturation or 100%. WBT can be determined from DBT and RH obtained from hygrometer using slide-rule.¹⁷⁴ It can be calculated by Clausius-Clapeyron equation and psychometric relation, which requires complex calculations, hence avoided to illustrate.¹⁷⁵

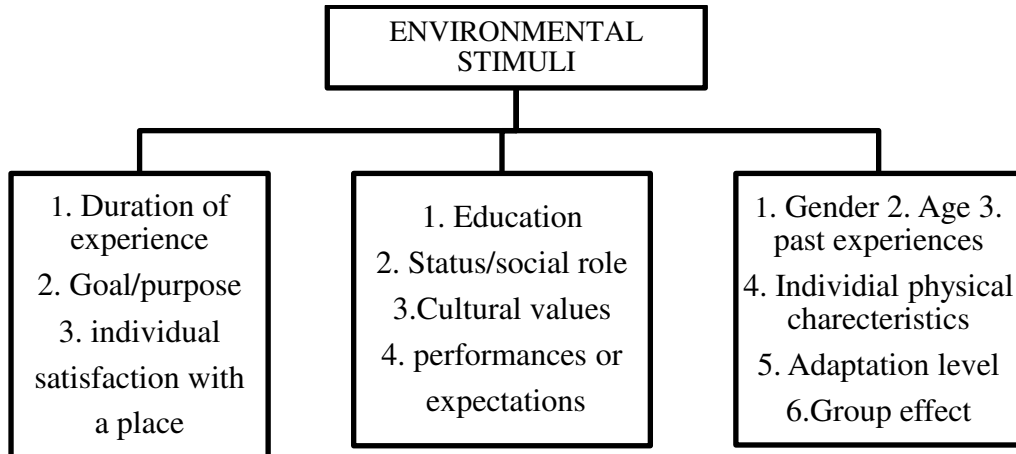
Building Related Illness (BRI) where workers complain coughs, chest tightness, fever, sinus congestion, headaches and muscle aches. These complaints were clinically defined. Killer variables which affect perceived productivity can be guesstimated that productivity gains (or losses) of up to about 20% may be attributable to the effects of buildings on their occupants. The Spearman's Rho (ρ) between perceived control & productivity measured by Adrian Lea man and Bill Bordass are as below.¹⁷⁶

Table 3.3.4: Effect of Environmental Factors on Productivity			
Killer variables	Spearman's Rho(ρ)	p-value	Significant Association
(1)	(2)	(3)	(4)
Heating	0.1	0.0001	Yes
Cooling	0.08	0.0001	Yes
Lighting	0.033	0.2513	-----
Ventilation	0.06	0.0001	Yes
Noise	0.12	0.0001	Yes

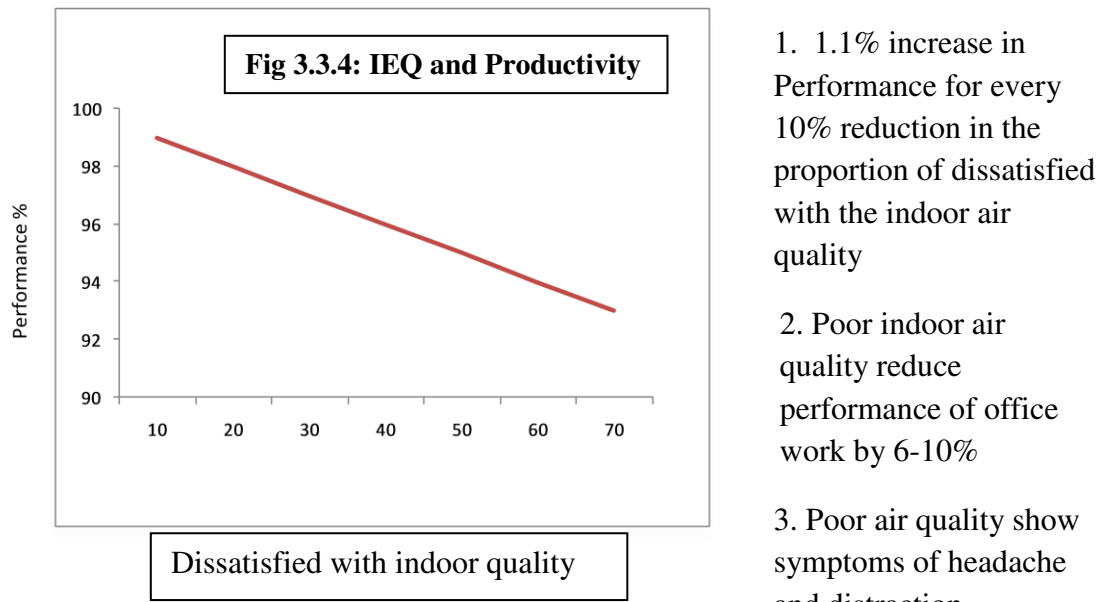
This table shows that noise is the most disturbing factor in the productivity. Heating is the next strongest whereas control over lighting is not significant.

Mantab A. et al., have found individual determinants to environmental stimuli consisting of noise, light, temperature, odour and touch as below.¹⁷⁷

Fig 3.3.3: Determinants to Environmental Stimuli



A study by Wyon and Wargocki showed clear picture of the dissatisfaction with indoor quality on the performance as below:¹⁷⁸



A study in Pune based engineering companies concluded that 40% respondents agree and 56% have no opinion about the environmental factors: poor light, vibrations, high humidity, high temperature, dusting conditions are sources of quality problems.¹⁷⁹

3.3.8 Overcrowding

Human require 6000ml (6lit) /min air for respiration. It is called Respiratory Minute Volume (RMV). At the workplace space 14.2 cum /worker shall be provided considering height upto 4.2 m. The chief inspector shall permit maximum number of workers employed in a room. Number of workers allowed and area required in square meters based on these criteria are as below:

Table 3.3.5: No. of Workers Allowed in a Room			
Area in Sq. M.	No. of workers allowed	No. of Workers	Area required in Sq. M.
100	30	100	338
500	148	200	676
1000	296	500	1690
2000	592	700	2367
3000	887	1000	3381

As a rule of thumb, 30 workers/100 sq.m shall be allowed to work in the workplace or area required per worker is 3.38 sq.m.

3.3.9 Dust

There are three types of dust particles depending on the diameter in microns: Total inhalable dust, Thoracic dust and Respirable dust. The Second Schedule of the F.A. gives permissible limits of certain chemical substances (116) in work environment. The permissible limits of the dust depend upon its nuisance type. Air dust can be measured using air sampling vacuum pump, Dust deposit gauges, Microbalance, Light scattering from dust-meters and Dust-lamps. Aerosol is a system of particles suspended in air in the form of airborne dust, sprays, mists, smokes and fumes. Airborne dusts are highly associated with occupational lung diseases, intoxication, cancer, asthma, allergy and irritation as well as whole range of non-respiratory illnesses. Wood dust used in moulding (R&D department) causes eye and skin irritation, allergy, reducing lung function, asthma and nasal cancer. Dusts are solid particles ranging from generally 1 μ m to 100 μ m in diameter which become airborne. Health effects resulting from exposure of dust may become obvious only after long-term exposure. However, many dusts have effects that

result from shorter exposure to higher concentrations. Byssinosis or 'Brown Lung' is caused by cotton and flax dust, sisal and soft hemp. Free crystalline silica dust is responsible for Silicosis.

In case of SEZ in China, Indonesia, Cambodia and India the workplace related issues are common. Employees suffer from severe work related diseases on account of dust. Faulty dust-extraction system has created problem. Women are majority of workforce. For organizations replacing a sick worker with fresh and healthy worker seems to be easier option than investing in improvement in working conditions; as thousands of workers are lining up outside the zones with the hope of getting jobs.¹⁸⁰

Deming cycle of Plan, Do, Check and Adjust can be used for dust control. It requires commitment from top management, adequate financial resources, technical knowledge & experience and effective management of programs. Instead of overemphasizing on multidisciplinary approach to problem solving; a joint efforts involving all stakeholders shall be adopted to achieve good level of workers' health protection. Some tools for efficient dust management are as below:¹⁸¹

1. Clear responsibilities and lines of communication
2. Standard operation, maintenance and inspection system
3. Proper selection, education and training of workers
4. Development of performance indicators and monitoring

3.3.10 Noise

Noise can be described as an unwanted sound. It is difficult to precisely separate noise from pleasant sound. Sounds of frequencies less than 20 HZ are called infrasonic and greater than 20,000 HZ are called ultrasonic sound. The worker's exposure to the high noise levels and its adverse impacts can be minimized by job rotation, exposure reduction and hearing protection. Literature survey shows that, average noise attenuation up to 32 dB can be achieved using earmuffs.

Impacts of noise on human health

1. Annoyance: Irregular sound causes displeasure leading to annoyance.

2. Physiological effects: It affects on breathing amplitude, blood pressure, heart-beat rate and pulse- rate
3. Loss of hearing:
4. Human performance: The working performance of workers/human will be affected on account of loose concentration.
5. Nervous system: It causes pain, ringing in the ears, feeling of tiredness,
6. Sleeplessness: restless and presence of mind during their activities

The damaging effect of the noise can be reduced or eliminated by controlling noise at source and protecting in following ways:

A. Control of Noise:

1. Reduction at Source, 2. Vibration isolation, 3. Vibration damping, 4. Silencers,
5. Noise insulation and 6. Noise absorption

B. Protection by : a) Reduce exposure time and b) Use of PPEs¹⁸²

“Noise exposure is one of the most prevalent causes of irreversible occupational disease. A mathematical model describes the hearing threshold levels as functions of age. The results show an age-related gender difference, with poorer hearing for men in age groups above 50 years. The overall prevalence of mild, moderate, severe or profound hearing loss was 20.9% collectively for women and 25.0% collectively for men. Tinnitus was reported by 8.9% of the women and 17.6% of the men. However, about 7.7% were estimated to potentially benefit from hearing aids as estimated from their degree of hearing loss. Noise-induced hearing loss primarily causes damage to the outer hair cells of the inner ear.” - Magnus Johansson¹⁸³. A study conducted by Philip L. Bigelow in Hong Kong concluded that noise had generated dissatisfaction at some level not very well understood its ill effects on productivity and health. However seldom organizations put acoustic improvement in the design.

SAFETY AND WELFARE FINDINGS

3.3.11 Introduction

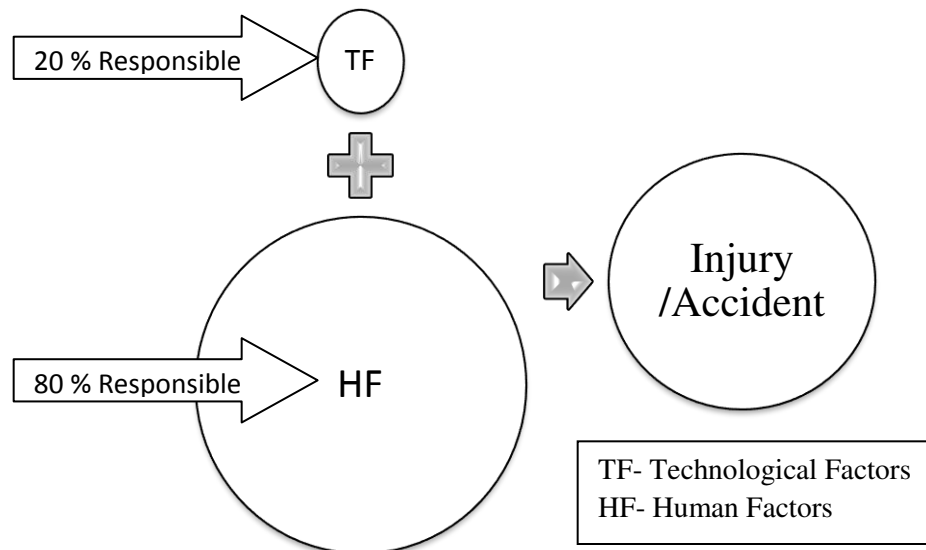
HR managers in every society are influenced by three repositories of ethical values such as Religion, Culture and Law. Ethics-driven restraints are more effective than

restrictive controls. However, improving ethical decision-making relating to H&S is a difficult task. As much of industrial works are hazardous therefore HR managers should make at least relative ethically correct decisions.¹⁸⁴ The main two activities are required to control accidents- correcting physical conditions and minimizing unsafe acts.¹⁸⁵ Resistance to harmful working condition and refusal to work is right of worker and providing the same is management's responsibility. "Reduction in cost through lower implementation of H&S is -A subsidy coined in bloods, broken bones, ill health, physical pain, mental anguish and the ultimate trauma of death. As parties in the contract (employer and employees) have divergent interests because one side's cost- investment benefits to the other side."¹⁸⁶ Higher level of safe and healthy work environment require capital as well as recurring cost.

The professional safety practice requires consideration of three distinct aspects of risk: 1. Avoiding, eliminating or reducing the probability of a hazards-related -incidents occurring, 2. Minimizing the severity of harm or damage if an incident occurs and 3. Post incident investigation required to determine, eliminate or control their causal factors.¹⁸⁷ Management is the process of reaching organizational goals by working with and through people and other organizational resources: property and efficacy. A definition of safety management is the process of protecting human resources and promoting efficacy resources on an organizational level. Safety engineering is the application of engineering principles to recognize and control of hazards.¹⁸⁸

Methods by which human behaviour can be influenced are: education, leadership, training, discipline, motivation and propaganda. People are understandably less willing to accept that their actions are responsible for injuries and will certainly defend themselves if they feel that they are being blamed. "Often 90 percent of the available efforts are directed towards correcting environment and unsafe conditions, which are important but it covers only 20 percent of the problem. Their work is much concerned with mechanical, engineering, accounting, production and technological problems without analyzing underlying human factor. As remaining 80 percent of issues being related to human behavior, it must be given due weightage. Trivial injuries or incidents are *by chance* but have potential of serious damage; hence should not be ignored."¹⁸⁹

Fig 3.3.5: Importance of Human Factors in Injury/Accident



The story of labour welfare in the entire world is to adjust machines and working conditions to meet the human needs of workers. Good welfare facilities will retain employees, increase morale and reduce attrition.¹⁹⁰ A multinational study conducted by Lucas concluded that a large number of laborers in developing countries confront poor working conditions. About half of all employees have no state sponsored protection against unemployment, work related injuries and diseases, or old age. In Latin America and the Caribbean the reported occupational fatality rate is 0.135 per 1000 workers which is more than three times the comparable rate for the United States.¹⁹¹

3.3.12 RESEARCHES AND FINDINGS

A study by Bauer¹⁹² in EU15 member countries concluded that most workers are fairly satisfied with the working conditions in their main job. Similarly, in another national survey conducted by European Foundation in the period July-October 2010, in Bulgaria, in 200 organizations and sample size more than 20000 belonging to five focus groups. It was found that 87% of respondents were satisfied or very satisfied with the working conditions in their enterprises. 40% of employees responded that during past 12 months their working condition had improved. This was due to investment in modern equipment and new building. Nine aspects of working condition were summed on the Likert scale and its average was taken as index.¹⁹³

Buck Consultants Survey¹⁹⁴ was based on 1248 large organizations in 47 countries totally employing more than 13 million employees. 62 % of employers in US and 19 to 41% of others used rewards (and penalties) to encourage employee engagement in wellness programs and life-style-related behavior changes. Employers promoted wellness efforts through use of web (72%), printed posters (70%) and mobile technology (11%). Only 33% of employees believe that they are experiencing culture of health in their organizations while 81% intent to pursue the same in the future. In the US 40% of employers reported the reduction in cost of healthcare as an effect of wellness program. It is the encouraging example for many manufacturers to maintain higher level of H&S in their organizations. It actually should be linked to reduced healthcare costs, increasing productivity and decreasing absenteeism.

Quality of working life in four companies was measured in terms of physical condition and social condition at work which revealed following results. These points were given out of 100 where 0-50 referred poor and 50-100 good.¹⁹⁵

Table 3.3.6 : ILO survey of Working Conditions: Results			
Sr. No.	Company	Physical conditions at work	Social conditions at work
1	GM	35	35
2	CAMI	48	40
3	Ford	51	49
4	Chrysler	51	51

The results clearly show that in the world renowned companies also the physical work conditions are marginally good (Ford, Chrysler). Our analysis by t-test shows that it cannot be treated as equal to 50 (tcal=1.977, df=7, p-value= 0.0885). The question arise here “What could be the HSW level in the OEMs situated in PCIA?” Though in the above document, it was not mentioned the components of physical conditions and measurement instrument; it was decided to take account of basic and statutory provisions as mentioned in the Act on Likert-type scale.

The European Foundation carried out the working conditions survey in 2001 in the new Member States - Cyprus, the Czech Republic, Estonia, Hungary, Latvia,

Lithuania, Malta, Poland, Slovakia, Slovenia, Bulgaria and Romania. In these countries, the levels of satisfied workers were below the EU15 average of 2000. In overall, the proportion of employees expressing satisfaction with their working conditions was 72.5%. Only Malta and Hungary exceeded a proportion of 80% of satisfied workers.¹⁹⁶

Other findings of the survey are as below:

1. The higher the education level, the higher the degree of job satisfaction.¹⁹⁷
2. No clear connection between job satisfaction and age in many countries.¹⁹⁸
3. The results of marital status and satisfaction with job show that in Austria, Bulgaria, Germany and Portugal single people are more satisfied with their job than married people. While in Netherland, Romania and Finland job satisfaction is higher in employees having children.
4. The workplace temperature and ventilation have significant correlation with job satisfaction.¹⁹⁹
5. It would be believed that job satisfaction is negatively related with number of working hours. However, in Denmark and Portugal, there is in fact a positive relationship between working hours and job satisfaction. In other words, people who work more hours are more satisfied in their work than their counterparts when other conditions are same. Employees working more than 45 hours a week are more satisfied than employees working a standard full-time week of 37 hours. This is because of the fact that job satisfaction improves with increasing autonomy due to longer working hours. Higher the working hours, higher will be influence or control over the job.²⁰⁰

A study²⁰¹ to measure OHS in public hospital in Malaysia (N=418, Questionnaire having 81 items, using 5 Point Likert scale) highest weightage was given to attitude and perceptions relating to aspects of safety measures provided at the work place. Age gender, race, educational level, job position and years of service, number of work-hours per week and shift work agreement were taken as demographic variables. This study confirmed an empirical relationship between nine dimensions of OHS management and outcome variables: satisfaction and feedback. Independent Variables consisting of safety communication, role of supervisor, work pressure, training and competence, management commitment, safety involvement, safety objectives, safety reporting and leadership style.

Findings suggested that there was a significant positive correlation between independent variable and outcome variables. Where employees perceived safety reporting was the most important dimension and work pressure was the least important component in the OHS practices. There was a significant difference in safety satisfaction faced by job position but there was no significant difference between employees with job tenure comprise of less than 1 year, 2 to 15 years, and 16 years and above.

Job satisfaction with working conditions in 15 fast-food restaurants of 108 respondents had taken on 5-point Likert scale (very happy to very unhappy).²⁰² It observed that neither happy nor unhappy were 43.5%, somewhat unhappy and somewhat happy both were around 25% having mean satisfaction of 3.00 with standard deviation 0.859. As majority of respondents have chosen central point and approximately same percentage of respondents have chosen higher and lower point, the mean is closer to mid-point.

A study in sugar industry in Kenya and India concluded that, “factory floors in some sugar factories were not kept clean hence caused industrial accidents. The working conditions in some sugar units in both countries were not properly recorded and maintained. No proper files kept concerning industrial accidents of their employees. 55 % of the respondents were actually dissatisfied with the safety norms and programs in their organizations. There was no proper mechanism in place and any systematic analysis in regard to safety management or disaster management in the organizations of both countries.”²⁰³

Cheyne et al. examined the relationships between components of organizational safety climate: employees’ attitudes to organizational and individual safety issues, perceptions of the physical work environment and perceptions of workplace hazards and relates these to self-reported levels of safety activity. Data were collected from 708 large manufacturing organizations. It concluded that individual responsibility, personal involvement, levels of safety activity and perceived levels of workplace hazards were vital in the safety climate. However, self reported levels of safety activity were different in different organizations depending upon its industry.²⁰⁴

A study conducted in large scale textile and clothing, electronics, printing and publishing organizations; a self regulatory approach to implement safety management elements were found effective and hence proposed.²⁰⁵

Some findings on lower implementation of H&S provisions in the F.A. were: Guarding of machinery, safe working methods, careful handling of materials, use of personal protective equipments, caution regarding protection from dangerous fumes and dust, proper ventilation, employment of young person on dangerous machines, excess weight, protection form fires and fencing of dangerous machinery. Due to lack of proper attention by management of small factories the standard of cleanliness was not found satisfactory. Disposal of waste and effluent, need of humidification, maintenance of hygrometer were some adverse remarks.²⁰⁶

A study carried out in 10 pharmaceutical companies (five Indian and five multinational companies, N=201) in Goa.²⁰⁷ Eight dimensions of welfare namely: education/training, recreation, medical, subsidized loans, canteen, housing, safety and others were positively and significantly correlated with job satisfaction. Others include satisfaction related to uniforms, drinking water, toilets, restrooms, other benefits and leave facilities. The high value of $r=0.76$ and 0.84 of reliability coefficient and reliability index respectively indicate labour welfare inventory is highly reliable and valid. An improvement in any labour welfare dimension or facility would significantly increase job satisfaction of employees. It was concluded that statutory labour welfare facilities are better predictors of job satisfaction than Non-statutory labour welfare facilities. Therefore companies/ employers need to pay special attention towards providing statutory labour welfare facilities. This research revealed the fact that HSW statutory provisions are essential components of job satisfaction.

The study²⁰⁸ conducted in the textile mills of Salem district shows that 15% of the employees are highly satisfied with their welfare measures. 22 % of the employees are satisfied with their welfare measures. 39 % of the employees are average with their welfare measures. 16% of them are in highly dissatisfied level. It was inferred that welfare measures plays important role in employee satisfaction and it results into improved quality of work life. The distribution of the respondents based on their opinion

about safety measures: Highly satisfied were 39%, Satisfied were 31 % and average were 14%. Indicating 70% employees responded more satisfaction than average.

A study of labour welfare provisions in large scale engineering companies in and around Pune had conducted by P.B. Kumbhar (2000) is very relevant to our research work.²⁰⁹ In the selected five companies 500 respondents had revealed following results.

Table 3.3.7 a : Statutory HSW provisions Leading to Standards of Living and Industrial Peace								
S.	Parameters	Ls	Ms	Vhs	Parameters	Ls	Ms	Vhs
Standards of living					Psychological well being			
1	Cleanliness	3.2	24	72.8	Physical work conditions	2.8	8.2	89
2	Drinking water	12	17.4	70.6	Safety provisions	12.4	21.2	66.4
3	Canteen	4.6	13.8	81.6	Safety training	2	30	68
4	Medical benefits	2.2	15.8	82	Prevention of accidents	2.4	28.2	69.4
5	Clothing	1	11	88	First-aid facilities	1.6	26	72.4
6	Crèches	2	24	74	Shelter, Rest rooms	6.2	28	65.8
<i>Note: Ls-Low satisfaction, Ms- Medium satisfaction and Vhs- Very high satisfaction</i>					Health centers	2.8	19.6	77.6
Industrial Peace								
1	Sanitation	4.6	30.2	65.2	3. working time	2.4	15.2	82.4
2	Shelter, restrooms & seating arrangement	6.2	28	65.8	4. working shifts	6	22	72

Table 3.3.7 b : Factors Contributing Industrial Peace			
Statutory labour welfare cause parameters		Non-statutory labour welfare cause parameters	
Top three	Low three	Top three	Low three
1. Work time 2. Job security 3. Working shifts	1. Working shifts 2. Shelter, rest rooms and seating arrangement 3. Sanitation	1. Provision of Latest technology 2. Transportation 3. Credit society	1. Transportation and training 2. Credit society 3. Recreational facilities

These statistics show that most of the employees in the sampled companies were very highly satisfied with the implementation of HSW provisions. The researcher had used 3-point rating scale. Limited options could be reason behind high level satisfaction. Similarly, the selection of respondents at company level indicates macro level satisfaction

which could be different from micro shop-level satisfaction. Our research intended to assess micro level satisfaction of employees as their nature of job and thereby the HSW situation in each shop is different.

Causes of accidents observed by Girish B. Gudesha in selected seven automobile companies in Pimpri Chinchwad and Pune are mentioned in descending order as below:²¹⁰

Ranks	Causes of accidents	Ranks	Causes of accidents
1	Unsafe acts of employees	7	Indifference
2	Unsafe working conditions	8	Defective plant/shop layout
3	Insufficient space	9	Hostility and excessive work hours
4	Recklessness	10	Muscular weakness
5	Emotional instability	11	Outdated machinery
6	Visual disability	Source: Gudesha Girish B., Ph.D. Thesis, p. 178	

Above research has brought forward the well known fact that unsafe acts and unsafe working conditions are prime reasons behind accidents/injury. The insufficient space, defective layout and outdated machinery are also components of unsafe working conditions. In this research we wish to establish the relationship between employees' satisfaction towards physical working conditions and injury/accidents parameter. The former is qualitative whereas the latter is quantitative measure; hence there may not be high degree of correlation, but existence of significant correlation cannot be denied. However, insights into Subjective Expected Utility Theory and Risk Homeostasis Theory and probabilistic nature of injury/accident do not allow us to believe the existence.

Another research²¹¹ in Pune region in seven companies revealed fact that the efficiency of the workers depends to great extent on the work environment in which they have to work. Because of the statutory requirements, in most of the companies there was no problem regarding working condition in five companies. In case of two companies

there was dissatisfaction regarding working condition about ventilation and temperature. The correlation between satisfaction of employees and the average productivity was observed highly positive. Regarding canteen facility 60-80% workers in five companies and 41-43% workers in two companies cited before were satisfied. This research has focused the economic aspect of the business and would be of great concern for management and policy makers. Productivity is an outcome of technological and psychological structure existing in a company and cannot be directly attributed to the latter, but in long term it proves beneficial.

Failure of managers to consult their staff over health and Safety issues indicates that the statutory framework should be made more robust and strict.²¹² Here statutory framework indicates observance of rules and regulations, manpower, inspection methods adopted by the managers and the reporting. In this research we have considered these factors for the assessment of satisfaction related to statutory framework.

Enforcement of self regulation depends upon manager's discretion and top management's support. Managers often are under pressure of improving productivity and sales volume and have to compromise H&S issues. Large proportion of employers either does not comply with or are ignorant of statutory obligations.²¹³ As this study relates to OEMs in the automobile structure we feel that they would not adopt such a myopic version of compromising employees H&S issues. H&S of employees is an essential part of productivity and the prime duty of the management. It would be interesting to investigate carefully the level of compliance of HSW provisions and satisfaction related to it in the sample companies under study.

A study concluded that service industries and manufacturing industries differ in OHS measures and presence of trade unions. Manufacturing industries have taken care of OHS provisions whereas service industries not.²¹⁴ The totality of agreement or disagreement is extreme case; this research is devoted to finding out 'to what extent the management has taken care of OHS provisions?' and locate the area where it is lower than average.

One of the influential books ‘Safety Management’ by John V. Grimaldi & Rollin H. Simonds, have illustrated various facets of safety management.²¹⁵ The relationship between plant size (number of employees) and injury frequency rates (IFR) has established as below.

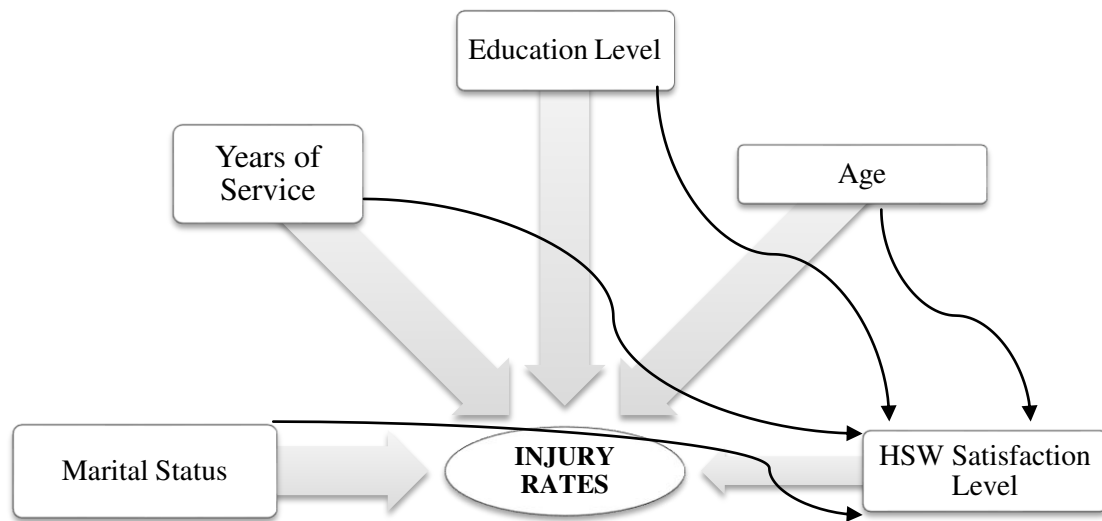
Table 3.3.9: Effect of Plant Size on IFR			
No. of Employees	IFR	No. of Employees	IFR
Less than 20	9.9	250-499	17.9
20-49	13.4	500-999	14.20
50-99	17.0	1000-2499	11.2
100-249	20.4	2500 or more	7.3
IFR-Injury frequency rate			

The table shows small/medium plants have greater OSH Problems and have higher injury frequency rate than larger plants. Generally very large plants with more than 2000 employees tend to have much better injury experience than smaller ones, particularly those in the range of 50 to 500 sizes. Mr. Ewan Clague (former commissioner of statistics, U.S. Department of labour) noted that, “The larger the plant tends to have lower injury frequency rates”. However, it depends upon type of industry. But it becomes noticeable at about 500 employee level. Very large companies may employ a staff of safety specialists and industrial hygienists. The presence of one person whose full time duty is safety seems to make a big difference. Further the large concern may (not always) be more strongly finance and better able to afford proper equipment. In this research an attempt of finding out correlation between plant size and FSI has made. As injury frequency rate cannot be treated as a measure of safety performance in all situation we have considered FSI (Ref: 3.1.6).

It also mentions a study by Shaffai-Sahrai which concluded that injury rates decline with the increasing age of the workers.²¹⁶ Another important conclusion was ‘injury frequency rate was much lower in firms having higher percentage of married employees than its counterparts.’ More settled and greater responsibilities which made

married employees less accident-prone.²¹⁷ As injury rates are dependent on age and marital status and it is inverse function of satisfaction level of employees with the HSW provisions; it can be believed that, there may have relation between satisfaction level and age and marital status. We hereby want to find out “whether the HSW satisfaction level has rooted from demographic variables: age and marital status?” Similarly as mentioned before “Has it some relationship with education level and years of service?” (Eurofound 2007 and Nor Azimah, 2009). We feel that years of service indicate experience and may have relationship with satisfaction level rather than age.

Fig 3.3.6: Effect of Demographic Variables on Injury Rates and Satisfaction



D.W.B. James opines that accident does not have to result in bloodshed. The potential of any unplanned incident should be assessed in order to plan or design corrective measures to prevent its recurrence. Manager/ supervisors in their domain with trained and experienced eye can find out/ imagine these situations. He further states that accidents are the consequences of unplanned (unsafe) acts or unplanned (unsafe) conditions performed or created by people. It is people, who use tools and equipments, who design plant and install it, who create dangerous activities or ignore unsafe conditions. He discards the term ‘Safety First’. As it puts profit, economic survival, progress, improved leaving standard and advancement in technology at subsequent places which is not acceptable. Hence ‘Accident prevention’ is the more acceptable term which

expresses definite goal and a real activity. The new concept 'Loss Prevention' is more-sound where many loss-creating factors can be anticipated and measured and all can be prevented or their effects minimized.²¹⁸ This can be achieved through training. It eliminates unsafe acts and unsafe conditions, so that accidents can be 'trained out' of existence.²¹⁹ Employees can perform profitably; efficiently, effectively, and safely with proper training.²²⁰

Effective cooperation between participants and technical experts seemed beneficial in order to stimulate preventive activity. A research in Sweden affirmed the association between degree of worker participation in working environment change processes and a feedback intervention, activity to modify the working environment, quality of modifications, psychosocial factors, comfort, emotional stress and musculoskeletal symptoms was positive in each case. Higher the feedback, higher would be activities to modify the working environment, quality of modifications, psychosocial factors, comfort, emotional stress and musculoskeletal issues.²²¹ Achieving workers' active participation is responsibility of management. The components of implementation level 'Involvement' include (V16 to V20): active involvement of employees and union, reward mechanism, competitions and contests and training. As only one person is responsible for accident (Ferrell's Human Factor Model, Ref: 3.1.2), involvement of every employee is expected.

It was found that companies addressed safety problems by technological solutions and that there were conflicts between safety and other company goals. Lack of system overview and a strong focus on product rather than production led to tradeoffs at operative level between safety and productivity. Companies should also aim towards a balance between technological solutions and organizational solutions addressing operators' knowledge and skills. There is a need to integrate safety and robustness related issues at the strategic level of the system.²²²

Manpower is and can be wasted easily in following five broad fields:²²³

- 1) Ineffective use of manpower
- 2) Inefficiency in maintenance of manpower
- 3) Accidents and health
- 4) Unnecessary overtime

5) Excessive non-productive labour

Accidents contribute to washed manpower, stop production for some time and reduce production. Replacement of injured men, their training and delay in work schedules costs the production. Bad lighting, ventilation or other unsatisfactory working conditions result in poor health and erode manpower. It demands money to provide variety of HSW provisions; but safety programs pay their way many times more. The supervisor who takes the necessary steps to eliminate causes for accidents and illness will not only win the confidence of his men and build morale and will also increase his production and lower his departmental costs. Safety campaign in a mill conducted with the cooperation of workers and supervising staff, had reduced on an average of 1 accidents/day to not a single accident in a month. It is also stressed that welfare facilities must be need based; the capacity of enterprise to provide and administer these schemes must also be looked into.

Musculoskeletal disorders: These can result in those injured, taking an average of 11 working days off each year. 'Upper limbs' refers to the neck, shoulders, arms, wrists, hands and fingers. Upper limb disorders (sometimes called repetitive strain injury (RSI)) can happen in almost any workplace where people do repetitive or forceful manual activities in awkward postures for prolonged periods of time. These can cause muscular aches and pains which may initially be temporary, but if such work is not properly managed and the early symptoms are not recognized and treated, can progress to a chronic and disabling disorder. Cumulative damage can build up over time causing pain and discomfort in people's backs, arms, hands and legs. Most of these cases can be avoided by selecting the right equipment for the job, making sure that equipment is safe to use and keeping it safe through regular maintenance, inspection and if appropriate thorough examination, training employees to use equipment safely and following manufacturers' or suppliers' instructions (HSE, 2000).²²⁴

Costs associated with work-related musculoskeletal disorders (WRMSDs) can be high for both the employer and employee. Employers incur medical and replacement costs when trained employees are unable to work. These could be a result of awkward postures when bending, reaching, twisting or performing repetitive motions while

completing their tasks and specially lifting heavy objects.²²⁵ The Section 44 of the F.A. recommends that suitable arrangements for sitting shall be provided and maintained for all workers obliged to work in a standing position so that they may take advantage of rest which may occur in the course of their work.

HSE studies²²⁶ have found that uninsured costs outweigh those covered by insurance policies. In a wide range of business sizes and activities the total uninsured losses from day to day accidents ranged from twice up to 36 times the total paid in insurance premiums in the same year; the average was around ten times the amount paid in premiums. Sick pay, damage or loss of product and raw materials, repairs to plant and equipment, overtime working and temporary labour, production delays, investigation time and fines are not included in insured cost.

The auto industry worldwide has been facing many problems such as sluggish demand, excess capacity based on escalating customer expectations, resultant capacity under-utilization and huge investments required to comply with environmental and safety standards. All these factors have squeezed the margins of global auto majors.²²⁷

A study by Hendre R.W.²²⁸ concluded that during the financial year 2004-2010, the fluctuations in the economic performance (net sales and profit after tax) were significant. But in the Indian auto industry these economic fluctuations have not reached to the realm of employees' health and safety ($F_{cal}=0.2963$, $p \text{ value}= 0.9578$, $v1=9$ and $v2=9$) and welfare related expenses ($F_{cal}=0.22$, $F_{critical}=7.70$ and $\alpha=0.05$ revealed $p \text{ value}= 0.66$). In this study the Annual reports of the sample companies were taken as source of financial data: expenditure on building and machinery maintenance, welfare expenses and profit; whereas a part of qualitative data collected for the purpose of this research had taken into account.

Dr. Shyam Pingale President IA OH accentuates the fact that basic occupational health services (BOHS) are an application of the primary health care principles which should be provided for all employees according to the principles of universal service provision. This concept was first discussed by WHO/ILO in 2003, which now has become central global occupational health services development plan. BOHS aims at 1. Protection of health at work, 2. Promotion of health, well being, workability and 3.

Prevention of occupational diseases and accidents. He recommends quadripartite collaboration between Governments, employers, employees and non-governmental organization to deal with OHS issues.²²⁹

S. M. Shambhag concludes healthy workplace initiative is a partnership between organizations, the union, the government and NGOs. This initiative has resulted in a good success in UK, Europe, Cannada and Latin America. **A higher level of implementation of health provision at workplace will** reduce sickness, absenteeism and liability, increase productivity, **improve industrial relations** and go a long way in image building. Hence investment in this initiative is a recipe for success.²³⁰

D.K. Lal Das opines that unfair working condition and welfare facilities at the plant are major source of the discontentment among workers. The presence or absence of health and safety facilities makes significant difference in their morale. It is difficult and in some cases impossible to estimate the benefits or returns on money spent on improving working conditions. Also it is difficult to calculate the effect of good working conditions on job performance. Employees dissatisfied will criticize working conditions, terms of employment, personnel policies and practices. This may bring about improvement in these matters so that eventual outcomes are better industrial relations.²³¹

Clare Gallagher et al. have strongly indicated that success in OHS management system (OHSMS) is conditional and depends upon a range of factors, including the kind of system used, senior management commitment, integration into general management systems and effective employee participation. OHSMS can succeed but in the wrong circumstances they will also fail. Research upon Quality Management (QM) supports the continued development of OHSMS. Close similarities exist between QM and OHSMS and between Quality Assurance and OHSMS auditing.²³²

The cost of accidents includes direct as well as indirect costs. Girmaldi and Simmonds have mentioned constituents of direct costs.²³³

1. Cost of wages paid for working time lost by working who were not injured.
2. The net cost to repair, replace material or equipment that was damaged in an accident.
3. Cost of wages paid for working time lost by injured workers.

4. Extra cost due to overtime work necessitated by an accident.
5. Cost of wages paid to supervisors for activities necessitated by the injury.
6. Wage cost due to decreased output of injured worker after return to work.
7. Cost of learning period or hiring new worker in place of injured person.
8. Uninsured medical cost borne by the company.
9. Cost of time spent by clerical workers on investigations or compensation.
10. Miscellaneous unusual costs.

OSHA has been historically using the indirect cost ranges from 1.1 (for most severe injuries) to 4.5 times (for least severe injuries) of the direct cost.²³⁴ It was also estimated for 2010, the annual cost of known workplace fatalities to be nearly \$ 40 billion in USA. This estimate does not include cost of non-fatal injuries and occupational illnesses.

Unsatisfactory mechanical environment gives birth to industrial fatigue, monotony, frustration and accidents. Tangible losses are reduction in productivity, deterioration in quality and increase in spoilage of materials. Intangible losses are stress leading to illness or accidents, neurosis and mental irritation.²³⁵

British Act, HASAWA 1974²³⁶ states: The duties mentioned in the Act are based on the principle of ‘so far as is reasonably practicable’. In other words, employer does not have to take measure to avoid or reduce the risks if they are technically impossible or if the time, trouble or cost of the measures would be grossly disproportionate to the risks. The main requirement on the employer is to carry out risk assessment. Employers with five or more employees need to record the significant findings of the risk assessment. An Approved Code of Practice which has legal status and illustrates requirements in particular circumstances where law uses the phrase “Suitable and sufficient.”

Five elements of management shall be appropriately used at any workplace are as below:²³⁷

1. Planning: Setting up of effective health and safety management system, decide priorities, set objectives, selecting appropriate method of risk control and give deadlines to eliminate or reduce risks.

2. **Organization:** Involvement of employees, health and safety committees for assessment and control of risks. Key mechanisms of communication, consultation, training, evaluation of preventive and protective measures and team working shall be initiated.
3. **Control:** It includes clarifying health and safety responsibilities, allocation of resources (time and other), setting up performance standards, rewarding good performance and action to improve poor performance.
4. **Monitoring:** Adequate routine inspections, investigations of causes of incidents and accidents and remedial action to be taken in order to prevent its reoccurrence, recording and analysis of results.
5. **Review:** Periodical review of the whole system and its elements in order to change priorities and take suitable action in advance.

Short term memory and its limitations can be significant factor in the causes of accidents at work and that is frequently associated with human error and poor memory skills. Important on-the-spot instructions should therefore be repeated several times to ensure that the recipient fully understands and can recall those instructions accurately when needed.

Jeremy Stranks suggested following questionnaire for assessment of level of risk: ²³⁸

Points	Yes/No	Low	Medium	High	Possible remedial action
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Agnihotram R.V. has taken account of occupational health of the children employed in the carpet weaving in Jaypur city provided an evidence of acute respiratory problem as compare to normal children living in the same community which may be associated with cotton dust (26.4% VS. 15.2% , P=0.005). ²³⁹

A study based on 1750 executives and 713 workers in 57 Indian organizations during year 1997 – 2009 came up with finding that more than 52.60% behaviors (at home, work place & on the way) are unsafe. It also emphasis the need of awareness programs on BBS for management staff at all levels. Training employees and formation

of steering committee of 20% trained employees, training to steering committee members is essential for implementing BBS at workplace.²⁴⁰

Dada, Joseph O., research has shown that “43.4% of the employees consider the improvement of total employee welfare as more motivating to work than just salaries and wages (28.7%). One possible reason is that, it is very difficult for an employer to pay a salary worth the value of the total welfare package. The good working environment is an important motivator.”²⁴¹

3.3.13 Canteen

Jeremy Joseph recommended that canteen facility should be run by company and existing facility should be improved without increase in rates during the period of agreement. Canteen employees should have opportunity for transfer to works or other places.²⁴²

“Among general welfare policies, the quality of the canteen facility and amount of subsidy are most likely to affect relationships. Even minor issues relating to canteen are taken by people very personally. Among more crucial matters 1) cleanliness, 2) the quality of the cooking and 3) price” Shaun T.²⁴³ Also “If canteen is given on contract the result is substandard food quality, food not properly cooked or it is not clean.”²⁴⁴ This provision made under Section 46 of the F.A. has reviewed by asking question regarding cleanliness and quality of food served in this research.

A study conducted in Metalcorp plants situated at Chakan and Jalgaon noticed that in terms of health standards there was mismatch in the information provided by the workers and HR. HR officials talked of high quality standards of the food prepared in the canteen as per nutritionist’s regular advice and in clean and hygienic condition. The workers talked outbreak of jaundice due to consumption of canteen food. Few workers have suspected existence of yellow union.²⁴⁵

A research conducted in 122 companies in and around Pimpri-Chinchwad Industrial area to study performance of canteen. Out of 122, 97 canteens have specified the visits of the VIP visitors to their canteen. There were 19 canteens which negatively hold the view that “there is no career in running an industrial canteen”. 45 canteens

expressed wide scope and bright future. 34 canteens expressed that the career depends upon management's support. Main challenge is to satisfy all the tastes and to maintain hygiene, time schedule and price level (for the 45 canteens). 16 canteens were balancing price and quality of food as their challenge. Smooth and successful functioning of industrial canteen depends upon following factors (Figures in the parentheses are no. of canteens).

1. Personnel management- (36), 2. Time management – (27), 3. Improving organizational functioning – (14), 4. Financial remedies – (19), 5. Decision making – (13) and 6. Not responded (13) canteens.²⁴⁶

Quality of the canteen food depends upon financial management, personnel management and systematic organizational working of the canteen.

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CHAPTER No.4

RESEARCH METHODOLOGY

OBJECTIVES	<ol style="list-style-type: none">1. To specify the rationale behind study2. To explain research design2. To illustrate strategy of data collection3. To justify the method of data analysis
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4.1 Research Motivation

Researcher has worked in construction industry during 1987-2008. “It is a labour-intensive and second largest employer after agriculture in India, contributing about 12% in national GDP.”¹ The construction workers are one of the most vulnerable segments of unorganized labour exposed to wide variety of OHS hazards having the rate of fatal accidents 4-5 times higher than that of the manufacturing sector.² Researcher has experienced number of violations on construction sites. Issues associated with safety are so wide that it makes confusion what measures should be taken into consideration for study. A study found significant difference in the safety climate of different organizations.³ “Government of India also concurred that construction industry has been witnessing decline in quality and safety aspect during past one/two decades. Underreporting of employed labourers (20% of the actual), highly unorganized nature of employment, inability of workers to respond government initiatives and the most no special division for enforcement of Acts are some responsible weaknesses”.⁴ Hence after voluntary retirement the researcher had decided to take up research in organized industry in OHS area. Another motivating factor is the researcher has been living in the PCIA since 1995 to till date. Similarly, OHS function is least studied, thought and described in the books of HRM. However, recently OHS has come into vogue because of upward trend in occupational injuries & illness, costs associated with it and effect of globalization.

4.2 Rationale behind Selection of OEMs

According to types of enterprises as defined by Government of India Notification No. 1152 dated September 30, 2006, Large scale -54, Medium Scale-621 and Small Scale-5520 enterprises were registered in Pimpri Chinchwad Industrial area. ⁵

However, 65% of these are automobile companies; hence automobile sector has selected for study. Amongst automobile companies the original equipment manufacturers (OEMs) are selected for survey. The reasons are:

1. Small scale companies employing less than 10 workers with power do not come under purview of the Factory Act.
2. The micro level study is not possible due to limited employees in departments. If there are less than 10 employees working in a shop it should be deleted from individual sample to uphold principle of anonymity. ⁶
3. The problems of productivity, profitability and efficiency are key issues before the medium scale companies which do not allow them to look after HSW provisions. In a study by Afshin M. 2004 the problems in the proprietary, partnership and private limited companies were similar. ⁷
4. The private sector is guilty of negligence on the safety point of view. In a research of small scale industries it is observed that, 65% companies do not have even elementary safety measures. In the unorganized sector many benefits and statutory welfare are ignored. ⁸ The researcher also has interviewed the President, Pimpri-Chinchwad Small Industries Association Chinchwad and realized that the problems of small and medium scale industries are as analogous to above; where implementation of HSW at the workplace is less important issue.
5. The unorganized workforce cannot express their rights or communicate anything which they think might lower their image in the eyes of management. This is on account of job security, confidentiality and direct relationship with owner(s). ⁹

A news from Maharashtra Times, Pune (12th March 2012)¹⁰ indicates “Medium and small scale companies disregard the implementation of safety related provisions that is mainly because of scarce capital, lowering cost of operation and profitability which

eventually result into higher rate of injuries. First –aid –box is not more than a show piece. The job need lowers voice of workers. Many small and medium workshops in this area employ 20-40 workers but on the pay role only 10 are recorded. This creates problem in the implementation of Acts.” The news blamed management as well as workers for strict enforcement of Law.

Hence, it felt appropriate to conduct the study in the original equipment manufacturers (OEMs) i.e. Tata Motors, Force Motors, Bajaj, Mahindra Vehicles Limited and Premier automobile limited situated in Pimpri Chinchwad Industrial Area (PCIA). Also as per experts’ opinions, HSW issues shall be studied in major companies. Thus study has conducted in the seven plants of these five companies representing ‘automobile sector’. As Bajaj Company has shifted its majority of operation at Chakan, 15km away from its previous plant is considered in the sample. The Kinetic Company’s plant in PCIA has acquired by Mahindra Two-wheeler Company in year 2009-10, but the new plant is installed and commissioned at Chakan hence the same (Mahindra Vehicles Limited) has considered for sample.

4.3 Statement of Problem

Title of the research topic:

“A STUDY OF HR PRACTICES IN AUTOMOBILE INDUSTRY IN PIMPRI-CHINCHWAD INDUSTRIAL AREA PUNE WITH SPECIAL REFERENCE TO HEALTH, SAFETY WELFARE (FOR THE PERIOD 2004-2010)”

The nature of problems addressed in the present study relates to assessment of implementation level of the mitigation of hazards faced by workers in different automobile companies as well as in the various shops in the same company. These problems are multidimensional in nature just as they would be need-based and action-oriented. This study attempts to answer the following set of questions.

1. To what extent employees are aware about the HSW information?
2. What is satisfaction level of employees about implementation of HSW provisions in their shop?
3. Whether this satisfaction level has roots in the demographic variables?

4. Whether Government machinery is efficient for monitoring the HSW situation in the company?
5. Whether the satisfaction level can be improved by maneuvering determinants influencing on it? To what extent it is associated with accidents and injuries?
6. How the implementations of provisions form a basis for healthy job relationship?

4.4 Rationale and Significance of the Study

The basic idea in making statutory provisions about HSW is to regulate, monitor and govern the working conditions of the workers, so that their well being and welfare not only add to the production and productivity levels but also determines, to a large extent, the work culture and the work environment, which ultimately lead to a superior level of workers' satisfaction and gives them a better quality of life.

The present study relates to the assessment level of workers satisfaction which is supposed to result from the implementation of HR practices relating to HSW. This study has conducted within the confines of five Original Equipment Manufacturer's Plants situated in and around Pimpri Chinchwad Industrial Area.

It must be pointed out that a study conducted in the automobile sector would lead to different inferences from a similar study conducted in the context of another product like cement, pharmaceuticals or even the IT sector. Even in case of automobile companies the study conducted at different points of time would lead to different inferences. It may be reasonable to suggest that all such studies conducted in India or abroad would be time specific and the space specific.

It appears necessary to emphasize that every such study will be unique and will have limited replicability components. Therefore, the uniqueness of the study will depend on the time span for which it is relevant and the industrial product it involves.

It has to be appreciated that the implementation of HSW provisions would involve cost and at the same time would lead to enhancement in the level of workers satisfaction, but its inverse correlation with accident and injury rate cannot be denied.

In every factory the final output is an outcome of several production processes which are conducted in several shops; the activities relating to each one of these shops would obviously be different and quite naturally the HSW norms required to be implemented would also be different. The assessment of workers satisfaction level in each one of these shops would have to be independently made at the “micro shop” level and will be quite distant from the “macro plant” level. Many previous studies (*Zambare Swati M., 1983, Gongera Enock George, 1999, Kumbhar P.B., 2000, Cheyne et al.2001, W.K. Law et.al., 2006, A. Sabarirajan et al. 2010, Cristina De Souza et al., 2011*) have assessed satisfaction level relating to HSW at macro level which may give general and different picture from micro level. **This study focuses satisfaction as well as implementation level related to HSW at micro level; hence, in this regard it is unique.**

Also, the said study by Kumbhar P. B., 2000, in Pune region is based on 3-Point rating scale: Low satisfaction, medium satisfaction and very high satisfaction. Limited options on the rating scale might have produced exaggerated results from than that of five-point rating scale.

For measuring effectiveness of Governments, previous researches (Deosthali Hemant, 1993, Kaila H. L., 2011) were based on dichotomous questions where the options were limited. In this research we have procured degree of respondent’s agreement on 5-point scale which would give more insights into the situation.

4.5 Aims and Objectives of the Study

1. To find out workers’ awareness about HSW activities and provisions in the sample companies.
2. To study, assess and quantify the satisfaction level in various shops of the plants of selected automobile companies with regard to HSW.
3. To evaluate implementation of HR practices related to HSW at each shop.
4. To identify the effect of demographic variables on the workers’ satisfaction relating to HSW.

5. To evaluate efficiency of the Government Machinery in monitoring HSW provisions in the sample companies from macro as well as micro angles and to know lacunas in the functioning with specific reference to Pune district.
6. To establish the relationship among the employees' satisfaction level, implementation of HR practices related to HSW and the injuries/accidents.
7. To see how the implementation of HSW provisions contribute in the establishing shop level healthy relationship.

4.6 HYPOTHESES

H1: The most of the workers in automobile companies under study are significantly aware about the provisions of Health, Safety and Welfare.

H2: The supervisory mechanism of the Government is inefficient to monitor various provisions of the Factories Act relating to Health, Safety and Welfare.

H3: Workers' satisfaction related to Health, Safety and Welfare is independent on the demographic variables: age, marital status, number of family members, education level, work-experience, nature of job and income level.

H4a: The shop specific satisfaction level of employees depends upon implementation of HR practices relating to HSW.

H4b: Lower level of satisfaction relating to HSW results into higher accidents/injuries.

H4c: Lower level of implementation of HR practices relating to HSW results into higher accidents/injuries.

H5: Higher level of implementation of provisions related to Health, Safety and Welfare would lead to form a basis for healthy job relationship.

4.7 Limitations of the present study

4.7.1 Effect of Extraneous Factors

1. Information collected for the purpose of this study is on a point of time and in different circumstances which may have impact on the response. Contacting operators at home without permission of their company, at workplace with permission of

- superiors and with favour of trade union representative (Company-E) may have different impact on responses.
2. Survey questions are structured in general which are representative of the various provisions made under Sections of F.A. The number of questions is kept minimum but sufficient to avoid long length of questionnaire and improve response rate. However, many Sections cover so diversified aspect that no single or two questions can be framed to be representative of the Section. Hence, the response to the question is regarded to the whole Section.
 3. The selection of operators in a shop was highly dependent on the supervisors and managers. It might be possible that they had selected respondents' favourable to them which might lead to increase in the level of satisfaction.
 4. The situation of union was different in the different companies: Company A, B and E had a single union, Company C had multiple unions and Company D had no union.

4.7.2 Effect of Respondents Tendency

Respondents have tendencies to make three types of errors in rating scale: 1) leniency, 2) central tendency and 3) halo effect.¹¹ In the design of questionnaire to reduce effect of leniency the asymmetric scale has constructed assuming 'satisfactory' response at the centre. To counteract central tendency error the difference between ends and before it are easily identifiable. Strength of descriptive adjectives has adjusted to differentiate end point and in-between. Halo effect is a systematic bias and pervasive error, difficult to avoid. We have made a separate section for each trait to neutralize its effect. Also a break has given in the questionnaire to eliminate response set bias by asking ranking, open ended and dichotomous questions intermittently.

4.8 RESEARCH DESIGN

4.8.1 Unit of analysis

Safety is everybody's job. Various researches (Jeremy Stank and HSE) mention that H&S shall be measured at shop floor, line management and top management level. Accordingly we have tried to predict implementation level of HSW provisions taking into consideration responses from following stakeholders.

1. Operators - Who are working on the machinery and assembly lines
2. Line management consisting of supervisors/cell leaders/ shop floor managers- who are directly related with working conditions.
3. Managers- HR managers, Production managers, Medical officers, Safety officers, and Welfare officers.
4. Trade Union- Members
5. Government Machinery- Directorates of Industrial Health and Safety (DISH).

Fig 4.1: Stakeholders in the OHS implementation at workplace



Stakeholders in the implementation of HSW at a workplace:

Management is wholly responsible for implementation, maintenance, compensation, recording and reporting of various sections of HSW mentioned under the F.A. Hence, the top management support becomes foundation.

4.8.2 Pilot Survey

A pilot survey was administered on operators in the sample companies between the period 2nd and 15th May 2011. 9 respondents faced difficulties to answer question questions 4a, 5a and 6a which were designed according to numerical scale without descriptive, faced difficulty in answering. The results of survey have presented in the following table.

Minimum elapsed time	10 Min	Response rate	76 %
Maximum elapsed time	40 Min	Completely answered questionnaire	45
Average time	17.2	Difficulties in understanding	9
Average time excluding 10 Min*	20.4	Incomplete questionnaire	2
Total questionnaires distributed	75	Deleted	1
Questionnaires received	57	* These respondents had read questionnaire before answering	

The final questionnaire was modified by incorporating following changes.

1. As no female was working in the shop floor in the sample companies hence the question of gender has deleted.
2. To save Space drop down boxes containing a range answer options has used in the questionnaire.¹²
3. Five point rating scale has adopted instead of four point scale.
4. Changes have been made in the drafting of question to make it vernacular.
5. Instead of numbers on rating scale, descriptions are given in the drop down boxes.

Structure of final questionnaire for measuring implementation level of HSW provisions at workplace/shop/block level was as below. This questionnaire was common for operators, supervisors and line managers.

Table 4.2 : Structure of the final questionnaire

Section- Title	Open ended	Scaled responses	Multiple choice	Dichotomous	Ranking	Total	Percentage
A- Preliminary Information	8	0	3	0	0	11	12%
B- Awareness	0	9	3	0	0	12	13%
C-Health	3	12	0	0	3	18	20%
D-Safety	4	25	0	3	3	35	38%
E-Welfare	3	8	1	0	3	15	16%
Total	18	54	7	3	9	91	100%

Question wording: The response rate is inversely proportional to the length of the questionnaire. Considering education level, reading habit of respondents especially operators a special attention had given to minimize the number of words.

Table 4.3: Question Wording

Common part: number of words	3	4	5	6	8	10	12	15	1. 50 (60%) questions out of 82 have 4 or less words. 2. Total words in questionnaire=541 3. Researcher's appeal note = 182 words 4. Instructions to respondents = 55 words 5. Total words = 778 words
Frequency	4	5	3	4	3	2	1	1	
Question wording	1	2	3	4	5	6	7		
Frequency	16	17	7	10	6	3	3		
Question wording	8	9	10	12	13	15	18		
Frequency	4	4	3	3	4	1	1		

Questionnaire –II was additional questionnaire specifically designed for supervisors and managers, wherein policy related questions were included. 28 questions were asked to get their responses on 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.

4.8.3 Dependent and Independent Variables

1. Dependent variable (Qualitative): - The dependent variables are based on the provisions of Health (chapter IV, section 11 to 20), Safety (chapter IV, section 21 to 41) and Welfare (chapter IV, section 42 to 49) of the Factory Act 1948. The questions are framed considering the purpose of the concerned section to avoid complexity and length of questionnaire.

2. Quantitative measures: Weighted Frequency Severity Incident (FSI) calculated from FSI of three years indicating accident/injury rate.

3. Independent variables: Communication, Compliance, Regulatory framework, Involvement, Supply of necessary asset and Government intervention are considered as independent variables influencing on the satisfaction level of employees.

4.8.4 Measurement Scale

The satisfaction on 5-point Likert scale was taken assuming that the ‘satisfactory’ response lies at the central position considering these well established companies of India. With the balanced scale, the distribution of responses likely to be skewed to the

positive side hence to bring it at centre unbalanced scale felt appropriate.¹³ According to the survey by *Infosurv (2010)*, use of 5 point scale preferred by 71% respondents as against 12% preferred 6-point scale. Following are limitations raised of other scales.¹⁴

4 and 6 point scale can't record neutral response, which is supposed a legitimate response. Naresh K. M. found that Five-point rating scale produced better results than 10 point rating scale in terms of the data characteristics as there were very little differences in the variation about the mean, skewness or kurtosis.¹⁵

Minnesota satisfaction questionnaire and Job description index are the most commonly used techniques for measuring job satisfaction. The Minnesota Satisfaction Questionnaire is a paper-pencil type of a questionnaire usually takes between 15-20 minutes for completion. It has two versions as mentioned below.¹⁶

Table 4.4: Satisfaction Scale Versions and Adopted Scale				
1967 Version		1977 Version		Our Questionnaire
_ Not satisfied, _ Somewhat satisfied, _ Satisfied, _ Very satisfied and _ Extremely satisfied.		_ Very satisfied, _ Satisfied, _ Neither satisfied nor dissatisfied, _ Dissatisfied and _ Very dissatisfied.		_ Highly dissatisfied _ Less satisfied _ Satisfied _ More satisfied _ Completely satisfied
Response scale rating values and nomenclature used				
1	2	3	4	5
Highly dissatisfied	Less satisfied	Satisfied	More satisfied	Completely satisfied
Not at all	Rarely	Some times	Many times	Every times
Not at all known	Slightly known	Somewhat known	Moderately known	Substantially known
Strongly Disagree	Slightly Disagree	Uncertain	Slightly Agree	Strongly Agree

4.8.5 Likert –Type Scale

The use of quantifiable scales when seeking information about non-mathematical statements such as Likert scale has been accepted in behavioural and attitudinal research including employee satisfaction. Treating ordinal scales as Likert scales has long been

controversial however it has become common practice to assume that Likert-type categories constitute interval-level measurement. The appropriateness of assumption should be addressed in research design.¹⁷ Brown J. D. states “Several researchers for instance, Baggaley & Hull, 1983; Allen and Seaman 1997; Maurer & Pierce, 1998; and Vickers, 1999 have shown that *Likert scales* can indeed be analyzed effectively as interval scales. Likert scales as interval data if the scale item has at least five or preferably seven categories. Likert items are ordinal but the total scores are always treated as interval data; provided the scales pass the Cronbach’s alpha or the Kappa test of inter-correlation and validity”.¹⁸ Likert in his researches combined the responses from series of questions and analyzed composite score instead of individual question score after deletion of neutral responses. Likert scale composite score should be analyzed at interval scale.¹⁹ “The data are typically treated as interval scale. When using this approach to determine the total score, it is important to use a consistent scoring procedure so that a high (or low) score consistently reflects a favorable response.”²⁰

Similar opinion has offered by Chester H. MecCall. The choice of the midpoint may result from ignorance, uncooperativeness, reading difficulty, reluctance to answer or inapplicability. Hence, selection of midpoint seems innocuous and which may lead to raise or lower the average response erroneously which eventually affect on decision making process.²¹

To treat it as merely ordinal would lose information. Where equal spacing of response levels is clearly indicated, the argument for treating it as interval-level data is even stronger. **If guaranteed by the Central Limit Theorem that ordinary averages of the Likert scale data behave normally, parametric analysis maybe performed.** It is also recommended that the scale shall reflect increasing levels of an attitude or trait. The verbal description should be converted into interval of means of equal difference (0.80 in case of 5-point scale) in order to give interpretations for the weighted mean.²²

Likert Scale	Description-1	Description-2	Interval
1	Highly Dissatisfied	Never	1.00 – 1.80
2	Less Satisfied	Rare	1.80-2.60
3	Satisfied	Sometimes	2.60-3.40
4	More Satisfied	Often	3.40-4.20
5	Completely Satisfied	Always	4.20-5.00

Cristopher A. Janicak recommended using Likert scale for measurement of safety performance.²³ However, the major disadvantage of the Likert scale is that it takes longer time to complete than other itemized rating scales. Respondents have to read the entire statement rather than a short phrase. Hence, to achieve high response-rate we have avoided wordy questions.

Douglas W. Hubbard mentioned decomposing the situation under consideration and selecting proper variable (s) which is (are) indicative of the whole may be to some extent erroneous. Many times it is not necessary to have great precision in measurement but it should be sufficient to justify the say. He also recommended wordy questions are more likely to confuse hence shall be avoided or reduced.²⁴ In our questionnaire design care has taken to keep question simple and precise and tried to break tendency of response set bias by putting open ended and dichotomous questions intermittently.

4.8.6 A Review of Measurement Scales Used in Previous Researches

Likert Scale and Dichotomous measurement have adopted by many researchers as a measurement instrument for assessing working condition and Health and Safety related issues at workplace. A short account of these researches has presented herewith on the basis of Chapter 3: Review of Literature.

Table 4.5 : A Review of Measurement Scales Used in Previous Researches

Researcher	Attribute	Sample size	Scale used
Kumbhar P.B., 2000, Ph.D. Thesis	Working conditions , various provisions in the Factories Act	500	3-Point rating scale: Low satisfaction, Medium satisfaction, Very high satisfaction
Nor Azimahchew Abdullah et al.	OHS management in 9 key areas – 81 items	418	5-Point Likert scale
Cheyne A. Oliver, J.M. Thomas Cox, 2002	Attitude of employees towards safety	N= 708, organizations - 2	Attitude scale

Dawal S.Zaviah & Taha Zahari,2006	The effect of environmental factors on job satisfaction	2 automotive companies N=170 (male)	Very uncomfortable to very comfortable 5-point scale
European Foundation, 2007 and 2012	Living and working conditions	15 European countries , N>20000	4-Point Likert type scale, Not at all satisfied to Very satisfied without neutral point.
Abuduani Wubuli, 2009	Working conditions	15 organizations N= 108	5-Point Likert scale, Very happy---Very unhappy
K.K.Singh, Anita Pathak, 2009	Awareness of labour welfare	N= 50	Dichotomous measurement
A Sabarirajan, T. Maharajan, B. Arun, 2010	Welfare and safety	N=250	5-Point Likert scale, from Highly satisfied to highly dissatisfied
Buck Consultants Survey, 2011	Global survey on health promotion and workplace wellness	47 countries, 1248 organizations, N=13 Million	Dichotomous measurement

4.8.7 Validity, Reliability and Practicability

In order to have confidence in the results of a study, one must assure that the questionnaire consistently measure what it purports to measure. There are three major criteria for evaluating the measurement tool: Validity, Reliability and Practicality. Validity refers to extent to which a test measures that actually one wish to measure. According to widely accepted classifications in research area there are three major forms of validity, which we have taken into consideration.

1. Content validity

As we have intended to undertake study of implementation level of statutory HSW provision, we have framed an indicative question based on the relevant section. Wherever it found necessary, two questions have asked. Also, it was critically reviewed

by five academicians having Ph.D. and five HR/Safety managers as per instructions of guide and appropriate corrections were made accordingly.

2. Criterion-related validity

The criteria measures have judged in terms of four basic qualities i.e. relevance, freedom from bias, reproducibility and availability of information with respondent.

3. Construct validity

Judgments of experts and theoretical concepts supported the goodness of items to measure dependent variable.

Face validity is basically subjective; questionnaire layout, balloon instructions, shaded columns exhibits professional touch.

Reliability has checked by using Cronbatch alpha and Karl Pearson's coefficient of correlation between the means of the sample and randomly (referring random numbers from 'Business Research Methods')²⁵ selected sub-samples at shop level. Reliability has also checked by Cronbach's alpha. Its higher value is an indication of internal consistency, homogeneity or uni-dimensionality. Internal consistency is interrelatedness of a sample of test items; whereas, homogeneity refers to whether items in questionnaire measure a single latent trait or construct. "Internal consistency is necessary but not sufficient condition for measuring homogeneity in a sample of test items. Hence, it cannot be interpreted as an index for internal consistency of a test. The accepted value of Cronbach's alpha is 0.7 to 0.95" (Michael J. Miller, 2003²⁶, Mohsen T et al. 2011²⁷). Regarding reliability necessary sample size for coefficient of alpha is commonly suggested as 200, 300 or 500. In some cases the sample size of 100 will be adequate.²⁸ However, alpha can be high in spite of low inter-item correlation and multidimensionality as number of items increased. Average inter-item correlation of 0.30 or better are exemplary.²⁹

Practicality consists of three elements namely: economy, convenience and interpretability. As mentioned earlier, the reason behind adoption of face to face interview with questionnaire method is to improve response rate. Clear, complete and several times instructions have given to make questionnaire convenient to read and

respond. Interpretability has maintained by correcting some questions according to pilot survey results.

A separate questionnaire had drafted for measurement of contributory factors for supervisors, line-managers and top management.

4.8.8 SOURCES OF DATA

A) Primary data

Primary data have collected through field work by the researcher. A separate questionnaire had designed to collect the required data from the stakeholders namely:

- a) Workers
- b) Trade Unions
- c) Management – Supervisors and Managers and
- d) Government.

Personal interview with Questionnaire method has used for data collection to exploit following benefits:

- 1) It gives high response
- 2) It is more flexible method of obtaining data
- 3) Supervision and control is possible which ensures more accuracy
- 4) References of other respondents can be obtained.

Though it took more time it was necessary from the viewpoint of structure of the questionnaire which demands more information. Also, the researcher has been staying in the area of research, it became possible. The data from the operators have collected during the period 1st July to 30th November 2011.

B) Secondary data

Secondary data have collected on the basis of the published literature from various sources listed as below.

1. Annual reports of the Automobile Companies e.g. Premier Ltd., Tata Motors, Mahindra Vehicles and Manufacturing Ltd., Force Motors and Bajaj Auto.
2. Relevant section of the Factory Act 1948, Maharashtra Factory Rules 1966 etc.
3. Periodicals, research journals, books, newspapers, articles etc.
4. The reports of the Government departments.
5. Data available on web sites.
6. Committee reports
7. Ph.D. theses and M. Phil. Projects on the concerned topics.

4.8.9 Sample Size

The required sample size depends upon number of issues such as the desired power of relationship, alpha level, number of predictors and expected effect sizes. The simplest rules of thumb are $n \geq 50 + 8m$ (where 'm' is the number of independent variables) for testing multiple correlation and $n \geq 104 + m$ for testing individual predictors (Green S.B., 1991³⁰ and Comrey and Lee, 1992³¹). Accordingly, our sample size is sufficient as per requirement.

Table 4.6: Calculation of Sample Size

Criteria	50+8m	104+m
n >=	50+8x28 = 274	104+28 =132
n taken	1331	1331

Formula	Values based on pilot survey	n
$n = \left[\frac{z \cdot \sigma p}{(\mu p - \bar{x})} \right]^2$	$\sigma p = 0.832$ and $\bar{x} = 2.95$ $\mu p = 3$	1064
$n = \frac{3.8416 \cdot N \cdot \sigma p^2}{(N - 1) \cdot e^2 + 3.8416 \cdot \sigma p^2}$	$N = 35000$, $e = 0.05$, $z^2 = (1.96)^2 = 3.8416$ $\alpha = 95\%$	1032
$n = \frac{p \cdot q}{\sigma_{prop}^2}$	Optimum proportion has considered $p = q = 0.5$, $\sigma_{prop} = 0.05 / 1.96 = 0.0255$, $\alpha = 95\%$	385

We have followed the rule stated by:

1. Donald Cooper and Pamela S,³²

“In a given stratum take a larger sample if stratum is larger than other strata; the stratum is more variable internally; and sampling is cheaper in the stratum” and “If the calculated sample size exceeds 5% of the population; sample size may be reduced without sacrificing precision”

2. Gupta S.P.,³³

“There are diverse opinions among researchers about sample size. However, 5% to 10% of the universe size has mentioned by many researchers”

In the sample companies, there are 20,341 operators. The sample size taken for this research work is 1331; which is 6.5% of the population. The samples of a company have taken according to support provided by the corresponding company and available time.

TABLE 4.7: COMPANY WISE SAMPLE SIZE

Company Names	Company code	Operators	Sample size	Percentage	Supervisors	Managers
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Premier Ltd.	A	1490	150	10.1%	31	22
Tata Motors	B	13261	793	6.0%	102	75
Mahindra	C	3250	169	5.2%	34	29
Force	D	1350	128	9.5%	39	30
Bajaj	E	990	91	9.2%	17	15
	Total	20341	1331	Av. 6.54%	223	171

TABLE 4.8: SHOP-WISE SAMPLE SIZE

Code	Shop Name	SC	Total op.	SSop	Percent	SSsup	SSmgr
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A	MTD	A 1	300	30	10.0%	10	6
	Engg/Innercon	A 2	615	60	9.8%	8	6
	LVD	A 3	270	30	11.1%	8	5
	Machine Shop	A 4	305	30	9.8%	5	5
B	Block-B	B 1	560	56	10.0%	10	8
	Block-C	B 2	1225	81	6.6%	11	7

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Block-D	B 3	1512	98	6.5%	15	8
	Block-E	B 4	993	78	7.9%	10	8
	Block-H	B 5	1610	55	3.4%	9	7
	Block-J	B 6	2504	182	7.3%	12	10
	ERC	B 7	2315	54	2.3%	8	6
	Block-K	B 8	1450	92	6.3%	10	8
	APD/RATP	B 9	298	29	9.7%	8	6
	Foundry	B 10	794	68	8.6%	9	7
C	TCF	C 1	700	35	5.0%	7	6
	Press Shop	C 2	900	47	5.2%	9	7
	B-I-W	C 3	800	33	4.1%	7	6
	Engine	C 4	450	31	6.9%	6	5
	Paint Shop	C 5	400	23	5.8%	5	5
D	Press Shop	D 1	100	10	10.0%	5	5
	Foundry	D 2	50	10	20.0%	5	5
	Ta Body Shop	D 3	125	14	11.2%	7	5
	Engine Shop	D 4	300	30	10.0%	7	5
	R&D & Tool	D 5	100	11	11.0%	7	5
	Transmission	D 6	675	53	7.9%	8	5
E	Press Shop	E 1	150	16	10.7%	5	5
	Engine Shop	E 2	300	27	9.0%	5	5
	Vehicle Assy	E 3	540	48	8.9%	7	5
Total		28	20341	1331		223	171
SC- Shop Code, Op - Operator, SS - sample Size, Sup – Supervisor, Mgr – Manager							

4.8.10 Basis of Stratification

Stratified purposive sampling method is used for the survey. This is because of the following reasons:³⁴

The classification of strata is based on various shops in the company. According to the inherent characteristics of the work carried out in various shops, the working condition formed in each case may be different; which eventually affect on the intensity of the requirement of the operators. The micro level study covers the shop level

satisfaction; while the macro aspect is organizational level and industry level includes all sample companies take together. The reasons behind adoption of stratified sampling are:

1. To increase a sample's statistical efficiency
2. To provide adequate data for analyzing the various sub populations and
3. To enable different research methods and procedures to be used in different strata.

4.8.11 Justification for Purposive Sampling

Probability sampling is theoretically superior but practically difficult in application. Even carefully selected random sampling respondent may respond carelessly. Hence, "self selection is more important than random selection". Non probability sampling procedures also satisfactorily meet the sampling objectives when getting true cross-section of the population is not objective of the research. Probability sampling calls for more planning, strong organizational support, repeated call backs to contact selected sample member. These activities are expensive, time consuming and many times do not give guarantee of acceptable response. "Carefully controlled non probability sampling often seems to give acceptable results." Hence purposive sampling by judgment and self selection by the respondent were considered during sampling process.³⁵ The same opinions are given by Donald Cooper and Schindler Pamela.³⁶

In the sample selection the first aim was 'Most of the characteristics of interest should be present in the respondent, so that most of questions would be answered authentically.' Secondly, the sample selection was from wide spectrum. We have taken due care to include respondents from various age groups as other demographic characteristics depend upon it.

4.8.12 Data collection

The survey was made successful with the help of company management as well as union leaders. The operators were explained that the survey is totally unconnected with either management or union leaders. The survey was conducted in the conference room attached with every block or shop of the company in absence of any managerial grade person. In some cases it was conducted at respondents home or on the occasion of group meeting set individually. During survey the care has taken to achieve unbiased response.

Following figure shows the different ways adopted in data collection and subsequent table 4.10 explains advantages and disadvantages associated with each of them.

Fig 4.2: Ways of Data Collection

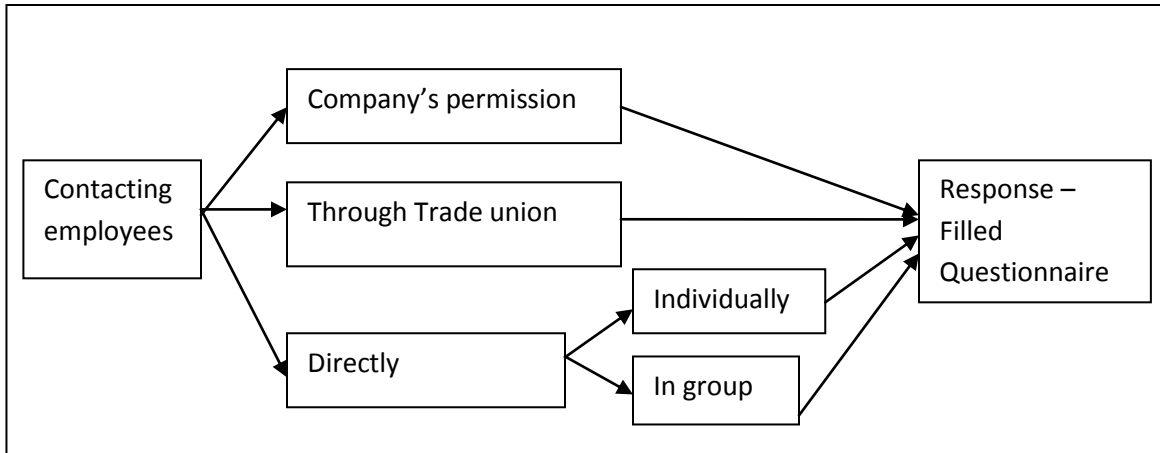


Table 4.9: Advantages and Disadvantages of Different Ways of Data Collection	
Advantages	Disadvantages
A) Company Permission	
1.Ease in approaching employees 2.Employees feel free to express 3.Supported by company hence can participate more actively 4.References of other employees can be taken	1.Role of manager/supervisor in employee selection 2.Influence of management on response 3.Less time due to loss of productive hours 4.Requires separate cabin /space 5.Company may not allow to contact employees during the time of high production, crisis or agreement 5.Can be conducted during the duty hours only
Advantages	Disadvantages
B) Through Trade Union	
1.Employees are supported by union hence feel free 2.Usually members are more expressive	1.Selection of favorable members only 2.Influence of union philosophy on response

hence can get additional information 3.No loss of productive hours	3.Influence of union leader's speech on rating 4.Diverse opinion in case of multiple union
C) Directly	
Advantages	Disadvantages
1.Can be conducted at surveyor's own time 2. A pre-appointment with briefing and reference may improve response 3. Management or Trade union's support is not necessary 4. Sufficient time can be taken 5. Personnel contacts can be developed 6. Easy in case of unmarried employees 7. More information can be obtained	1. Employees may not feel free in response 2. Time consuming as employees have to contact at home or wait for their gathering 3. It is based on references and hence conveyance sampling 4. Possible for local researcher or surveyor. 5. Employees assembled for other purpose may undermine significance of the research. 6. It is expensive method 7. Response depends upon communication skill of the surveyor

4.8.13 Data Analysis

The primary data collected at a point of time are the outcome of the implementation level of the HR practices relating to HSW maneuvered by the management. The collected data are analyzed by using various statistical techniques such as – Measures of central tendency, Standard deviation, and Coefficient of correlation as per need of the study. The results are presented using graphs, Histograms, Pie diagrams and tables. All data analysis has carried out by using 'data analysis' software available in excel. Normality which is an essential requirement for use of these tests has been checked by using:

1. Empirical Rule
2. Chybyshev's Theorem
3. Skewness and Kurtosis

Hypothesis	Statistical Technique Applied
H1	One tailed t-test
H2	One tailed t-test
H3	Correlation and Two sample t-test
H4	Multivariate Regression Analysis and correlation
H5	Theoretical Explanation and previous findings

Explanation of Statistical Tools Applied

1. Methods of t-test are applicable for small samples as well as large samples, though the reverse is not true! In our case minimum sample size at shop level is 10; whereas, maximum is 182. Samples above 30 are 16 and 12 samples are equal to or less than 30.
2. Our calculation work confirms that the population can be assumed to be normal. In case of markedly skew i.e. U or J shaped this method cannot be applied with confidence.
3. The reliability check (Cronbatch alpha and Correlation) assures that Likert scores can be suitably assumed to be interval scale.

Hence, t-test, correlation test and regression analysis have applied.

Hypothesis 1: The most of the workers in automobile companies under study are significantly aware about the provisions of Health, Safety and Welfare.

This hypothesis is based on assumption that the awareness level of workers about provisions of HSW is significantly more than the central point “3”. Here theoretically following situation may occur:

No	Situation	t-calculated value	p-value	Conclusion
1	$Awl = 3$	+ve or – ve but numerically within t-critical	>0.05	Insignificant
2	$Awl > 3$	+ve and numerically more than t-critical	< 0.05	Significantly more
3	$Awl < 3$	-ve and numerically more than t-critical	< 0.05	Significantly less

Hypothesis 2: The supervisory mechanism of the Government is inefficient to monitor various provisions of the Factories Act relating to Health, Safety and Welfare.

The same theory is applicable. Here following situation may occur:

No	Situation	t-calculated value	p-value	Conclusion
1	Govti = 3	+ve or – ve but numerically within t-critical	>0.05	Insignificant
2	Govti < 3	-ve and numerically more than t-critical	< 0.05	Significantly Less
3	Govti > 3	+ve and numerically more than t-critical	< 0.05	Significantly More

Hypothesis 3: Workers’ satisfaction related to Health, Safety and Welfare is independent on the demographic variables: age, marital status, number of family members, education level, work-experience, nature of job and income level.

This is a complex hypothesis involving multiple variables. Hence, it feels appropriate to test this challenging hypothesis using correlation analysis and t-test as explained below.

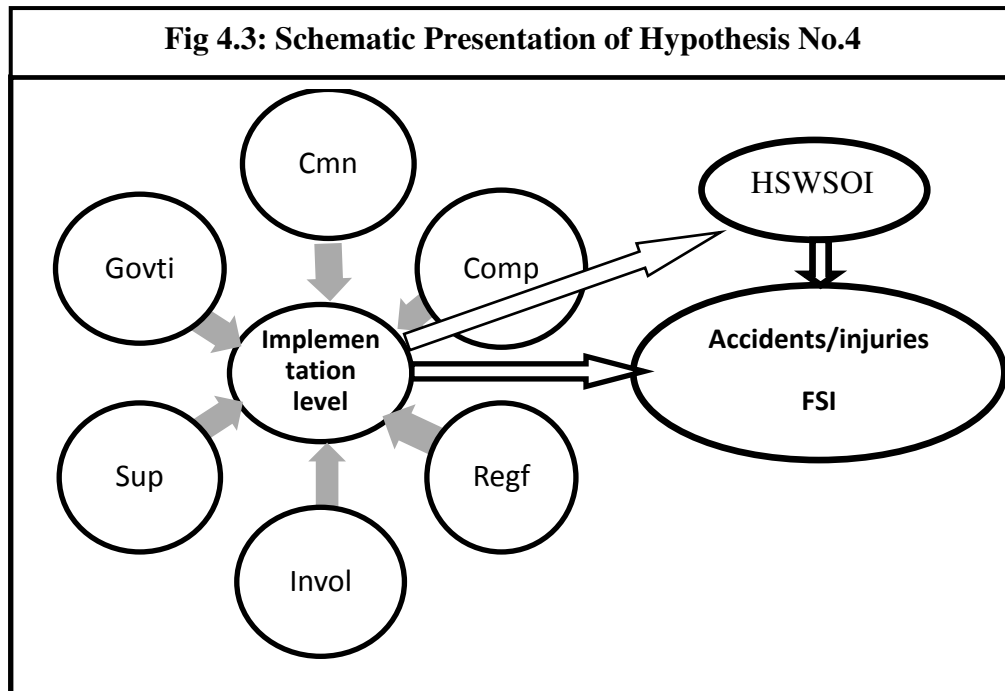
1. Find out Karl Pearson Coefficient of Correlation (denotation “r”) for each of the relationship of the demographic variable with *HSWSI* at shop level.
2. Find out the critical values of “r” for the (df=N-2, N= sample Size) and $\alpha=0.05$
3. Make conclusion about significance of correlation as usual
4. In case of categories i.e. marital status and nature of the job apply two-sample t-test and find out “t-cal” and p-values as usual.
5. For more insights into data use percentages of number of cases and population belonging to significant and insignificant categories.

Hypothesis No.4

H4a: The shop specific satisfaction level of employees depends upon implementation of HR practices relating to HSW.

H4b: Lower level of satisfaction relating to HSW results into higher accidents/injuries.

H4c: Lower level of implementation of HR practices relating to HSW results into higher accidents/injuries.



Independent Variables: The components of Implementation level of HR practices: Communication (Cmn), Compliance (Comp), Regulatory Framework (Regf), Involvement (Invol), Supply of assets relating to HSW (Sup) and Government intervention (Govti).

The dependent variable (Qualitative): Level of satisfaction about HSW.

The dependent variable (Quantitative): Accident/injury rate or FSI (Frequency Severity Incidence)

In case of a), there are six independent variables and one dependent variable. As all data are assumed to be quantitative and hence metric, the general linear model followed in multiple regressions. The photo copy of reference (C.R.Kothari, “Research Methodology, Methods & Techniques” New Age International Publications, India, 2004, p. 317, fig 13.1³⁷) is appended in the Appendix-I. The necessary parameters have calculated before test to give justification of assumption of linearity and normality.

The general model with usual denotations is presented as:

$$Y' = A + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6$$

In our case,

$$HSWSOI = A + B_1 Cmn + B_2 Comp + B_3 Regf + B_4 Invol + B_5 Sup + B_6 Govti$$

Where B_i indicates regression coefficient and are weights assigned to each of the independent variable. A is Y axis intercept.

Other parameters “ R^2 ” and “ t ” have calculated to conclude about the weights or power of influence of the variables in determining level of satisfaction. Coefficient of correlation “ r ” has calculated to explain the data.

In case of b) and c) the usual correlation analysis has adopted to make conclusion.

Hypothesis 5: Higher level of implementation of provisions related to Health, Safety and Welfare would lead to form a basis for healthy job relationship.

This hypothesis has tested on the basis of theoretical construct, statutory perspective and research findings of previous hypotheses.

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CHAPTER No.5: ANALYSIS OF HSW SCENARIO

5.1 PRELIMINARY ANALYSIS

OBJECTIVES	<ol style="list-style-type: none">1. To illustrate overall trend of responses2. To carry out analysis of “no responses”3. To check the randomness, reliability and normality of the data4. To acquaint with demographic profile of the workers
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5.1.1 INTRODUCTION

We are applying quantitative statistical techniques for hypothesis testing; hence, it is necessary to carryout reliability, normality check of the data first. Accordingly, the layout of this chapter is as below:

1. Industry and Organizational level analysis of data
2. Reliability, Normality check of the data.
3. The demographic results of the sample.

5.1.2 Industry Level Analysis

For the purpose of this study we have collected responses from operators/workers, Supervisors/cell leaders and Managers in the sample companies. The position - wise number of respondents are mentioned in the following table. Operators/workers are the end consumers of the HSW services provided by the organization. They form the largest (77%) contributor of this study. The responses are collected on a 5 point Likert-type scale for 46 questions pertaining to Health, Safety and Welfare parameters as mentioned in the F.A.

In Company A, B, D a supervisor is in-charge of 15 workers/operators whereas in company C and E Cell Leaders are responsible for 4-5 workers. Thus, the supervisor category includes cell leaders also. The managers associated with the shop were selected for interview.

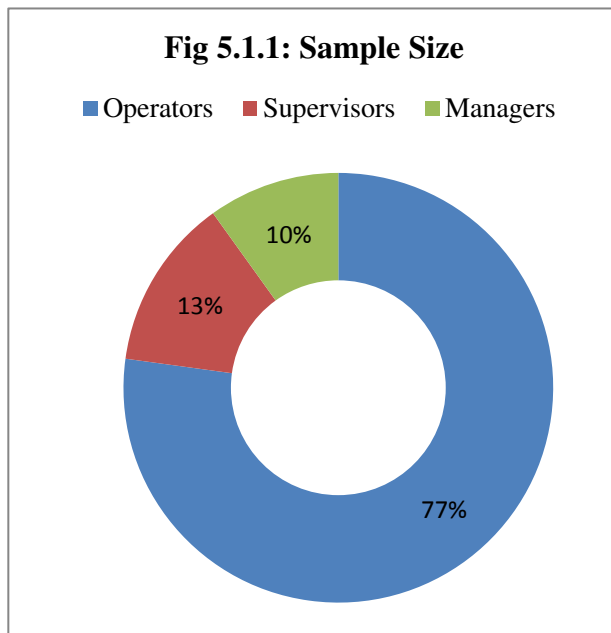


Table 5.1.1: Position-wise Respondents

Position	Sample Size	Percent
Operators	1331	77.16%
Supervisors	223	12.93%
Managers	171	9.91%
Total	1725	100%

The descriptions used for scale and their numerical values are mentioned below for quick reference.

Description of Likert-type Scale and its Numerical Values

Highly Dissatisfied	Less satisfied	Satisfied	More Satisfied	Completely Satisfied
1	2	3	4	5

The following table gives overall responses at industry level in each of the section i.e. Health, Safety and Welfare.

Table 5.1.2: Industry Level Responses (in %)

Responses	Overall	Health	Safety	Welfare
(1)	(2)	(3)	(4)	(5)
0	2.11%	0.20%	3.21%	1.77%
1	3.04%	4.28%	2.12%	3.94%
2	13.82%	17.22%	11.15%	16.65%
3	35.14%	35.67%	34.35%	36.77%
4	30.33%	27.31%	32.67%	27.91%
5	15.55%	15.31%	16.50%	12.97%
Total	100%	100%	100%	100%

Above table shows that highest (35%) percentage of respondents has selected middle point representing “Satisfied” category. In overall about 81% of respondents are more and highly satisfied with implementation of HSW provisions in their companies. The balance 19% of employees shows their dissatisfaction. The individual Health, Safety and Welfare section-wide responses shows that about 78 to 84 % of respondents are satisfied whereas 13 to 21% of respondents are dissatisfied. The single factor ANOVA results ($F_{cal}=0.002$, $F_{crit}= 3.23$, $n_1=3$, $n_2=16$, $\alpha=0.05$, $p\text{-value}= 0.9998$) show that in the overall, Health, Safety and Welfare categories the percentage of responses are same. In other words, where implementation of Health related provisions are satisfactory, the provisions related to Safety and Welfare also likely to be satisfactory.

5.1.3 Organizational Level Analysis

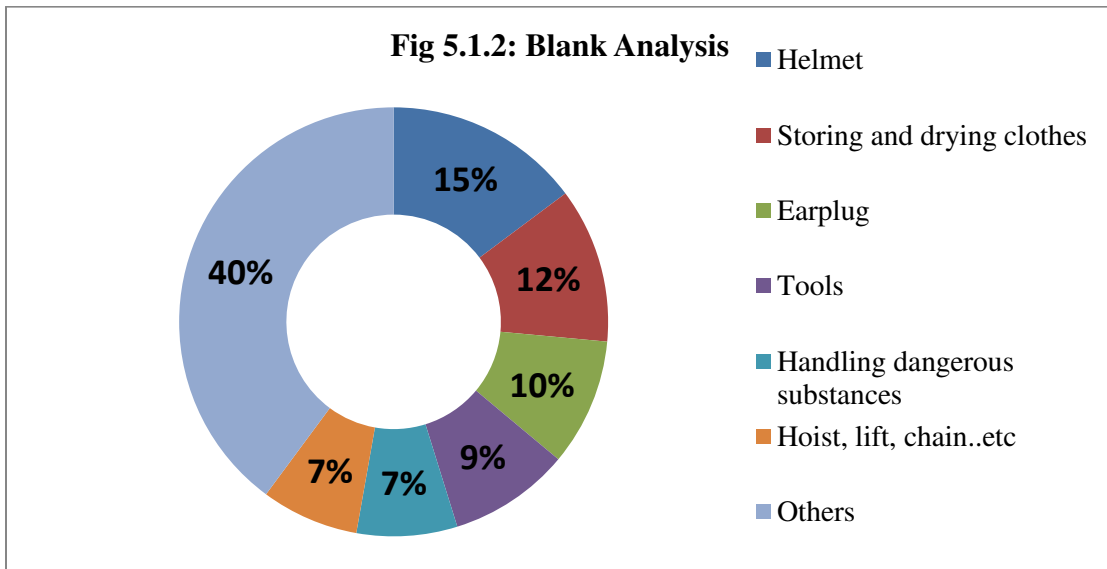
The following table shows responses received from workers/operators of sample companies in each category. Questionnaire –I was designed to receive 46 responses in the form of ratings comprising of section Health (13), Safety (25) and Welfare (8). The organization-wide structure of the response-distribution is given in following table.

Response	Co. A	Co. B	Co. C	Co. D	Co. E	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0 (Blank)	147	250	153	222	520	1292
1	480	195	264	296	629	1864
2	2009	2370	1417	1494	1173	8463
3	2595	12220	2525	2703	1473	21516
4	1312	13501	2428	1004	325	18570
5	357	7942	987	169	66	9521
Total	6900	36478	7774	5888	4186	61226
Percentage of Blanks	2.13%	0.69%	1.97%	3.77%	12.42%	2.11%

It shows normal behaviour (highest at centre and reducing towards both sides) except in case of company-B; where it is skewed to the right side. At this moment, the detailed normality check has not carried out as the purpose of this analysis is to

investigate the HSW situation at macro level without application of quantitative statistical technique.

The overall expected responses were 61,226. However, we have received 59934 (97.89%) responses in “Highly Dissatisfied” to “Completely Satisfied” categories (Hereafter referred in numbers 1 to 5) and 1292 (2.11%) responses were ‘Not Applicable’. This indicates our questionnaire has matched with working condition of 97.89% of samples. It also shows the sample selection was in order. In other words 2.11 % operators/workers did not possess characteristics of our interest or their working conditions were not in accordance with our questionnaire. The following figure shows the responses under “Not Applicable” category.



The responses under this category are kept blank in the table to make it ineffective while calculating quantitative parameters i.e. mean and standard deviation.

5.1.4 Distribution of Workers’ Responses in Percentage

5.1.4: Modal Responses		
Responses	Modal responses	Percentage of mode
1	10	0.8%
2	80	6.0%
3	660	49.6%
4	512	38.5%
5	69	5.2%
Total	1331	

It is expected that responses should be distributed over many categories of the Likert-type scale. The responses sticking to any one category reveal less information and hence less useful from analysis point of view. The number of expected responses in HSW sections is 46. Out of 1331 respondents only 38 (2.86% of 1331) have chosen one category for more than 28 (60% of 46) responses. Similarly, 172 (13% of 1331) have chosen one category for more than 23 (50% of 46) responses. About 60% of respondents have chosen one category for more than 18 responses. This indicates the rest of responses obtained are distributed over non-modal classes. The distribution of responses in percentage of frequencies has given in column No. 3. It clearly indicates that distribution of the responses spread over all the points of Likert scale.

5.1.5 Reliability Check

10% of Randomly Selected Sub-Samples (RSSS) have selected among respondents at shop level by using random numbers (given on page number 829 of Donald Cooper and Pamela Schindler's book) and the Karl Pearson's correlation (r) between RSSS means and Shop Level Sample (SLS) means has worked out. Matched or paired sample t-test (two-tailed $df = 47-1=46$) has applied to test difference between original responses and RSSS responses (Ref: SP Gupta p. no. 544). The conclusions for the t-test have made assuming $\alpha=0.05$.

Shop Code	SS	RSSS Size	r	6 X P. Er.	Conclusion	p-values	Conclusion
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A1	30	3	0.8589	0.1565	Sign.	0.0821	Insig.
A2	60	6	0.8857	0.1287	Sign.	0.2341	Insig.
A3	30	3	0.7985	0.2162	Sign.	0.4177	Insig.
A4	30	3	0.8779	0.1368	Sign.	0.4740	Insig.
B1	56	6	0.6154	0.3707	Sign.	0.1252	Insig.
B2	81	9	0.7808	0.2329	Sign.	0.0658	Insig.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B3	98	10	0.6520	0.3430	Sign.	0.4063	Insig.
B4	78	8	0.8209	0.1946	Sign.	0.9174	Insig.
B5	55	6	0.7322	0.2768	Sign.	0.0896	Insig.
B6	182	18	0.9035	0.1096	Sign.	0.6833	Insig.
B7	54	6	0.8414	0.1743	Sign.	0.0111	Sig.
B8	92	10	0.9263	0.0847	Sign.	0.1843	Insig.
B9	29	3	0.5955	0.3851	Sign.	0.0007	Sig.
B10	68	7	0.9396	0.0699	Sign.	0.8156	Insig.
C1	35	4	0.7355	0.2739	Sign.	0.7805	Insig.
C2	47	6	0.8772	0.1376	Sign.	0.0014	Sig.
C3	33	4	0.8308	0.1848	Sign.	0.2064	Insig.
C4	31	3	0.9034	0.1097	Sign.	0.0065	Sig.
C5	23	3	0.8210	0.1945	Sign.	0.0000	Sig.
D1	10	2	0.9519	0.0560	Sign.	0.6798	Insig.
D2	10	2	0.9115	0.1009	Sign.	0.3698	Insig.
D3	14	2	0.8424	0.1733	Sign.	0.0228	Sig.
D4	30	3	0.7265	0.2817	Sign.	0.2428	Insig.
D5	11	2	0.7585	0.2534	Sign.	0.0655	Insig.
D6	53	6	0.9504	0.0577	Sign.	0.9508	Insig.
E1	16	2	0.5738	0.4002	Sign.	0.2567	Insig.
E2	27	3	0.5568	0.4117	Sign.	0.0878	Insig.
E3	48	5	0.6362	0.3552	Sign.	0.8644	Insig.

The results presented in above table confirm the correlations (r) between SLS and RSSS means in all 28 cases are practically significant, as their values are more than (6 x Probable Error). All values of “r” are more than 0.5 with the lowest being 0.5568; which

is assumed to be moderate coefficient¹. The coefficient of determination “r²” of this lowest value is 0.31; indicating that 31% of the variation is explained by the data. Similarly, the t-test has conducted to find out significance of the difference between means of SLS and RSSS. The p-values of the two-tailed t-test are given in the column (7). Its conclusion shows the difference is ‘insignificant’ in 22 (79%) cases and in the remaining 6 (21%) cases it is significant. Therefore, there is sufficient evidence to accept that the data are reliable.

Cronbach’s Alpha

Cronbach’s alpha is typically used when items that have several response options (i.e., 1 = strongly disagree to 5 = strongly agree). It is the mostly used parameter by researchers to check the reliability of questionnaire in measuring the single latent trait or construct.

The Cronbach’s alpha for the whole responses has calculated using following formula

$$Cronbach \ \alpha \ w = \frac{k}{(k - 1)} x (1 - \frac{\sum Si^2}{\sum St^2})$$

Where k refers to number of items on the test, **Si²** refers to variance of items, and **St²** refers to variance of total scores summed over items on the test (Noreen M. Webb et al., 2006).² For workers’ response the value is 0.956.

$$Cronbach \ \alpha \ w = \frac{46}{(45)} x (1 - \frac{43.581}{668.176}) = 0.956$$

Similarly, the values for satisfaction level and implementation level have calculated and presented in the following table

Satisfaction level		Implementation level	
Supervisors	Managers	Supervisors	Managers
0.918	0.919	0.927	0.926

¹ Richard Taylor, ‘Interpretation of the Correlation Coefficient: A basic review’ JDMS, Vol.6, No.1, Jan-Feb 1990, p.37

² Noreen M. Webb, Richard J. Shavelson and Edward H. Haertel, 2006, ‘Reliability Coefficient and Generalizability Theory: Handbook of Statistics’, Elsevier B.V., Vol. 26, p. 4 & 5

The value of alpha shall be more than 0.70 to carry out quantitative analysis. Here, all values of alpha are high and hence acceptable to apply quantitative techniques (Ref: Ch.3, Michael J. Miller, 2003 and Mohssen T. et al, 2011).

5.1.6 Normality check

Empirical Rules and Chybyshhev's³ Theorem have used to measure the normality of responses. The Empirical Rule states that minimum 68%, 95% and almost all observations should fall in the ± 1 , ± 2 and ± 3 standard deviation limit respectively.

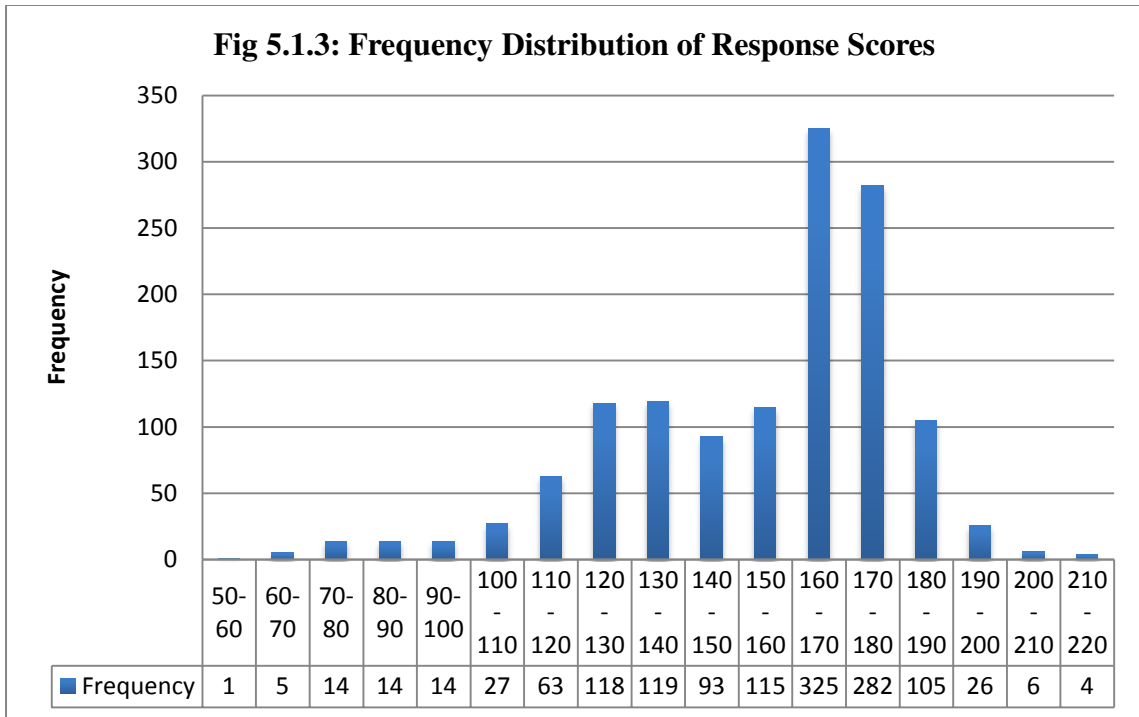
Chybyshhev's Theorem

1. At least $3/4^{\text{th}}$ (75%) of observations in a set will lie within 2 std. dev. Limit
2. At least $8/9^{\text{th}}$ (88.89%) of observations in a set will lie within 3 std. dev. Limit

Rating	Frequency	Table 5.1.6: Normality check for responses				
1	1864	Mean	3.424	Std. Dev	0.973	
2	8463	Criterion	Lower Limit	Upper Limit	Observed %	Conclusion
3	21516	Mean $\pm 1 \sigma$	2.45	4.40	66.88%	OK
4	18570	Mean $\pm 2 \sigma$	1.48	5.37	96.89%	OK
5	9521	Mean $\pm 3 \sigma$	0.50	6.34	100.0%	OK

The normality check results for overall responses indicate that it is appropriate to assume the data are normal. Similarly, the total of responses of all 46 items under Health, Safety and Welfare sections (response score) has calculated. The continuous frequency distribution of the same is as below:

³ Gupta S.P. "Statistical Methods" Sultan Chand & Sons, New Delhi, 2002, pp. 291,302



The above table indicates that about 46% of response score ranges between 160 to 180 and 87% of them have range 120 to 190. The former score is disaggregated in two classes whereas the later in seven classes. The minimum score is 46 and maximum is 230; gives average as 154.56. The distribution shows that the score is skewed to the right side indicating overall higher implementation of HSW provisions in the companies under study. The other parameters of the above distribution are presented in the following table.

Kurt	2.3298	Skew	0.558	
Mean	154.56	Median	163	
Mode	169	Range =	Min =	Max =
Std. Dev	25.849	164	54	218

Higher and positive value of the kurtosis indicates higher peakedness of the distribution as compared to the normal distribution. The positive value of skew indicates its inclination towards right side. Generally it lies between ± 1 . The mode and median fall in the same class; whereas, mean falls immediate previous class. The Empirical Rule and Chebyshev's Theorem have applied to check the normality of the data.

Criterion	Theoretical			Actual			
	Lower Limit	Upper Limit	Expected %	Lower Limit	Upper Limit	Frequency	Observed %
Mean $\pm 1\sigma$	128.71	180.41	68%	128	180	959	72.05%
Mean $\pm 2\sigma$	102.86	206.26	95%	102	206	1272	95.57%
Mean $\pm 3\sigma$	77.01	232.11	Almost all	77	232	1317	98.95%

Range	Min proportion of responses	Observed proportion of responses
Mean $\pm 2\sigma$	3/4 or 75%	95.57%
Mean $\pm 3\sigma$	8/9 or 88.89%	98.95%

The above results support our assumption of existence of normality of the population.

Further, the shop wise average skewness of operators responses over the parameters of HSW has calculated and results are presented as in fig 5.1.4. The shop level skewness values are positive for 7 cases (25%) and negative for 21 (75%) cases. The average skewness values are tested for Ho: skewness=0 against Ha: skewness is not equal to zero. The result indicates that in 10 cases (36%) it is significant whereas in 18 cases (64%) it is insignificant at $\alpha = 0.05$. In all cases the skewness is less than 0.5, which can be assumed to be approximately symmetric. The skewness between limit 0.5 to 1.00 represents moderately skewed and above 1.00 it is highly skewed. ⁴

Similarly, as per 4.8.14 hypothesis No. 4a the normality check of elements of Implementation (of HR practices) Level has carried out and results are tabulated in 5.1.8c as below.

⁴ Stan Brown, 'Measure of Shape: Skewness & Kurtosis' 2008 Source: <http://www.tc3.edu/instruct/sbrown/stat/shape.htm> date: 13/1/2013.

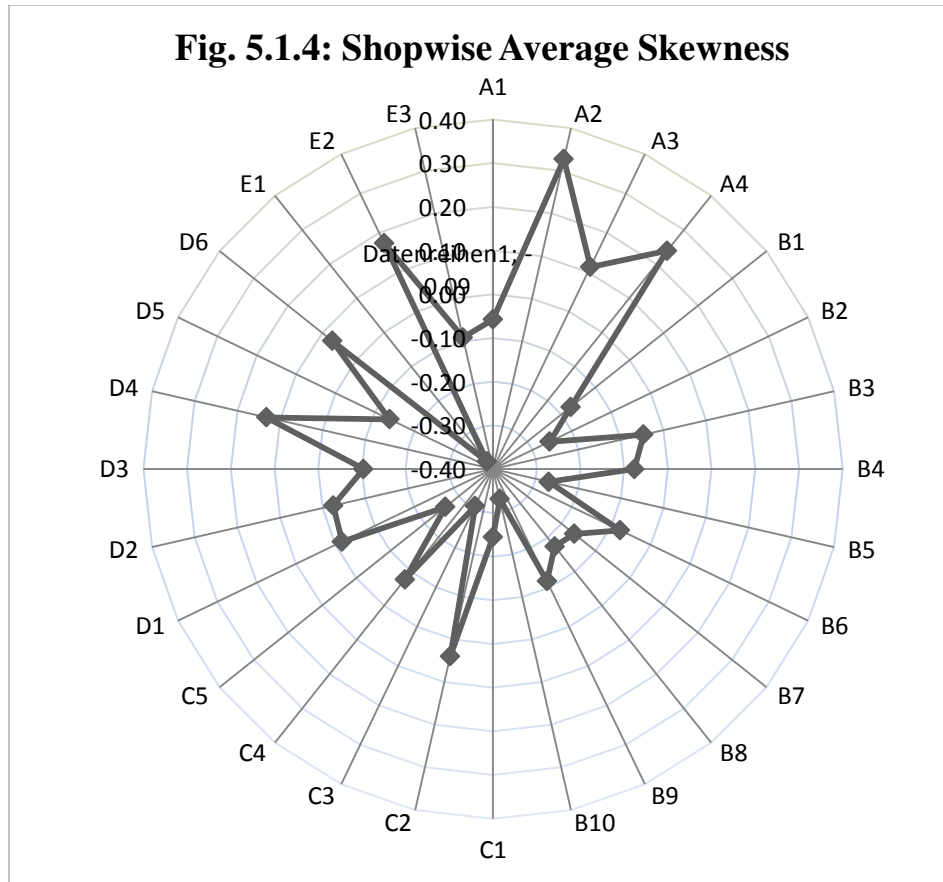


Table 5.1.8 C : Normality Check for values of Implementation Level						
Parameters	Cmn	Comp	Regulatory Framework	Involvement	Supply of Assets	HSWSOI
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Min	2.45	2.14	2.24	1.94	2.34	56.18
Max	4.19	4.23	4.24	3.73	4.43	80.00
AM	3.38	3.41	3.43	2.89	3.65	68.25
STDEV	0.536	0.629	0.706	0.546	0.637	7.015
Skewness	-0.171	-0.568	-0.480	-0.272	-0.437	-0.070
Lower limit	2.28	2.12	1.98	1.77	2.34	53.85
Upper limit	4.48	4.70	4.88	4.01	4.95	82.64

1. As the minimum and maximum values fall in the lower and upper limit established by assuming $\alpha=0.05$, it can be assumed that the samples are drawn from population having normal distribution.

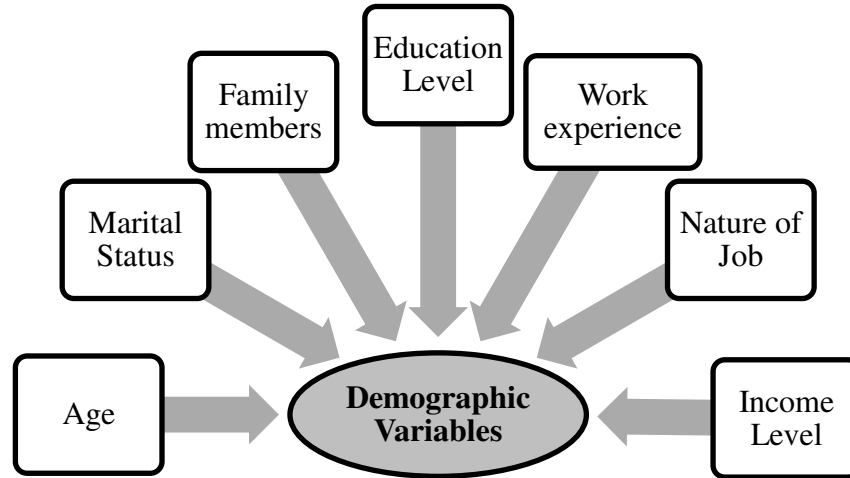
2. In our case out of six cases it is approximately normal in 5 cases and in case of Compliance it is slightly moderately skewed. Hence, the distribution of population can be assumed to be normal.

Note: Cmn= Communication, Comp= Compliance, HSWSOI = HSW satisfaction Overall Index

DEMOGRAPHIC PROFILE OF RESPONDENTS

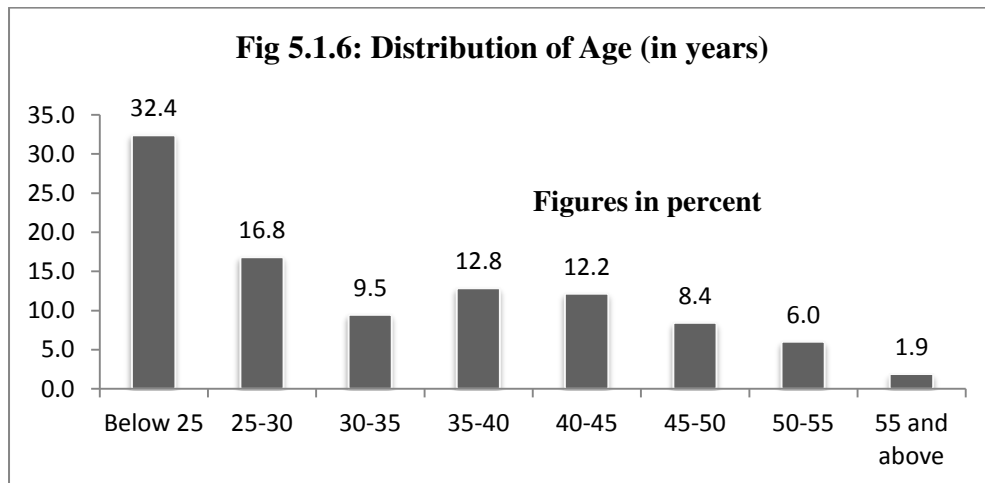
This section will give more information about respondent's characteristics which would be helpful while testing the third hypothesis. The reason of its presentation in the beginning of the hypothesis testing is its primary nature.

Fig 5.1.5: Constituents of Demographic variables



5.1.7 Age Distribution

The overall average age of respondents is 32.65 years with SD = 10.04 years. The highest (32%) respondents are below 25 years age. It is also observed that modal value of age is 23 and it is arrived for 161 times (12% of total sample size). The respondents of age 25 to 35 years and 35 to 45 years are approximately equal i.e. about 25% each.



The percentage of respondents age in Mean $\pm 1\sigma$ limit is 77.10%, Mean $\pm 2\sigma$ limit is 99.85% and Mean $\pm 3\sigma$ limit is 100%. The skewness of age found as 0.595 and kurtosis as -0.826 indicates that the data are normal and feasible for mathematical operations. The company wise distribution of age with salient statistics has presented as below.

Company	Nos.	Mean	Stdev	Cov
A	150.00	33.79	10.61	31.40
B	793.00	34.99	9.93	28.37
C	169.00	22.13	1.05	4.74
D	128.00	34.89	9.45	27.09
E	91.00	26.73	2.62	9.81

The average age of respondents in company A, B and D is approximately same (33.8 to 35 years); having approximately same Cov i.e. 31.40, 28.37 and 27.09 respectively (max $Z_{cal}=1.28$). Company C employed fresher's having age limit of 21 years at the time of appointment; hence, their average age is 22.13 years with SD = 1.05 and Cov= 4.74. The lower Cov indicates high homogeneity in the age distribution.

Nature of Job	Frequency	Mean	Stdev	Cov
(1)	(2)	(3)	(4)	(5)
Permanent	823	38.43	8.5	22.12
Temporary	330	23.9	2.44	10.21
Apprentice	178	22.12	1.06	4.79

Above table shows relationship of variability in age as: apprentices < temporary < permanent. The difference between average age of the apprentice and temporary workers is significant ($Z_{cal}=11.42$, $Z_{crit}=1.96$, $\alpha=0.05$). The reason lies in their purpose of employment.

5.1.8 Nature of Job

Permanent	Temporary	Apprentice
62%	25%	13%

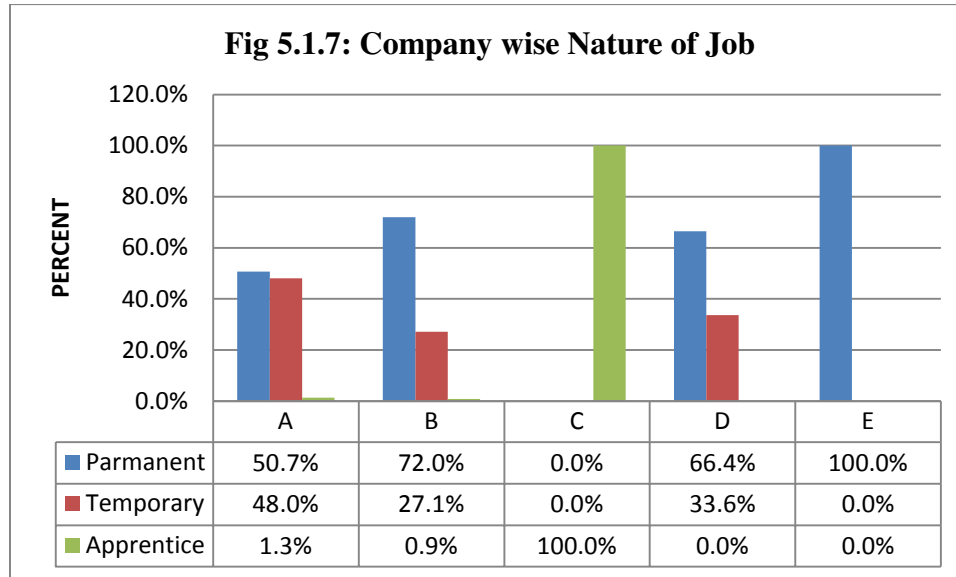


Table : 5.1.11: Company-wise Employment Type

Company	Permanent	Temporary	Apprentice	Total
A	76	72	2	150
B	571	215	7	793
C	0	0	169	169
D	85	43	0	128
E	91	0	0	91
Total	823	330	178	1331
Percent	61.8%	24.8%	13.4%	

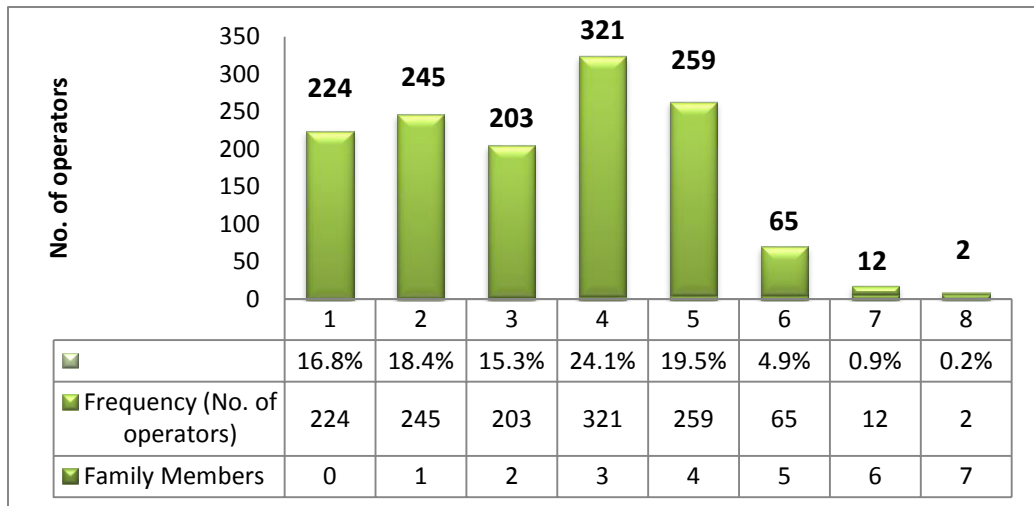
The overall respondents consist of about 62% permanent, 25% temporary and 13% apprentice. However, it does not indicate any picture of the nature of job in the automobile industry. The sample companies have adopted different policies of employment. The figure exhibits company-wise percentage of workers under different

category of employment. Company C and E have adopted completely opposite policies of employment. Company A has employed about four times more employees on contract basis (temporary) than permanent employees. Company B has employed about 30%-40% of temporary employees at shop floor and this percentage in company D is about 60.

5.1.9 Number of Dependent Family Members

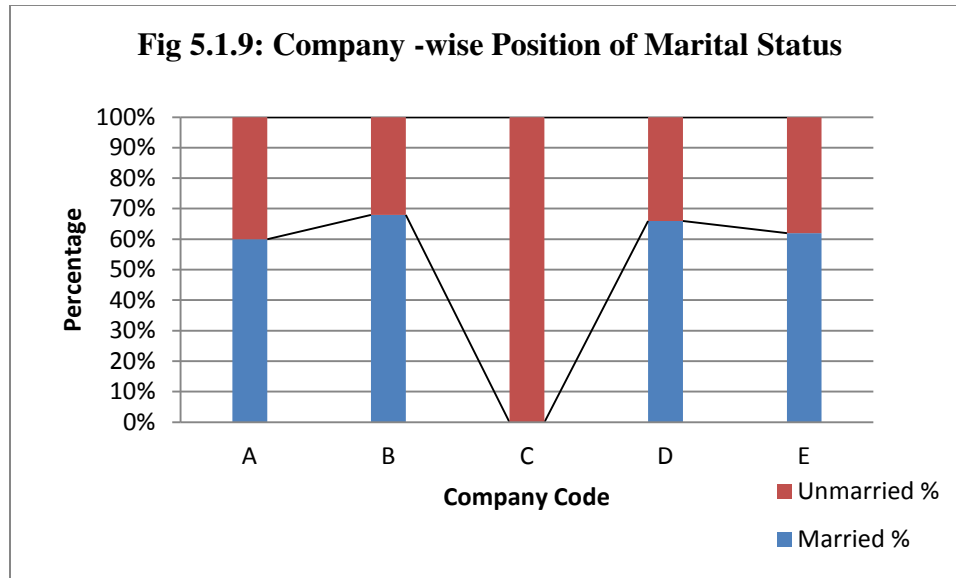
The highest 24.1% of respondents have 3 dependent family members. 19.5% have 4 and 18.4%, 16.8% and 15.2% respondents have 1, 0 and 2 family members respectively. 6% of respondents have more than 6 dependent family members. This indicates coverage of wide variety of respondents based on number of dependent family members. In all 75% of respondents have 3 or less and 25% of them have 4 or more dependent family members.

Fig 5.1.8: The Frequency Distribution of Family Members



5.1.10 Marital Status

In Overall 58% respondents are married and remaining 42% are unmarried. Company A, B, D and E have 60 to 68% of married and 32 to 40% of unmarried respondents. Company C has 100% unmarried respondents. The company wise details of respondents falling in both categories are given in the following table. As the average age of operators in Company C is lowest i.e. 22.13 years; they belong to unmarried category. The company-wise position of marital status is given in the following figure.



In overall company B's 70% respondents are married, while company A, D, E's this percentage lies between 62 to 68%. Again it is observed that structure of marital status depends upon employment policy and year of establishment of the company. Our sample includes both married and unmarried workers in approximately equal proportion except company C.

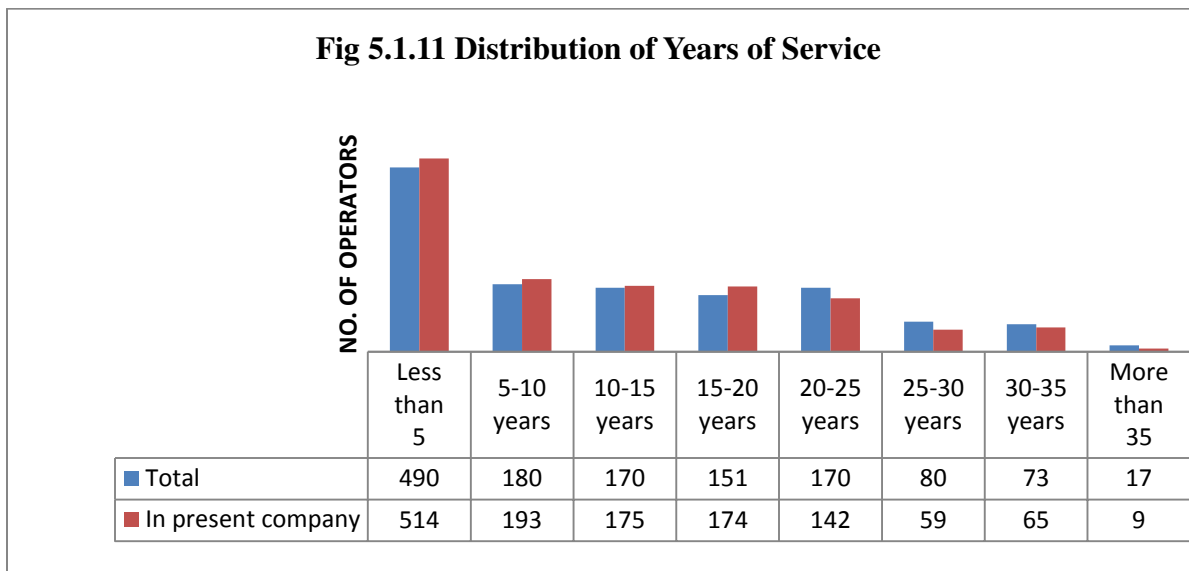
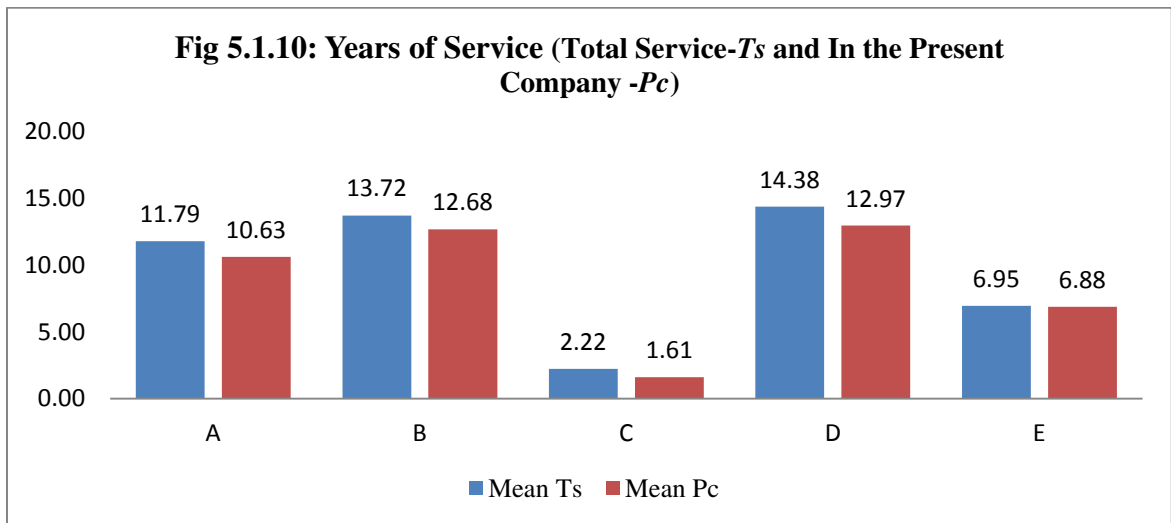
5.1.11 Educational Profile of Operators

Generally operators have education HSC or ITI level. In our samples overall about 64% of respondents come under this category. Company C has highest 83% of respondents under this category whereas this percentage in company A is 39%. Similarly, 62 to 75% of respondents in the company B, D and E have education in the said category.

EL	Upto SSC	SSC+ 2Years	Graduates	Engineering Diploma
A	68	59	19	4
B	144	488	114	47
C	22	141	6	0
D	22	94	11	1
E	1	68	21	1
Total	257	850	171	53
Percent	19.3%	63.9%	12.8%	4.0%

5.1.12 Years of Service

In all about 50% of respondents have completed upto 10 years of service, 25% have completed 10 to 20 years of service and remainder 25% of respondents have completed 20 or more years of service. The average years of service in a company depends upon number of factors such as pay, employment policy, welfare and convenience.



Company	Weighted Mean	Combined SD	Cov
A	11.21	10.00	89.20
B	13.20	9.70	73.46
C	1.92	0.68	35.44
D	13.67	9.39	68.69
E	6.91	2.40	34.68

The mean years of service in the company C is slightly less than 2 years whereas in company A, B and D it is 11 to 14 years. In company E it is slightly less than 7 years. The variability among A, B and D is between 68% to 89% which is more than that of Company C and E. This indicates the distribution of weighted years of service is more uniform in company C and E than that of remaining companies A, B and D.

5.1.13 Income level



Income Level	Monthly Income (Rs.)	Frequency	Percentage
1	Upto 8000	287	21.6%
2	9000-12000	137	10.3%
3	13000-16000	155	11.6%
4	17000-20000	164	12.3%
5	21000-24000	207	15.6%
6	Above 25000	381	28.6%
	Total	1331	100%

About 56% of respondents have income upto 20000 per month and remaining 44% have above 21000. The highest 28.6% of respondents have income more than 25000 and the next to highest 21.6% have income below 8000. Maximum income of respondents in company A and B is above 25000 whereas that of company C is upto 12000. Income of respondents in company D and E is 21000 to 24000. Minimum monthly income of respondents in company A, C and D is upto 8000 and that in case of company B and E is 9000 to 16000. Company C employed apprentice on probation period of two years hence the monthly income of 93% of respondents is upto 8000. On the basis of average income of respondents the following sequence has arranged in descending order.

Monthly Income	B > E > A > D > C
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5.2 MACRO LEVEL ANALYSIS

5.2.1 Qualitative Analysis: Introduction and Methodology

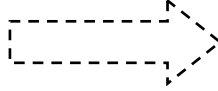
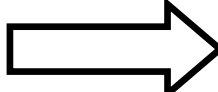
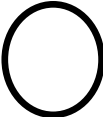
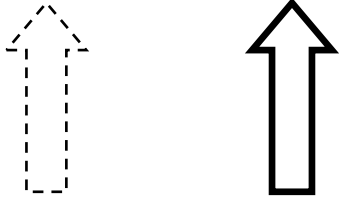
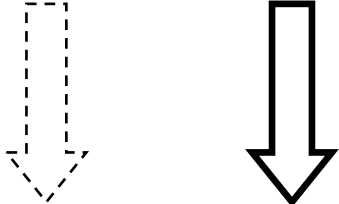
The objective of the qualitative analysis is to support the results of the quantitative analysis and have a richer understanding about situation in unguided circumstances. It is an inductive approach to the development of theory whereas quantitative research is deductive as it tests theories which have already been proposed. It concerns about opinions, experiences and feelings of individuals which describes phenomena naturally without manipulating situation under study. It can be done through interview or observation or both.

In our research, inferences about the HSW phenomena have drawn on the basis of interviews of experts: HR manager, Safety Officer and workers' representative as the trade union member.

Unit of Analysis

Interviews are conducted with the Trade-union members, HR managers, Safety Managers, Welfare officers of the company. As a function, trade union members watch the implementation levels of the issues related with HSW. Trade union members are elected by employees therefore they can be assumed to be representative of the many employees and hence, become our sample. The latter HR managers, Safety Managers and Welfare officers are experts in their respective field and can authentically offer opinions on the HSW situation in the company as a whole. In this interview the researcher has asked to express their opinions and feelings about the implementation of HSW provisions by the company. They allowed speaking freely on the subject and no try has made to manipulate the situation.

Their opinions provide some direction about the implementation of HSW provisions (statutory and non-statutory) in the company. A guesstimate in terms of range can be made from it about the expected resultant value (ERV) of quantitative research. Following table shows directions of opinions of trade union and management. These directions will be combined to arrive at resultant value.

Table 5.2.1: Directions of opinions	
Trade Union's average opinion (No direction)	
Management's average opinion (No direction)	
Expected Resultant Value (ERV)	
Trade Union and Management's positive opinions	
Trade Union and Management's negative opinions	

Sample Size

Table 5.2.2: Sample Size of Expert Survey									
Company A		Company B		Company C		Company D		Company E	
T.U.	Mgmt	T.U.	Mgmt	T.U.	Mgmt	T.U.	Mgmt	T.U.	Mgmt
2	2	4	10	4*	2	2	5	3	4
*No trade union hence production managers were interviewed									

5.2.2 Macro Level Qualitative Analysis

In this section the opinions of respondents based on interview are summarized and presented in diagrams to arrive at ERV, which eventually would provide premise for making inferences.

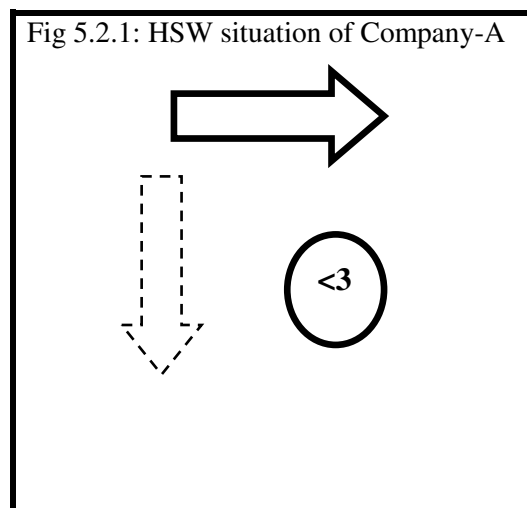
Company A

The researcher has good relationship with some of the managers and the trade union leader so it became possible to enter in the company. Firstly, the HR head and his assistant of this company were reluctant to express any opinion on the said topic. They had denied for carrying out any type of such employee survey in the premises of the company. However, to show some respect to the company manager (who was with me) they expressed following view.

Management: *“We are following statutory provisions as per the Factories Act. The health and safety situation changes with type of operations carried out in a shop and cannot be improved to match with other. It is shop specific.”*

Trade Union: *“The Company should follow good labour employment practices. Temporary and contract employees are six times more than permanent employees. They are engaged in the activities having high health hazards. Unhealthy, unsafe working conditions and activities have spotted time to time, but no any attempt has been made to improve it.”*

Management’s opinion did not indicate any direction (upward or downward) about HSW situation in the company. However, trade union members show clearly negative opinion. The graph of the above opinions has presented as below:



Company B

When the researcher approached HR head of the company, he asked to submit a file alongwith research proposal in brief, questionnaire, information required and data collection letter issued by the university. The General Manager HR approved the research proposal after a small presentation. The HR head then handed over the file to his assistant and allowed to visit the company for 15 days alongwith one assistant for data collection. The researcher then carried out the survey of operators working in different shops with the help of HR manager of the concerned shop. This was very pleasant experience for the researcher. In this period the HR managers of the shops and trade union members have expressed opinions as summarized below.

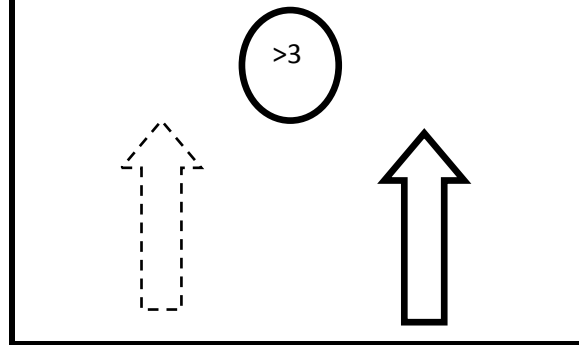
Trade Union: *“As far as H&S is concerned, company is following world class practices as per OSHA, SA-8000 and other international standards. Company has won number of recognitions in this area; one to name is Golden Peacock Award. The world leader Du Pont Corporation of Japan is working on the maintenance of H&S situation in all plants of Tata Motors at par with world standards. We are very satisfied with the efforts that the company has been taking in this area.”*

HR Managers: *“Employee’s Health and Safety is foremost important to company. Cardiac health check up camp has conducted for operators; which is exemplary in the industry and indicates our genuine feelings about employees’ health. We have initiated mass communication (Maha-Communication) to increase employees’ awareness on these issues. The safety rules are made stringent. Safety non-compliances are taken very seriously and can even stop promotion of the manager or supervisor. A show-cause notice is served to defaulter. It is one of the performance criteria for managers.”*

Safety Officers: *“Apart from the provisions mentioned in the F.A. we are maintaining high level of H&S environment in the company. Advance techniques such as Behaviour Based Safety, Zero Accident Plan, periodical audits and Ergonomic study are being conducted in the company. We are at the first level of Du Pont’s level of safety. We continue to emphasis on communication, compliance and reward system in the safety. Upward communication is our input-base where we are excellent.”*

Welfare Officers: *“We are implementing employee welfare schemes above the Government’s Acts. Survey indicates that most of the Tata Motors employees are very satisfied with it. The list of welfare schemes is comprehensive and useful to feel employees tension free. As far as H&S of workers are concerned ... they are our family members and we are responsible for their overall wellbeing.”*

Fig 5.2.2: HSW situation of Company-B



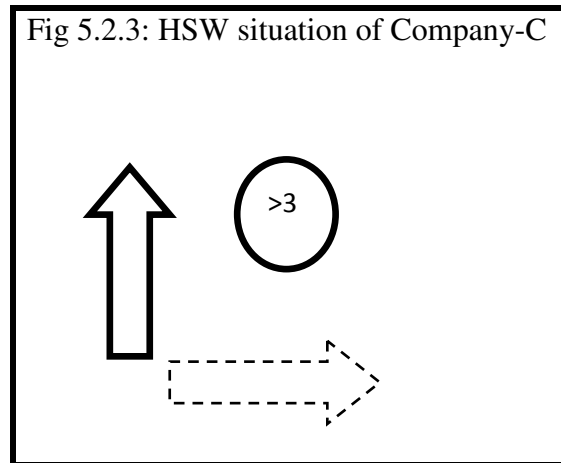
Company C

The researcher on the basis of personal relationship developed through teaching profession with number of managers became successful in getting data of this company. As there was no trade union, opinions of production managers have considered as that of the trade union and ultimately operators'. The opinions of HR manager and safety officer have taken on the situation under study.

HR Managers: "We are developing ourselves to make remarkable at global level. We are following OSHA standards in our company. We have been taking high level of efforts for safety of employees, machines, environment and information also. If anybody wants to be globally recognized then one has to follow globally accepted principles in all practices. Zero lost time injuries in eight sectors of the company in 2010-2011 is the result of these efforts. This plant is making excellence in this way."

Safety Officer: "---- being a new plant, we are adopting high level of technology and practices in all processes. As far as technology is concerned it is world class. The training to improve behavioural aspect of the employees is a continuous activity, on which we are mainly focusing."

Production Managers: "Health and Safety is highly considered in the design, layout and operation of the plant. We feel that in case of welfare, there is gap between employees expectation and what actual they receive."



Company D

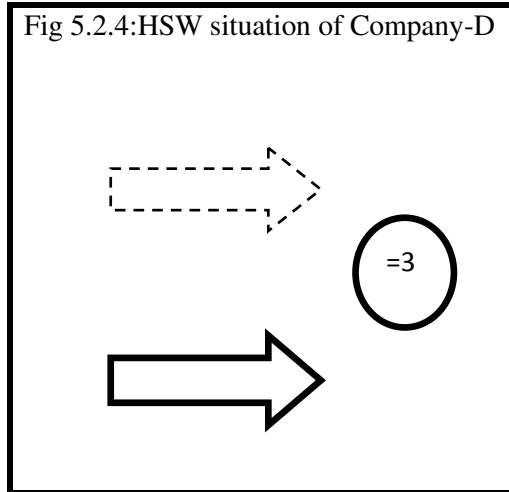
In this company, researcher collected information from HR managers, Welfare Officer, Safety Officer and Medical Officer. The trade union leader also gave opinion as below:

Trade union: *“The prime problem with union is not related to health and safety of the members but the legal issue pending with the hon’ble Supreme Court. The Company should work to improve environmental factors in the shops. Also technical improvements should be carried out to improve safety performance of the company. The training and information displayed are satisfactory. Working of safety department is satisfactory.”*

Management: *“We don’t claim that we are following world class health and safety regulations; as our company is old in terms of some machines and buildings, high technology standards cannot be met with. Hence, obviously the H&S situation is mediocre. About welfare we are offering various schemes for employees’ convenience. In house health centre is maintained for ordinary injuries. Rewards for safety and cleanliness are given to operators.”*

The direction of trade union members and Management Group does not show any clear picture of existence of high or low level of HSW situation in the company.

Fig 5.2.4:HSW situation of Company-D



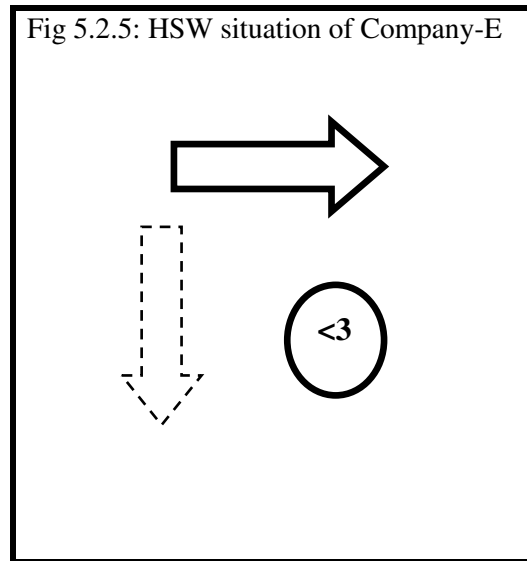
Company E

The researcher had not allowed for carrying out employees' survey on the topic under study. Therefore, he approached trade union leader who extended high level of cooperation in the collection of data. The HR manager and Trade union leader have expressed their opinions as below.

Management: *“Health and safety is an inherent characteristic of any activity, which is applicable to operations carried out in the production processes. Production in healthy and safe environment is our objective. This issue is linked with many aspects such as production, training and economic objectives of the company. We are following these with such a coordinated manner to satisfy employees as well as employers.”*

Trade Union: *“You can imagine Health and Safety situation of the company where there is no safety officer from eight months. Company is deliberately delaying the recommendations of safety committee. Safety committee members are not informed well in advance and not confirming their availability. Why a researcher is kept apart from knowing the situation? What it indicates?”*

The management's opinion does not show any positive or negative direction of the HSW situation in the company. They expressed a practical approach considering production, finance and cooperation; however, trade union leader's opinion is clearly to the negative direction. The combined result expected in this situation is as below.



Summary

On the basis of above discussion the expected results of the HSW situation in the company have presented in the following table in terms of ERV.

Table 5.2.3: HSW situation in the Sampled companies

Co	Opinions of		ERV
	T. Union	Mgmt.	
A	Negative	Average	Slightly less than average
B	Positive	Positive	Significantly more than average
C	Average	Positive	Slightly more than average
D	Average	Average	Near to average
E	Negative	Average	Slightly less than average

MACRO LEVEL ANALYSIS ON THE BASIS OF SURVEY

5.2.3 WORKERS'/OPERATORS' LEVEL OF SATISFACTION

Operator/workers are actually facing the effect of implementation of HSW provisions in a shop or company. Hence, their level of satisfaction can be assumed as an indicator of true situation. Following table is output of table No. 5.1.3.

Response	Co. A	Co. B	Co. C	Co. D	Co. E	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Below the Average	36.9%	7.1%	22.1%	31.6%	49.2%	17.2%
Average	38.4%	33.7%	33.1%	47.7%	40.2%	35.9%
Above the Average	24.7%	59.2%	44.8%	20.7%	10.7%	46.9%
Satisfied %	63.1%	92.9%	77.9%	68.4%	50.8%	82.8%

The overall maximum responses are received in category-3. During the construction of measurement scale it had assumed that the average level of satisfaction of the operators would be satisfactory, which found true here. As our sample organizations are OEMs, it was supposed that they maintain overall HSW provisions satisfactorily. The result is expressed in the comparative form as below:

Operators/Workers	B > C > D > A > E
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Further, we have tried to associate the workers' satisfaction with the trade union's opinion. In company A -63% of workers are satisfied which is unfavourable to union. In company B-93% respondents are satisfied and found it is appreciated by the union. Company C's-78.0 and company D's -68% both are average from union's perspective. Company E's 51% percentage of satisfied workers is unfavourable to union. This indicates satisfied workers' percentage upto 65 is unfavourable to unions, 65 to 80 is average and above 80 % is favourable from trade union and thereby workers' point of view.

5.2.4 Supervisors' Responses

Rating	Co. A	Co. B	Co. C	Co. D	Co. E	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	59	0	0	3	0	62
2	380	103	117	224	19	843

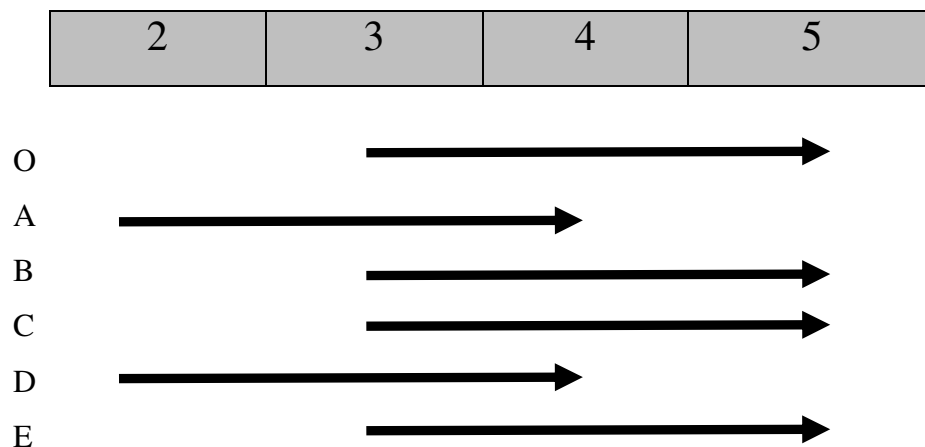
(1)	(2)	(3)	(4)	(5)	(6)	(7)
3	621	1668	569	564	284	3706
4	304	1814	401	242	288	3049
5	62	1106	477	100	191	1936
Total	1426	4691	1564	1133	782	9596
Below the Average	30.8%	2.2%	7.5%	20.0%	2.4%	9.4%
Average	43.5%	35.6%	36.4%	49.8%	36.3%	38.6%
Above the Average	25.7%	62.2%	56.1%	30.2%	61.3%	51.9%
Satisfied %	69.2%	97.8%	92.5%	80.0%	97.6%	90.6%

In case of company B and E the results are matching with each other and they both remain at the top rank. On the basis of satisfied percentage of supervisors the sequence of the companies A, C and D in descending order has arranged as below:

Supervisors	B & E > C > D > A
-------------	---------------------------------------

The table gives clear picture that the percentage of responses in the category of “Satisfied” to “Completely Satisfied” as an overall is 90.6%. However, the percentage of satisfied supervisors is least in company A at 69% to the highest at 98% in company B and E. The following figure shows response categories in which more than 90% of responses of supervisors are recorded. The “O” denotes “Overall” responses, while A, B, C, D and E are Company codes.

Fig : 5.2.6: Categories of more than 90% Responses



5.2.5 Responses of Line Managers

Table 5.2.6: Responses of Line Managers						
Rating	Co. A	Co. B	Co. C	Co. D	Co. E	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	50	0	0	3	0	53
2	266	83	99	241	10	699
3	423	1222	496	666	262	3069
4	218	1386	358	306	220	2488
5	55	757	381	139	198	1530
Total	1012	3448	1334	1355	690	7839
Below the Average	31.2%	2.4%	7.4%	18.0%	1.4%	9.6%
Average	41.8%	35.4%	37.2%	49.2%	38.0%	39.2%
Above the Average	27.0%	62.2%	55.4%	32.8%	60.6%	51.3%
Satisfied %	68.8%	97.6%	92.6%	82.0%	98.6%	90.4%

In case of company B and E the results are approximately equal and they both remain at the top rank. On the basis of satisfied percentage of managers' the sequence of the companies A, C and D in descending order has arranged as below:

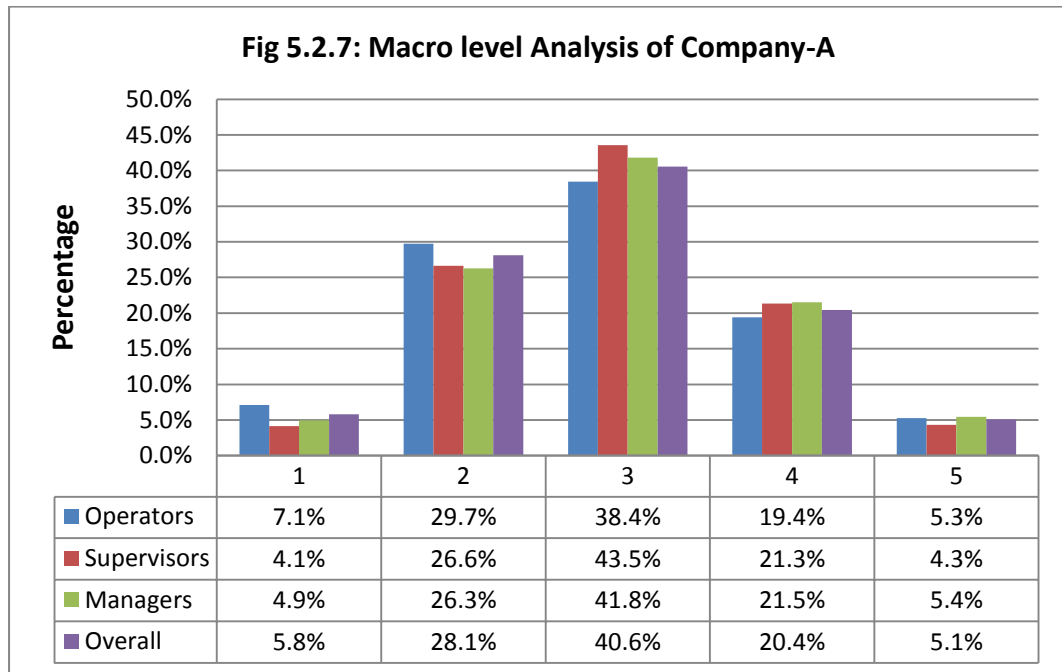
Managers	B & E > C > D > A
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It is exactly matching with the sequence arranged on the basis of supervisors' ratings. This indicates at macro level supervisors' and managers' opinions about implementation of HSW provisions in the company are approximately equal. With comparison to operators/workers responses it is observed that the position of Company E has elevated to first rank (supervisors' and managers' responses) from the fifth rank given by workers/operators. This indicates, there is more difference in the responses of these two classes. In case of Company E, as data had collected with the help of union, it is possible that operators have lowered their ratings to show loyalty with their union. The table gives clear picture that the percentage of responses of managers in the category of "Satisfied" to "Completely Satisfied" as an overall is 90.4% which is equivalent to that of

supervisors' but about 8% higher than operators/workers' responses. However, the percentage of satisfied supervisors is minimum (68.8%) in company A and the maximum (98.6%) in company E.

5.2.6 Importance Index

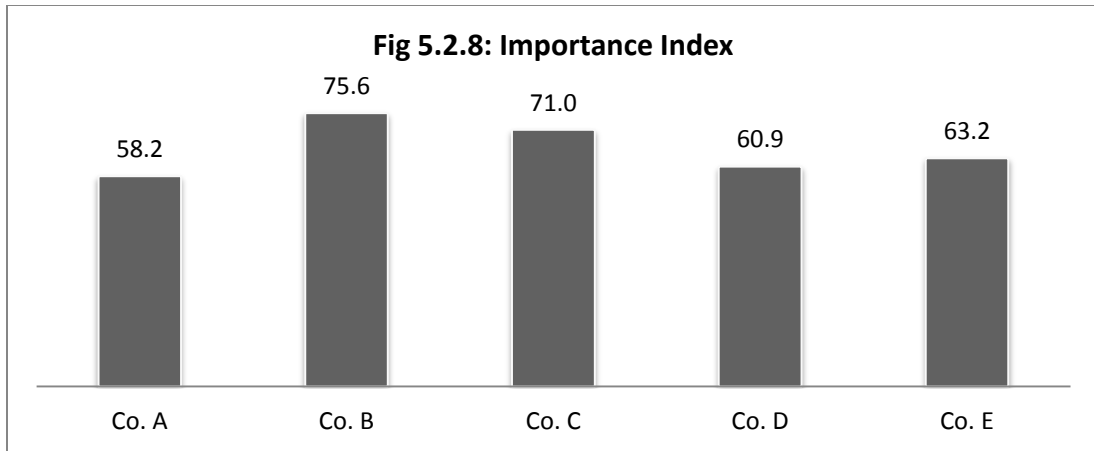
As mentioned in the research methodology, macro-level overall percentages have calculated by assigning 50%, 25% and 25% weightage to the operators, Supervisors and Managers' ratings respectively. The Importance Index is average of the product of ratings and corresponding percentages.



Overall scores under category – 1 = 0.50x7.10 + 0.25x4.1 + 0.25x4.9 = 5.8

$$IIa = \frac{(1 \times 5.8 + 2 \times 28.1 + 3 \times 40.6 + 4 \times 20.4 + 5 \times 5.1)}{5} = 58.2$$

Similarly, other calculations are made to find out Importance Indices for company B, C, D and E producing the following results.



The comparative sequence of these results is as below:

Overall	B > C > E > D > A
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5.2.7 Summary

The summary of the above discussion and calculation is exhibited below

Table 5.2.7 : Summary of Results	
Basis	Results
Expert Interview	B > C > D > A & E
Operators/Workers	B > C > A & D > E
Supervisors	B > C > D & E > A
Managers	B > C > D & E > A
Overall	B > C > E > D > A

On the basis of this review it is noticed that the companies under study can be grouped in three broad classes where the satisfaction is high, mediocre and low. Further we would like to link these classifications with the plant size and ultimately the accident/injury rates. Grimaldi and Simonds (1996) found that plant size in terms of number of working employees inversely affects on the accident/injury rates. In this research we have theoretically accepted that accident/injury rate is an inverse function of

the employees' satisfaction relating to HSW. Thus, it can be said that higher the plant size higher will be employees' satisfaction.

Grimaldi and Simonds (1996): Higher the plant size lower will be accident/injury rate.

Our assumption: Higher the satisfaction relating to implementation of HSW lower will be the accident/injury rate.

Conclusion: Higher the plant size higher will be satisfaction

Table 5.2.8: Plant Size and Satisfaction		
Plant Size	Company	Satisfaction
1000-2000	A, D and E	Lower
2000-5000	C	Moderate
5000 and above	B	Highest

This situation is already explained by the overall ratings that

Importance Index	B > C > E , D & A
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Hence, higher the plant size higher will be satisfaction of employees.

This macro level analysis gives general idea of the implementation level of HSW provisions in a company as well as industry. The basic purpose of our research is to carryout micro level analysis i.e. at shop/block level and hypothesis testing. The forthcoming chapter intended for this purpose.

Supervisory mechanism of Government is responsible for enforcement and inspection of the provisions mentioned in the F.A. relating to HSW. It is also responsible for prosecution and penalty or closure of the hazardous plant or activity in case of breach of provisions. In the subsequent section we have taken review of functioning of Government Department and HSW situation in Maharashtra.

5.2.8 Analysis of Health and Safety Situation in Maharashtra

In Maharashtra, there are about 43,261 registered factories engaging 20.86 lakh employees including 15% female, under the command of DISH. The total sanctioned posts factory inspectorates were 134 out of which 67 were in position and 67 were vacant. The scenario of factories in Maharashtra since 2000 is as below.

Year	Working factories	Employment in Lakh	New Factories (working)	No of directorates* required	Average employment per factory
(1)	(2)	(3)	(4)	(5)	(6)
2000	29562	12.31			42
2001	28324	12.01	-1238	142	42
2001	28707	11.81	383	144	41
2003	28816	11.72	109	144	41
2004	29256	11.93	440	146	41
2005	30385	12.58	1129	152	41
2006	31560	12.91	1175	158	41
2007	33328	15.69	1768	167	47
2008	44644	17.79	11316	223	40
2009	34060	15.00	-10584	170	44
2010	35129	19.13	1069	176	54
2011	41201	20.86	6072	206	51

1. As per norms every deputy director and assistant director shall be in charge of 150 and 250 factories respectively. The required number of posts on the basis of these norms comes 206 in 2011 whereas sanctioned posts were 134 out of which 67 posts were in position. The post shall be revised to match with the rate of adding new factories per year. This indicates the existing staff is overburdened by at least three times more than norms. In the draft labour policy-2010, government mentioned need of right deployment of directorates in terms of number, place and need considering the next 5 years' projections.
2. In Maharashtra there were 1162 large scale industries (as on 31/03/2009, mpcb.gov.in). The work of large industries is disaggregated over many departments or

shops which may not be inspected in one day. Also scattered factories add difficulty in inspection.

Year	Inspection of factories	No of cases filed	Percentage of inspection	Fine Recovered (Lakh)	By Medical Wing	By Authorized Surgeon
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2006	19402	672	61.48%	31.13	2453	3703
2007	16437	701	49.32%	46.18	3436	5063
2008	15432	647	34.57%	51.43	2419	5816
2009	11950	562	35.09%	39.33	3245	15545
2010	9466	547	26.95%	52.68	4143	29772
2011	8616	650	20.91%	113.18	2127	59944

3. The number of inspections per year has been decreasing since 2006 (61.5%) to 21% in 2011. The inspection of MAH and chemical factories having high potential of hazards should be carried out on the top priority. Other factories shall be inspected on the basis of previous compliance, failure to abate violation, willful or frequent violations and its severity and employee's complaints. Thus, for optimal utilization of inspecting staff it becomes necessary to inspect factories on the basis of hazards.
4. Every director has power to prosecute in case of non-compliance of the provisions. The number of cases filed in year 2011 is 650; considering 67 strength of staff on an average they have to deal with 9-10 new cases and appear before the court. This is the exclusive power and basic authority of the directorates which cannot be delegated.
5. There are 4911 hazardous factories in Maharashtra employing about 2.47 lakh workers. The data show that higher performance of medical wing is possible through appointment of more number of authorized surgeons.

Year	Fatal	Non Fatal	Frequency Rate
2006	177	240	-
2007	213	3754	0.89
2008	218	3312	0.73
2009	217	3128	0.64
2010	225	2765	0.43
2011	183	2449	0.43

6. The average fatal accidents in factories were 206 and non fatal accidents were 3082. The trend of nonfatal accidents is decreasing since 2007 however, that of fatal accidents remains fairly constant. This indicates there is need to look into matter in detail.

S.N.	Safety and Health issue	Maharashtra State		
		Required	Appointed /available	Percentage
(1)	(2)	(3)	(4)	(5)
1	Safety Officers (SO)	481	537	111.6%
2	No. of Factories requiring SO	579	387	66.8 %
3	Safety policy	2665	1545	58%
4	Safety committee	1495	997	66.7%
5	Emergency plan (for MAH units)	348	348	100%
6	Full time Medical Officers	409	230	56.2%
7	No. of ambulance	299	243	81.3%
8	Welfare Officers	537	512	95.3%

7. In Maharashtra 579 factories required safety officers out of which 387 factories have appointed them (66.80%). There were 537 safety officers working, against requirement of 481 (111.60%). This indicates some factories have appointed more safety officers according to the intrinsic nature of plant i.e. being more hazardous whereas some factories have not or less appointed.

8. Declaration of the safety policy, establishment of safety committee and appointment of full time medical officer are prime necessities in Maharashtra to foster Health and Safety in the factories.

Providing HSW at the workplace requires capital investment and working capital for its operation and maintenance. In the period of prosperity it becomes possible to maintain facilities and offer services to employees with high involvement of cost. But, cost cutting measures on account of reduced profitability may reach to the realm of HSW expenses. Our further analysis examines whether the economic fluctuations in the 2004-2010 have affected the maintenance and welfare cost? As these costs are highly correlated with employees' HSW and supposed to be the last option of cost cutting measure that an organization has to adopt.

Reference: Hendre R.W., "Impact of Financial Performance Indicators on Employees' Health, Safety and Welfare with Specific Reference to Indian Automobile Industry (Year 2004-2010)", Dimension 2012, SIBACA, Feb 2012, pp. 1-12.

5.2.9 Impact of Financial Performance Indicators on Employees' Health, Safety and Welfare with Specific Reference to Indian Automobile Industry

(Financial Year 2004-05 to 2009-10)

Premier limited, Tata motors, Mahindra Vehicles and Manufacturing Limited, Force motors and Bajaj automobiles are the companies which would represent the Indian automobile industry. Their annual reports become primary source of data for this analysis. It is mandatory for public limited companies to disclose the expenses on repairs to building and tools and plants (machinery) and economic performance in the annual report. The net sales and profit (after tax) have assumed to be the crucial performance indicators.

The expenditure incurred on the maintenance of building, machinery and welfare may not represent a true picture of health, safety and welfare situation in an organization; but, there must be high degree of correlation between them. The maximum and minimum net sales are considered as a parameter of economic performance in the study period. This is due the fact that in the normal business fluctuations the expenditure cut may not reach to the realm of employees HSW as it may again worsen the situation.

The table exhibiting financial performance and HSW related parameters extracted from Annual Reports of the sample companies is appended in the Appendix-IV. On the basis of the table following explanation has put forward.

Company A

The net sales have grown by 368%, registering profit at 11.1% in FY 2009-2010. Salary of the employees has grown by 208% and accordingly the welfare cost raised by 220%. The average expenditure on repairs to building in this period was 0.04 Cr and on repairs to machinery was 0.47 Cr. The average net asset value of the building was 31.67 Cr and that of machinery was 32.08 Cr. On an average 0.12% expenditure has incurred on repairs to building and 1.46% on repairs to machinery.

Company B

The net sales have grown by 202%, registering profit at 6.30% in FY 2009-2010. Salary of the employees has grown by 190% and accordingly the welfare cost raised by

168%. The average expenditure on repairs to building in this period was 31.42 Cr and on repairs to machinery was 53.01 Cr. The average net asset value of the building was 857.91 Cr and that of machinery was 4131.82 Cr. On an average 3.66% expenditure has incurred on repairs to building and 1.28 % on repairs to machinery.

Company C

The net sales have grown by 150%, registering profit at 11.60% in FY 2011-2012. Salary of the employees has grown by 120% and accordingly the welfare cost raised by 120%. The average expenditure on repairs to building in this period was 20.22 Cr and on repairs to machinery was 86.14 Cr. The average net asset value of the building was 493.43 Cr and that of machinery was 1627.11 Cr. On an average 4.1% expenditure has incurred on repairs to building and 5.29 % on repairs to machinery.

Company D

The net sales have grown by 110%, registering profit at 6.30% in FY 2009-2010. Salary of the employees has grown by 132% and accordingly the welfare cost raised by 119%. The average expenditure on repairs to building in this period was 1.72 Cr and on repairs to machinery was 5.14 Cr. The average net asset value of the building was 41.61 Cr and that of machinery was 88.28 Cr. On an average 4.12% expenditure has incurred on repairs to building and 5.82 % on repairs to machinery.

Company E

The net sales have grown by 201%, registering profit at 14.8% in FY 2009-2010. Salary of the employees has grown by 152% and accordingly the welfare cost raised by 197%. The average expenditure on repairs to building in this period was 19.86 Cr and on repairs to machinery was 52.27 Cr. The average net asset value of the building was 294.69 Cr and that of machinery was 463.63 Cr. On an average 6.74% expenditure has incurred on repairs to building and 11.27 % on repairs to machinery.

THE CONCLUSIONS OF DATA ANALYSIS : (Period 2004-05 To 2009-10)

1. The minimum and maximum net sales of companies during the period 2004-2010 and corresponding profits after tax have high degree of correlation ($r=0.91$) between them.
2. Company to company the variations in the reductions in the net sales and profit after tax are significant during the study period ($F_{cal}=9.74$, $F_{critical}= 6.39$ at $\alpha= 0.05$).

As net sales and profits are highly associated, the reduction in net sales is approximately equal to the reduction in profit ($F_{cal}=3.77$, $F_{critical}=7.71$ at $\alpha= 0.05$).

3. On the basis of analysis of minimum and maximum profit after tax expressed in terms of the percentage of net sales during the study period 2004-2010, it is observed that variation in the profit after tax was significant.

4. In an attempt to find out relationship between the 1. repairs on building (in terms of percentage with net asset value of building) and 2. repairs on machinery (in terms of percentage with net asset value of machinery) with employees' level of satisfaction level related to 3. Health and 4. Safety parameters; it is found that in the former the correlations are not significant ($r_{13} = 0.27$ and $r_{14} = 0.46$) and in the latter there is inverse and no correlation ($r_{23}= - 0.17$ and $r_{24}= - 0.01$) between them. Thus, there is not enough evidence to say the satisfaction related to health and safety is significantly related to the amount of repairs to building and machinery ($r_{crit}=0.632$, $df=10-2=8$, $\alpha=0.05$).

5. The correlations between net assets of 1. Building and 2. Machinery per employee with satisfaction related to 3. Health and 4. Safety are encouraging ($r_{13}=0.889$, $r_{14}=0.923$, $r_{23}=0.916$ and $r_{24}=0.97$). This indicates employees' satisfaction depends upon reliability or quality of the assets which is a function of net asset value. Higher the reliability higher will be the cost of assets and lower will be the amount of maintenance required for it.

6. The welfare expenses as percentage to the salary in the period of minimum and maximum net sales show, in this period the expenditure on the employees' welfare remained unchanged ($F_{cal}=0.22$, $F_{critical}=7.70$ and $\alpha=0.05$ revealed p value= 0.66). The minimum expenditure on welfare by company-D was 4.71% whereas that by company-C was 16.13%. Thus, company to company the difference in welfare expenses is significant ($F_{cal}=18.02$, $F_{critical}=6.38$ and $\alpha=0.05$ revealed p value 0.008). In a nutshell there is enough evidence to assume that, in the given period the welfare expenses of all companies have not affected.

7. The average percentage of expenditure on repairs to machinery (with its net asset value) is higher than that of building. The extent of variability in the former is higher than that of latter. This is because of repairs to machinery is active and associated with the usage of machinery and demand whereas the repairs to building is static element.

5.3 HYPOTHESES TESTING AND INTERPRETATION

OBJECTIVES	<ol style="list-style-type: none">1. To explain hypothesis testing methodology in brief2. To carry out the test and interpret the results3. To explore the effect of other variables on dependent variable
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The data collected through questionnaire-I and II have tabulated in the excel sheet after editing and coding. Using inbuilt software and “Data Analysis” in Windows XP (professional version 2002) we have calculated parameters required for quantitative testing. We have structured five hypotheses for this study. This section is devoted for hypothesis testing and interpretation as well as more insights into data.

5.3.1 HYPOTHESIS NO.1

H1: The most of the workers in automobile companies under study are significantly aware about the provisions of Health, Safety and Welfare.

This hypothesis structured in the present study requires assessment and testing as mentioned below:

- a. Self reported Awareness Level of operators/workers about the provisions of HSW (*Awr*) is based on Arithmetic Mean (hereafter referred as AM) of Q. 1H (information about Health provisions), 1S (information about Safety provisions) and 1W (information about Welfare provisions) of the questionnaire I. Other questions related to this are sources and medium of information addressed in Q. 2 and 3 respectively.
- b. Derived Awareness Level of employees (*Awd*) is based on the following parameters:
 - i. Functioning of health department, safety committees and welfare committees in the company (AM of Q. 4H, 4S, 4W)
 - ii. Operators’ participation in the HSW related activities (AM of Q. 5H, 5S and 5W)
 - iii. Training of safe operational method and fire training (AM of Q. 23 and Q. 38)
 - iv. Communication specific to the work and in general (AM Q.30and Q. 32a)
 - v. Safety and welfare department’s working (AM of 40b and 49)

Assuming each of the above parameters contributes equally in the awareness level, the AM of the above will determine the derived level of awareness. The responses of workers/operators are measured on Likert-type scale having following descriptions and numerical values assigned to each of them.

Table 5.3.1: Descriptions of Likert-type Scale and its Numerical Values				
Not at all known	Slightly known	Somewhat known	Moderately known	Substantially known
Never	Rare	Some times	Often	Always
Highly Dissatisfied	Less satisfied	Satisfied	More Satisfied	Completely Satisfied
1	2	3	4	5

The following sets of propositions have tested using one –tailed t-test

- a. $P_o: Awr = Awd$ b. $P_o: Awd = 3$ c. $P_o: Awr = 3$
 $P_1: Awr > Awd$ $P_1: Awd > 3$ $P_1: Awr > 3$

Further, to have more insights into awareness level and identify the factors influencing on it we have assessed its relationship with age and nature of the job. For this purpose appropriate statistical tests of correlation, t-test and ANOVA have applied.

Table 5.3.2: Distribution of <i>Awd</i> and <i>Awr</i>								
a. Derived Awareness Level (<i>Awd</i>)								
Awd level	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Frequency	25	127	220	339	502	110	8	1331
Percentage	1.9%	9.5%	16.5%	25.5%	37.7%	8.3%	0.6%	100.0%
Percentage of respondents having more than average derived Awareness				72.1%				

b. Reported Awareness Level (Awr)								
Awr level	1.5-2	2-2.5	2.5-3.0	3-3.5	3.5-4	4-4.5	4.5-5	Total
Frequency	12	105	119	348	133	366	248	1331
Percentage	0.90%	7.89%	8.94%	26.15%	9.99%	27.50%	18.63%	100.00%
Percentage of respondents having more than average Self Reported Awareness				82.27%				

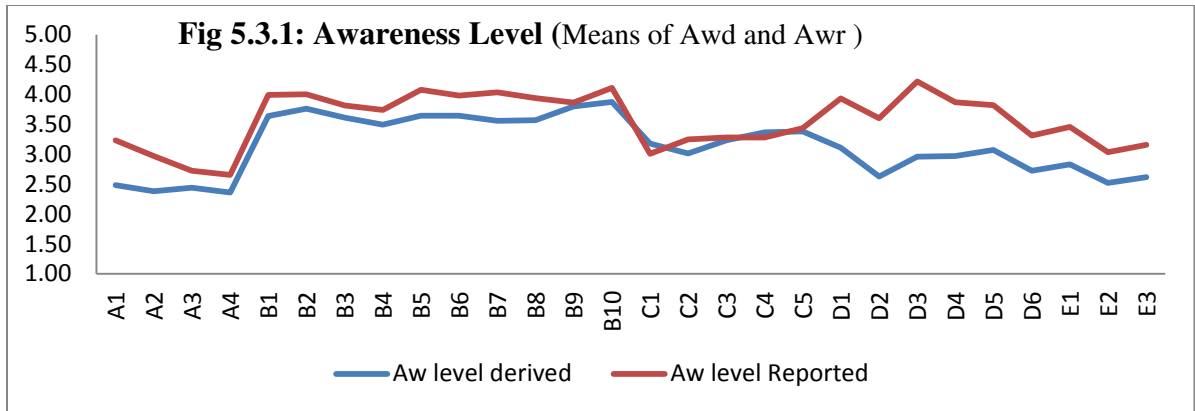
Table 5.3.3: Parameters of Awd and Awr

Parameters	Awd	Awr
(1)	(2)	(3)
AM	3.31	3.66
SD	0.59	0.81
Cov	17.8%	22.1%
Skewness	-0.177	-0.421
Kurtosis	-1.33	-1.00

The distribution of awareness level in the above table shows that about 2% of respondent have Awd between 1.5 -2.0, 26% have between 2 -3, 63% have 3 -4 and 9% have 4 -5. The mean value of Awd is lesser than that of Awr. We have predicted that respondents will rate higher value about their knowledge than actual to glorify the self image. Also, the lesser value of coefficient of variability of Awd indicates its more uniformity or higher reliability than Awr. The lower value of skewness i.e. upto -0.5 represents the distribution is approximately symmetric and the negative value of kurtosis shows, it is flatter than normal. About 72% of respondents have more than average derived awareness.

The mean Awr value is higher than Awd, showing greater variation, moderately skewed to the right side. About 82 % of respondents reported awareness more than 3.0.

The shop wise mean values of Awd and Awr have presented in the following figure.



The Awr is greater than Awd in 26 (93%) cases out of 28. In the remaining two cases also the difference between Awr and Awd is insignificant; hence, assumed to be equal. This difference is less than 0.5 in 17 (61%) cases and in the rest 11 (39%) cases it is between 0.5 to 1.

One tailed t-test has applied to test the propositions in set a, b and c. The ‘Windows-XP Excel-Data Analysis software’ has generated following results. The conclusions in column 4, 6 and 8 are made with level of significance 0.05. The symbols “>” indicates significantly higher value, “=” indicates the insignificant difference and “<” indicates significantly lower value.

Shop Code	Pop.	p-Values for set (a)	Con.	p-Values for set (b)	Con.	p-Values for set (c)	Con.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A1	300	0.0015	>	0.0000	<	0.2844	=
A2	615	0.0000	>	0.0000	<	0.7338	=
A3	270	0.0071	>	0.0000	<	0.0036	<
A4	305	0.0022	>	0.0000	<	0.0002	<
B1	560	0.0054	>	0.0000	>	0.0000	>
B2	1225	0.0025	>	0.0000	>	0.0000	>
B3	1512	0.0061	>	0.0000	>	0.0000	>
B4	993	0.0136	>	0.0000	>	0.0000	>
B5	1610	0.0001	>	0.0000	>	0.0000	>

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B6	2504	0.0000	>	0.0000	>	0.0000	>
B7	2315	0.0000	>	0.0000	>	0.0000	>
B8	1450	0.0000	>	0.0000	>	0.0000	>
B9	298	0.6031	=	0.0000	>	0.0000	>
B10	794	0.0186	>	0.0000	>	0.0000	>
C1	700	0.1779	=	0.0157	>	0.9267	=
C2	900	0.0032	>	0.7008	=	0.0004	>
C3	800	0.6736	=	0.0021	>	0.0038	>
C4	450	0.3423	=	0.0000	>	0.0011	>
C5	400	0.7791	=	0.0047	>	0.0096	>
D1	100	0.0066	>	0.1175	=	0.0061	>
D2	50	0.0024	>	0.0016	<	0.0478	=
D3	125	0.0000	>	0.5274	=	0.0002	>
D4	300	0.0000	>	0.6000	=	0.0000	>
D5	100	0.0150	>	0.5651	=	0.0095	>
D6	675	0.0000	>	0.0000	<	0.0084	>
E1	150	0.0179	>	0.2312	=	0.0459	=
E2	300	0.0161	>	0.0007	<	0.8245	=
E3	540	0.0000	>	0.0000	<	0.1299	=

For Set (a) Proposition: In the 5 shops the difference between Awd and Awr is insignificant and hence can be treated as equal. In the remaining 23 (82%) shops the difference is significant; where Awr is higher than Awd. As most of the (82%) shops mean reported awareness level is significantly more than derived awareness level we accept proposition P1 as stated in set (a). This indicates **“The self reported awareness level of workers is significantly higher than derived awareness level.”**

Table 5.3.5 : Interpretation of Test Results in the Table No. 5.3.4				
For Proposition (b): Derived Awareness Level				
<i>Awd level</i>	Frequency	Percentage	Population covered	Percentage
(1)	(2)	(3)	(4)	(5)
> (High)	14	50.00%	15611	76.75%
= (Equal)	6	21.43%	1675	8.23%
< (Low)	8	28.57%	3055	15.02%
Total	28	100%	20341	100.00%
For Proposition (c): Reported Awareness Level				
<i>Awr level</i>	Frequency	Percentage	Population covered	Percentage
> (High)	19	67.86%	17111	84.12%
= (Equal)	7	25.00%	2655	13.05%
< (Low)	2	7.14%	575	2.83%
Total	28	100%	20341	100.00%

The summary table indicates that in 50% of cases Awd level is significantly more than the central point '3' (3-satisfactory). In 29% of cases it is significantly lower than '3' and in 21% of cases the difference is insignificant. The population representing to more than '3' category is about 77%. **As the 50% of cases where the awareness level is more than '3' representing 77% of population, we confirm our say and accept proposition P1 as stated in Set b.**

“In case of Self reported awareness level, it is significantly more than '3' in 68% of cases which represents 84% population.” Hence, we accept proposition P1 stated in Set c.

Further insights into data reveals the fact that in company A, the Awr is lower than '3' in all four shops. In case of first two shops the difference can be attributed to random variation and hence can be said 'Insignificant' whereas in the remaining two shops it is significantly less than '3'.

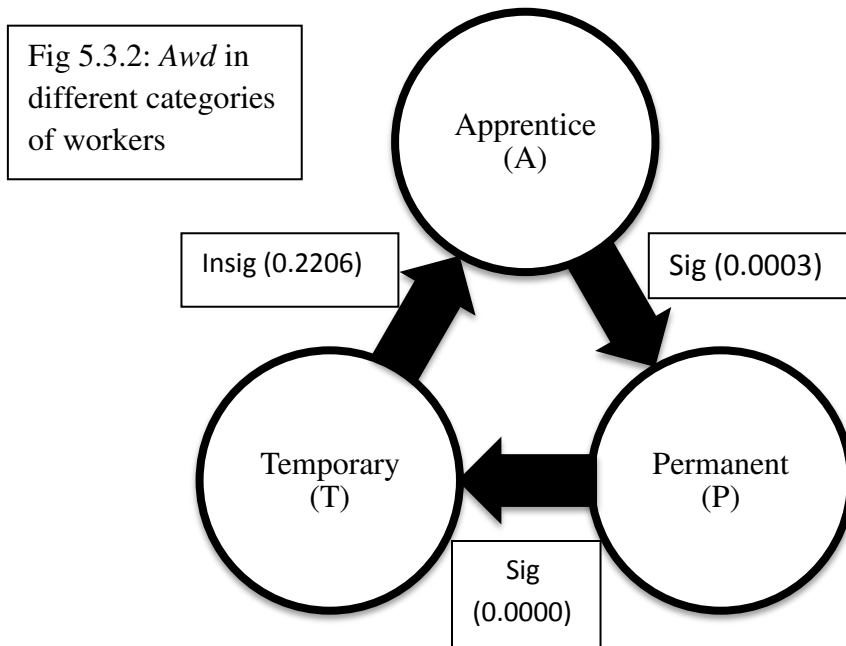
Hence, on the basis of above explanation, it can be said that **Hypothesis No. 1:**

“The most of the workers in automobile companies under study are significantly aware about the provisions of Health, Safety and Welfare.” is proved.

Our further analysis investigates ‘Whether the derived awareness level depends upon nature of job?’ ANOVA test results are tabulated in the following table.

Table 5.3.6 ANOVA: Single Factor Summary				
Aw derived and its relation with nature of job				
<i>Groups</i>	<i>Count</i>	<i>Average</i>	<i>Variance</i>	ANOVA Results
Apprentice	178	3.21	0.1759	Fcal = 22.11, Fcrit = 3.00, at $\alpha=0.05$, p-value = 0.0000
Permanent	823	3.39	0.3741	
Temporary	330	3.15	0.3109	

‘The level of awareness in temporary workers is lowest and in permanent workers it is highest’. The one-way ANOVA result shows that awareness level in these different categories is not same. Further, the t-tests have applied to find out significance of difference in three categories of workers. The results are depicted below for more clarification.



These results clarify that “the difference between derived awareness level in ‘A’ and ‘T’ workers is insignificant whereas in ‘P’ & ‘T’ and ‘P’ and ‘A’ it is significant (at $\alpha=0.05$).” The reason behind insignificant and lower awareness level in

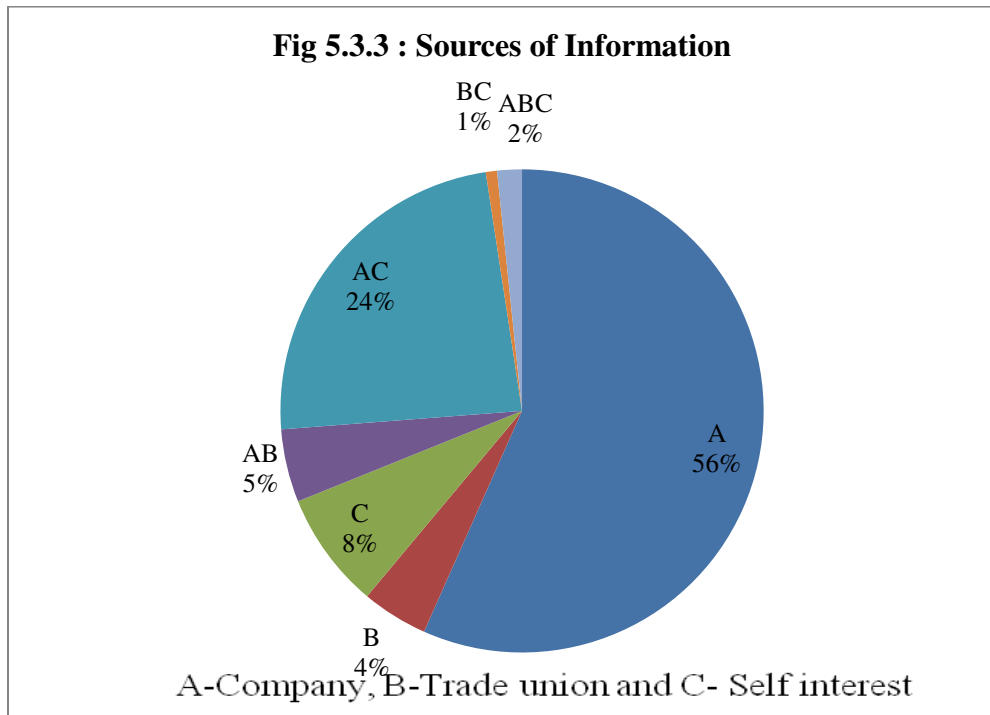
‘A’ and ‘T’ may lie into their ‘temporary’ nature of employment and lesser work experience as compared to ‘P’.

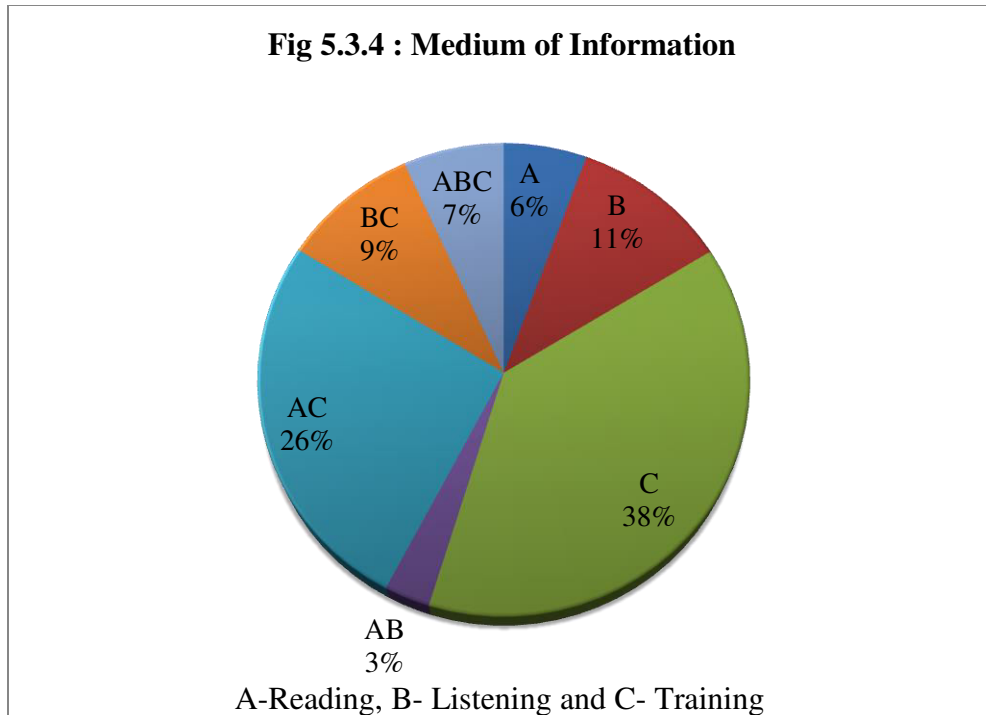
Again, in the quest to trace its (Awd) roots, the correlation and t-test have applied to check the effect of age on the awareness level. This revealed following results:

Correlation between age and Awd	0.2257	Conclusion: Derived Awareness level significantly depends upon age of the workers.
t-cal=	8.461	
p-value	0.0000	

These results are in consistent with the previous results; where we found the awareness in ‘A’ and ‘T’ is lower than ‘P’. As age of ‘A’ and ‘T’ is lower than ‘P’, the result shows “**higher the age higher is the awareness level.**”

Analysis of ‘sources’ of awareness level and ‘medium’ of information are given in following figure.





Above figure undoubtedly indicates that, “company is dominant source of information about HSW provisions for the workers. 87% workers receive information from the organizational communication system. However, trade unions have not yet prepared enough to contribute in the improvement of awareness level.”

Secondly, training is the most influential medium of providing HSW related information. Its individual and shared contribution is 80%. Reading also has significant role in (42% shared) this process. The listening from others contributes for 30% in providing information. Hence, it feels that, **“workers take information through various medium.”**

5.3.2 HYPOTHESIS No. 2

The second hypothesis of the study is as below:

H2: The supervisory mechanism of the Government is inefficient to monitor various provisions of the Factories Act relating to Health, Safety and Welfare.

The efficiency of the supervisory mechanism of Government can be measured from the viewpoint of supervisors’ and managers’ responses. If AM of these responses is

significantly lesser than the 3.0 (middle response) then it is inefficient. Here, we state the proposition as below:

d. $P_0: \text{Govi} = 3.0$

$P_1: \text{Govi} < 3.0$ at $\alpha = 0.05$ level.

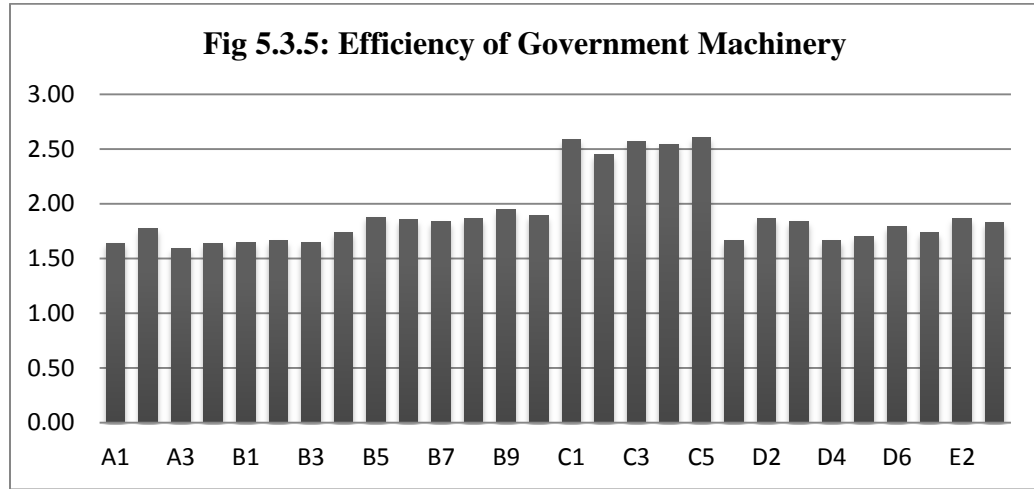


Table 5.3.7: Parameters Showing Efficiency of Government Machinery

S.N.	Parameters	Values
1	AM	1.90
2	STDEV	0.315
3	tcal	-18.40
4	tcrit	2.0049
5	p-value	0.0000

In all 28 cases the means of responses to measure efficiency of the Government machinery are less than '3'. The highest mean is 2.60 whereas the lowest is 1.65. The result of t-test shows that absolute tcal is more than tcrit having p-value = 0.0000. The negative value of tcal shows that government's efficiency is significantly lower than 'satisfactory'.

Further observing the higher means in the Company C we have applied t-test to check 'whether the difference between these means and '3' can be assumed to be insignificant?' or in other words 'can it be said that government machinery is efficient

from the viewpoint of company C?’ The result ($t_{cal} = -17.16$, $t_{crit} = 1.89$, $\alpha = 0.05$ and $df = 8$) prohibits us to assume the difference is insignificant. Hence, the efficiency of the Government machinery is significantly lower than ‘satisfactory’.

On the basis of above explanation, it can be said that the Hypothesis No. 2:

“The supervisory mechanism of the Government is inefficient to monitor various provisions of the Factories Act relating to Health, Safety and Welfare” is proved.

Our advanced analysis intends to know ‘whether the differences in the means from shop to shop are insignificant?’ The shop-wise mean representing conceived efficiency of the government has given in the following table. The reason behind this analysis is ‘whether the hazardous nature of a shop (like paint shop) has attracted more visits of government machinery than relatively non-hazardous shops (like machine shop or assembly shop).

A	B	C	D	E
1.64	1.65	2.58	1.67	1.73
1.77	1.67	2.45	1.87	1.87
1.59	1.65	2.56	1.84	1.83
1.63	1.74	2.54	1.67	
	1.88	2.60	1.70	
	1.85		1.79	
	1.83			
	1.87			
	1.94			
	1.89			

Company code	A	B	C	D	E
AM	1.66	1.80	2.55	1.75	1.81
STDEV	0.078	0.112	0.059	0.089	0.069
Cov	4.683	6.220	2.310	5.055	3.795

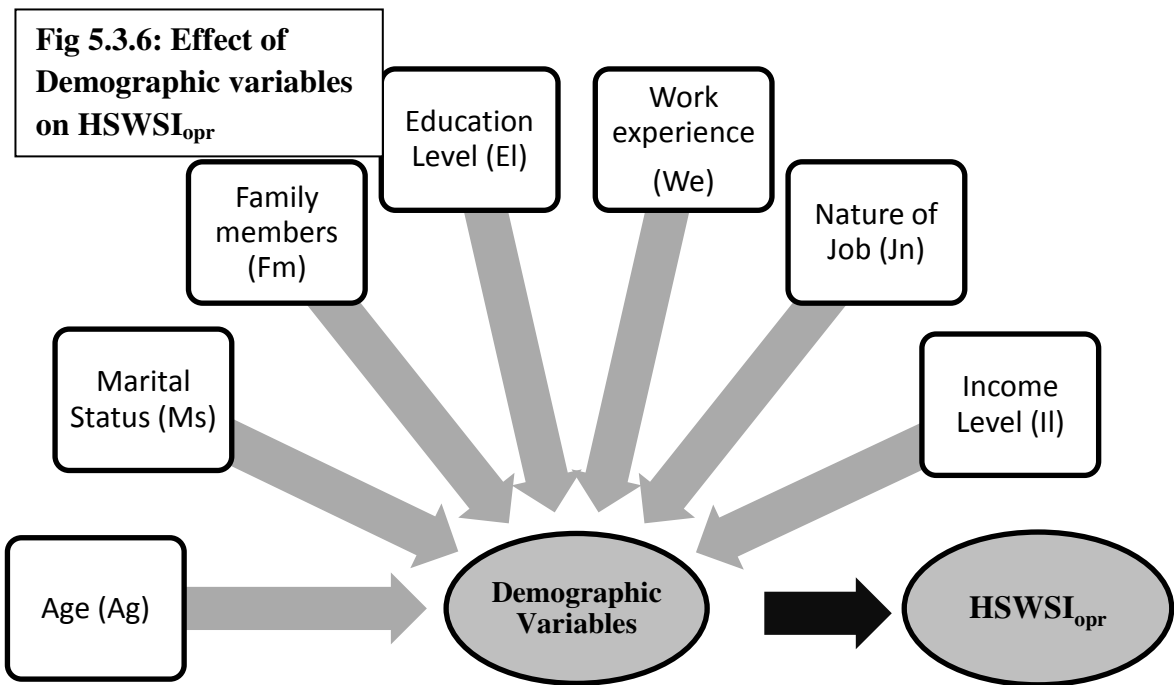
Again, the ANOVA Results shows that the variation in the conceived efficiency of the Government is significant among the sample companies ($F_{cal}=77.10$, $F_{crit}=2.7955$, $\alpha = 0.05$, $n_1= 4$ and $n_2=23$). The table shows efficiency of government machinery reported by company C is higher than others. It may be because of its construction/installation work was in-progress during the time of data collection. The Factory Inspectorates (Directorates) may have visited the site frequently than that of others.

The difference between rows indicating government monitoring from shop to shop in a company is insignificant (ANOVA Results: $F_{cal}=0.082$, $F_{crit}=2.4563$, $\alpha = 0.05$, $n_1= 9$ and $n_2=18$). This means the monitoring of the government machinery is (though lower but) uniformity distributed over the shops in a company. It has no relevance with the hazardous or non-hazardous nature of the shop.

5.3.3 HYPOTHESIS No. 3

The third hypothesis of the study is as below:

H3: Workers' satisfaction related to Health, Safety and Welfare is independent on the demographic variables: age, marital status, number of family members, education level, work-experience, nature of job and income level.



To test this complex hypothesis following sets of propositions are stated:

Set	Statement of Proposition
e.	P_0 : $HSWSI_{opr}$ is independent upon age P_1 : $HSWSI_{opr}$ depends upon age
f.	P_0 : $HSWSI_{opr}$ is independent upon marital status P_1 : $HSWSI_{opr}$ depends upon marital status
g.	P_0 : $HSWSI_{opr}$ is independent upon number of dependent family members P_1 : $HSWSI_{opr}$ depends upon number of dependent family members
h.	P_0 : $HSWSI_{opr}$ is independent upon education level P_1 : $HSWSI_{opr}$ depends upon education level
i.	P_0 : $HSWSI_{opr}$ is independent upon work experience P_1 : $HSWSI_{opr}$ depends upon work experience
j.	P_0 : $HSWSI_{opr}$ is independent upon nature of job P_1 : $HSWSI_{opr}$ depends upon nature of job
k.	P_0 : $HSWSI_{opr}$ is independent upon income level P_1 : $HSWSI_{opr}$ depends upon income level
$HSWSI_{opr}$ is Health, Safety and Welfare Satisfaction Index of operators/workers at shop level. It has calculated on the basis of summation of weighted responses of shop level score as mentioned in Appendix-VII-a.	

For testing above e, g, h, i and k propositions we have used correlation test, while in remaining f and j set (nature of job and marital status being nominal scale) two-sample t-test has applied and conclusions are made assuming level of significance 0.05. The reason behind application of t-test is statistical complexity in selecting pairs of values (and also to avoid blame of biased selection) that is required for correlation test. The two-sample t-test can be applied to series having unequal number of samples.

Testing of propositions by Karl Pearson's Coefficient of Correlation involves calculation of 't value' and 'p-value' associated with it at each shop level. The presentation of these results requires long tables and may feel monotonous; hence, the calculation part has given in the Appendix-V table No. 1 to 6. The summary of observations of these tables has presented for analysis based on the following concepts:

1. The number of positive and negative correlations without considering significance of its value to know the direction of influence.⁵
2. The number of cases in which the value of correlation found 'insignificant' and 'significant'. Here, 'insignificant' means $r = 0$ and 'significant' means 'r' is not equal to zero. Conclusions are made assuming level of significance = 0.05.

S.N.	Independent variable	+ve values	-ve values	Total	+ve values %	-ve values %
1	Age	16	12	28	57.1%	42.9%
2	Family Members	12	16	28	42.9%	57.1%
3	Education level	13	15	28	46.4%	53.6%
4	Work Experience	15	13	28	53.6%	46.4%
5	Income Level	21	7	28	75.0%	25.0%
Total		77	63	140	55.00%	45.00%

In 55% of cases the correlation of demographic variables found positive with the workers' shop-specific satisfaction level about HSW whereas in 45% of cases it is negative. This does not demonstrate any indication of positive or negative association with $HSWSI_{opr}$. An application of χ^2 test to these data reveals: $\chi^2_{cal} = 0.998$, $\chi^2_{crit} = 9.488$ at $df = 4$ and $\alpha = 0.05$, $p\text{-value} = 0.1307$. The difference between frequencies of positive and negative values can be attributed to the general heading of chance. Thus, demographic variables listed above are independent on the 'sign'.

2. This analysis directly leading to our hypothesis test. It is intended to check how many values of coefficient of correlation are 'significant' or 'insignificant'. The results of significance and insignificance of all independent variables with $HSWSI_{opr}$ are presented in the following table.

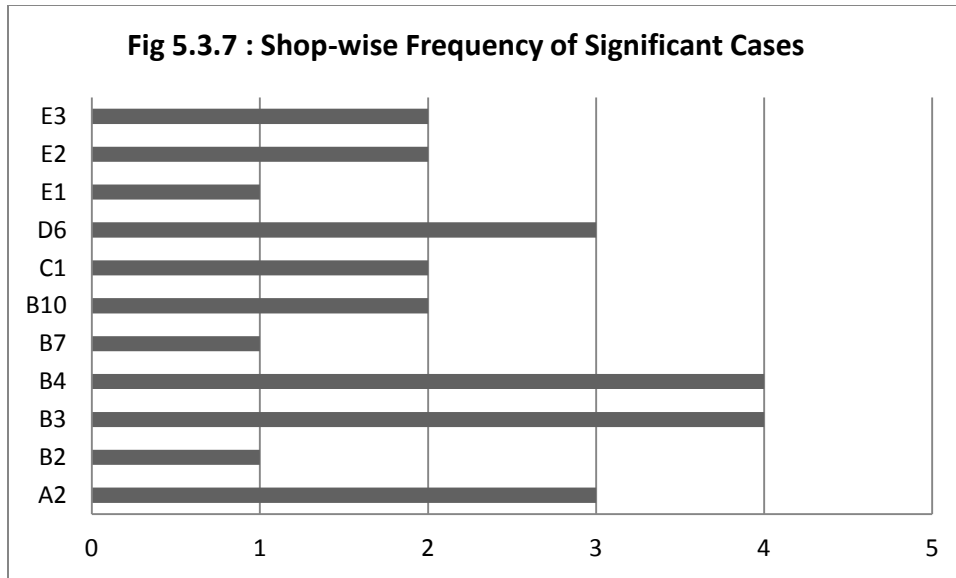
⁵ Cooper Donald and Schindler Pamela. p.52

Significance ↓	Ag	Ms	Fm	El	We	Jn	II	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Insig	20	19	22	27	21	16	25	150
Sig	8	4	6	1	7	4	3	33
Total	28	23	28	28	28	20	28	183
% of Sig	28.6%	17.4%	21.4%	3.6%	25%	25%	10.7%	18%

In 150 cases (82%) out of total 183, the correlation between demographic variables and workers' shop-specific satisfaction level about HSW ($HSWSI_{opr}$) found insignificant or 'no correlation'; whereas in remaining 33 (18%) cases it is 'significant'. The corresponding percentages of significance for each of the demographic variable are shown in the last row. The demographic variables where correlation with $HSWSI_{opr}$ found significant in 25% or more cases are age, work experience and nature of job. The values of 'significant correlations' in above 25 cases (33-8 as tested by t-test) are given in the following table:

Age		Family members		Work Experience		Income Level	
Shop code	r	Shop code	r	Shop code	r	Shop code	r
A2	0.37	B2	-0.24	A2	0.35	A2	0.26
B3	0.22	B3	0.25	B3	0.21	B3	0.24
B4	0.25	B4	0.23	B4	0.30	B4	0.28
B10	-0.34	B7	-0.34	B10	-0.33	Total cases 25, Positive values =16 (64%) and negative values =9 (36%).	
C1	0.42	C1	-0.36	D6	-0.33		
D6	-0.31	D6	-0.40	E2	0.56		
E2	0.57	Educational level		E3	0.39		
E3	0.35	E1	-0.54				

It is observed that there are 11 shops (out of 28) where the 'r' is significant. The shop-wise frequency of these significant cases is as below:



The overall observation

The highest value of positive 'r' is 0.57 in case of age whereas the highest negative value is -0.54 in case of education level. The coefficient of determination 'r²' of the +ve value is 0.3249 and that of the -ve value is 0.2916. This implies that about 32% of variation in the *HSWSI_{opr}* has been explained by the independent variable i.e. age. In other words, 68% of variation remains unexplained. In the -ve correlation this percentage of explained variance is about 29% and unexplained variance is 71% by education level.

In case of maximum +ve 'r' (belonging to shop E2) the value of 6 times of probable error (P.Er.) for 27 samples is 0.526. As the value of $r=0.57$ is more than the 6x P.Er. it is said to be practically certain or significant.⁶

In case of maximum -ve 'r' (belonging to shop E1) the value of 6 times of probable error (P.Er.) for 16 samples is 0.717. As the absolute value of $r = -0.54$ is less than the 6x P.Er, there is no evidence to say it is practically certain.

Based on the same concept the analysis of 25 cases where the coefficient of correlation is significant has carried out and the results are tabulated below:

⁶ Gupta S.P. p. 400

Table 5.3.13: Analysis of Significant Cases							
Variables	Shop code	r	r ²	PVexpd (%)	PVunexpd (%)	Sample size	6xP.Er.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ag	A2	0.37	0.1369	13.7	86.3	60	0.451
	B3	0.22	0.0484	4.8	95.2	98	0.389
	B4	0.25	0.0625	6.3	93.8	78	0.430
	B10	-0.34	0.1156	11.6	88.4	68	0.434
	C1	0.42	0.1764	17.6	82.4	35	0.563
	D6	-0.31	0.0961	9.6	90.4	53	0.502
	E2	0.57	0.3249	32.5	67.5	27	0.526
	E3	0.35	0.1225	12.3	87.8	48	0.513
Fm	B2	-0.24	0.0576	5.8	94.2	81	0.424
	B3	0.25	0.0625	6.3	93.8	98	0.383
	B4	0.23	0.0529	5.3	94.7	78	0.434
	B7	-0.34	0.1156	11.6	88.4	54	0.487
	C1	-0.36	0.1296	13.0	87.0	35	0.595
	D6	-0.4	0.16	16.0	84.0	53	0.467
El	E1	-0.54	0.2916	29.2	70.8	16	0.717
We	A2	0.35	0.1225	12.3	87.8	60	0.458
	B3	0.21	0.0441	4.4	95.6	98	0.391
	B4	0.3	0.09	9.0	91.0	78	0.417
	B10	-0.33	0.1089	10.9	89.1	68	0.437
	D6	-0.33	0.1089	10.9	89.1	53	0.495
	E2	0.56	0.3136	31.4	68.6	27	0.535
	E3	0.39	0.1521	15.2	84.8	48	0.495
II	A2	0.26	0.0676	6.8	93.2	60	0.487
	B3	0.24	0.0576	5.8	94.2	98	0.385
	B4	0.28	0.0784	7.8	92.2	78	0.422

Short forms: PVexpd=Percentage of variation explained PVunexpd= Percentage of variation unexplained P.Er = Probable Error

Out of above 25 only in 2 cases the value of 'r' is more than 6 times of probable error (P.Er.). Therefore in the 2 cases results are said to be practically certain or significant. Hence, rejecting the 23 cases on the basis of practical insignificance in overall 10 cases the relationship is significant (including 8 cases of t-test). This further improves our power of accepting hypothesis as about 5% cases (10 out of 183) the relationship is significant whereas in 95% (173 out of 183) of cases it is insignificant.

On the basis of above results, it can be said that, Hypothesis No. 3: **“Workers’ satisfaction related to Health, Safety and Welfare is independent on the demographic variables: age, marital status, number of family members, education level, work-experience, nature of job and income level”** is proved.

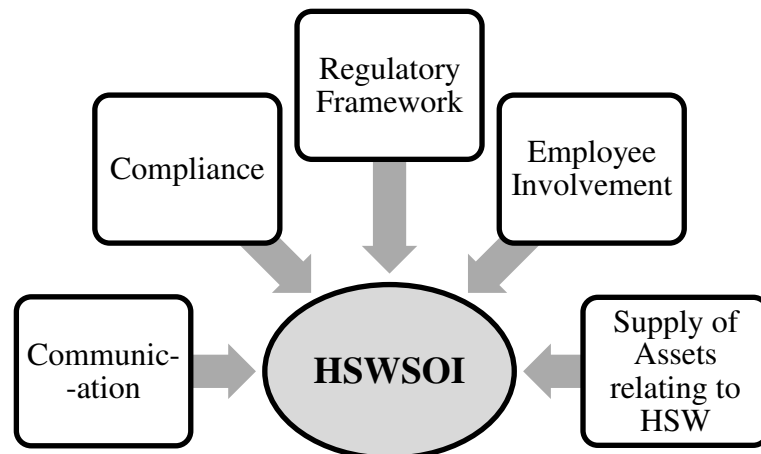
5.3.4 HYPOTHESIS No. 4a

The fourth hypothesis of the study is as below:

H4a: The shop specific satisfaction level of employees depends upon implementation of HR practices relating to HSW.

The objective of this H4a hypothesis is to find out significance of elements of HSW management (or HR practices relating to HSW) in determining the shop-specific satisfaction level. Here, we have considered shop-specific overall satisfaction level of employees by combining opinions of operators, supervisors and managers in the proportion of 50%: 25% :25% respectively. It is hereafter denoted as ‘HSWSOI’.

Fig 5. 3. 8: Effect of Elements of Implementation Level on HSWSOI



We have undertaken this study at micro level with an assumption that workers’ satisfaction changes from company to company as well as from shop to shop in the same company. This is because of diverse nature of work carried out in a shop creates different level of environment, hardship and working conditions which influence their satisfaction. ANOVA test has carried to test ‘whether the means of workers satisfaction from shop to shop in a company differ significantly?’

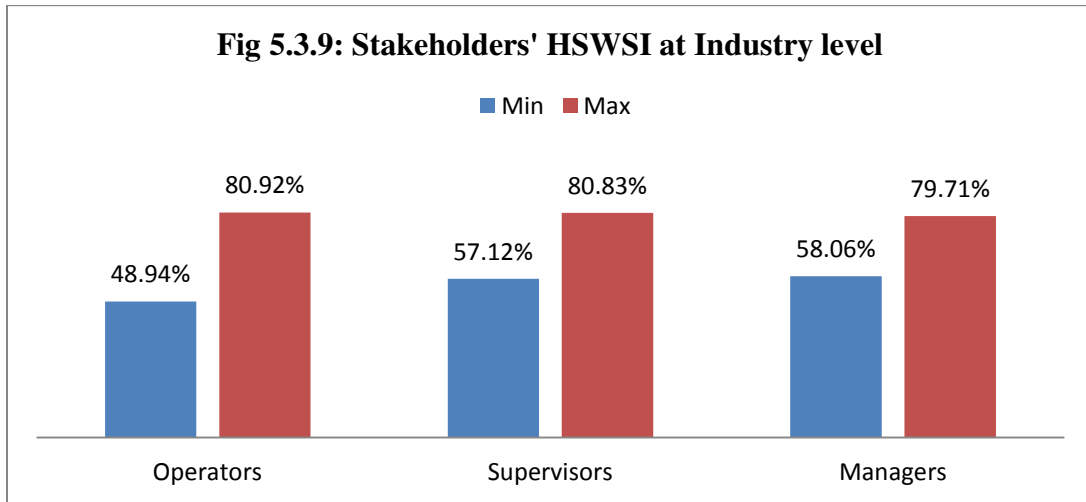
Com.	SS	df	MS	Fcal	P-value	F crit	Conclusion
A	3.231	3	1.077	2.838	0.041	2.678	Sig
B	5.042	9	0.560	3.536	0.000	1.910	Sig
C	4.430	4	1.108	3.705	0.007	2.430	Sig
D	5.843	5	1.169	3.124	0.010	2.263	Sig
E	2.491	2	1.245	9.011	0.000	3.094	Sig

Here, we have received an important conclusion that, “**in all companies under study the workers’ satisfaction from shop to shop differs significantly.**” ($\alpha=0.05$)

Now we need to find out overall Satisfaction level at each of the shop. The individual shop specific indices on the basis of responses by operators, supervisors and managers have calculated as per **formulae developed and attached in the Appendix-VIIa**. The results are presented in following table.

A1Sup	59.92	B4Sup	76.72	C1Sup	71.35	D3Sup	68.88
A1Mgr	60.70	B4Mgr	75.94	C1Mgr	69.66	D3Mgr	67.26
A1Opr	58.72	B4Opr	74.17	C1Opr	64.48	D3Opr	59.70
A2Sup	57.12	B5Sup	75.44	C2Sup	71.86	D4Sup	62.98
A2Mgr	58.06	B5Mgr	76.03	C2Mgr	69.76	D4Mgr	63.36
A2Opr	55.89	B5Opr	73.52	C2Opr	60.95	D4Opr	57.48
A3Sup	63.21	B6Sup	78.55	C3Sup	77.72	D5Sup	71.28
A3Mgr	63.80	B6Mgr	75.26	C3Mgr	78.43	D5Mgr	71.06
A3Opr	60.56	B6Opr	73.04	C3Opr	67.24	D5Opr	62.13
A4Sup	64.33	B7Sup	73.81	C4Sup	71.92	D6Sup	64.00
A4Mgr	60.94	B7Mgr	74.90	C4Mgr	73.92	D6Mgr	62.74
A4Opr	62.57	B7Opr	72.94	C4Opr	65.63	D6Opr	55.88
B1Sup	77.09	B8Sup	74.13	C5Sup	80.83	E1Sup	78.04
B1Mgr	77.27	B8Mgr	74.56	C5Mgr	79.21	E1Mgr	79.24
B1Opr	77.36	B8Opr	71.63	C5Opr	71.33	E1Opr	54.21
B2Sup	78.46	B9Sup	79.05	D1Sup	67.26	E2Sup	75.55
B2Mgr	79.71	B9Mgr	77.39	D1Mgr	68.03	E2Mgr	77.48
B2Opr	80.92	B9Opr	77.23	D1Opr	62.56	E2Opr	46.96
B3Sup	76.10	B10Sup	75.16	D2Sup	59.61	E3Sup	76.40
B3Mgr	73.80	B10Mgr	74.90	D2Mgr	59.88	E3Mgr	78.26
B3Opr	73.40	B10Opr	75.69	D2Opr	52.61	E3Opr	48.94

In doing so, we have taken into account ratings of 1331 operators, 223 supervisors and 171 managers. The maximum numbers of shop level involvement of stakeholders were: 182 operators, 15 supervisors and 10 managers. The minimum numbers of shop level involvement of stakeholders were: 10 operators, 5 supervisors and 5 managers. The minimum and maximum indices of each stakeholder have presented below:



The average satisfaction indices of these stakeholders are calculated at macro shop level in companies and presented in following table.

Company Code	Sample size of			Average HSWSI of		
	Opr	Sup	Mgr	Opr	Sup	Mgr
A	150	31	22	59.45	61.15	60.87
B	793	102	75	74.99	76.45	75.98
C	169	34	29	65.92	74.73	74.19
D	128	39	30	58.40	65.67	65.39
E	91	17	15	50.04	76.66	78.32
Total/Weighted mean	1331	223	171	68.79	72.19	72.08

Industry level satisfaction index (HSWSII) has calculated by assigning 0.50, 0.25 and 0.25 weightage to operators, supervisors and managers level of satisfactions.

$$HSWSII = 0.50 \times HSWSI_{opr} + 0.25 \times HSWSI_{sup} + 0.25 \times HSWSI_{mgr}$$

$$\text{HSWSII} = 0.50 \times 68.79 + 0.25 \times 72.19 + 0.25 \times 72.08 = \mathbf{70.46}$$

Industry level Satisfaction Index (HSWSII) is 70.46

The overall HSWSI of employees (hereafter referred as “HSWSOP”) then calculated by assigning weightage to individual indices as below.

$$\text{HSWSOI} = 0.50 \times \text{HSWSI}_{\text{opr}} + 0.25 \times \text{HSWSI}_{\text{sup}} + 0.25 \times \text{HSWSI}_{\text{mgr}}$$

The HSWSOI obtained with above weightage are as below:

Table 5.3.17: Shop Specific Overall Satisfaction Level (HSWSOI)							
A1	59.52	B4	75.25	C1	67.49	D3	63.89
A2	56.74	B5	74.63	C2	65.88	D4	60.32
A3	62.03	B6	74.97	C3	72.66	D5	66.65
A4	62.60	B7	73.65	C4	69.27	D6	59.63
B1	77.27	B8	72.99	C5	75.67	E1	66.42
B2	80.00	B9	77.72	D1	65.10	E2	61.74
B3	74.18	B10	75.36	D2	56.18	E3	63.14

The minimum HSWSOI is 56.18 whereas maximum is 80.00. The sequence of companies in descending order according to their average HSWSOI value is as below.

B > C > E > D > A

Similarly, the sequence of the shops in the companies in descending order of average HSWSOI value is as below.

SEQUENCE	Comp A	A4	A3	A1	A2						
	Comp B	B2	B9	B1	B10	B4	B6	B5	B3	B7	B8
	Comp C	C5	C3	C4	C1	C2					
	Comp D	D5	D1	D3	D4	D6	D2				
	Comp E	E1	E3	E2							

In company A, shop A2 is known as ‘Engineering and Innercon’ where sand blasting operation is carried out, which creates noise and dust. Workers are also facing other inconveniences such as cleanliness, temperature, overcrowding, layout problem,

unsafe working conditions, safety lock-out problem, uncovered moving parts and sitting facilities. In the shop A4 (machine shop) job operations are carried out where improvement in temperature, noise, layout and fire precautions is needed.

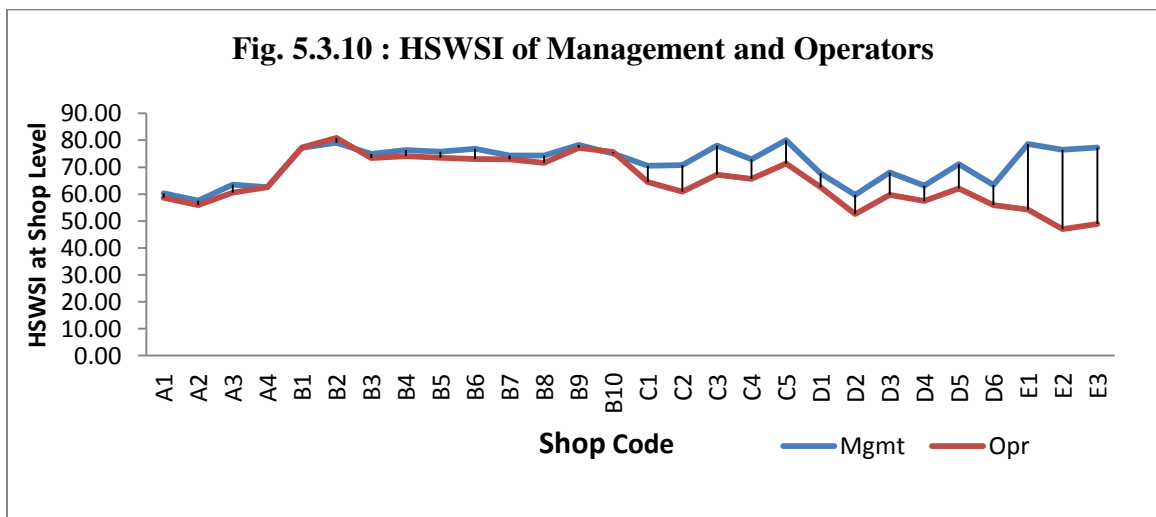
In company B, B8 is a weld shop, on account of its intrinsic nature it creates dust, fumes which needs proper ventilation. Similarly, in B7 ‘Engineering Research Centre’ where development process is going on requires moulding and basic un-standardized operations resulting into formation of dust and noise. B10 being foundry shop the ventilation (temperature) and dust, fumes and noise issues are troublesome issues.

In company C, C2 is ‘press shop’ where workers are unhappy with some facilities whereas C5 is a paint shop which should be maintained with high level of precaution due to its hazardous nature and workers are comparatively happier.

In company D, D2 is foundry shop which has shop-specific issues of ventilation, dust, noise, eye protection and layout related problems. D5 shop being R&D maintained at high level comparatively.

In company E, there are multiple of problems with the shop E2 (Engine shop) and E3 where we are not in position to relate it with the nature of the shop.

In a quest to locate the difference between HSWSI reported by management and operators we have calculated HSWSI of management by combining indices of supervisors and managers equally. Supervisors are also instrumental in the management of HSW provisions at shop floor level; hence their opinions have assigned equal weightage. The results are exhibited in the following figure.



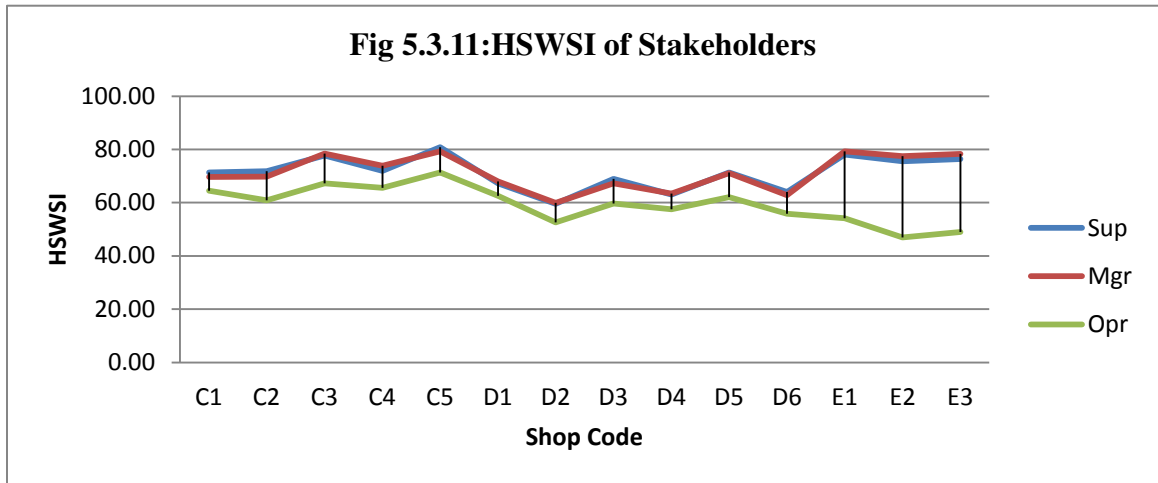
The Observation of this figure clearly points out that in company A and B the differences in opinions of management and operators are small whereas in company C and D it is moderate and in company E it is high. The overall coefficient of correlation ‘r’ between these series is 0.52 ($r^2 = 0.27$). Further on the basis of means and standard deviations of the series (mgmt: mean=71.58 & S.D. = 6.77 and opr: mean=64.92 & S.D.=9.26) we have established confidence interval at $\alpha=0.05$ (mgmt: C.I. 58.31 to 84.85 and opr: C.I. 46.77 to 83.07). As most of our values of HSWSI fall in the respective confidence interval, it allows us to carryout quantitative tests without any modification.

To analyze the significance of differences between opinions of management and operators in company A, B and C, D, E we have calculated correlation and p-values of t-test for these groups. The results are given in the following table.

Correlation		2 sample 2 tailed t- test p-values	
Parameter	Value	Parameter	Value
(1)	(2)	(3)	(4)
Overall 'r'	0.521	Overall 'tcal'	0.0033
r for A and B	0.981	tcal for A and B	0.6492
r for C,D and E	0.181	tcal for C,D and E	0.0001

This shows in companies A and B there is very high degree of association between management’s and operators’ indices. The differences in the opinions are insignificant. In company C, D and E there is no significant association between indices. In other words the differences in the opinions are significant.

Now our further backward analysis reaches to compare HSWSI differences at the individual stakeholder’s level in company C, D and E. The following figure shows HSWSI of operators, supervisors and managers. ANOVA has applied to find out significance of these differences.



<i>ANOVA Table</i>				
<i>Source of Variation</i>	<i>df</i>	<i>Fcal</i>	<i>P-value</i>	<i>F crit</i>
Company C,D & E	2	26.686	0.0000	3.369

The figure shows satisfaction indices of operators, supervisors and managers. It indicates the differences are insignificant in the supervisors and managers indices. However, the differences in the groups of the stakeholders it is significant (p-value = 0.0000).

Now our intention is to assess the implementation levels of HR practices relating to HSW in various shops. Implementation level consists of elements:

S/N	HR practices / Elements of I_{level}	Denotations
1	Communication	Cmn
2	Compliance	Cmp
3	Regulatory- Framework	Regf
4	Involvement of workers	Invol
5	Supply of Assets related to HSW	Sup

In determining the implementation level of these elements in 28 shops under study we have taken opinions of 223 supervisors and 171 managers. The implementation level (**hereafter referred as I_{level}**) has calculated by summing up all elements and converting it out of 100.

$$I_{level} = 4(\sum Cmn + \sum Cmp + \sum Regf + \sum Invol + \sum Sup)$$

The means of the implementation indices perceived by supervisors and managers at each shop level are shown in the following table.

Table 5.3.19: Shop- Specific Implementation level							
Shop	I _{level}	Shop	I _{level}	Shop	I _{level}	Shop	I _{level}
A1	49.13	B4	77.32	C1	67.15	D3	58.98
A2	50.37	B5	74.72	C2	69.40	D4	55.99
A3	53.09	B6	75.29	C3	72.40	D5	56.95
A4	54.32	B7	78.93	C4	72.82	D6	55.56
B1	81.07	B8	80.93	C5	78.34	E1	63.28
B2	79.41	B9	81.82	D1	56.96	E2	60.96
B3	77.32	B10	80.80	D2	52.24	E3	61.45

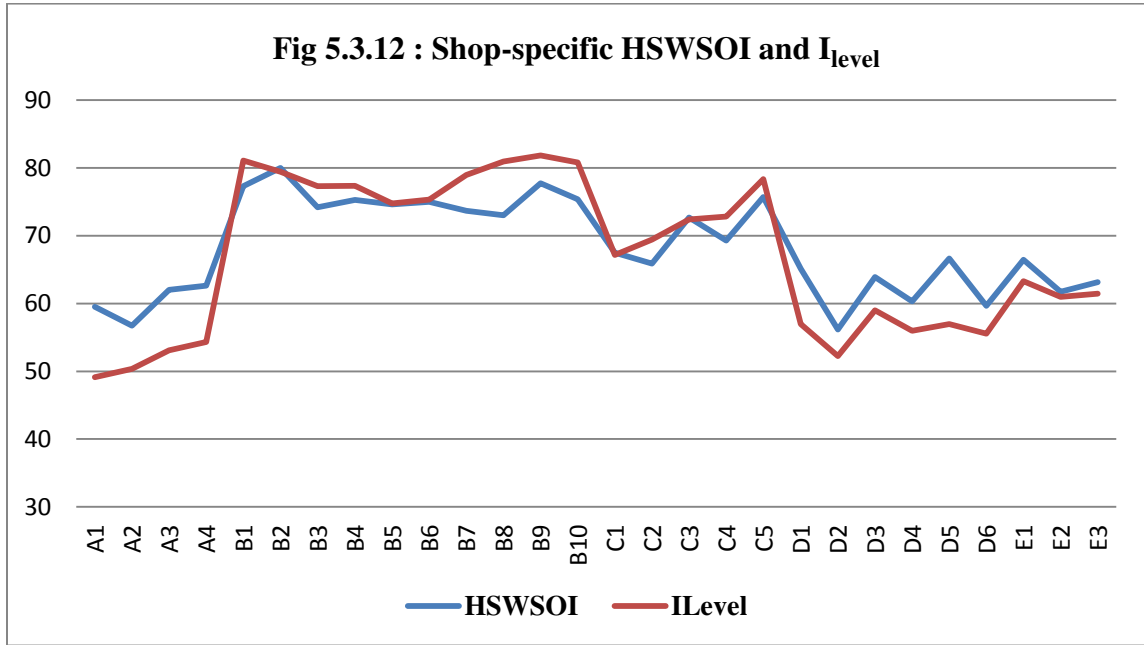
The minimum I_{level} is 49.13 and maximum is 81.82. The mean = 67.04 and S.D. = 11.23. The range of this series is 32.69, which feels high. Hence, it needs to calculate confidence interval (C.I.) to check whether these values belong to population having normal distribution. C.I. (at $\alpha=0.05$, $t_{crit}=2.056$ at $df=27$) is 43.90 to 90.12. As our 27 values fall in this range (except 49.13) we can proceed for application of statistical tests. The skewness is -0.12 which indicates (0 to -0.25) the distribution is highly symmetric. The value of kurtosis -1.61 indicates that the distribution is platykurtic (lower peakedness than normal). The following figure 5.3.12 shows these properties.

The sequence of the companies in descending order of their mean level of implementation is as below:

$$\mathbf{B < C < E < D < A}$$

We are very impressed with this result! It is exactly matching with the sequence arranged on the basis of average HSWSOI. This indicates higher level of implementation of parameters of HSW management will tend to increase satisfaction of employees. **This accepts our hypothesis (H4a) at macro level.**

However, our plan is to study the micro level association by application of quantitative tests. The following figure shows HSWSOI and I_{level} at each shop.

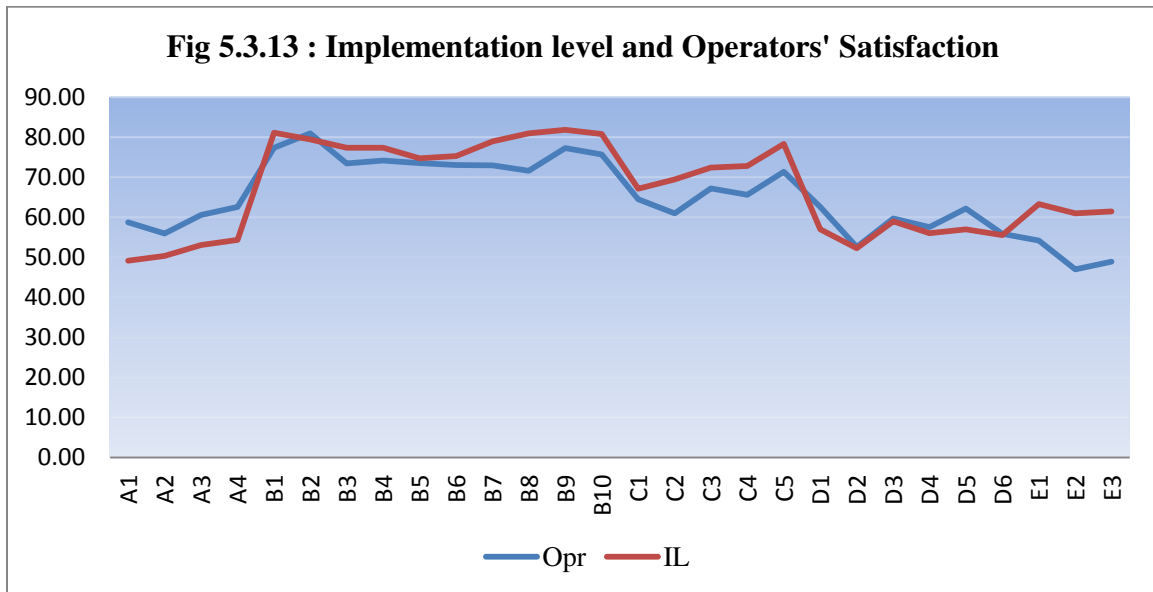


The overall correlation between implementation level and overall satisfaction level (HSWSOI) is 0.9474, $r^2 = 0.896$. Indicating that variation in the satisfaction level is about 90% explained by the implementation of HR practices. HSWSOI is highly dependent on the implementation of elements. The two sample t-test (two tailed) has applied to confirm whether the difference between means of I_{level} and HSWSOI is by chance. The p-value 0.6299 clearly indicates the difference is by chance. This accepts our hypothesis 4a at micro level. ($\alpha = 0.05$).

Hypothesis No. 4a: “The shop specific satisfaction level of employees depends upon implementation of HR practices relating to HSW.” is proved.

To have more insights into data we have analyzed association between implementation level and **operators’ satisfaction indices**. The correlation and two sample t-test have revealed following results.

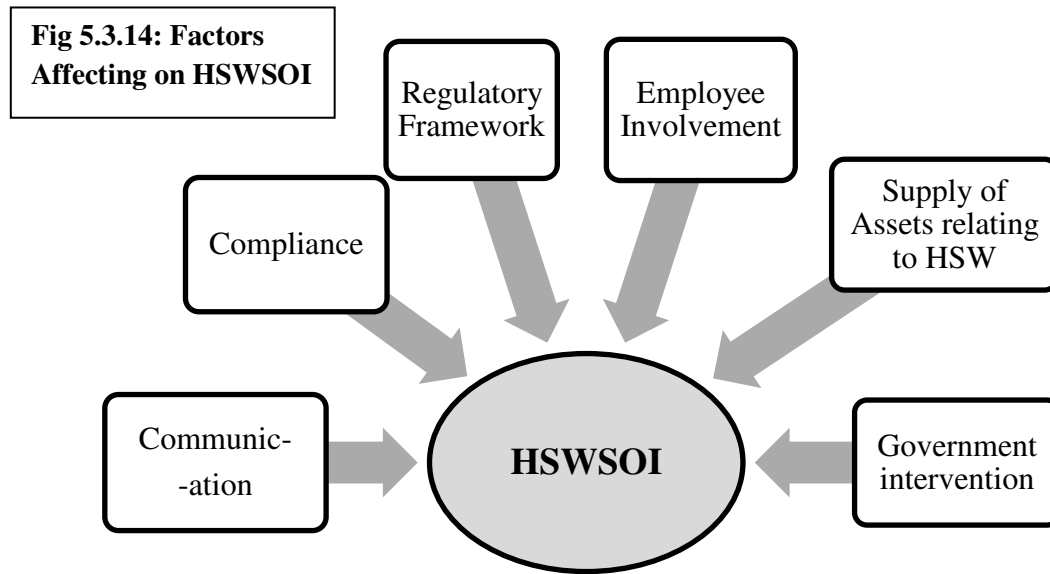
Table 5.3.20: Operators' Satisfaction Indices and I_{level}				Conclusion at $\alpha=0.05$
Correlation		2 sample t test p-values		
Overall 'r'	0.52	Overall 'tcal'	0.003	Sig
r for A and B	0.98	tcal for A and B	0.65	Insig
r for C,D and E	0.18	tcal for C,D and E	0.00007	Sig



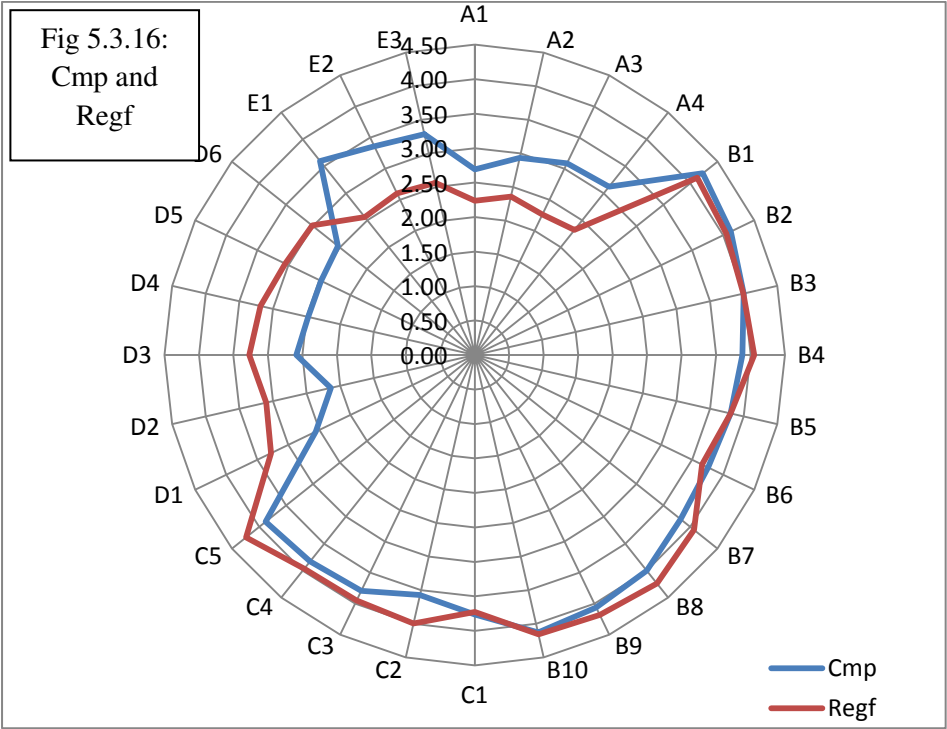
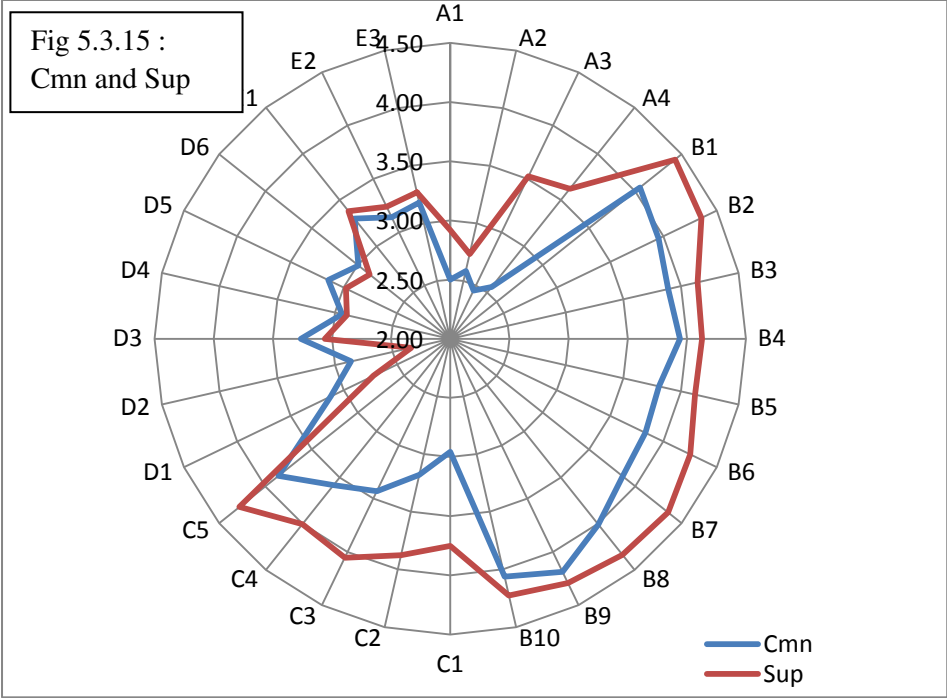
This is completely opposite result as we got previously and invalidates our acceptance of H4a hypothesis, as overall difference between operators' satisfaction indices and implementation level is significant. For company A and B it is insignificant and for company C, D and E it is significant. The coefficient of correlation also indicates very high (0.98) correlation between company A and B's satisfaction level and implementation level of operators; it is lower for overall (0.52) and insignificant for C, D and E (0.18). The opinions of operators, supervisors and managers should be taken into account for determining HSW related performance (Stranks Jeremy, 2007). Hence, we accentuate this result but, remain stick up to the previous acceptance of hypothesis.

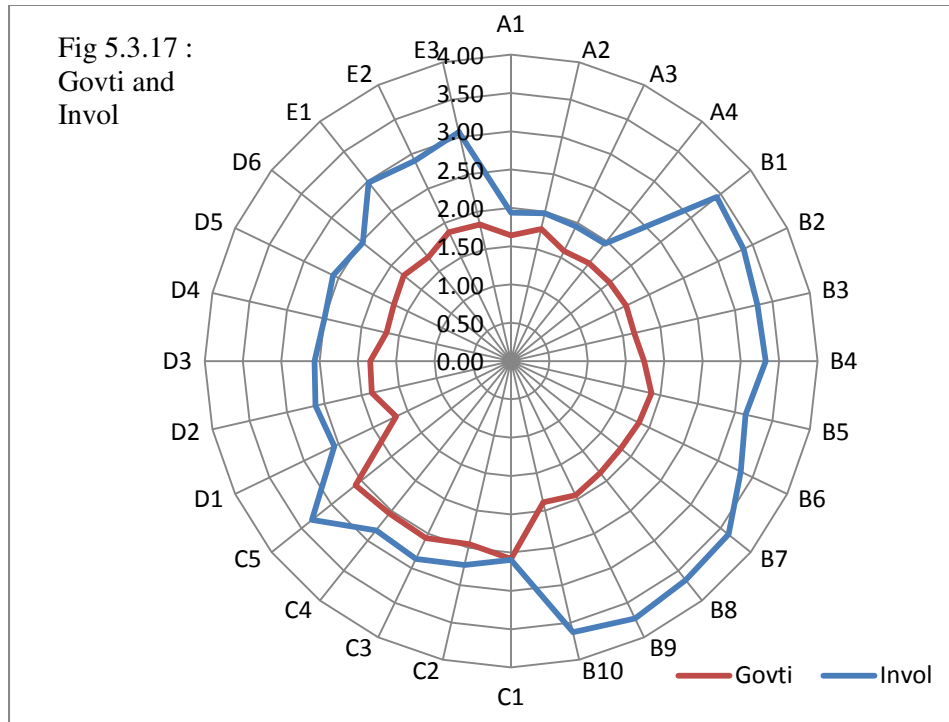
Our further quest is to find out significance of elements of implementation level in determining the overall level of satisfaction. Here, we have incorporated influence of government machinery (as an additional variable) on the level of implementation of HSW

provision and thereby ultimately on the overall satisfaction indices. The modified figure is as below.



We have conducted multivariate regression analysis using Data Analysis software in 'Windows XP Excel (LINEST)'. Before the analysis the shop-wise mean values of elements of implementation level are presented in the following three graphs. These elements are grouped according to their power of influence in determining HSWSOI. To avoid complexity only two elements are taken in each diagram.





The overall comparison on the basis of means of elements of implementation level at macro (company) level defines following sequence of the companies in descending order.

Table 5.3.21: Sequence of Companies based on Implementation of Elements	
Elements	Sequence
Communication	B < C < E < D < A
Compliance	B < C < E < A < D
Regulatory Framework	B < C < D < E < A
Involvement of employees	B < E < C < D < A
Supply of Assets	B < C < E < A < D

The observation of this sequence clearly shows company B is implementing all elements at higher level followed by company C. The overall sequence will remain same as previous

$$\mathbf{B < C < E < D < A}$$

The result of multivariate analysis with HSWSOI as single dependent variable and elements of I_{level} as independent variables are presented in the following table.

Table 5.3.22: Results of Multivariate Analysis Between Elements of Ilevel and HSWSOI							
	Govti	Sup	Invol	Regf	Cmp	Cmn	A-value
B- values	-1.134	5.368	-4.454	0.483	0.068	10.705	25.624
$R^2 = 0.941$	S. Er of Y estimate = 1.930 Fcal= 55.939, Fcrit = 4.50 at $\alpha=0.05$ and $n1= 134, n2= 5$						
t- cal	-0.656	2.520	-1.755	0.308	0.032	3.017	
tcrit	2.048 at $\alpha=0.05$ and $df= 26$						
p-values of t	0.5188	0.0199	0.0978	0.7610	0.9744	0.0066	
	Insig	Sig	Insig	Insig	Insig	Sig	

This analysis gives following equation

$$\mathbf{HSWSOI=25.624+10.705Cmn + 0.068Cmp +0.483Regf - 4.454Invol + 5.368Prov - 1.134Govti}$$

This equation explains 94.10% of variation in the HSWSOI through these elements; hence, these elements are vital as Fcal shows very high value against the Fcrit.

THIS ACCEPTS OUR HYPOTHESIS No. 4a

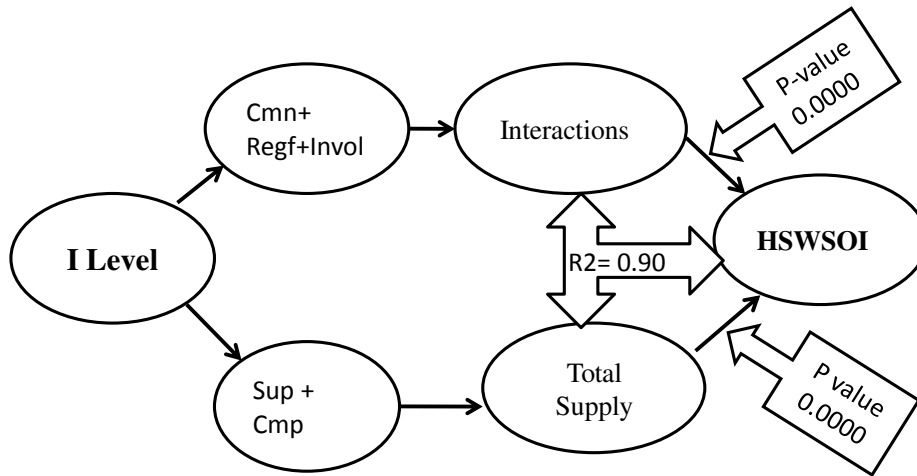
However, we are not satisfied yet. The further analysis by t-test shows that only ‘Communication’ and ‘Supply of assets relating to HSW’ are significant elements in determining the value of HSWSOI. Hence, we have conducted multivariate analysis for 3 times with different sets of independent variable and observed the following results.

Trial	Set of independent variables	R²	Results
I	Com and Sup	0.929	Both elements are significant p-values are 0.0000 and 0.0000 respectively
II	Com, (Cmp+Regf+Invol) and Sup	0.932	Cmn is significant (p=0.0010), (Cmp+Regf+Invol) is insignificant (p= 0.3386) and Sup is significant (p=0.0001)
III	(Cmn+Regf+Invol) and (Sup+Cmp)	0.90	(Cmn+Regf+Invol) is significant (p= 0.0000, tcal=4.742) and (Sup+Cmp) is significant (p=0.0000, tcal=4.813)

Hence, in the first trial the results are consistent with previous as Communication and Supply of assets are significant in determining HSWOI. In the second trial, the combination of (Cmp+Regf+Invol) also not produced any significant effect whereas other two are significant. In the third trial, the combination of (Cmn+Regf+Invol) and (Sup+Cmp) produced significant effect on the HSWSOI with small loss in the value of R². This clearly shows that the assumption of five separate elements of level of implementation is invalid or unnecessary. (Cmn+Regf+Invol) and (Sup+Cmp) form only two elements. In other words, each of the individual elements in the parenthesis has similar construct and hence are synonymous.

(Cmn+Regf+Invol) representing communication, regulatory framework and involvement of workers are related to psychological sphere whereas (Sup+Cmp) representing supply of assets and Compliance are belonging to physical sphere. The following figure indicates links between variables contributing HSWSOI.

Fig 5.3. 18: Dynamics of Elements of I Level and HSWSOI



The following cross correlation matrix gives degree of association between these elements.

Table 5.3.24: Cross Correlation Matrix of Elements of Implementation Level

	Cmn	Cmp	Regf	Invol	Sup	Govti	HSWSOI
Cmn	1.000						
Cmp	0.779	1.000					
Regf	0.866	0.692	1.000				
Invol	0.959	0.749	0.801	1.000			
Sup	0.802	0.946	0.759	0.745	1.000		
Govti	0.145	0.317	0.444	0.136	0.292	1.000	
HSWSOI	0.916	0.865	0.830	0.838	0.915	0.186	1.000

The impact of government in defining HSWSOI is insignificant. The minimum value of correlation (r) is 0.692 ($R^2 = 0.48$); explaining 48% of variation in the regulatory

framework and compliance. This value of 'r' is more than $r_{crit} = 0.374$ at $df = 26$ and $\alpha = 0.05$ and hence is significant. The correlations between other values except government are more than 0.692; hence are significant. The government machinery has significant control over the Regulatory Framework in the organization. However that may be by chance as we cannot delink any variable from other because of moderate correlation among them.

5.3.5 HYPOTHESIS No. 4b

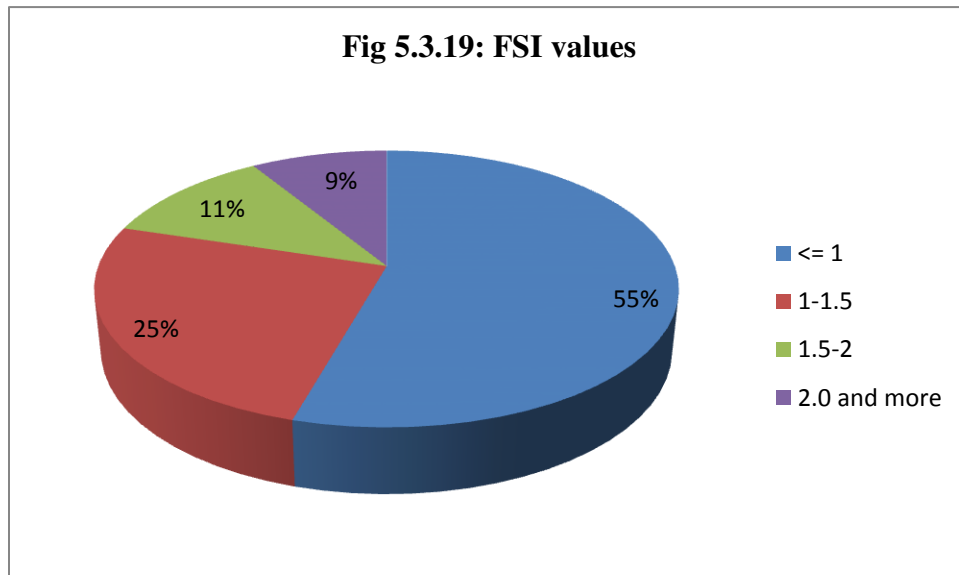
H4b: Lower level of satisfaction relating to HSW results into higher accidents/injuries.

Now, whether the HSWSOI has impact on accident/injuries is our objective of further analysis. As discussed in the Chapter 2b we have considered Frequency Severity Incidence (FSI) as a measure of accident/injury. FSI takes into account severity and frequency of the accidents/injuries in the reference period (1year). In this exercise we have collected FSI from the companies under study and the weighted FSI have calculated by assigning higher weightages 60:30:10 to the most recent year's value. In case of company C, 70:30 weightage has adopted as the production of the company started in year 2010. These values are generally displayed on the notice board of each shop or at safety department.

Table 5.3.25: Values of FSI				
Shop Code	2009	2010	2011	Weighted FSI
(1)	(2)	(3)	(4)	(5)
A1	2.13	2.65	2.89	2.74
A2	1.89	2.56	2.43	2.42
A3	2.84	1.75	1.98	2.00
A4	2.01	1.35	1.54	1.53
B1	0.62	0.38	0.46	0.45
B2	0.462	0.427	0.286	0.35
B3	0.49	0.96	0.42	0.59
B4	0.86	0.45	0.38	0.45
B5	0.92	0.35	0.4	0.44
B6	0.86	0.74	0.42	0.56
B7	1.34	1.01	0.74	0.88
B8	1.02	0.94	0.54	0.71

(1)	(2)	(3)	(4)	(5)
B9	1.78	1.35	1.032	1.20
B10	1.45	1.01	1.1	1.11
C1		1.01	0.82	0.88
C2		0.62	0.46	0.51
C3		0.65	0.57	0.59
C4		0.52	0.68	0.63
C5		1.02	0.96	0.98
D1	1.84	1.96	1.32	1.56
D2	1.86	1.74	1.21	1.43
D3	1.02	0.96	0.87	0.91
D4	0.86	0.52	0.44	0.51
D5	0.95	0.82	0.52	0.65
D6	0.74	0.45	0.62	0.58
E1	1.26	1.42	0.97	1.13
E2	1.05	0.87	1.23	1.10
E3	0.87	1.12	1.08	1.07

In the industry it is said good if the value of FSI is below 1. There are 79 values of FSI ranging from minimum 0.286 to the maximum 2.89. As the value of FSI is probabilistic in nature we have not applied quantitative test on ‘individual value of the FSI’. The frequency distribution of these FSI is shown in the following figure.



In given 3 years the individual FSI values are less than 1 in 55% of cases and in 45% it is above 1. The correlation between HSWSOI and FSI is $r = -0.5814$, $r^2 = 0.338$

(explanation = 33.8%) and $r_{crit}=0.374$ at $df=26$ and $\alpha = 0.05$. As the absolute value of the 'r' is more than critical value we accept it is practically significant. The negative sign of 'r' indicates the direction is reverse or existence of inverse relationship between two variables. This indicates higher level of HSWSOI lowers the FSI and vice versa.

Further FSI is dependent variable and HSWSOI is independent variable; the regression analysis shows following results.

S.N.	Parameters	Values
1	B value of HSWSOI	-0.050
2	A value	4.410
3	Correlation	-0.581
4	t-cal	-3.643
5	t table	2.056
6	p-value	0.001

This table clearly indicates that HSWSOI has significant influence on the FSI. The resulting equation is as below:

$$FSI=4.41- 0.05xHSWSOI$$

On the basis of above explanation, it can be said that,

Hypothesis No. 4b: “Lower level of satisfaction relating to HSW results into higher accidents/injuries.” is proved.

5.3.6 HYPOTHESIS No. 4C

The statement of Hypothesis

H4c: Lower level of implementation of HR practices relating to HSW results into higher accidents/injuries.

Now the objective of further analysis is to check the effect of elements of Implementation level on the accidents/injuries. It involves multivariate regression analysis for establishing relationship between dependent variable (FSI) and independent variables as elements of implementation level. Values of these elements have already reported hence it is not repeated here. The results of multivariate regression analysis have presented in the following table.

Table 5.3.27: Results of Regression between FSI and elements of I_{Level}

	Sup	Invol	Regf	Cmp	Cmn	A value
B- values for	-0.345	-0.235	-0.413	0.470	-0.125	3.17
R ²	0.508					
t-cal	-0.686	-0.383	-1.515	0.997	-0.164	
t-crit	2.074		at df=22 and alpha = 0.05			
p-values	0.500	0.705	0.144	0.330	0.871	

The last row representing ‘p-values’ of the t-test which are more than 0.05; hence we cannot say the effect of these individual elements is significant in determining the value of accident/injury rate.

However, further we have combined these elements so as to form the implementation level as mentioned before (Ref table No. 5.3.19) and its effect on FSI is presented in the following table.

SN	Parameters	Values
1	B value of I _{level}	-0.034
2	A value	3.262
3	Correlation	-0.629
4	t-cal	-4.122
5	t table	2.0555
6	p-values	0.0003

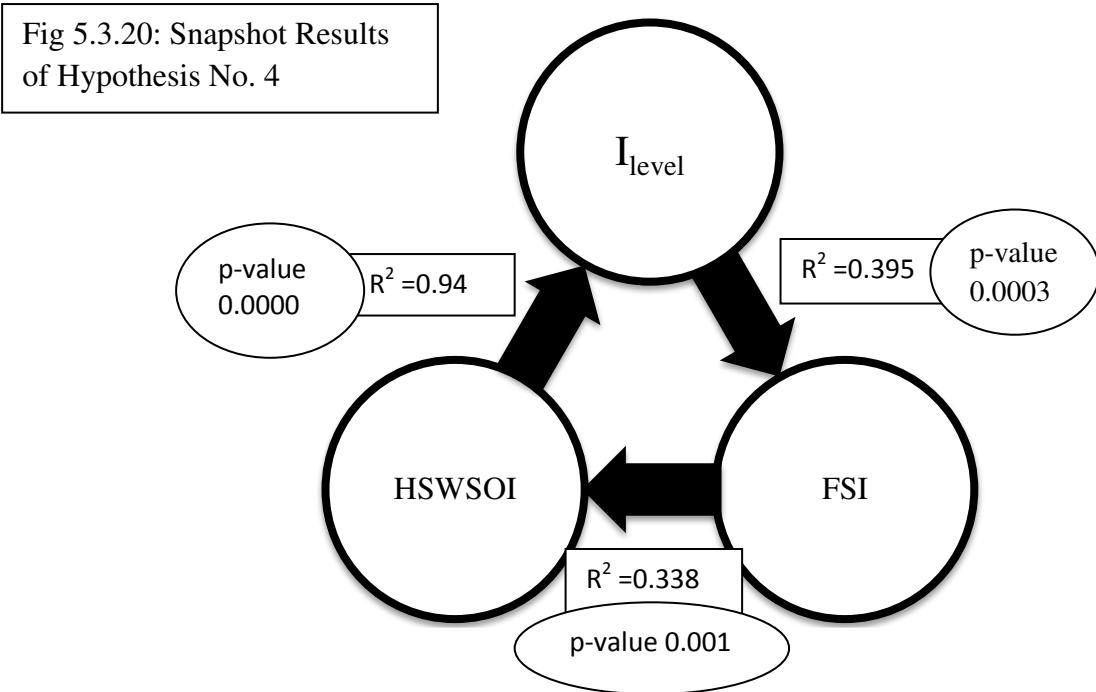
This result is surprising that the effect of implementation level on FSI is significant (p=0.0003). The negative values of correlation and t-cal represent the opposite direction. This means higher level of implementation results into lower accidents/injuries. The following regression equation is proposed herewith:

$$FSI = 3.262 - 0.034x I_{level}$$

On the basis of above explanation it can be said that, Hypothesis No. 4c

“Lower level of implementation of HR practices relating to HSW results into higher accidents/injuries.” is proved.

The final results of the hypotheses H4a, H4b and H4c are displayed in the following figure.



Further, we have examined the effect of following determinants on the FSI by applying correlation analysis

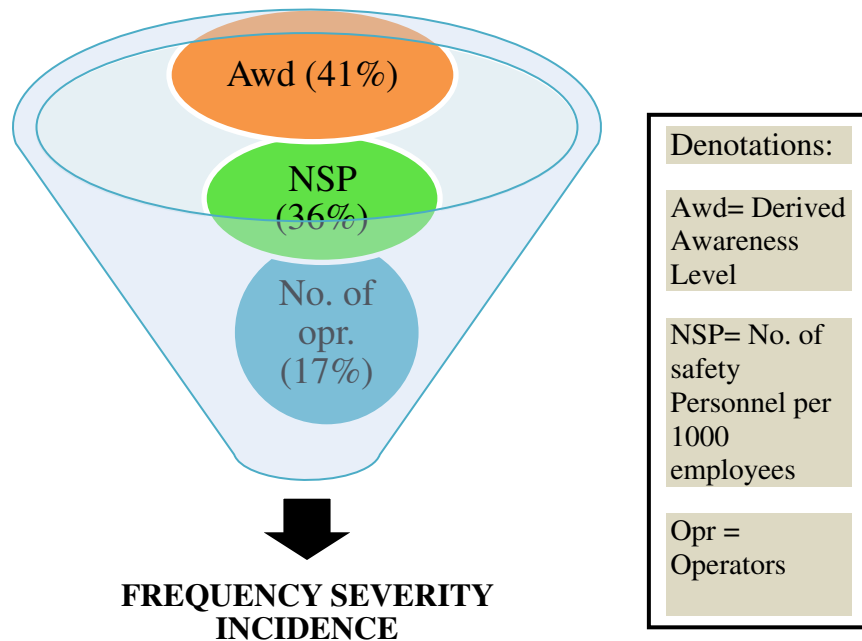
- 1) Number of safety personnel per 1000 employees
- 2) Derived Awareness Level and
- 3) Number of operators working in a shop

The results are tabulated as below

Correlation between No. of safety personnel/1000 employees and Weighted FSI		Correlation between Awd and Weighted FSI	Correlation between No of operators and Weighted FSI
SN	Parameters	Values	Values
(1)	(2)	(3)	(4)
1	r	-0.596	-0.638
2	r ²	0.356	0.407

(1)	(2)	(3)	(4)	(5)
3	N	28	28	28
4	P. Er.	0.0821	0.0756	0.106
5	Lower limit	-0.514	-0.562	-0.305
6	Upper limit	-0.679	-0.714	-0.517
7	r crit	0.374	0.374	0.374
8	df	26	26	26
9	α	0.05	0.05	0.05

Fig 5.3.21
: Effect of
Awd, NSP
and No. of
Opr on FSI



Interpretation

1. The accident/injury rate in terms of weighted FSI is significantly and negatively associated with the number of safety personnel/1000 employees. In other words higher the safety personnel lower will be accident/injury rates.
2. The weighted FSI is significantly and negatively associated with the derived awareness level of workers/operators. In other words higher the awareness of workers, lower will be accident/injury rates.

3. The weighted FSI is significantly and negatively associated with the number of workers/operators. In other words higher the workers/operators in a shop, lower will be accident/injury rates.

5.3.7 HYPOTHESIS No. 5

The fifth hypothesis of the study is as below:

H5: Higher level of implementation of provisions related to Health, Safety and Welfare would lead to form a basis for healthy job relationship.

This hypothesis has proved on the basis of deductions from accepted hypothesis No. 4a, 4b and 4c as well as analysis of statutory provisions under the Chapter Health, Safety and Welfare of the F.A. We have applied induction method with a question “What are the factors affecting on Healthy Job Relationship (hereafter referred as HJR)?” These 21 answers to this question have classified under three categories namely: HSW related factors, partially related factors and not related factors.

Statutory Perspective

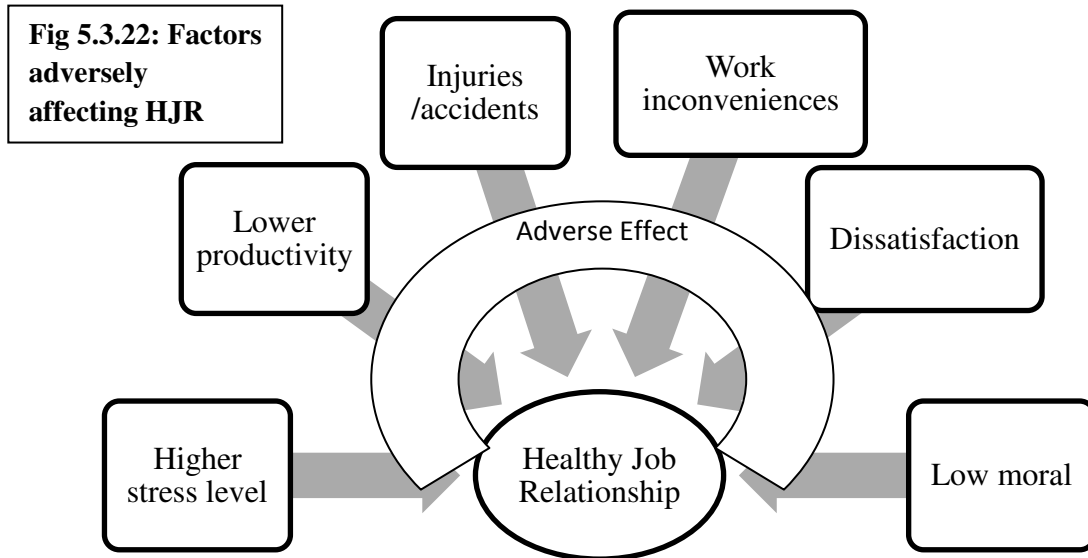
The adverse effects of lower level of statutory HSW provisions and its consequences are summarized in the following figure.

Ch	Broad Area	Situation		Consequences
H E A L T H	Cleanliness	<ul style="list-style-type: none"> • Unhygienic condition • Building Sickness 		<ul style="list-style-type: none"> • Injuries and accidents • Dissatisfaction • Reduced moral • Reduced productivity • Fatigue • Diseases • Higher Stress • Distraction • Inconveniences at workplace
	Atmospheric Conditions	<ul style="list-style-type: none"> • High temperature • Sweating • Suffocation • Dust related diseases • Chemical/biological hazards 		
	Fulfillment of biological needs	<ul style="list-style-type: none"> • Biological inconveniences 		

Ch	Broad Area	Situation		Consequences
S A F E T Y	Behavioural factors	<ul style="list-style-type: none"> • Unsafe work condition • Unsafe acts 		<ul style="list-style-type: none"> • Fear of danger • Injuries and accidents • Dissatisfaction • Apathy
	Technological factors	<ul style="list-style-type: none"> • Inconveniences • Chemical and physical hazards 		
	Safe work conditions	<ul style="list-style-type: none"> • Complaints 		

Ch	Broad Area	Situation		Consequences
W E L F A R E	Welfare facilities for health and conveniences	<ul style="list-style-type: none"> • Chemical and biological contamination 		<ul style="list-style-type: none"> • Dissatisfaction • Biological, chemical and physical diseases
	Quality of food	<ul style="list-style-type: none"> • Unhygienic condition • Low quality food 		

All these factors are adversely affecting on healthy job relationship. Therefore, we conclude herewith that higher level of implementation of provisions related to HSW will positively improve the “Situation” and “Consequences” and in the long term would form the basis of healthy job relationship.



There are number of factors which contribute in healthy relationship with between supervisors/managers and workers. We have collected 21 factors which have impact on relationship in workers and management. These factors have categorized in three classes namely:

- 1) HSW related factors
- 2) Partially related to HSW and
- 3) Not related to HSW.

Working hours, job security, shift provision, pay scales and incentive are well defined by organizational policies and set rules. Similarly, they are not in the sphere of local management i.e. supervisors and managers. Recreational facilities are higher need factors and personal factors are related to behavioural, cultural and psychological factors. HSW related issues are basic, physiological and hygienic factors; its lower implementation or absence creates high dissatisfaction. Problems related to HSW are immediately threatening and dissatisfying than ‘not related to HSW’. Putting crudely, inhaling silica or high noise level at the workplace will create immediate dissatisfaction among workers than long working hours or job security. The HSW issues affect much more quickly than others, although both adversely affect on healthy job relationship. Following figure classifies the factors affecting HJR. It shows most of the factors are under the category “related to HSW”.

Table 5.3.30 : Classification of Factors Affecting on HJR

HSW related	Partially related to HSW	Not related to HSW
<ul style="list-style-type: none"> • Unhygienic condition • Maintenance and repairs • Atmospheric condition • Dust, dirt, fumes and noise • Chemical, biological and physical hazards • Unsafe work conditions • Old technology • Inconveniences • Low quality food • Training 	<ul style="list-style-type: none"> • Communication • Supply of assets related to HSW • Workers' involvement • Compliance of recommendations • Regulatory framework 	<ul style="list-style-type: none"> • Working hours • Job security • Shift provision • Recreational facilities • Pay and incentives • Personal factors

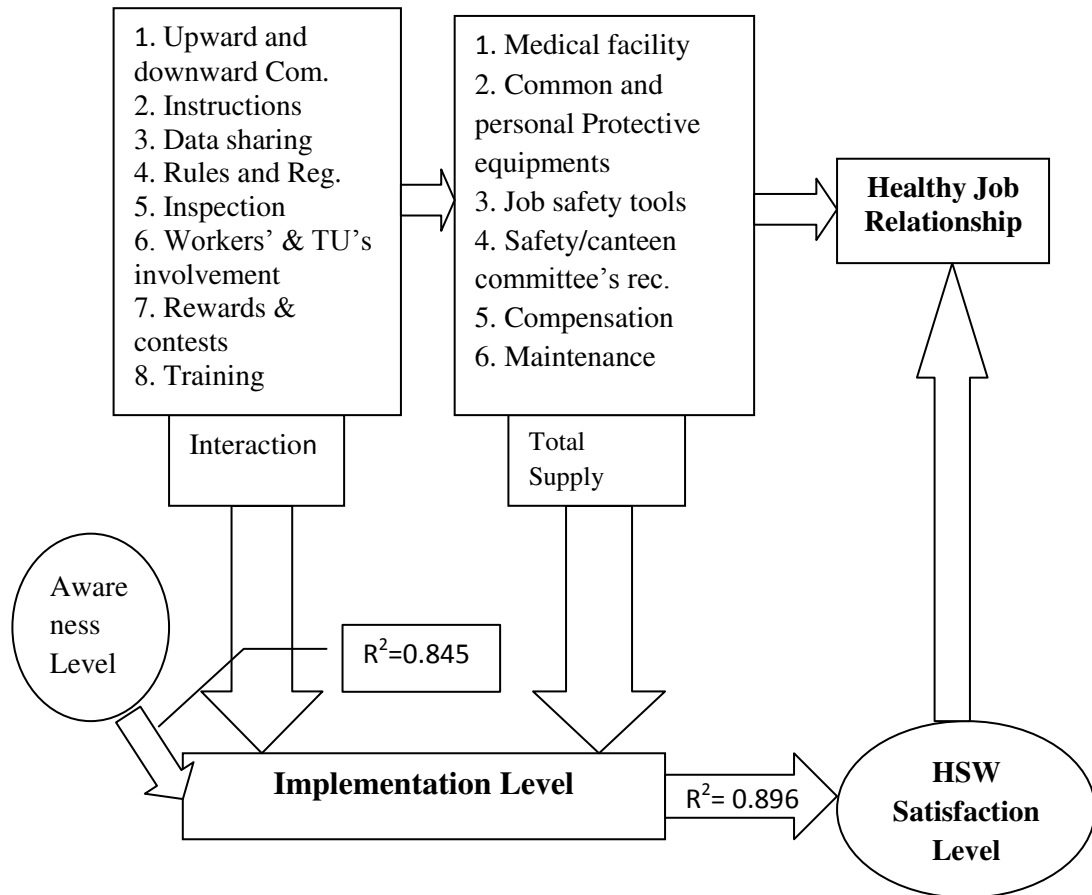
Hence, on the basis of above interpretation it can be said that Hypothesis No.5 **“Higher level of implementation of provisions related to Health, Safety and Welfare would lead to form a basis for healthy job relationship”** is proved.

RESEARCH FINDINGS

Our hypothesis No. 4a concluded that, **“Employees’ satisfaction is highly and positively associated with implementation of HR practices relating to HSW”**. Higher implementation requires higher level of “Interactions” (Upward and downward Communication, Instructions from superiors, Data sharing, Rules and Regulations, Inspection, Workers’ and trade union’s involvement, Rewards and contests and Training) which psychologically affects on employees. Similarly, higher level of “Total Supply” (Medical facility, Common and personal Protective equipments, Job safety tools, Safety/canteen committee’s recommendations, Compensation, Maintenance) indicates management’s commitment in real as it demands higher finance.

The following figure shows the variables of Implementation level and its relationship with HSWSOI and HJR, as found in hypothesis No. 4.

Fig 5.3.23: Relationship among I_{level} , HSWSOI and HJR



During the analysis of hypothesis No. 4a, we have proved that there is significant contribution of communication in determining HSWSOI. As satisfaction is a base of job relationship, it can be concluded that higher level of communication would lead to HJR. Many reports and researchers support this fact (ILO report V(I); Harter J.K. et al, 2003; De Silva S.R2008; Burton John, 2010; Department of Labour, New Zealand, July 2012).

Accidents and injuries are the most devastating events at the workplace and hence it is responsibility of everyone to reduce its frequency, severity or eliminate the same. Our hypothesis No. 4b and 4c concluded that “Implementation of parameters of HSW and satisfaction of employees are significantly and negatively associated with accident/injury level”. Hence, “higher level of implementation leads to higher satisfaction

and eventually lowers accident/injury at workplace. Thus it forms a basis for healthy job relationship”.

The following table shows values of explanation of satisfaction (HSWSOI) by the elements of Implementation level. It is derived from cross correlation matrix given above under table 5.3.24.

Table 5.3.31: Values of Explanation ($r^2 \times 100$)					
Variables	Cmn	Cmp	Regf	Invol	Sup
HSWSOI	84	75	69	70	84

The minimum value of correlation $r = 0.830$ with $r^2 = 0.69$ (between regulatory framework and HSWSOI); explaining 69% of variation in the satisfaction is explained by regulatory framework. It is significant ($r_{crit} = 0.374$ at $df = 26$ and $\alpha = 0.05$). As correlations between other variables are greater than 0.830, the corresponding values of explanation are higher than 69%; hence are significant.

In a nutshell, following deductions are made

Premise 1: Higher the level of HSW implementation, higher is the employees’ satisfaction

Premise 2: Employees’ satisfaction and healthy job relationship are closely related

Conclusion: Higher level of implementation forms basis for healthy job relationship.

On the basis of above explanation, it can be said that Hypothesis No 5:

“Higher level of implementation of provisions related to Health, Safety and Welfare would lead to form a basis for healthy job relationship” is proved.

CHAPTER No.6

SUMMARY, FINDINGS AND SUGGESTIONS

OBJECTIVES	<ol style="list-style-type: none">1. To summarize in brief the research work executed2. To enunciate the general findings3. To summarize the organizational and specific findings of the study and explain it in the context of previous findings4. To offer suggestions for improvement in OHS situation
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6.1 Introduction

This study is addressed for the assessment of statutory health, safety and welfare provisions in the automobile industry situated in Pimpri-Chinchwad Industrial Area. This Area is dominated by automobile industry encompassing original equipment manufacturers (OEMs) and number of auto component manufacturers. For the purpose of this study we have considered five major employers, investors and OEMs in the automobile industry.

- A. Premier Limited,
- B. Tata Motors,
- C. Mahindra Vehicles Manufacturing Limited,
- D. Force Motors and
- E. Bajaj Auto.

Being micro level study, we have taken into account 28 shops of these companies. Small and medium scale companies have limited employees in departments where micro level study is not possible; hence we have selected above major companies for study.

The aim of this study was to measure awareness among workers about HSW related issues and assessing efficiency of supervisory mechanism of the government. It was also intended to quantify satisfaction of workers about implementation of statutory provisions under HSW and its association with demographic variables such as: age,

marital status, number of dependent family members, education, work experience, nature of job and income. Further it was aimed to find out HR practices (elements of implementation level) relating to HSW and its relation with employees' satisfaction and influence of both on the accidents/injuries. Furthermore, it was proposed to enlighten how implementation of HSW provisions would form basis for healthy job relationship. For data analysis, we have applied t-test, correlation test, ANOVA and multivariate regression analysis by using "Data Analysis" software available in the 'excel' of 'Windows XP' version 2002.

6.2 Summary of Research

OHS is a multidisciplinary issue comprising knowledge of multiple subjects including management science, HRM, health science and environmental science. Implementing provisions relating to HSW as mentioned in the Factories Act and Rules thereof is a responsibility of HR department. It is specifically mentioned that provisions made in the Chapter V welfare are also related to 'Health' of workers. Role of HRM in the management of HSW has substantiated on the backdrop of many theories of HR, welfare and motivation. Many studies revealed that OHS has favourable impact on the employees' satisfaction, production and productivity, profitability, moral, attrition rate and accident/injury rates. The modern approach of OHS management emphasizes on training, improvement in awareness, establishing communication system, reward and compliance. As human errors are responsible for most of the accidents, workers' participation and motivation play key role in the performance. OHS is not only limited to mere fulfillment of statutory requirement or freedom from injuries but it is a continuous process of coordinated efforts of all stakeholders through the HR mechanisms. The government is responsible for enforcement of statutory provisions through the Directorates of Industrial Safety and Health. Managers, researchers and government feel importance of OHS due to its cascading-chain-effect on the multiple areas.

This research work consists of six chapters namely: 1) Introduction, 2) Profile of Automobile Industry 3) Review of Literature, 4) Research Methodology, 5) Analysis of Health Safety and Welfare Scenario and 6) Summary, Findings and Suggestions. Every Chapter is started with contents and objectives and is ended with references arrived in the

chapter sequentially. At the end, bibliography of all 301 references alphabetically arranged has attached. It consists of excerpts from

- A) Government Reports, Committee & Commission Reports & Acts: 39 Nos. (13%)
- B) Ph.D. Theses ----- 16 Nos. (5%)
- C) Reference Books ----- 86 Nos. (29%)
- D) Journals, Magazines and others ---- 106 Nos. (35%) and
- E) Websites ----- 54 Nos. (18%)

The **Chapter No.1: “Introduction”** is started with linking HRM theories to OHS management. A historical review of the Factories Act and its implementation in India and Maharashtra has elaborated. The OHS situations in various countries and importance of its management have been explained in the subsequent section. Further, researches in the OHS promoted by ILO and government of India have elaborated. Afterwards, it is turned to explain significance and main focus of this research work.

The **Chapter No. 2:“Profile of Automobile Industry”** brings into sharp focus the automobile industry in general and pertaining to this study.

The **Chapter No.3: “Review of Literature”** is divided into three sections namely: “OHS Management and Theories”, “Statutory Framework and HR practices (HSW)” and “Previous Researches and Findings”. The first section explains theories of accidents causation, its measurement and analysis methods. After examining literature on awareness in the OHS management, it states hypothesis No. 1. The review of some studies evaluating the efficiency of the government machinery has taken in the next section which brought forward the second hypothesis of the study. The second section takes account of the F. A. and responsibilities of stakeholders. It brings forward remaining three hypothesis No. 4 and 5. The third section as name implies, explores previous researches in the context of OHS management.

The **Chapter No.4: “Research Methodology”** elaborates about criteria behind selection of industry and sample companies, questionnaire design and research design. It also points out some previous researches and need of this research. The aims and objectives, statement of hypotheses, research design and hypothesis testing methodology have been appropriately explained in this chapter.

The **Chapter No.5: “Analysis of HSW Scenario”** comprised of three sections namely: “Preliminary analysis”, “Macro level Analysis” and “Hypotheses testing and interpretation”. The first section has laid foundation for application of quantitative techniques and focused on profile of respondents. In the second section organizational level qualitative analysis has carried out. It is also supported with the introductory observations of the survey. The third section is devoted for the most important part i.e. hypothesis testing and interpretation, where all five hypotheses have tested.

The **Chapter No.6: “Summary, Findings and Suggestions”** has started with a very brief review of present study at conceptual level and further it summarizes very briefly the chapter-wise account of contents. The subsequent section ‘Findings’ is divided into three subsections namely: 1) General Findings, 2) Macro level Findings and 3) Specific Findings. The first subsection attempts findings regarding HSW situation at global, national and state level whereas the macro level conclusions are related to organizations on the basis of data analysis. Specific suggestions are based on the hypotheses testing.

6.3 General Findings

1. The joint survey by ILO, 2007 has revealed the fact that in most of UAE countries the implementation of OHS has marred by 1) deficiency of dialogue, 2) poor inspection system, 3) financial potential, 4) weak motivation from government, 5) lack of specialists and 6) lack of awareness among workers. **In this study it is found that vacant posts of factory inspectors lead to poor inspection. Also, 77% of workers’ are significantly aware about OHS related issues.**

2. Europe has always played a key role and supposed to be pioneer in the field of OHS management. At present, European countries are developing their learning capabilities to act efficiently in knowledge based society in OHS domain. Employers and employees have made number of decisions to improve quality of living and working environment. Physical hazards are reduced but the rise in psychological stress lead to diseases. The inspection system is more strict than Asian countries on account of availability of vehicles and advent of information technology in the management of OHS.

3. In India, OHS is a complex and multifaceted issue. Some detrimental causes to OHS have originated from huge workforce in unorganized sector, cheap labour force, inadequate enforcement of legislation, inadequate budget provision, corruption, lack of reliable data and apathy of stakeholders. Similarly, inadequate workforce of factory inspectors, non availability of vehicles and equipments, meager computerization and manageable situation are responsible for lower efficiency of government mechanism. The condition of Maharashtra state and Pune region is also not different from this. The researcher has realized the same during visits to these offices.

4. The situation of implementation of OHS is dissimilar in the automobile companies under study. Tata Motors has acquired ISO 18001-2007 and high level of standards matching with developed countries whereas others are managing statutory requirements under the Factories' Act. Two companies are adopting behaviour based safety, ergonomic study and advance safety management techniques whereas others are lagging in training also. Tata Motors utilizes suggestion scheme in an excellent manner and received 22 suggestions per head in 2011 whereas others are receiving not more than 2 suggestions per head per year. It is specifically mentioned that **Tata Motors, Mahindra and Force Motors have fully fledged safety department whereas Premier Ltd. and Bajaj Auto have no safety officer for more than one year.** The safety committee recommendations are complied in a time frame whereas in other companies it is neglected and taken casually. The researcher has observed during the survey that in a company the injured worker hospitalized and remained uncared for long period without financial support, whereas another company has carried out cardiac check up for all workers having more than 45 years age and operated 10 of them having blockage at company's cost. Thus at the end we come to the conclusion that OHS cannot be compelled by the law or externally. Its implementation at workplace highly depends upon management philosophy.

6.4 Industry level Findings

The Questionnaire has matched with conditions of 98% of workers; indicating that it was in order. Appropriate reliability check using correlation analysis and Cronbach's alpha has carried out and found it is acceptable for the use of quantitative

techniques. The data are examined for normality using appropriately empirical rule, Chybyshchev's theorem and skewness norms and found in order; which is an essential condition for statistical tests. The demographic profile of the operators /workers revealed following results.

1. Population: 20, 341
2. Sample size of operators/workers: 6.5%
3. Total 23 top managers, 15 trade union members, 171 line managers, 223 supervisors/cell leaders and 1331 workers/operators have participated in the survey.
4. Overall average age of respondents: 32.65 years with SD of 10.04 years. About 25% of respondents had age between 25-35 years and 35-45 years each. 32% operators had age below 25 years.
5. Total 823 permanent (62%), 330 temporary (25%) and 178 (13%) apprentice had taken participation in survey.
6. Marital Status of operators/workers: Married -58% and unmarried -42%
7. 35% respondents had 0-1 dependent family members. 40% had 2-3 and 25% had above 4 dependent family members.
8. 19% of operators/workers were educated upto SSC, 64 % were SSC+2 Years, 13% were Graduates and 4% were Diploma in engineering.
9. Experience in years of service: upto 5 years and 5 to 20 years were 40% each.
10. Income of 22% operators/workers was less than Rs. 8000 per month. In company C, 93% of respondents had income below Rs. 8000 per month. Overall about 56% of respondents had income upto Rs. 20000 per month.

Diekemper and Spartz (1970) have developed qualitative approach for the assessment of Health and Safety in an organization. This assessment gives general idea about where to focus with priority (Rory Sullivan, 2005). However, Opinions of operators, line management and senior management should be taken into account while doing so (Jeremy Stranks, 2007).

It is found in EU– 15 survey (2001) that overall 72.5 % employees were satisfied with working condition in their organizations. Another study by Baur T.K. (2004) in Europe concluded that most of the workers were fairly satisfied with working conditions. **Our study reveals that 83% of respondents are satisfied or completely satisfied with the working conditions in their company.** Similar result has observed in European Foundation survey (2010) where this percentage was 87.

In a job satisfaction research by Abuduani Wubuli (2009) with working condition in fast food restaurants, both equally 25% of ratings were below and above the central point rating. In our case, the results are highly inclined to the above the central point.

Operators		Supervisors		Managers	
Above	Below	Above	Below	Above	Below
45.9%	16.8%	52.0%	9.4%	51.2%	9.6%

In Indian and Kenyon sugar factories 55 % of respondents were dissatisfied with HSW conditions. **In our case only 16.8% of workers are dissatisfied.** Auto industry is free, high technology industry, globally operated and major enterprises; whereas sugar industry is highly controlled by state and central governments comparatively lower technology industry, operated locally and cooperative sector. The sugar industry needs strict economic discipline, clean leadership and sincere efforts to overcome the problems;

¹ whereas it feels that these underlined issues are exist upto the mark in the auto industry.

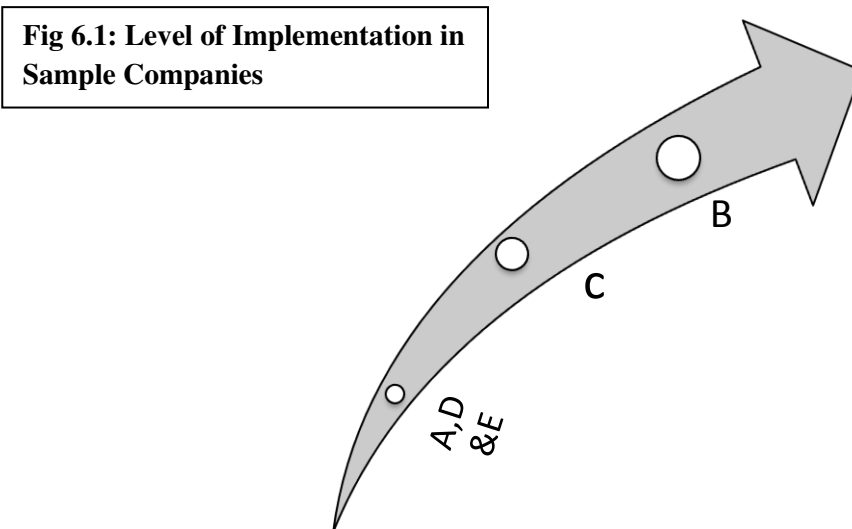
A study in textile industry in Salem, Tamil Nadu (A. Sabarirajan, T. Meharajan, B. Arun, 2010) reveled following results which are surprisingly matching to our results.

¹ Parkhe G.G., ‘Impact of Globalization on Indian Sugar Industry and Perspectives’, Impact of Instability and Uncertainty on Business Functions and Processes, S.B.Patil Institute of Management, Nigadi, Pune, Feb 2012, pp. 116-119

Table 6.2: Comparison With Previous Findings						
	Textile industry Study			Our study		
Area	Average	Satisfied	Highly Satisfied	Satisfied	More Satisfied	Completely Satisfied
Welfare	39%	22%	15%	36.8%	27.9%	13%
Total	76 %			77.7 %		
Safety	14%	31%	39%	34.4%	32.7%	16.5%
Total	84 %			83.6 %		

A similar study by P.B. Kumbhar (2000) in Pune district has revealed that about 65 to 89% of respondents were very highly satisfied with some statutory HSW provisions. The researcher has adopted 3 point Likert scale hence there is difference in results, **in our case this percentage is about 41 to 50 %**.

It is also found that the opinions expressed by various stakeholders i.e. top managers, line managers, supervisors and operators taken individually or collectively are consistent with each other. On the basis of these opinions, sample companies can be divided into three categories implementing the statutory HSW provisions at higher, mediocre and lower level.



Factory inspection is disregarded in Maharashtra. The inspection mechanism is paralyzed on account of inadequate staff and lack of vehicles and equipments. This situation is consistent with situation mentioned in the Draft Labour Policy, 2010 of Labour Department.

On the basis of analysis of annual reports of sample companies, it is concluded that the **fluctuations in the economic performance** (net sales and profit after tax) **were significant in the period 2004-2010**. But, in the Indian automobile industry, **the economic downturn has not reached to the cost cutting in the employees' health, safety and welfare related expenses**. The employees' satisfaction was found more significant with reliability and quality (net asset value) of building and machinery and not with amount of expenses on maintenance of these assets. In the study by European Foundation, it is found that investment in modern equipment and new building had improved working condition and hence satisfaction of employees. Our results are consistent with this.

6.5 Organization level Findings

6.5.1 Overall Findings

The overall results of workers' satisfaction about HSW provisions at organizational level are tabulated as below:

Table 6.3: Organization Level Satisfaction						
	Co. A	Co. B	Co. C	Co. D	Co. E	Total
Less Satisfied	36.9%	7.1%	22.1%	31.6%	49.2%	17.2%
Satisfied	63.1%	92.9%	77.9%	68.4%	50.8%	82.8%
Note: The "Less Satisfied" category also includes "Highly Dissatisfied" responses and "Satisfied" category includes "Satisfied", "More Satisfied" and "Completely Satisfied" categories.						

This result shows workers' satisfaction differs from company to company with a minimum of 7 % to maximum of 50%. This clearly indicates that implementation of HSW issues are dependent on company policy, top management support and ultimately on the company philosophy.

Following previous researches shows workers' satisfaction about the same issue

SN	Findings	Researcher/Reports
1	87% of respondents were satisfied with working conditions	Baur T.K. 2004
2	33% respondents experiencing culture of health	Buck consultants, 2011
3	Physical conditions at work were marginally good in Ford and Chrysler and poor in General Motors	ILO survey, 2000
4	72.5 % workers in European countries were satisfied with working conditions	Eurofound, 2007
5	68.5% of workers were satisfied with HSW situation in fast food restaurants	Wubuli Abuduani, 2009
6	45% workers were satisfied with HSW situation in sugar industry in India and Kenya	Gongera E. George, 1999
7	About welfare 76% and safety 84% workers were satisfied in textile industry in Salem	A.Sabarirajan, T. Meharajan, B. Arun, 2010
8	Most of workers (65 to 89%) were satisfied with implementation of some of the statutory HSW provisions in automobile industry, Pune	Kumbhar P.B., 2000
9	Manufacturing industries have taken care of OHS provisions	R. Krishnaveni & R. Deepa, 2011

On the basis of workers opinions on five-point Likert-type scale the five limits (bands) of opinions have established. This would form the basis of findings and suggestions where the workers opinion is not satisfactory.

Range	Descriptions
1.0 to 1.8	Highly dissatisfactory
1.8 to 2.6	Less satisfactory
2.6 to 3.4	Satisfactory
3.4 to 4.2	More satisfactory
4.2 to 5.0	Completely satisfactory

The item specific table of means of satisfaction and particularly those coming in the lower bands is attached in the Appendix-VI. The three key provisions in each of the chapter depending upon workers' lower satisfaction and hazardous nature are as below.

Ch.	Section No.	Description of Section	No. of Shop	Percentage	Dissatisfied Population
(1)	(2)	(3)	(4)	(5)	(6)
HEALTH	20E	Noise	15	54%	9849
	13	Ventilation and temperature	13	46%	5819
	14	Dust and Fumes	10	36%	5444
SAFETY	24	Striking gear and devices for cutting off power	9	32%	3005
	35	Protection of eyes	9	32%	3000
	36	Dangerous substances	9	32%	3200
WELFARE	46	Canteen	15	54%	5890
	44	Sitting facilities	13	46%	4130
	45	First-aid-appliances	5	18%	2030

It is suggested that the companies should take suitable action to reduce the noise, temperature, dust and fumes and improve ventilation at the workplace. Similarly, the striking gear and devices for cutting off power in emergency should be provided where necessary. Adequate precautions for protection of eyes from dust, fumes, temperature or any particles should be taken at the workplace. A system for handling of dangerous substances should be installed. In the health section canteen facility, sitting facility at the workplace and first-aid- appliances should be provided and maintained properly.

ORGANIZATION-WISE HSW SCENARIO AND SUGGESTIONS:

In this section Company-wise three provisions have been suggested for improvement where the satisfactions of the operators/workers found lowest. These findings and suggestions are based on the table appended in the Appendix-VI.

6.5.2 PREMIER LIMITED (A)

a. Health

The workers in shop A2 are very dissatisfied with the high noise level; in the other shops also they have indicated less satisfaction. At an immediate effect, exposure time should be reduced or suitable PPEs should be provided. Secondly, the ventilation, temperature and dust level are the areas where satisfaction found lower. Increasing number of fans, exhausts and roof treatment are some remedies the company can adopt. The dust level can be reduced by adopting higher technology processes. Thirdly, Shop floor cleanliness, effluent disposal and overcrowding are issues which should be dealt with. Workers, trade union and workplace committees should be involved to find out amicable solution.

b. Safety

The workers are less satisfied with the hazardous condition created by fumes and they need protection from it. Eye protection and fire training have also indicated low satisfaction. Secondly, the technological improvement at workplace to make the operation safely such as striking gear or lock out, tag out and fear out, changes in layout and appropriate covering the revolving parts should be attempted. Thirdly, dangerous machinery/operation should be separated to reduce its hazardous effect on human.

c. Welfare

According to workers, improvement in quality of canteen food and its cleanliness is the first priority in the company. Secondly, first-aid box at the shop floor should be maintained properly alongwith trained attendant. Adequate sitting facility at workplace should be made to take advantage of any opportunities for rest which may occur during the course of work. It can be made roughly for 20% of workers as decided by company B. Thirdly, adequate and suitable shelters, rest rooms and lunch rooms are the needs of the workers which should be fulfilled through discussion with them.

6.5.3 TATA MOTORS (B)

a. Health

The workers in shop B6, B7 and B8 are less satisfied with the high noise level. Hence, company should take action to control the noise level. Secondly, the ventilation, temperature and dust level are the areas where satisfaction of workers found lower in shop B8 and B9. Thirdly, provision of wash basin and water taps near some shops should be made.

b. Safety

All the workers in the 10 shops are satisfied with the sections covered under this chapter. Satisfactory ratings include precautions against dangerous fumes, eye protection, striking gear and devices for cutting off power in emergency and separation of dangerous machinery/ operations. We suggest herewith to involve trade union in the decision making process of improvement in working conditions.

c. Welfare

Sitting facility is one of the areas where workers reported 'Satisfactory' opinion in all blocks. The Du Pont Corporation also has suggested for providing sitting-facility at workplace for 20% of workers. Secondly, in case of shop B8 dangerous machinery / operation should be separated, lock out, tag out and fear out should be carried out alongwith worker's training. The design of goggles supplied should be improved appropriately to reduce the inconvenience in use.

6.5.4 MAHINDRA VEHICLES MANUFACTURING LIMITED (C)

a. Health

The latrines and urinals facility at the workplace should be improved on priority in terms of number and cleanliness where most of the workers are 'less satisfied' and 'very dissatisfied'. Secondly, adequate wash basin and water tap facility should be provided at the convenient places. In the shop C4 where workers conveyed 'less and average satisfaction' about effluent disposal, ventilation facility, dust and fume level in the atmosphere; it should be attempted by involving union and committees.

b. Safety

Company has adopted advanced technology in this new plant and following sophisticated hazard assessment techniques like behaviour based safety and OSHA standards. The workers satisfaction in this area is higher. However, on the basis of some responses company should examine the working of lifting machinery and display technical information and precautions in written form at the place of operation. Secondly, some workers have expressed average satisfaction to ‘lifting weight’; which should be appropriately looked into. The third issue workers have raised is about quality of shoes; which should be corrected in the future purchases.

c. Welfare

The biggest drawback found in this section is maintenance of canteen food quality and cleanliness. It should be improved through regular inspection and discussion with workers and society running the canteen. Secondly, sitting facility should be provided at the shop floor so that workers can take advantage of rest when there is an opportunity. Thirdly, adequate washing facility near the workplace and lockers for storing clothes should be provided and maintained.

6.5.5 FORCE MOTORS (D)

a. Health

The area where most of the workers are less satisfied and highly dissatisfied is atmospheric condition in which they have to work. Therefore, it is suggested to look into for improving ventilation, air velocity and reducing temperature, dust & fumes level in the shops. Secondly, the company should adopt appropriate noise control strategy in shops where workers are facing nuisance. Thirdly, the improvement in toilet facility in terms of number and cleanliness, effluent disposal problem in shop D2 and general cleanliness i.e. wash-basins, housekeeping and painting should be attempted as per recommendation of health committee. These issues are inclusive and come under the broad heading of ‘cleanliness’.

b. Safety

Company should take action to reduce dust, light, heat and dangerous substances in the atmosphere to reduce irritation of eyes on account of it. Also, reduce the fume level in the shops. Secondly, adequate emergency-power cutting arrangements should be installed. The machines should have adequate safety locks and safety tags. Necessary trials shall be carried out in the presence of workers. Thirdly, the repairs and maintenance of the building are necessary to have pleasant indoor atmosphere.

c. Welfare

Sitting facility at the workplace should be provided. Secondly, canteen food quality should be improved by implementing suggestions of the canteen committee. Similarly, action on the inspection reports of the welfare officer and register of suggestions at the canteen should be taken. Adequate number of wash basins with water taps should be provided at convenient places.

6.5.6 BAJAJ AUTO LIMITED (E)

a. Health and Safety

There are number of issues in shop E2 and E3 of the company where the workers are less satisfied. The present survey does not show any clear cut picture to suggest priority of work to be carried out in the company. It feels that, this low satisfaction might be originated on account of absence of safety officer. Hence, it is suggested to:

1. Appoint full time safety officer.
2. Carry out series of discussions with safety committee and trade union (newly formed) in order to set priorities.
3. Communicate workers/employees about the activities taken up in their favour to ensure health and safety at workplace.

b. Welfare

On the basis of workers satisfaction, following priorities are set for further improvement in this area.

1. Provide and maintain adequate lockers for storing clothes
2. Provide sitting facility at workplace and replenish first-aid box at regular interval
3. Canteen food quality should be improved by implementing suggestions.

6.6 SPECIFIC FINDINGS

These findings are based on hypotheses testing and quantitative analysis carried out by using statistical tests in the Section 5.3 of this thesis.

1. Workers' Awareness Level

a. Workers' awareness about HSW related issues affects on the OHS performance. This fact has substantiated by many researches and reports (It improves OHS performance-PACE, 1999; It is prerequisites for participation- Court Fiana, 2005; It improves OHS and other performance- Baig S.A. & Narhari N.S., 2012; It reduces hazards-National policy on safety, GOI, 1999; It is necessary for all staff-Kaila H.L., 2011; It is necessary for government staff- NHS Employers, 2006). Our analysis showed that **“self reported awareness level of 84% of respondents is significantly more than average.”** Similarly, **“derived awareness level of 77% of respondents is significantly more than average.”** This result is much higher than findings of Brodie David, 1994, who found that 56% of workers are aware about H&S related issues. However, **“in Premier ltd., the awareness of workers is lower than average in all four shops.”** Awareness level is a function of working of Health, Safety and Welfare departments and committees, training, communication, participation of workers in the activities. The lower level of implementation of these mechanisms is responsible for lower awareness level. It is also observed that **self reported awareness level of workers is significantly higher than derived awareness level.** The reason behind this is to glorify self image self rated knowledge was overestimated by workers.

b. It is observed that **“awareness levels of apprentice and temporary workers are significantly less than permanent workers.”** The reason of this may be in the temporary nature of employment and lesser work experience as compared to their counterpart.

c. Companies are dominant source of information dissemination, as 87% of workers are getting information through them (Brodie David, 1994, found it as 23%).

d. **Trade unions have not yet prepared enough to contribute their efforts in the improvement of awareness level** (Brodie David, 1994, found it as 22%). A study by Ramjas, 1992 found that union affects positively on working condition and safety. Our findings match with Carmen Garcia Olaverri and Emilio Huerta, 2011 that TU has no relationship with training activities. It may be on account of growing trend of non-unionized workers in the organization.

e. Training is the most influential medium of information dissemination, as its individual and shared contribution was 80%; the same for Reading was 42% and listening from others was 30%. It rather indicates “**workers take information from various medium**” which is consistent with media synchronicity theory by Dennis Alan R. & Valacich J. S., 1999 and researches of Endsley Mica R., 2000, Lawler Mohrman & Ledford Jr., 1995; Joel Light, 2004.

2. “The efficiency of the government machinery is significantly lower than satisfactory.” This fact is substantiated by many researchers (Patel Jagdish 1999; Draft Labour Policy, GOI, 2010; ILO Report III (1B), 2006, Beck, M. and Woolfson, C. 2000; Nair V. Surendran and S. Thajudeen, 2007; Ronkoni Lucas, 2010; A. Phillippe ,2011). However, Deosthali Hemant, 1993 found that factory inspectors visited the plant regularly and their visits were useful in improving work environment. Kaila H.L., 2011 found that factory inspectors’ advice were useful and practical.

A. Phillippe, 2011, concluded that the mild enforcement of OHS was due to 1) prevalent socio-political situation, 2) lack of consideration for the functions of labour administration and 3) weak motivation of the staff. **We observed that it is on account of 1) low budget provision, 2) inadequate staff and 3) non-availability of vehicles and equipments.** It is also found that government interventions were higher during the construction/installation phase of the factory as most of the safety structural requirements are considered in the formation phase.

3. Workers’ satisfaction about HSW is independent on the demographic variables such as: age, marital status, number of dependent family members, education, work experience, nature of job and income. Out of 183 relationships among demographic

variables and Workers' shop-specific satisfaction, 174 relationships (95%) were insignificant and remaining 9 (5%) were significant. Similar results have established in many previous researches in different industries that workers' satisfaction was:

- a. Dependent upon working condition and independent on demographic variables - In Sook Lee, 2012
- b. Independent on age, marital status and education – Meagan Scott et al., 2005
- c. Independent on age and income- M. Zeki Tesdimir et al., 2012
- d. Independent on years of employment and age- Dennis M., Jennings, 2011
- e. Dependent on job and environmental factors but independent on age, work experience and marital status - Dawal Siti Z., Taha Zahari, 2006
- f. Independent on marital status, work experience and educational qualification - Ofuani Felicia Ngozi, 2010

Some researchers found that the job satisfaction was:

- a. Dependent on nature of job - Austin Christina L., 2009 and Cristini Annalisa & Federica Origo, 2010
And following as stated by Meagan Scott et al., 2005 in their research
- b. *Dependent on age: Berns, 1989; Bowen et al., 1994; Griffin, 1984; Herzberg et al., 1957; Nestor & Leary, 2000.*
- c. *Dependent on marital status: Bowen et al., 1994; Fetsch & Kennington, 1997*
- d. *Dependent on education level: Andrews, 1990; Berns, 1989.*

This result provides some practical guidelines for sampling decision. In this research our decision to adopt purposive non random sampling was in consistent with the conclusion. **As satisfaction related to HSW is mostly related to physical and environmental condition, it is independent on demographic factors.** This finding makes us confident to state that the operators'/workers' satisfaction depends on the HSW situation established in the shops and not on the demographic variables.

4. We have undertaken this study at micro level with an assumption that workers' satisfaction changes from company to company as well as from shop to shop in the same company. This is because of diverse nature of work carried out in a shop creates different

level of environment, hardship and working conditions which influence their satisfaction. We have received the result in accordance with our assumption that, **“in the companies under study the workers’ satisfaction from shop to shop differs significantly.”**

5. “Employees’ satisfaction related to HSW is highly associated with the implementation of HR practices such as: communication, Compliance of recommendations, Regulatory framework at the workplace, Employees’ involvement and Supply of necessary assets relating to HSW.” This indicates employees’ satisfaction can be enhanced by the maneuvering these elements. Nor Azimah Chew Abdullah et al, 2009 confirmed significant positive correlation between nine dimensions of OHS management and outcome variables as satisfaction and feedback. This result is in parallel with Kumbhar P.B., 2000: higher implementation of HSW provisions improve satisfaction; De Souza Cristina and Silvia N, 2011: Job satisfaction is correlated with statutory HSW issues; D.K.Lal Das, 1983: working conditions and welfare facilities are major source of discontentment among workers and Dada Joseph O., 2006: Working environment is a good motivator.

6. The other important finding of this study is **“the correlation between employees’ satisfaction relating to HSW and Frequency Severity Incidence is significantly negative”**. This indicates higher level of employees’ satisfaction related to HSW tends to lower the accident /injuries at the workplace and vice versa. Many accident theories like Henrich’s Domino theory, Farrell’s Human Factor theory, Paterson’s accident/incident Model and Behaviour Based Theory and Kaila H. L.’s study found that human factor is responsible in most of the accidents; hence, satisfaction of employees has association with it.

7. It also concluded that **“higher level of implementation of HR practices results into lower accidents/injuries.”** This finding is very important for employers, managers and practitioners in the field of OHS to plan the activities. DGFASALI reported that cleanliness accounts for 33% of fatal injuries and 10.68% nonfatal injuries; OSHA, 2006 and HSE, 2006 also show slips and trips are third reason in major injuries at the workplace. Hence, OSHA and HSE have incorporated special chapter on this issue. Moeller Dade W., 1992 also indicates OHS management reduces all kind of work hazards. Agalgatti Bhooshan B., 2008: unsatisfactory mechanical environment leads to

illness or accidents. Also following findings in different industries are in the line of our results.

- a. Abdelnaser Omran et al., 2008 found in Malaysian construction companies that adoption of OHSAS-18001 has reduced accident cost in 81% of companies. This indicates reduction in number of accidents or its severity in the reference period.
- b. OSHA report 2012 states that Injury and illness prevention program (IIPP) has reduced workplace injuries by 6% to 60% in their states.
- c. Zakaria Noorul Huda et al., 2012 found that stress and fatigue, machineries and tools, design of workplace and training have moderate association with workplace accidents. All these factors are covered in the Sections of HSW in the F.A.
- d. Christian Van Stolk et al., 2012 found that voluntary OHSMS improved safety climate and declined rate of work related accidents.

However, the first finding is based on adoption of OHSAS-18001, the second IIPP by OSHA, third includes some provisions in the F.A. and fourth is based on voluntary OHSMS. Our findings are related to various Sections of HSW as mentioned in the F.A. Also these researches are carried out in Malaysia and USA and in different industries; our research is limited to Pimpri Chinchwad based five Automobile companies.

It is found that **in Premier Ltd. and Tata Motors there is very high degree of association between management's and operators' HSW satisfaction indices.** The differences in the opinions are insignificant. **In Mahindra, Force Motors and Bajaj Auto Limited there is no significant association between indices.** In other words the differences in the opinions are significant. Our results are in the line of previous findings of Wilkinson David and Aspinall Samantha, 2007 who found that employees' and employers have different perceptions of awareness. Stranks Jeremy, 2007 recommended to consider opinions of workers, supervisors and managers for making conclusions about HSW scenario as they have different level of awareness, perceptions and opinions. The difference in the opinions can be attributed to the class conflict. Indira Gartenberg and Supriya Bandekar, 2011 found that there are differences in the information provided by the management and workers in Metalcorp Company.

8. Determinants of accident/injury rate

1. **The accident/injury rate in terms of weighted FSI is significantly and negatively associated with number of safety personnel/1000 employees.** In other words higher the safety personnel lower will be accident/injury rates. Henrich's Domino theory states that inspection plays key role in reducing unsafe acts and thereby accidents/injuries. It is obvious that number of activities such as: creating awareness, training, compliance, auditing, communication, maintaining regulatory framework, inspections are dependent upon safety personnel; hence number of safety personnel has affect on accident/injury rates.
2. **The weighted FSI is significantly and negatively associated with derived awareness level of workers/operators.** In other words higher the awareness of workers, lower will be accident/injury rates. This result is consistent with Du Pont Corporation's (2009) opinion that, "Employees safety knowledge should be improved and sustained to eliminate injuries." PACE, 1999 stated that "education and training enable to eliminate and identify hazards."
3. **The weighted FSI is significantly and negatively associated with number of workers/operators.** In other words higher the workers/operators at the workplace lower will be accident/injury rates. According to Grimaldi and Simonds (1996), plant size in terms of number of employees affects on injury rates. Higher the plant size lower are the injury rates. Our results are consistent to this for FSI also.

9. "Higher level of implementation of provisions related to HSW would lead to form a basis for healthy job relationship." Kumbhar P.B. 2000 concluded that higher implementation of some statutory provisions in HSW of the F.A. improved industrial peace. Christian Van Stolk et al. 2012 also concluded that OHSMS has increased safety climate and OHS awareness, improved perception and participation of workers. These outcomes are indication of improved healthy job relationship between workers and management.

6.7 SUGGESTIONS

On the basis of findings of this study following suggestions are offered to the management of the automobile companies.

1. First it is suggested that **full time safety officer should be appointed by the Premier Limited and Bajaj Auto Limited.**
2. The company and shop specific means of satisfaction of workers for provisions mentioned in HSW of the F.A. are given in the Appendix-VI. It is suggested that **companies should initiate the mechanisms in order to eliminate or reduce the hazard or protect workers from its ill effects where their satisfaction is lower and hazards are high.** Three provisions in each Chapter Health, Safety and Welfare are mentioned in the section 6.5.2 to 6.5.6 should be considered for improvement initially.
3. The action priorities and alternatives selection shall be determined through active involvement of safety committee and trade union. Improving their awareness, training, communication and commitment from both sides would improve HSW scenario in the organization. **Involvement of union/workers in the OHS management may also reduce differences in the opinions.**
4. The workers' awareness level in Premier Ltd. is below the average. Appointment of Safety Officer and adoption of various mechanisms such as communication, contests, programs, instructions and training will improve awareness. It is also found that **temporary workers and apprentice** have lower level of awareness about HSW provisions. **A special training program or mass communication should be arranged for them.**
5. Workers' satisfaction related to HSW is independent on demographic variables and is a function of only higher level of implementation of provisions as mentioned in the F.A. Hence, organizations should benchmark the HSW related practices of another company having superior performance. The second point to suggest is while carrying out qualitative survey, it is not necessary to select respondents on the basis of any demographic variables. Non-random purposive sampling method also would produce reliable results as of random sampling. Tata Motors conducts this type of survey through third party and unanimously to receive factual responses.

6. In this research it is concluded that implementation of HR practices such as communication, compliance, regulatory framework at workplace, employee involvement and supply of necessary assets would form a basis for healthy job relationship between workers and Management. It would also improve workers' awareness and satisfaction related to health and safety and tends to lower injury/accident rates. This is a matter of great concern for not only workers but managers, safety professionals and government also. **On this basis model (Fig 6.2) for OHS management in an organization is suggested.**

SUGGESTIONS FOR GOVERNMENT

A) Government machinery is inefficient in monitoring implementation of HSW provisions in the factories. It is suggested that in their visits they should look into the specific provisions where the workers satisfaction is lower. As a ready reference they can use table as appended in the Appendix-VI for setting priorities. These results are relating to OEM's and may be applicable to the other major companies in the automobile industry but may not be to small/medium scale companies.

B) It is specifically mentioned that **safety committee's recommendations** for the compliance are not reportable activity to the government. As per Rule 73 J (5), the minutes /records of the meeting should be produced when demanded by the inspectors. As inspectors are overloaded by work, it is difficult to look into details of minutes. **Hence, it should be made reportable activity by incorporating appropriate change in Annual Returns or even Amendment in the Rule 73 J.** The government should arrange a training program for safety committee members and trade union members to raise their awareness and improve participation.

C) As workers satisfaction is different from shop to shop in a company, **a shop level committee comprising of 3-4 members should be established**, which will report the safety committee at organizational level quarterly or as the case may be. As per Rule 73 J (8): sub-committees should be established to assist and improve effectiveness of safety committee. Our findings substantiate the formation of shop-level committees. The

existing model and suggested model for effective functioning of these committees and government intervention are given in fig 6.3 and 6.4 respectively.

Fig 6.2 SUGGESTED MODEL OF OHS MANAGEMENT

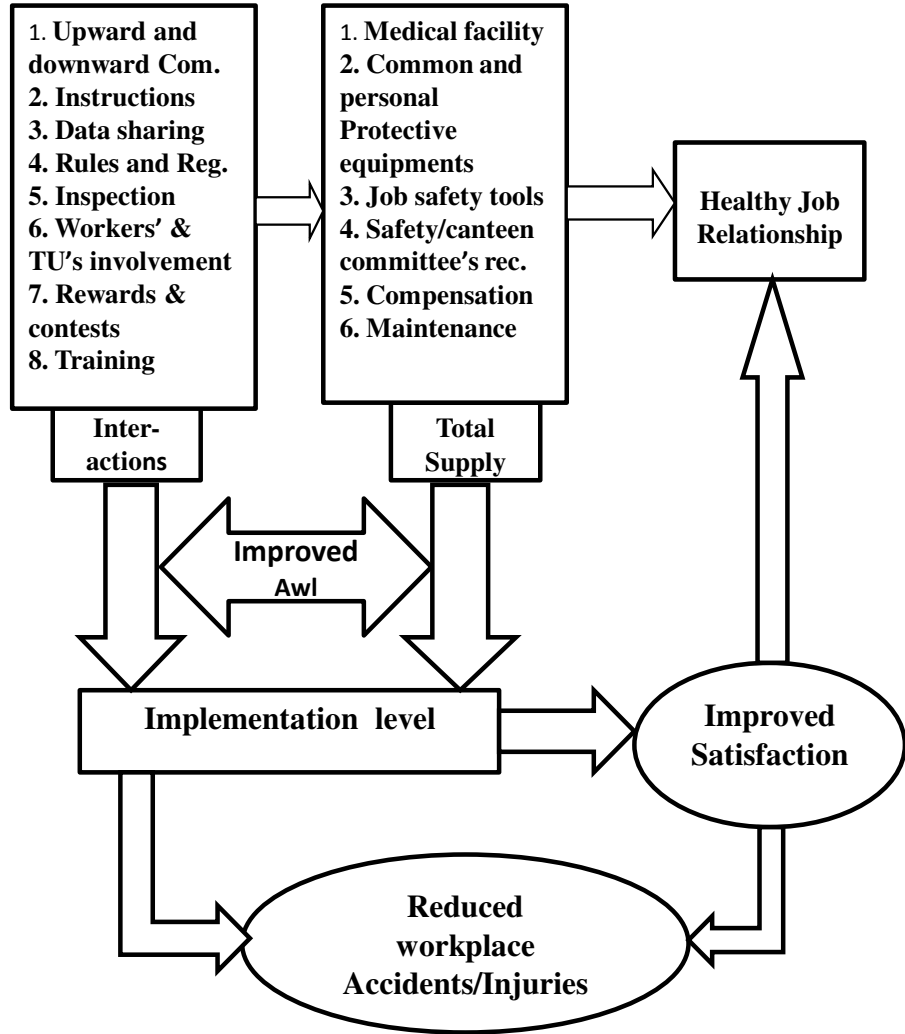


Fig 6.3: Existing Model of functioning of Safety Committee and Government intervention

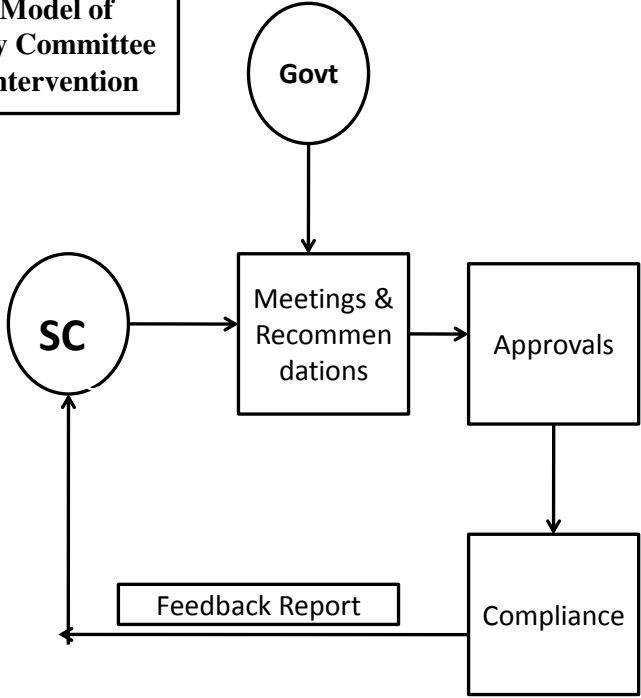
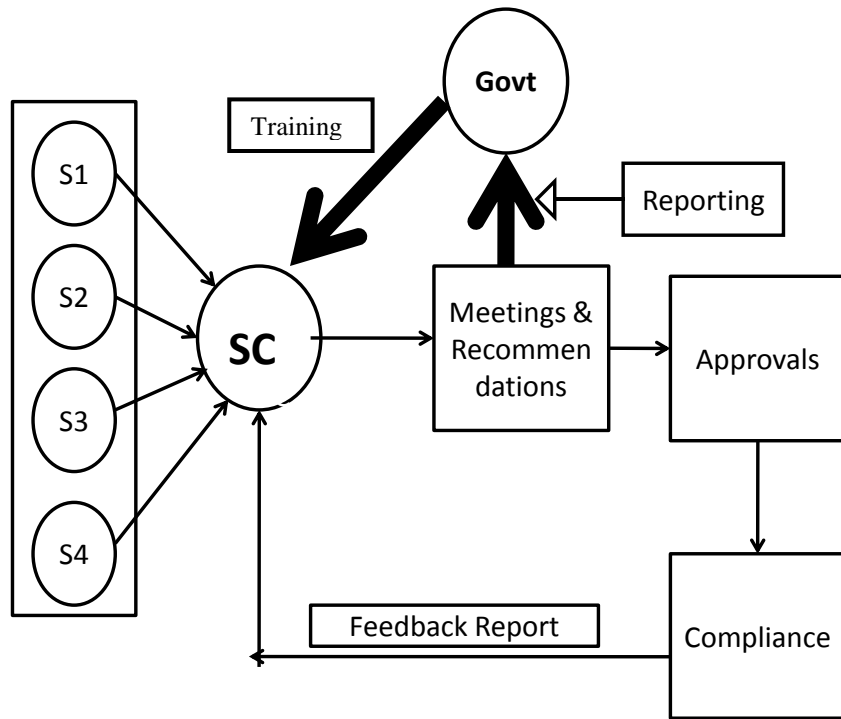


Fig 6.4: Suggested Model for Effective Functioning of Safety Committee and Government Intervention



SC= Safety Committee, S1,S2, S3,S4 = Shop Level Safety Committees, Govt = Government Intervention

FOCUS ON THE FURTHER STUDIES

On the basis of limitations and scope of this study, we would like to suggest some guidelines for researchers wishing to study in this field.

1. An expert group of 4-5 members can be formed who will carry out technical as well as management system survey in various companies and various shops in a company. The criteria of OHS depending upon intrinsic nature of the shop shall be decided and its weightage shall be assigned accordingly. The total shop specific evaluation carried out will represent implementation level of OHS, which may have high degree of negative association with accident/injury rates. However, it requires strong organizational support.
2. This study is time specific and hence the corrective action taken by the companies in the forthcoming years may affect the satisfaction level of employees which may be eventually resulted into reducing accident/injury level. In the developed countries researchers have taken challenge to prove how investment in OHS management is beneficial for overall organizational performance. A researcher may undertake its effect on a single parameter such as reduction in compensation, man-days lost or improvement in satisfaction or quality. Financial parameters have not considered in this research on account of its high relevance with management philosophy. However, it can be incorporated and studied by interested researcher.
3. This study has conducted in Indian original equipment manufacturers in automobile industry. It is also replicable for the suppliers and vendors or any other manufacturing company. Similarly, many foreign companies situated in the Pune district are General Motors, Ford Motors, Volks wagon and Mercedes Benz. A comparative study of OHS management between Indian and foreign companies can be carried out.
4. The present study highlights the provisions which are statutorily laid on for purpose of ensuring certain standards of Health, Safety and Welfare. Any deviation from the prescribed standards statutorily laid down results into hardship to the working classes and lowers the levels of satisfaction which further leads to injuries/accidents. However, it also would lead to reduction in production and productivity. This aspect should be observed, studied and analyzed for creating healthy and safe workplace which ultimately would lead to increased competitive advantage of the plant.

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APPENDIX - I

the data are quantitative, collected on interval or ratio scale, or whether the data are qualitative, collected on nominal or ordinal scale. The technique to be used for a given situation depends upon the answers to all these very questions. Jadish N. Sheth in his article on "The multivariate revolution in marketing research"³ has given the flow chart that clearly exhibits the nature of some important multivariate techniques as shown in Fig. 13.1.

Thus, we have two types of multivariate techniques: one type for data containing both dependent and independent variables, and the other type for data containing several variables without dependency relationship. In the former category are included techniques like multiple regression analysis, multiple discriminant analysis, multivariate analysis of variance and canonical analysis, whereas in the latter category we put techniques like factor analysis, cluster analysis, multidimensional scaling or MDS (both metric and non-metric) and the latent structure analysis.

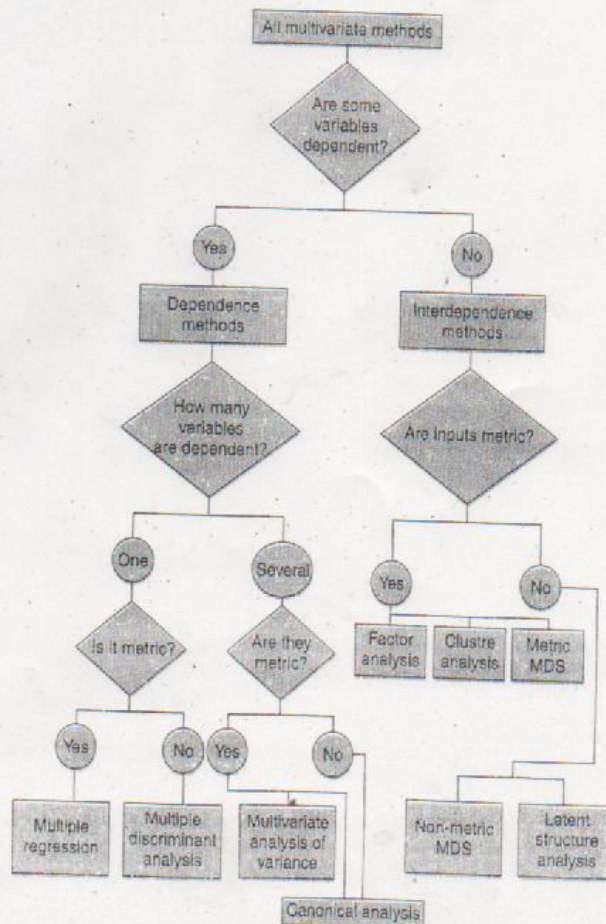


Fig. 13.1

³Journal of Marketing, American Marketing Association, Vol. 35, No. 1 (Jan. 1971), pp. 13-19.

APPENDIX-II: LIST OF FORMULAE USED

(with usual denotations)

1. **AM or Xbar** = $\frac{\sum X}{N}$

2. **STDEV** = $\sqrt{\frac{\sum(X-Xbar)^2}{N-1}}$

3. **t - cal** = $\frac{X1bar-X2bar}{S} \sqrt{\frac{n1.n2}{n1+n2}}$ S= Combined Standard Deviation

4. **t - cal** = $\frac{Xbar-\mu ho}{\sigma/\sqrt{n}}$.

5. **Confidence Interval** = $Xbar \pm \frac{\sigma}{\sqrt{n}} \cdot t\alpha$

6. **t** = $\frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$ for df = n-2

7. $\chi^2 = \sum \frac{(O-E)^2}{E}$

8. **r** = $\frac{\sum x.y}{\sqrt{\sum x^2.y^2}}$ where $x = (X - Xbar)$ and $y = (Y - Ybar)$

9. ANOVA :

a. **Fcal (for col)** = $\frac{Ms\ bet\ col}{Ms\ residual}$

Fcal (for row) = $\frac{Ms\ bet\ row}{Ms\ residual}$

b. **Ms bet col** = $\frac{SS\ btn\ col}{(c-1)}$

Ms bet row = $\frac{SS\ btn\ row}{(r-1)}$

c. **SS btn col** = $\sum \frac{(Tj)^2}{nj} - \frac{(T)^2}{n}$

SS btn row = $\sum \frac{(Ti)^2}{ni} - \frac{(T)^2}{n}$

(**Denotations:** $c =$ No. of columns, $r =$ No. of rows, $i =$ row and $j =$ column, $n =$ No. of observations, $T =$ total, $Ms =$ Mean Square, $SS =$ Sum of Squares)

10. Skewness =

$$\frac{n}{(n-1)(n-2)} \sum \left(\frac{x_j - \bar{x}}{s} \right)^3$$

11. Kurtosis =

$$\left\{ \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum \left(\frac{x_j - \bar{x}}{s} \right)^4 \right\} - \frac{3(n-1)^2}{(n-2)(n-3)}$$

12. Cronbach Alpha = $\frac{k}{(k-1)} x \left(1 - \frac{\sum Si^2}{\sum t^2} \right)$

13. P. Er. = $0.6745x(1 - r^2)/\sqrt{N}$

14. S. Er. in the estimate of Y = $\sigma_y \cdot \sqrt{(1 - r^2)}$

APPENDIX-III

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Table 10
Significance of product-moment correlation coefficient r

<i>df (n = N-2)</i>	0.05	0.01	<i>df (n = N-2)</i>	0.05	0.01
1	0.997	1.000	24	0.381	0.496
2	0.950	0.990	25	0.381	0.487
3	0.878	0.959	26	0.374	0.478
4	0.811	0.917	27	0.367	0.470
5	0.754	0.874	28	0.361	0.463
6	0.707	0.834	29	0.355	0.456
7	0.666	0.798	30	0.349	0.449
8	0.632	0.765	35	0.325	0.418
9	0.602	0.735	40	0.304	0.393
10	0.576	0.708	45	0.288	0.372
11	0.553	0.684	50	0.273	0.354
12	0.532	0.661	60	0.250	0.325
13	0.514	0.641	70	0.232	0.302
14	0.497	0.623	80	0.217	0.283
15	0.482	0.606	90	0.205	0.267
16	0.468	0.590	100	0.195	0.254
17	0.456	0.575	125	0.174	0.228
18	0.444	0.561	150	0.159	0.208
19	0.433	0.549	200	0.138	0.181
20	0.423	0.537	300	0.113	0.148
21	0.413	0.526	400	0.098	0.128
22	0.404	0.515	500	0.088	0.115
23	0.396	0.505	1000	0.062	0.081

What is true of +ve r is true of -ve r . Significance of r for intermediate values of n can be found out by interpolation. The tabulated values are for a two-tailed test. For a one-tailed test, the probability levels are to be halved, i.e., $P(0.05)$ is to be read as $P(0.025)$.

APPENDIX-IV

Table 1 : Extract of Annual Reports (Figures in Crore) 2004-2010									
Co.	Year	Net sales	PAT	Salary	Welfare	Rb	Rm	Navb	Navm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A	2004-05	40.71	10.99	10.80	0.84	0.14	0.24	3.46	4.06
	2005-06	140.81	21.44	11.32	0.92	0.00	0.33	9.22	6.49
	2006-07	78.44	48.24	14.49	1.09	0.01	0.49	16.43	18.86
	2007-08	107.03	23.41	20.99	1.85	0.02	0.96	39.74	24.01
	2008-09	129.37	13.61	21.12	1.84	0.04	0.38	57.93	34.19
	2009-10	149.94	16.63	22.42	1.82	0.03	0.40	63.25	104.86
B	2004-05	17585.22	1236.95	763.53	123.13	24.21	36.98	827.59	2719.29
	2005-06	20891.31	1528.88	829.05	122.23	27.67	45.61	901.31	2989.82
	2006-07	27535.24	1913.46	1038.68	152.64	23.49	49.16	582.69	2889.3
	2007-08	28739.41	2028.92	1208.22	165.15	25.87	53.52	749.57	3965.32
	2008-09	26586.76	1001.26	1227.77	191.82	31.15	56.06	897.34	5668.91
	2009-10	35593.05	2240.08	1444.54	207.03	56.13	76.7	1188.98	6558.26
C	2010-11	12649	836.78	822.36	93.58	17.88	75.36	484.75	1610.91
	2011-12	18038	2087.75	988.1	112.17	22.56	96.92	502.11	1643.3
D	2004-05	856.33	2.72	83.52	4.71	1.98	6.36	35.3	56.53
	2005-06	933.93	30.13	97.04	4.97	2.05	6.07	36.17	56.65
	2006-07	976.26	37.49	111.75	6.06	1.71	5.27	36.24	98.47
	2007-08	905.58	83.65	124.66	6.17	1.71	4.27	44.24	109.08
	2008-09	750.51	124.56	101.65	4.79	1.29	4.41	42.57	110.24
	2009-10	956.03	60.42	110.65	5.6	1.55	4.43	55.13	98.68
E	2004-05	5724	766.81	202.25	23.49	11.33	45.1	155.33	515.96
	2005-06	7469.4	1101.63	220.81	24.19	24.87	49.88	171.83	512.77
	2006-07	9292.2	1237.96	242.71	32.64	25.06	64.41	276.09	506.19
	2007-08	8663.29	755.78	272.69	29.49	21.01	48.9	375.3	453
	2008-09	8436.94	656.48	273.21	31.84	17.17	51.55	395.18	425.92
	2009-10	11508.5	1703.63	307.28	46.21	19.74	53.79	394.42	367.95
Denotations: PAT = Profit after tax, Rb=Repairs to building, Rm= Repairs to machinery, Navb= Net asset value of Building and Navm= Net asset value of machinery									

Co.	Sale	Net Sale	PAT	Salary	Welfare	Rb	Rm	Navb	Navm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A	Min	40.71	10.99	10.80	0.84	0.00	0.24	3.46	4.06
	Max	149.94	16.63	22.42	1.82	0.14	0.46	63.25	104.86
B	Min	17585.2	1236.95	763.53	123.13	24.21	36.98	827.59	2719.29
	Max	35593.1	2240.08	1444.54	207.03	56.13	76.7	1188.98	6558.26
C	Min	12649	836.78	822.36	93.58	17.88	75.36	484.75	1610.91
	Max	18038	2087.75	988.1	112.17	22.56	96.92	502.11	1643.3
D	Min	750.51	30.13	83.52	4.71	1.29	4.27	35.30	56.53
	Max	976.26	124.56	124.66	6.17	2.05	6.36	55.13	110.24
E	Min	5724	766.81	202.25	23.49	11.33	45.1	155.33	367.95
	Max	11508.5	1703.63	307.28	46.21	19.74	64.41	395.18	515.96

Category	Passenger Vehicles	Commercial Vehicles	Three Wheelers	Two Wheelers	Grand Total
(1)	(2)	(3)	(4)	(5)	(6)
2002-03	6.09	3.18	2.77	50.76	62.8
2003-04	8.43	4.21	3.56	72.44	88.64
2004-05	12.10	3.54	3.74	65.30	84.68
2005-06	13.09	3.91	4.34	76.09	97.44
2006-07	15.45	5.20	5.56	84.67	110.88
2007-08	17.78	5.49	5.01	80.27	108.54
2008-09	18.39	4.17	4.97	84.20	111.72
2009-10	23.57	5.68	6.19	105.13	140.57
2010-11	29.87	7.53	8.00	133.76	179.16
2011-12	31.2	9.11	8.78	154.54	203.67

Source: SIAM, Source: siamindia.com/scripts/industrystatistics Date: 12/02/2013

APPENDIX V

Table1: Dependence of Age on Shop Level HSWSI

S Code	r	t cal	p-value	Remark
A1	0.33	1.8280	0.0782	Insig
A2	0.37	3.0399	0.0035	Sig
A3	0.19	1.0152	0.3187	Insig
A4	0.12	0.6138	0.5443	Insig
B1	0.01	0.0962	0.9237	Insig
B2	-0.15	-1.3065	0.1952	Insig
B3	0.22	2.2159	0.0291	Sig
B4	0.25	2.2693	0.0261	Sig
B5	0.18	1.3704	0.1763	Insig
B6	-0.05	-0.6281	0.5307	Insig
B7	-0.05	-0.3958	0.6938	Insig
B8	0.02	0.1521	0.8795	Insig
B9	-0.03	-0.1762	0.8614	Insig
B10	-0.34	-2.9105	0.0049	Sig
C1	0.42	2.6954	0.0110	Sig
C2	-0.15	-1.0366	0.3055	Insig
C3	-0.06	-0.3352	0.7398	Insig
C4	0.13	0.6829	0.5001	Insig
C5	-0.14	-0.6399	0.5291	Insig
D1	-0.45	-1.4371	0.1886	Insig
D2	0.63	2.2765	0.0524	Insig
D3	0.02	0.0666	0.9480	Insig
D4	-0.21	-1.1298	0.2682	Insig
D5	-0.01	-0.0301	0.9767	Insig
D6	-0.31	-2.3667	0.0218	Sig
E1	0.47	1.9755	0.0683	Insig
E2	0.57	3.4276	0.0021	Sig
E3	0.35	2.5696	0.0135	Sig

Table 2: Dependence of Number of Dependent Family Members and Shop Level HSWSI

S Code	r	t cal	p-value	Remark
A1	0.27	1.4726	0.1520	Insig
A2	0.19	1.4898	0.1417	Insig
A3	0.20	1.0979	0.2816	Insig
A4	0.16	0.8643	0.3948	Insig
B1	-0.11	-0.8103	0.4214	Insig
B2	-0.24	-2.1746	0.0327	Sig
B3	0.25	2.5398	0.0127	Sig
B4	0.23	2.0997	0.0391	Sig
B5	0.14	1.0425	0.3019	Insig
B6	-0.09	-1.2505	0.2128	Insig
B7	-0.34	-2.5664	0.0132	Sig
B8	0.01	0.0496	0.9606	Insig
B9	0.05	0.2433	0.8096	Insig
B10	-0.15	-1.2297	0.2232	Insig
C1	-0.36	-2.2271	0.0329	Sig
C2	-0.17	-1.1870	0.2414	Insig
C3	-0.04	-0.2442	0.8087	Insig
C4	-0.31	-1.7369	0.0930	Insig
C5	0.14	0.6326	0.5338	Insig
D1	-0.58	-2.0343	0.0763	Insig
D2	0.58	2.0288	0.0770	Insig
D3	-0.02	-0.0721	0.9437	Insig
D4	-0.12	-0.6256	0.5366	Insig
D5	-0.18	-0.5488	0.5965	Insig
D6	-0.40	-3.1150	0.0030	Sig
E1	-0.21	-0.8167	0.4278	Insig
E2	0.21	1.0822	0.2895	Insig
E3	-0.05	-0.3335	0.7402	Insig

Table 3: Dependence of Education Level on Shop Level
HSWSI

S Code	r	t cal	p-value	Remark
A1	-0.13	-0.6685	0.5093	Insig
A2	0.14	1.0494	0.2983	Insig
A3	-0.20	-1.0657	0.2957	Insig
A4	-0.01	-0.0724	0.9428	Insig
B1	-0.22	-1.6203	0.1110	Insig
B2	0.17	1.4880	0.1407	Insig
B3	-0.01	-0.0938	0.9255	Insig
B4	-0.20	-1.7781	0.0794	Insig
B5	-0.21	-1.5470	0.1278	Insig
B6	0.06	0.7882	0.4316	Insig
B7	0.09	0.6653	0.5088	Insig
B8	0.06	0.5784	0.5645	Insig
B9	-0.06	-0.3243	0.7482	Insig
B10	0.08	0.6239	0.5348	Insig
C1	-0.01	-0.0851	0.9327	Insig
C2	-0.03	-0.1842	0.8547	Insig
C3	-0.16	-0.9196	0.3649	Insig
C4	0.00	0.0000	1.0000	Insig
C5	-0.17	-0.7806	0.4438	Insig
D1	0.18	0.5292	0.6111	Insig
D2	-0.34	-1.0385	0.3294	Insig
D3	0.45	1.7678	0.1025	Insig
D4	0.14	0.7490	0.4601	Insig
D5	0.00	0.0000	1.0000	Insig
D6	-0.07	-0.4847	0.6300	Insig
E1	-0.54	-2.3926	0.0313	Sig
E2	0.05	0.2750	0.7856	Insig
E3	0.00	0.0027	0.9978	Insig

Table 4: Dependence of Years of Service on Shop Level
HSWSI

S Code	r	t cal	p-value	Remark
A1	0.32	1.7638	0.0887	Insig
A2	0.35	2.8832	0.0055	Sig
A3	0.17	0.8867	0.3828	Insig
A4	0.10	0.5492	0.5872	Insig
B1	-0.05	-0.3537	0.7250	Insig
B2	-0.11	-0.9731	0.3335	Insig
B3	0.21	2.1219	0.0364	Sig
B4	0.30	2.7412	0.0076	Sig
B5	0.21	1.5450	0.1283	Insig
B6	-0.07	-0.8913	0.3740	Insig
B7	-0.10	-0.7093	0.4813	Insig
B8	0.01	0.0737	0.9414	Insig
B9	-0.06	-0.3292	0.7445	Insig
B10	-0.33	-2.8165	0.0064	Sig
C1	0.11	0.6551	0.5170	Insig
C2	-0.11	-0.7567	0.4532	Insig
C3	-0.14	-0.7902	0.4354	Insig
C4	-0.01	-0.0287	0.9773	Insig
C5	0.32	1.5531	0.1353	Insig
D1	-0.47	-1.4916	0.1741	Insig
D2	0.62	2.2201	0.0572	Insig
D3	0.03	0.1086	0.9153	Insig
D4	-0.20	-1.0546	0.3006	Insig
D5	0.00	-0.0074	0.9942	Insig
D6	-0.33	-2.5142	0.0151	Sig
E1	0.49	2.1087	0.0535	Insig
E2	0.56	3.4181	0.0022	Sig
E3	0.39	2.8514	0.0065	Sig

Table 5: Dependence of Income level on Shop Level**HSWSI**

S Code	r	t cal	p-value	Remark
A1	0.27	1.4915	0.1470	Insig
A2	0.26	2.0428	0.0456	Sig
A3	0.12	0.6505	0.5207	Insig
A4	0.17	0.9227	0.3640	Insig
B1	-0.04	-0.2749	0.7844	Insig
B2	-0.14	-1.2943	0.1993	Insig
B3	0.24	2.4069	0.0180	Sig
B4	0.28	2.5687	0.0122	Sig
B5	0.02	0.1820	0.8563	Insig
B6	0.03	0.3952	0.6932	Insig
B7	-0.15	-1.1299	0.2637	Insig
B8	-0.13	-1.2493	0.2148	Insig
B9	-0.10	-0.5432	0.5914	Insig
B10	-0.20	-1.6618	0.1013	Insig
C1	0.11	0.6417	0.5255	Insig
C2	0.00	0.0000	1.0000	Insig
C3	-0.20	-1.1179	0.2722	Insig
C4	0.00	0.0000	1.0000	Insig
C5	0.00	0.0000	1.0000	Insig
D1	0.00	0.0000	1.0000	Insig
D2	0.14	0.3976	0.7014	Insig
D3	0.41	1.5530	0.1464	Insig
D4	0.15	0.8076	0.4261	Insig
D5	0.33	1.0388	0.3260	Insig
D6	0.02	0.1350	0.8932	Insig
E1	0.40	1.6131	0.1290	Insig
E2	0.36	1.9507	0.0624	Insig
E3	0.24	1.6681	0.1021	Insig

Table 6a: Dependence of Job nature on HSWSI				Table 6b: Dependence of Marital Status on HSWSI		
Shop Code	tcal	p-values	Remark	tcal	p-values	Remark
A1	1.293	0.2067	Insig	0.848	0.4036	Insig
A2	2.035	0.0465	Sig	2.214	0.0308	Sig
A3	0.491	0.6269	Insig	1.891	0.0690	Insig
A4	1.732	0.0944	Insig	1.231	0.2287	Insig
B1	0.152	0.8800	Insig	0.253	0.8012	Insig
B2	1.742	0.0853	Insig	1.746	0.0847	Insig
B3	1.935	0.0559	Insig	1.448	0.1510	Insig
B4	1.230	0.2226	Insig	0.236	0.8142	Insig
B5	0.789	0.4336	Insig	0.246	0.8064	Insig
B6	0.943	0.3469	Insig	0.726	0.4685	Insig
B7	1.479	0.1453	Insig	1.890	0.0644	Insig
B8	0.899	0.3713	Insig	0.615	0.5401	Insig
B9	0.075	0.9408	Insig	0.419	0.6783	Insig
B10	2.251	0.0277	Sig	1.834	0.0712	Insig
D1	3.607	0.0069	Sig	1.531	0.1642	Insig
D2	1.438	0.1882	Insig	1.373	0.2069	Insig
D3	0.146	0.8861	Insig	0.146	0.8861	Insig
D4	1.329	0.1946	Insig	1.329	0.1946	Insig
D5	0.133	0.8974	Insig	0.362	0.7256	Insig
D6	2.360	0.0221	Sig	2.381	0.0211	Sig
E1				0.676	0.5100	Insig
E2				2.938	0.0070	Sig
E3				2.808	0.0073	Sig

WORKER'S SATISFACTION ABOUT HEALTH, SAFETY AND WELFARE PROVISIONS AS MENTIONED IN THE FACTORIES ACT, 1948.

S/N	Descriptions	Colour Code
1	More satisfied and Completely satisfied	
2	Satisfied	
3	Less Satisfied	
4	Highly dissatisfied	

APPENDIX – VI: WORKER’S SATISFACTION ABOUT HEALTH

Shop Code	Cl	Ed	Ven	Dst	Hum	Ocr	Lit	Dw	Toil	Spit	Ns
	11	12	13	14	15	16	17	18	19	20	E
A1	3.00	2.77	2.17	2.40	2.97	2.60	3.80	3.87	3.45	3.13	2.13
A2	2.50	2.97	2.33	1.93	2.95	2.20	4.23	3.90	3.31	2.93	
A3	3.50	2.30	2.32	2.23	3.83	3.83	3.73	4.07	3.00	3.60	2.57
A4	3.23	3.03	2.75	2.77	3.50	3.90	4.37	4.00	2.87	2.83	2.13
B1	3.84	4.25	4.25	3.93	3.63	3.42	4.41	4.00	3.46	3.77	3.54
B2	3.78	4.30	4.02	4.14	4.04	4.01	4.36	4.26	3.85	3.81	3.43
B3	3.57	3.82	3.79	3.92	3.81	3.69	3.91	3.80	3.21	3.65	3.23
B4	3.86	4.21	3.88	3.58	3.77	3.91	4.22	3.95	3.37	3.36	2.65
B5	3.67	3.80	3.50	3.00	3.58	3.93	3.96	3.85	3.64	3.58	2.89
B6	3.72	3.90	3.49	3.65	3.64	3.70	4.15	3.86	3.12	3.38	2.48
B7	3.44	3.41	3.69	2.78	3.78	3.91	4.50	4.37	3.45	3.35	2.20
B8	3.43	2.88	2.37	2.17	3.15	3.97	4.54	4.51	3.99	3.38	2.23
B9	3.79	4.07	3.86	3.52	3.62	3.86	4.45	3.86	3.91	3.62	3.28
B10	3.13	3.25	2.28	2.01	3.24	3.62	4.54	4.29	4.32	3.54	2.74
C1	2.69	3.30	3.60	2.69	3.53	3.71	4.11	3.00	1.83	2.55	3.37
C2	2.94	3.74	3.67	2.83	2.83	4.15	4.02	2.02		2.21	2.96
C3	2.79	3.39	3.91	3.15	3.58	3.73	4.27	3.79	1.98	2.81	3.39
C4	2.84	2.45	2.53	2.17	3.29	3.35	3.94	4.13	2.21	2.90	3.10
C5	3.26	3.96	3.35	3.70	4.00	4.35	4.57	3.78	2.30	3.00	3.52
D1	3.40	3.40	2.25	3.40	3.90	4.00	4.40	4.20	2.70	3.10	2.10
D2	2.60	2.30		2.00	3.00	3.40	4.10	4.10	3.05	2.70	2.40
D3	3.14	3.43	2.25	3.21	3.50	3.00	3.43	3.21	2.18	2.86	2.00
D4	2.77	2.90	2.37	2.20	3.27	3.53	4.03	3.87	2.67	2.97	2.07
D5	3.18	3.18	2.68	3.18	3.45	3.55	4.18	3.45	3.00	3.09	3.18
D6	2.47	2.75	1.99	2.00	3.08	3.49	3.92	3.77	2.69	2.85	2.30
E1	2.88	2.56	2.13	2.63	2.50	3.00	3.25	3.31	3.16	3.00	2.63
E2	2.52	2.50	3.00	3.35	3.11	2.52	3.00	2.67	2.00	1.93	1.85
E3	2.83	2.44	1.82	2.00	2.42	2.68	3.04	3.04	2.29	2.24	1.85

WORKER'S SATISFACTION ABOUT SAFETY

Shop Code	Fen	Trg	Siw	Lay	Csg	Lft	Int	Inf	Pit	Wt	eye	d/s
	21	22	24	25	26	29	30	32	33	34	35	36
A1	2.90	2.82	2.47	2.48	2.47	3.73	2.90	3.00	3.30	3.90	2.86	2.21
A2	2.07	2.44	2.20	2.50	2.15	2.50	3.27	3.32	2.60	2.77	2.43	2.42
A3	3.30	2.42	3.75	3.25	2.83	3.97	3.93	3.15	3.30	3.10	2.17	2.40
A4	2.67	2.87	3.57	2.80	3.87	3.90	3.80	3.23	3.73	3.00	2.83	3.40
B1	3.82	3.50	3.75	3.99	3.88	3.52	4.09	4.07	4.04	4.27	3.50	4.28
B2	3.98	3.65	4.04	4.24	4.33	4.04	4.15	4.08	3.99	4.22	3.91	4.01
B3	3.70	3.72	3.65	3.64	3.85	3.57	3.47	3.65	3.78	4.04	3.56	3.43
B4	3.76	3.44	3.61	3.86	3.63	3.56	3.69	4.04	4.18	4.03	3.57	3.65
B5	3.78	3.65	3.65	3.45	3.82	3.82	3.71	3.78	3.71	4.07	4.05	3.80
B6	3.68	3.92	3.44	3.65	3.90	3.74	3.60	3.65	3.89	4.26	3.48	3.32
B7	3.41	3.78	3.51	3.45	3.80	3.85	3.76	3.87	3.65	4.35	3.53	3.82
B8	3.39	3.98	3.39	3.68	3.96	3.88	3.74	3.92	3.88	4.30	3.17	3.27
B9	3.83	3.90	3.90	3.47	3.83	3.66	3.86	3.98	3.86	4.00	3.83	4.08
B10	4.01	4.06	3.69	3.90	3.85	3.78	3.97	4.20	4.33	4.19	3.69	3.99
C1	3.46	3.50	3.66	3.79	3.71	3.80	3.51	3.73	3.41	3.74	3.44	3.53
C2	3.96	3.37	3.24	3.20	3.77	3.02	2.91	3.43	2.98	3.85	3.39	3.74
C3	3.61	3.48	3.77	3.95	4.12	4.09	3.09	3.65	3.61	2.94	3.64	3.65
C4	2.97	3.95	4.02	4.05	3.68	3.30	3.74	4.10	4.23	3.68	3.43	4.04
C5	3.52	3.93	3.91	3.72	3.96	3.78	3.78	4.07	3.57	3.30	3.55	3.95
D1	3.40	3.40	1.95	2.45	2.10	2.56	3.00	3.80	3.90	3.90	3.25	3.50
D2	2.50	2.75	2.05	2.55	2.90	0.00	2.60	3.35	3.50	3.20		2.00
D3	3.21	3.29	2.21	2.82	2.86	3.14	3.07	3.86	3.71	4.14	3.46	3.54
D4	2.63	2.95	2.28	2.95	3.50	2.83	3.00	3.35	3.80	4.00	2.27	2.53
D5	2.55	3.45	2.86	3.05	3.09	3.50	3.36	3.64	3.45	3.91	2.18	2.82
D6	2.72	3.09	2.51	3.16	3.23	3.04	2.66	3.09	3.53	4.04	1.87	2.06
E1	2.88	2.19	2.78	2.44	2.69	2.60	2.50	2.91	2.80	2.80	2.42	2.43
E2	2.16	1.92	2.54	2.33	2.46	2.41	2.70	2.72	2.36	2.35	2.00	1.87
E3	2.51	2.10	2.43	2.64	2.68	2.55	2.97	2.86	2.51	2.29	1.89	2.32

	SAFETY			WELFARE					
Shop Code	Fir	bldg	ppe	w/f	l/f	s/f	f/a	ctn	r/r
	38	40A	41	42	43	44	45	46	47
A1	2.84	3.67	3.05	3.43	3.33	2.00	2.80		3.27
A2	2.44	3.78	2.85	3.00	2.92	1.82	2.20	3.22	2.47
A3	2.48	3.93	2.79	3.00	2.70	1.83	2.03	3.27	2.33
A4		4.10	2.92	3.03	2.80	1.90	2.37	3.02	2.97
B1	3.59	3.77	3.86	3.45	3.35	3.22	4.05	4.26	3.63
B2	4.20	4.05	4.17	3.86	3.77	3.23	4.35	4.46	3.91
B3	3.68	3.78	3.74	3.68	3.44	2.81	3.88	3.94	3.58
B4	3.51	3.82	3.92	3.69	3.20	3.23	3.94	3.81	3.53
B5	3.69	3.93	3.87	3.69	3.68	2.71	3.42	3.85	3.46
B6	3.81	3.47	3.78	3.49	3.65	2.94	4.09	4.10	3.60
B7	3.60	3.46	3.81	3.41	3.66	2.93	3.54	4.06	3.70
B8	3.66	3.86	3.91	3.43	3.83	2.67	3.71	4.53	3.40
B9	3.86	3.79	4.04	3.21	3.72	3.21	4.21	4.31	3.59
B10	4.09	3.88	4.07	4.00	3.55	2.93	4.57	4.51	3.76
C1	3.57	3.57	3.29	2.97	2.86	2.86	3.17	2.33	3.09
C2	3.55	3.68	3.32	2.53	2.40	2.81	3.13	2.01	2.89
C3	3.85	3.45	3.88	3.31	3.28	3.06	3.58	2.27	3.09
C4	3.87	3.77	3.55	3.45	2.94	2.39	3.39	2.32	3.26
C5	3.91	3.74	3.97	3.39	3.55	3.39	3.91	2.54	3.04
D1	3.30	2.90	2.94	2.80	3.40	2.10	3.80	2.30	2.90
D2	3.40	2.70	2.74	2.60	2.70		3.30	1.95	2.90
D3	3.29	2.14	2.81	2.79	2.93	2.29	3.71	2.11	2.93
D4	3.00	2.27	2.75	2.27	3.07	2.20	2.90	2.47	3.20
D5	3.09	2.45	3.17	2.27	3.00	2.45	3.64	2.27	3.27
D6	3.00	2.19	2.84	2.85	2.94	2.26	3.15	2.34	2.89
E1	2.29	2.64	2.39	3.00	2.55	3.00	2.69	2.56	3.00
E2	2.00	2.36	2.33	1.92				2.26	2.33
E3	2.40	2.64	2.39	2.60		2.29	2.29	2.56	2.88

APPENDIX VII a:
WEIGHTAGE SCHEME AND CALCULATION OF HSW
INDEX

**(Based on Questionnaire-II, Respondents: Operators
/Supervisors/Line Managers)**

Denotations	Provisions	Cp	ML	Rating		Weightage of		C. W.	Remarks
				Cp	ML	Cp	ML		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A) HEALTH									
									<i>Section C</i>
H11	Cleanliness	<i>Very low</i>	<i>Very high</i>	1	5	0.037	0.116	0.077	
H12	Disposal of waste and effluence	<i>High</i>	<i>Very high</i>	4	5	0.148	0.116	0.132	
H13	Ventilation and temperature	<i>Medium</i>	<i>Very high</i>	3	5	0.111	0.116	0.114	
H14	Dust and fumes	<i>Low</i>	<i>Medium</i>	2	3	0.074	0.070	0.072	
H15	Artificial humidification	<i>Medium</i>	<i>Medium</i>	3	3	0.111	0.070	0.090	
H16	Overcrowding			0	0	0.000	0.000	0.000	
H17	Lighting	<i>Medium</i>	<i>High</i>	3	4	0.111	0.093	0.102	
H18	Drinking water	<i>Medium</i>	<i>High</i>	3	4	0.111	0.093	0.102	
H19	Latrines and urinals	<i>Very high</i>	<i>Very high</i>	5	5	0.185	0.116	0.151	<i>Average of Q. 19a and 19b</i>
H20	Spittoons	<i>Very low</i>	<i>Very high</i>	1	5	0.037	0.116	0.077	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
H20 E	Noise	<i>Low</i>	<i>High</i>	2	4	0.074	0.093	0.084	
		Total Health		27	43	1.000	1.000	1	

B) SAFETY									<i>Section D</i>
S21	Fencing of machinery – (separation)	<i>Very high</i>	<i>No</i>	5	0	0.132	0.000	0.066	
S22	Work on or near machinery in motion	<i>Very high</i>	<i>Very low</i>	5	1	0.132	0.026	0.079	<i>Average of Q. 22a and 22b</i>
S24	Striking gear and devices for cutting off power	<i>Very high</i>	<i>Medium</i>	5	3	0.132	0.077	0.104	<i>Average of Q. 24a and 24b</i>
S25	Self acting machinery	<i>No</i>	<i>No</i>	0	0	0.000	0.000	0.000	<i>Average of Q. 25a and 25b</i>
S26	Casing of a new machinery	<i>Low</i>	<i>Very low</i>	2	1	0.053	0.026	0.039	
S29	Lifting machines, chains, ropes and lifting tackles	<i>Very low</i>	<i>High</i>	1	4	0.026	0.103	0.064	
S30	Revolving machinery	<i>Medium</i>	<i>Very high</i>	3	5	0.079	0.128	0.104	
S32	Floors, stairs and means of access	<i>Very Low</i>	<i>Very high</i>	1	5	0.026	0.128	0.077	<i>Average of Q. 32a and 32b</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
S33	Pits, sumps, openings in floors	<i>Low</i>	<i>Low</i>	2	2	0.053	0.051	0.052	
S34	Excessive weight	<i>Medium</i>	<i>Low</i>	3	2	0.079	0.051	0.065	
S35	Protection of eyes	<i>Low</i>	<i>Medium</i>	2	3	0.053	0.077	0.065	
S36	Precautions against	<i>Low</i>	<i>High</i>	2	4	0.053	0.103	0.078	

	dangerous fumes and explosive or inflammable dust								
S38	Precautions in case of fire	<i>Low</i>	<i>High</i>	2	4	0.053	0.103	0.078	
S40	Maintenance of building	<i>Medium</i>	<i>Low</i>	3	2	0.079	0.051	0.065	
S41	PPEs	<i>Low</i>	<i>Medium</i>	2	3	0.053	0.077	0.065	<i>Average of Q. 41a and 41b</i>
Total Safety				38	39	1.000	1.000	1.000	<i>Section E</i>
C) WELFARE									
W42	Washing facilities	<i>Very low</i>	<i>Very high</i>	1	5	0.063	0.250	0.156	
W43	Facilities for storing & drying clothing	<i>Medium</i>	<i>Very low</i>	3	1	0.188	0.050	0.119	
W44	Facilities for sitting	<i>Low</i>	<i>No</i>	2	0	0.125	0.000	0.063	
W45	First aid appliances	<i>Low</i>	<i>High</i>	2	4	0.125	0.200	0.163	
W46	Canteens	<i>Very high</i>	<i>Very high</i>	5	5	0.313	0.250	0.281	<i>Average of Q. 46a and 46b</i>
W47	Shelters, rest rooms and lunch rooms	<i>Medium</i>	<i>Very high</i>	3	5	0.188	0.250	0.219	
Total Welfare				16	20	1.000	1.000	1.000	

$$\mathbf{Health\ Index} = \sum 0.077 H11 + 0.132 H12 + 0.114 H13 + 0.072 H14 + 0.090 H15 + 0.000 H16 + 0.102 H17 + 0.102 H18 + 0.151 H19 + 0.077 H20 + 0.084 H20E$$

$$\mathbf{Safety\ Index} = \sum 0.066 S21 + 0.079 S22 + 0.104 S24 + 0.000 S25 + 0.039 S26 + 0.064 S29 + 0.104 S30 + 0.077 S32 + 0.052 S33 + 0.065 S34 + 0.065 S35 + 0.078 S36 + 0.078 S38 + 0.065 S40 + 0.065 S41$$

$$\mathbf{Welfare\ Index} = \sum 0.156 W42 + 0.119 W43 + 0.063 W44 + 0.163 W45 + 0.281 W46 + 0.219 W47$$

$$\mathbf{Shop-level\ Health,\ Safety\ and\ Welfare\ Satisfaction\ Index\ (HSWSI)} = \frac{20}{183} \sum 70 x$$

$$\mathbf{Health\ Index} + 77x \mathbf{Safety\ Index} + 36x \mathbf{Welfare\ Index}$$

$$\mathbf{HSWSOI} = 0.50 \mathbf{HESSI}_{opr} + 0.25 \mathbf{HSWSI}_{Sup} + 0.25 \mathbf{HSWSI}_{Mgr}$$

ANNEXURE-VII b: CALCULATION OF IMPLEMENTATION LEVEL

(Based on Questionnaire-II, Respondents: Supervisors/Line Managers)

GENERAL INFORMATION	QGism1	Position	COMPLIANCE	V6	Safety Com. Recommendation
	QGism2	Age in years		V7	Accident/injury claims
	QGism3	Years of Service Total/In present Company		V8	Canteen com. Suggestions
	QGism5	Daily work hours.		V9	Plant maintenance
	QGism6	Reading of provisions		V 10	CPE maintenance
	QGism7	Specialized Training	REGULATORY FRAMEWORK	V 11	Safety rules and regulations
	QGism8	Hours per week for HSW		V 12	Manpower with H & S
	QGism9	Involvement in safety week		V 13	Frequency of Inspection
	QGism10a	Knowledge sharing in safety week programs		V 14	Quality of Information
	QGism10b	Induction program adequacy		V 15	Obedience of workers to follow Safety rules and instructions
COMMUNICATION	V1	Written arrangement in the premises	INVILVEMENT	V 16	Employee involvement
	V2	Suggestion collection system		V 17	Union Involvement
	V3	Data on injuries/accidents		V 18	Rewarding
	V4	Consistency in Instructions		V 19	Competitions/contests
	V5	Free and Open to consider employee's suggestions		V 20	No. of employees trained

SUPPLY OF ASSETS	V 21	Medical department	GOVERNMENT	V 26	Inspection frequency
	V 22	Provision of CPE		V 27	Usefulness of Suggestions
	V 23	PPE supply		V 28	Involvement in visits
	V 24	Equipments/tools for job safety			
	V 25	Commitment			

$$\begin{aligned}
 \text{Implementation Level (I}_{\text{level}}) &= 4x (1/5(V1+V2+V3+V4+V5) \\
 &+ 1/5(V6+V7+V8+V9+V10) + 1/5(V11+V12+V13+V14+V15) + \\
 &1/5(V16+V17+V18+V19+V20) + 1/5(V21+V22+V23+V24+V25))
 \end{aligned}$$

APPENDIX-VIII (a): QUESTIONNAIRE FOR OPERATORS/WORKERS

प्रति,

सप्रेम नमस्कार,

मी राजेश्वर वामनराव हेन्द्रे, चिंचवड, पुणे - ३३ 'टिळक महाराष्ट्र विद्यापीठांतर्गत' पी.एच.डी. या पदवीसाठी संशोधन करीत आहे. माझ्या पी.एच.डी. चा विषय खातीलप्रमाणे आहे.

“पिंपरी-चिंचवड औद्योगिक क्षेत्रातील वाहननिर्मिती करणाऱ्या कंपन्यांमधील कर्मचाऱ्यांच्या आरोग्य, सुरक्षितता व कल्याणकारी योजना बाबतच्या कार्यप्रणालीचा अभ्यास”

सदर संशोधनाचा मुख्य उद्देश, कंपनीमार्फत पुरविल्या जाणाऱ्या “आरोग्य, सुरक्षितता व कल्याणकारी योजना” व त्याबद्दल आपल्या अपेक्षा यामधील तफावत शोधून काढणे हा आहे. या कार्यामध्ये आपण सहभाग घेवून आपले बहुमुल्य मत, अपेक्षा कंपनीस अप्रत्यक्षरीत्या पोचविण्यासाठी सहकार्य करावे. सदरचे संशोधन कंपनी, संघटना व शासन यांना आरोग्य, सुरक्षितता व कल्याणकारी योजना बाबतचे धोरण ठरविणेस उपयोगी ठरतील अशी अपेक्षा आहे.

सदर संशोधन कार्यात आपल्याकडून “आरोग्य, सुरक्षितता व कल्याणकारी योजना” याबाबत आपले मत सोबत जोडलेल्या प्रश्नसंचामध्ये मांडणेत यावे. प्रश्नसंचात दिलेल्या मार्गदर्शनानुसारच कृपया योग्य ती खूण (✓) करावी अथवा आवश्यक तेथे माहिती द्यावी.

संशोधनाच्या नीतीनुसार सदरची माहिती गुप्त ठेवणेत येणार असून आपले नाव कोठेही नमूद करण्याचे नाही. तथापी आपलेकडून काही प्रश्न अपूर्ण राहिले असल्यास किंवा समजले नसल्यास माझे मोबाईलवर संपर्क साधावा, अथवा प्रश्नसंचामध्ये आपला संपर्क क्रमांक (मोबाईल / दूरध्वनी क्रमांक) नमूद करावा म्हणजे आपल्याकडे संपर्क राधता येईल.

सदर माहिती फक्त संशोधन कार्यासाठीच वापरणेत येईल याची ग्वाही देतो.

आपला विश्वासू

राजेश्वर वा. हेन्द्रे V-II/7, काकडे पार्क, चिंचवड, पुणे - ३३ (९८६०००७४१२)

नोट -

- १) जी बाब आपल्याशी संबंधित आहे त्याबाबतचे आपले समाधान त्यापुढील योग्य त्या कॉलममध्ये (✓) अशी खूण करून नोंदवावे.
- २) एखादी बाब आपल्याशी संबंधित नसल्यास कृपया कॉलम 'संबंधित नाही' मध्ये (✓) अशी खूण करावी.
- ३) ज्या बाबींवर कंपनीने प्राधान्याने लक्ष द्यावे असे आपणास वाटते त्यापुढे अंक १, २, ३ नमूद करावे -

१ म्हणजे उच्च प्राधान्याची बाब -

२ म्हणजे मध्यम प्राधान्याची बाब -

३ म्हणजे कमी प्राधान्याची बाब -

प्रश्नसंच

भाग अ - प्राथमिक माहिती

- १) वय पूर्ण वर्षांमध्ये - ----- वर्षे
मोबाईल / फोन नं. - -----
- २) वैवाहिक स्थिती - विवाहित अविवाहित इतर
- ३) आपल्यावर अवलंबून घरातील सभासदांची संख्या -
- ४) उच्चतम शैक्षणिक गुणवत्ता - -----
- ५) एकूण कामाचा अनुभव - ----- वर्षे
- ६) सध्याच्या कंपनीत किती वर्षांपासून काम करीत आहात ? - ----- वर्षे
- ७) नौकरीचे स्वरूप -
कायमस्वरूपी तात्पुरते ट्रेनी
- ८) सध्या काम करीत असलेल्या विभागाचे / शांपचे / ब्लॉकचे नाव - -----
- ९) दररोज कामाचे एकूण तास - -----
- १०) आठवड्यातील ओव्हरटाईमचे एकूण तास
० - ३ ३ - ६ ६ - ९ ९ - १२ १२ - १५

भाग ब - सहभागाचे मुल्यांकन

- १) आपल्या कंपनीमधील आरोग्य, सुरक्षितता व कल्याणकारी योजना बाबतची आपणास असलेली माहिती

	काहीच नाही	अल्प प्रमाणात	काही प्रमाणात	बऱ्यापैकी	बहुतांशी
आरोग्य					
सुरक्षितता					
कल्याणकारी योजना					

- २) सदर माहिती आपणास कशी झाली -
अ) वाचनाद्वारे ब) ऐकल्यामुळे क) ट्रेनिंगद्वारे
- ३) सदरच्या बाबींविषयी माहिती आपणांस कोण देत असते ?
कंपनी संघटना (ट्रेड युनियन) स्वतः माहिती घेतली

४) कंपनीतील आरोग्य विभाग / सेफटी कमिटी / वेल्फेअर कमिटी यांच्या कामकाजा विषयी आपले समाधान

	अत्यंत असमाधानी	अल्प समाधानी	समाधानी	जास्त समाधानी	पूर्ण समाधानी
आरोग्य विभाग					
सेफटी कमिटी					
वेल्फेअर कमिटी					

५) कंपनीतील आरोग्य विभाग / सेफटी कमिटी / वेल्फेअर कमिटीच्या कार्यात आपला सहभाग

	कधीच नाही	कचित	काही वेळा	बऱ्याच वेळा	नियमितपणे
आरोग्य विभाग					
सेफटी कमिटी					
वेल्फेअर कमिटी					

भाग क - आरोग्य विषयक

संबंधित नाही

प्राधान्य

अनु क्रमांक	बाब	संबंधित नाही	अत्यंत असमाधानी	अल्प समाधानी	समाधानी	जास्त समाधानी	पूर्ण समाधानी	प्राधान्य १, २, ३
१	२	३	४	५	६	७	८	९
११	स्वच्छता							
१२	दूषित द्रव व वायूरूप पदार्थांचा निचरा							
१३ अ	हवेशिरपणा							
१३आ	तापमान							
१४	धूळ आणि धूर							
१५	हवेतील दमटपणा							
१६	कामाच्या ठिकाणी गर्दी							
१७	प्रकाश योजना							
१८	पिण्याच्या पाण्याची व्यवस्था							
१९ अ	शौचालयाची व्यवस्था							
१९ ब	मुतारीची व्यवस्था							
२०	धुंकीपात्र / वॉशबेसीनची व्यवस्था							
	आवाज / गोंगाटाबाबत							

प्राधान्य १, २, ३ बाबत आपले मत / म्हणणे

प्राधान्य	आपले मत / म्हणणे
प्राधान्य - १	
प्राधान्य - २	
प्राधान्य - ३	

भाग ड - सुरक्षितता विषयक

संबंधित
नाही

प्राधान्य

अनु क्रमांक	बाब	संबंधित नाही	अत्यंत असमाधानी	अल्प समाधानी	समाधानी	जास्त समाधानी	पूर्ण समाधानी	प्राधान्य १, २, ३
१	२	३	४	५	६	७	८	९
२१	धोकादायक मशिनरी किंवा त्याच्या भागास केलेल्या कुंपण आणि स्वतंत्र व्यवस्थेबाबत							
२२	कंपनीने पुरविलेल्या युनिफॉर्मबाबत -							
२३	आपण जे काम करता त्याचे कंपनीने दिलेल्या ट्रेनिंग बाबत -							
२४ अ	मशिनवरील कामाच्या सुरक्षिततेबाबत							
२४	संकटकाळांमध्ये मशिनरी किंवा त्याचे फिरते भाग आपोआप बंद होण्याची व्यवस्था केली आहे काय ? होय - <input type="checkbox"/> नाही - <input type="checkbox"/> असल्यास त्याबाबत आपले समाधान-							
२५ अ	मशिनरीची मांडणी व कामाच्या जागेची सुरक्षितता / रचनाबाबत -							
२५ ब	स्वयंचलित मशिनरीचा / साहित्य वाहतूक यंत्रणेचा मार्ग व आपली सुरक्षितताबाबत -							
२६	मशिनरी किंवा त्याचे फिरत्या भागावरील आवरणाची मजबूती व ते पक्के राहिल याच्या व्यवस्थेबाबत -							
२९	क्रेन, चेन, रोप, पुली इत्यादी सेवा साधनाबाबत घेण्यात येणाऱ्या दक्षतेविषयी आपले मत							
३०	ग्राईडिंग किंवा तत्सम मशिनरीच्या बाजूला आवश्यक तांत्रिक माहिती दर्शविणारे बोर्ड/सूचना फलक बाबत-							
३२ अ	कंपनीतील एकंदरीत सुरक्षिततेसाठी विविध ठिकाणी सूचना, बोर्ड, धोकादायक चिन्ह यांच्या व्यवस्थेबाबत							
३२ ब	फरश्या (फ्लोरींग) पायऱ्या, जीने, कठडा व इतर वाहतूकीचे मार्ग यांच्या स्वच्छतेबाबत -							
३३	टाक्या, फ्लोअर मधिल मोकळीजागा, छिद्र येथील सुरक्षा व्यवस्थेबाबत. (उदा. झाकण, कुंपण)							
३४	आपणांस उचलाव्या लागणाऱ्या वजनाबाबत -							

अनु क्रमांक	बाब	संबंधित नाही						प्राधान्य	
		संबंधित नाही	अत्यंत असमाधानी	अल्प समाधानी	समाधानी	जारत समाधानी	पूर्ण समाधानी	प्राधान्य १, २, ३	
१	२	३	४	५	६	७	८	९	
३५	डोब्यांच्या संरक्षणासाठी दिलेल्या गॉगल / मास्क बाबत -								
३६	धोकादायक पदार्थांच्या हाताळणीसाठी घेतल्या जाणाऱ्या खबरदारी बाबत -								
३८	आगीपासून सुरक्षेसाठी आवश्यक ट्रेनिंग / माहिती दिली आहे काय ? होय - <input type="checkbox"/> नाही - <input type="checkbox"/> होय असल्यास त्याबाबतचे समाधान								
४० अ	सुरक्षेच्या दृष्टीकोनातून फॅक्ट्री शोड / बिल्डींगचे देखभाल व दुरुस्तीबाबत								
४० ब	सुरक्षा विभागाचे कामकाजाविषयी								
४१ अ	आपण करित असलेल्या कामापासून उद्भवणारे शारीरिक अपाय व त्यावरील खबरदारीची कल्पना आपणांस देणेत आली आहे काय ? होय - <input type="checkbox"/> नाही - <input type="checkbox"/> होय असल्यास त्याबाबतचे समाधान								
४१ ब	आपणास खालील वैयक्तिक सुरक्षा साधने पुरविणेत आली असल्यास ✓ व नसल्यास × अशी खूण करावी								
	१) शूज (बूट) <input type="checkbox"/>								
	२) हॅडग्लोव्हज <input type="checkbox"/>								
	३) हेल्मेट <input type="checkbox"/>								
	४) इअर प्लग <input type="checkbox"/>								
	५) कामासाठी लागणारी उपकरणे (टेस्टर, रोप, बेल्ट) <input type="checkbox"/>								
	सदर साधनाबाबत काही अडचण असल्यास नमूद करावी								

असल्यास त्याबाबत आपले समाधान

प्राधान्य १, २, ३ बाबत आपले मत / म्हणणे

प्राधान्य	आपले मत / म्हणणे
प्राधान्य - १	
प्राधान्य - २	
प्राधान्य - ३	

भाग इ - कामगार कल्याण योजनाबाबत

संबंधित
नाही

प्राधान्य

अनु क्रमांक	बाब	संबंधित नाही	अत्यंत असमाधानी	अल्प समाधानी	समाधानी	जास्त समाधानी	पूर्ण समाधानी	प्राधान्य १, २, ३
१	२	३	४	५	६	७	८	९
४२	हात व कपडे धुण्याच्या व्यवस्थेबाबत							
४३	ओले कपडे सुकविण्याची व ठेवण्याची (ड्रेसिंग रूम) व्यवस्था							
४४	बसण्याची व्यवस्था							
४५	प्रथमोपचाराची साधने व व्यवस्था							
४६ अ	कॅटिन - खाद्यपदार्थांच्या दर्जाबाबत							
४६ ब	कॅटिन - स्वच्छतेबाबत							
४७	आरामकक्ष व भोजनकक्षाची व्यवस्थेबाबत							
४९	वेलफेअर विभागाचे कामकाजाबाबत							

प्राधान्य १, २, ३ बाबत आपले मत / म्हणणे

प्राधान्य	आपले मत / म्हणणे
प्राधान्य - १	
प्राधान्य - २	
प्राधान्य - ३	

आपला मासिक पगार (१००० मध्ये)	८ पर्यंत	९ ते १२	१३ ते १६	१७ ते २०	२१ ते २४	२५ च्या पुढे

आपण दिलेल्या वेळेबाबत व सहकार्याबाबत धन्यवाद !

APPENDIX-VIII (b)

QUESTIONNAIRE FOR MANAGERS AND SUPERVISORS

I	
---	--

SECTION A: INTRODUCTORY INFORMATION

Note: * indicates optional

1. Name*:
Position: -----
2. Age in years: ----- Years Mobile / Phone Number* - -----
3. a. Total years of Service: -----, b. Years of Service in present company: -----
4. Name of the department / Shop/Block where you are working now. -----
5. In general daily hours of working: ----- Hours

SECTION B: GENERAL INFORMATION

6. Have you read provisions relating to **Health, Safety and welfare** ?
Yes No
7. Have you received specialized training on Safety?
Yes No
8. How many hours per week you do you get to involve in the activities of Health Committee/ Safety Committee / Welfare Committee

Please mark "v" in appropriate box

Not at all	Upto 2 Hours	2-4 Hours	More than 4 Hours

Please indicate the extent to which you agree or disagree with the following statements by writing number as shown below in the "Last" column of the table:

Please indicate the extent of satisfaction or dissatisfaction with the following “Items” by writing number as shown below in the “**Rating**” column:

Highly Dissatisfied	Less satisfied	Satisfied	More Satisfied	Completely Satisfied
1	2	3	4	5

SECTION C: HEALTH

S. No.	Items	Not Applicable		Rating		Please express your opinion about Priority 1, 2 and 3.
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	Cleanliness and Washing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Priority 1:
12	Disposal of wastes and effluence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 a	Ventilation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 b	Temperature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Priority 2:
14	Dust and fumes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15	Humidity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16	Overcrowding at workplace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Priority 3:
17	Lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18	Drinking water facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19a	Latrine facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19b	Urinals facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20	Spittoons/ wash basins facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20 E	Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

SECTION D: SAFETY

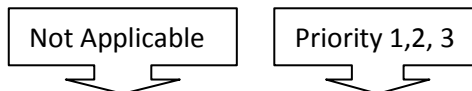
Highly Dissatisfied	Less satisfied	Satisfied	More Satisfied	Completely Satisfied
1	2	3	4	5

S. No.	Items	NA	Rating	Priority 1,2,3
21	Fencing or separation of dangerous machines and their parts			
22	About supply and quality of uniforms			
24a	About safety training provided by company			
24b	Is there arrangement for cutting off power in case of dangerous situation Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes, indicate your satisfaction			
25a	About layout of machines and working space from the viewpoint of safety			
25b	About movement of automatic machinery/material transportation and operator's safety			
26	About the sturdiness and fixity of cover over machinery or its moving parts.			
29	About precautions taken from movement of crane, chain, rope and pulley (Lifting machines)			
30	About display of technical information boards near grinding or other similar machines.			
32 a	Place and sufficiency of information, board and danger signs for overall safety in the premises.			
32b	Cleanliness/Emptiness and safety in the movement on flooring, steps and staircase.			
33	Precautions taken at Pits, sumps, openings in floors (provision of covers and fencing)			
34	About weight that operators have to lift during work.			

35	About Goggles/Mask supplied for the protection of eyes			
36	Precautions taken in the handling of dangerous substances			
38	Have you received specialized training and information regarding fire protection? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, indicate your satisfaction			
40a	Maintenance and repairs of building/ factory shed from the view point of safety			
40b	Your satisfaction about working of Safety Department			
41a	Do you provide sufficient information about physical risks and precautions to be taken in working? Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes, indicate your satisfaction			
41b	About Personal Protective Equipments (PPEs)			
B1	Shoes			
B2	Hand gloves			
B3	Helmet			
B4	Ear plug			
B5	Work related equipments (Tester, Rope, Belts etc.)			
Please mention if any inconveniences about PPEs:				
Please express your opinion about Priority 1, 2 and 3				
Priority 1				
Priority 2				
Priority 3				

Highly Dissatisfied	Less satisfied	Satisfied	More Satisfied	Completely Satisfied
1	2	3	4	5

SECTION E: WELFARE



S. No.	Items	NA	Rating	Priority 1,2,3	Please express your opinion about Priority 1, Priority2 and Priority3.
42	Washing facilities for hands and clothes				Priority 1:
43	Facilities for storing & drying clothing				
44	Sitting facility at workplace				Priority 2:
45	First aid box and attendant				
46a	Canteen – Quality of foods				Priority 3:
46b	Canteen – Cleanliness				
47	Shelters, rest rooms and lunch rooms				
49	About working of welfare Department				

☀ Thank you for sparing your valuable time ☀

QUESTIONNAIRE FOR LINE MANAGERS/ SUPERVISORS

Please indicate the extent to which you agree or disagree with the following statements by writing number as shown below in the “**Rating**” column:

Strongly	Slightly	Uncertain	Slightly Agree	Strongly Agree
1	2	3	4	5

A. COMMUNICATION		Rating
V1	Sufficient written arrangements are made by company to communicate the Health and Safety information to employees.	
V2	Employee’s opinions/suggestions collection system in the company is adequate	
V3	The data on injuries and accidents are regularly shared	
V4	Work related Health and safety instructions are consistently given to the employees	
V5	Management is free and open to consider employee’s suggestions to improve health, safety and welfare at the workplace	
B. COMPLIANCE		Rating
V6	Safety committee’s recommendations are promptly addressed for compliance	
V7	Accident/injury claims are settled fairly	
V8	Canteen committee’s recommendations are promptly addressed for compliance	
V9	Maintenance of Plant and Machinery is adequate to have safe and healthy operation	
V10	Equipments for preserving healthy environment (fan, blower) are properly maintained	
B. REGULATORY FRAMEWORK		Rating
V11	Safety rules and regulations are strictly observed in the company	
V12	The manpower with the health and safety department is sufficient	
V13	Frequency of inspection is adequate to identify unsafe behaviours and	

	unsafe working conditions	
V14	Detailed inspection is carried out to predict future risks	
V15	In general, workers follow safety rules and superiors' instructions	

D. INVOLVEMENT		Rating
V16	Employees are actively involved in matters concerning health and safety	
V17	Union is actively involved in Health & Safety issues	
V18	Suggestions about Health & Safety are fairly rewarded	
V19	Competitions / contests taken in the company are enough to keep employees motivated	
V20	Number of employees trained (Health and safety) per year is sufficient	

E. SUPPLY OF ASSETS		Rating
V21	Medical department is well equipped to treat most of workplace injuries	
V22	Provision of equipments is adequate to preserve healthy environment at the workplace	
V23	Employees receive adequate personal protective equipments when required	
V24	The materials and equipment provided are satisfactory to do job safely	
V25	The company is committed to ensure health and well being of employees	

F. GOVERNMENT'S EFFICIENCY		Rating
V26	The inspections of Government officials are adequate to monitor health, safety and welfare	
V27	The suggestions given by Government officials are useful to improve Health & Safety at work	
V28	Most of the times, I am involved during visits of the Government officials	

☀️ **THANK YOU FOR SPARING YOUR VALUABLE TIME** ☀️

APPENDIX-IX a

Government of Maharashtra
Directorate Industrial Safety and Health

"Kamagar Bhavan", 5th floor, Block -E , C-20, Bandra (East), Mumbai -400 051.
Office Ph. 022-26572504/09/22/58 , Fax – 26572474 ,
Email dish.maharashtra@gmail.com

No.DISH/ Statistics / SBP/ 13077 /D-8

Date : 02-11-2011

To.

Shri. Rajeshwar W. Hendre,
AMIE(Civil),MBA(HR)(D0B 30/01/1966),
At Chinchwad, Pune.

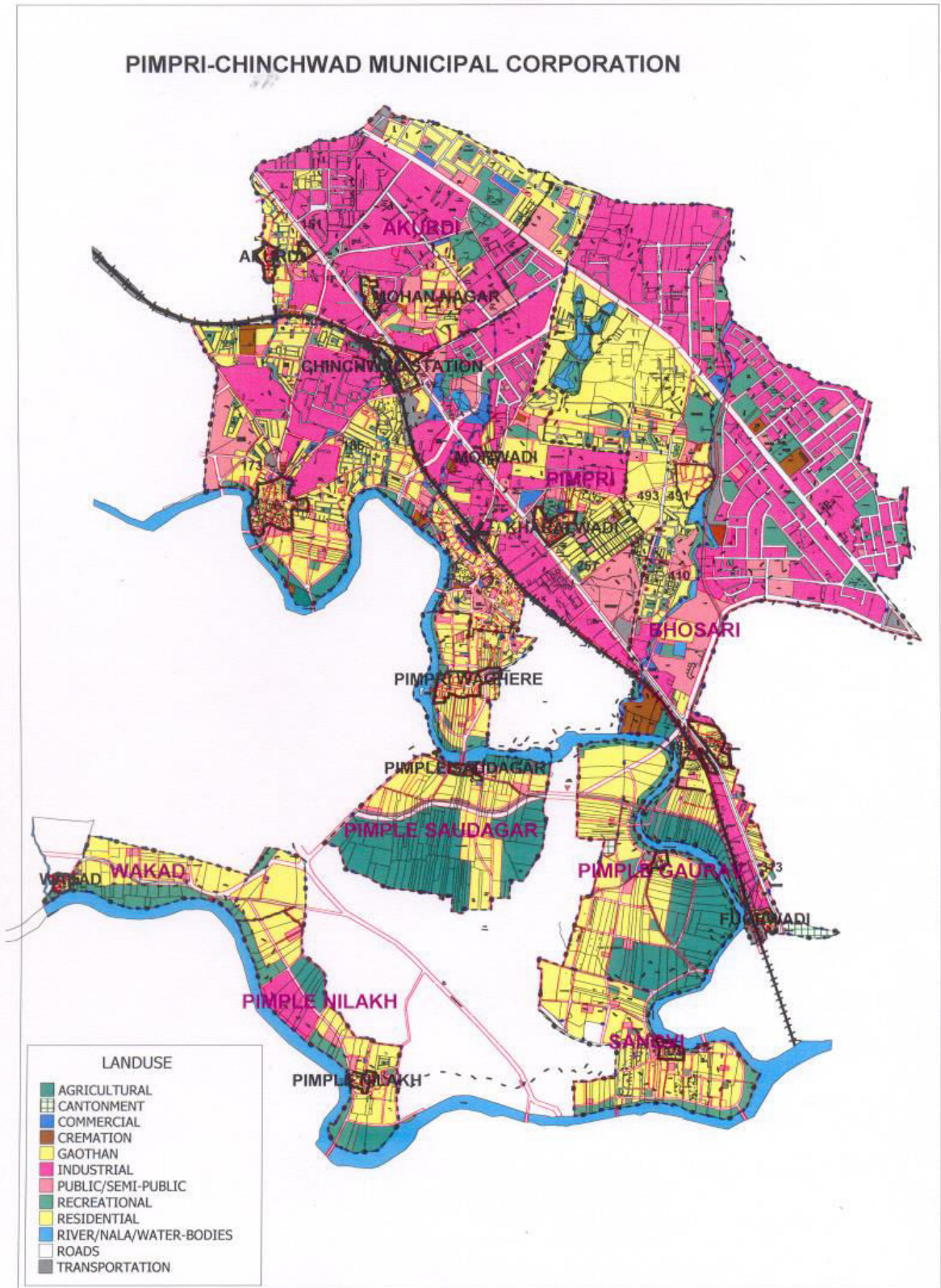
Subject:- Guidance for conducting the research work.

Ref :- Your mail letter dt.10-10-2011

With reference to the subject noted above, you are requested to contact to the office of "Additional/Joint Director, Industrial Safety and Health, 694/1, Bibwewadi, Adarsh Nagar, Pune-Satara Road, Pune-411 037, Phone No.020-24266918, 020-24268898, Email- [jointdirectorpune@yahoo.in/](mailto:jointdirectorpune@yahoo.in) addishpune@gmail.com / addishpune@yahoo.in for the guidance for conducting the research work.

(M. R. PATIL)
P. A. to Director,
Industrial Safety And Health,
Maharashtra State, Mumbai-51.

APPNENDIX- IX b



APPENDIX-IX c



टिळक महाराष्ट्र विद्यापीठ Tilak Maharashtra Vidyapeeth

(Declared as Deemed University under section 3 of UGC Act 1956 vide
Notification No.F-9-19/85-U-3 dated 24 April 1987 by the Government of India).

Vidyapeeth Bhavan, Mukundnagar, Gultekdi, Pune-411037

Tel: 91-020-24261856, 24264699, 24267888
E-mail : tmv@tmvnet.in/ kulasachiv@tmvnet.in

Fax: 91-020-24266068, 24271695
Website: www.tmv.edu.in

Ref.No.Ph.D./2010/842

Date - 01. 09. 2010

To.
Mr. Hendre Rajeshwar Wamanrao
Pune

Sub. :- Registration for Ph. D. Program in Management

Dear Student,

With reference to your application for admission to the Ph.D. programme in Management. I am glad to inform you that your name is registered for the said program, subject to the fulfillment of the conditions given below.

- 1) You are requested to obtain a copy of Prospectus from the Publication section of this Vidyapeeth by paying Rs. 500/- (by post Rs.550/-) for the registration of Ph. D.
- 2) You will have to pay the balance fees, including the Registration fee and 1st year academic Fee immediately failing which your admission will be treated as cancelled.
- 3) You are requested to submit a half yearly progress report of your research work through your Research Guide.
- 4) You will be Require to remit the examination fee of Rs. 12000/- before the submission of your thesis.

Topic of your research will be as mentioned below.

"A STUDY OF HR PRACTICES IN AUTOMOBILE INDUSTRY IN PIMPRI-CHINCHWAD INDUSTRIAL AREA, PUNE WITH SPECIAL REFERENCE TO HEALTH, SAFETY AND WELFARE. (FOR THE PERIOD 2004-05 to 2009-10) "

Research Guide Name - Dr. Mukund Dongare, Pune (Mob: 9822761430)

Copy to:-

- 1) Research Guide
- 2) H.O.D. Management Dep.


Assistant Registrar

CAMPUSES

Pune City - 1)1242, Sadashiv Peth, Pune - 30. (020)24454866. 2)Dept. of Comp Science, 568 Narayan Peth, Pune-30. (020)20243493. Nigdi- Sector No.25, Sindhanagar, Pradhikaran, Nigdi, Pune- 44. (020)27656523. Navi Mumbai - Plot No.28, Sector No.11, CBD Belapur, Navi Mumbai- 400614, (022)27572995, 27572985. Sangli - D. M. Kesari, 67-70, Ind.Estate, Madhavnagar Road, Sangli-416416, (0253)2310838, 2310737.

ADMINISTRATIVE OFFICES - Mumbai: Mukhyadhyapak Bhavan, Plot No. 6B (w), Sion, Mumbai, 400 022 (022)4090408, New Delhi: Kesari Maharrata Trust, 107 P.T.I. Building, Sansad Marg, New Delhi 110001. (011)23714149.

APPENDIX -X

PROFILE OF SAMPLE COMPANIES

1: PREMIER LIMITED

Premier limited company has its head quarter and facility at Chinchwad, Pune. The Chinchwad plant comprises four divisions as mentioned below:

Division	Product	Consumers	Emp.	S/ Mgr	Opr
Machine Tool Division	Heavy machines for turning, Vertical machining, Gear.	Morgan, Voith, L& T and various BHEL units.	640	340	300
Light Vehicle Division	Sigma, Rio, Roadstar.	Open market	310	40	270
Engineering and Innercon	Products in general engineering, automotive and wind turbine sector.	Automobile companies and Suzlon.	700	85	615
Machine Shop	Cylinder blocks required for automobile companies.	Tata Motors	350	45	305
Total employees			2000	510	1490
Emp.=Employees, S/Mgr= Staff/Managers, Opr=Operators					

In the staff about 70% employees are engineers. Most of the operators have educational level upto 10th and ITI. 10 CNC operators are engineering diploma holder. Out of 1490 operators/workers, 300 (20%) are permanent and remaining 1190 (80%) are temporary, contract workers and trainee. The degree of unionization is 20%. In 2009-10 there were 8% women employees in the Company which was targeted to increase to 25% within the next 3 years i.e. upto 2012-13.

Employee Health and Safety

Since resignation of the Safety Officer in 2011, there is no full time safety officer/manager in the company till December 2012 ends. Two hour safety training is given to the new worker. In-house Health Awareness Program was organized by Care India Medical Society, Pune for all employees. A power-point presentation was made on the bad effects of Tobacco chewing, which was very much appreciated by Workmen. A health check-up camp was organized for all the Company's employees. The health check-up was undertaken to create awareness on early disease detection and offer guidance on necessary treatment.

2 TATA MOTORS LIMITED

Today the company is the world's fifth largest medium and heavy commercial vehicle manufacturer and the world's second largest medium & heavy bus manufacturer. Tata Motors is the largest producer of commercial vehicles (66% market share of Light Commercial Vehicles and 64% market share of Medium and Heavy commercial vehicles) and the second largest (20% market share) in the passenger vehicles market in the India.

The company's manufacturing base spread across India. In the East it is in Jamshedpur (Jharkhand). Pune (Maharashtra) is their main centre for the West. The North base is at Lukhnow (Uttar Pradesh) and Pantnagar (Uttarakhand). A new plant to manufacture Nano has shifted to Sanand District -Kuch in Gujarat in the year 2010-11.

Health, Safety and Welfare Department

All of the Company's operating plants in India have been certified by OHSAS - 18001 and ISO - 14001 standards and all the commercial units have been conferred with the 'Golden Peacock Award' on Safety & Health. The Company has recently completed an investigation of the existing safety systems through DuPont and is taking steps to raise the safety standards to world class levels. ZAP (Zero Accident Plan) meetings are being held in all plants and the efficient bay owner in these plants is declared as "champion". Host of initiatives on health and wellness were taken across all plants in India. Specifically, a Health Index was initiated in the Pune plant and Ergonomics study carried out to improve workplace environment. Employees receive H&S training as part of their induction and are kept up-to-date by 1) weekly H&S briefings, 2) quarterly OHS information bulletin, 3) safety narration in response to significant incident occurred, 4) H&S information on notice boards at each shop and 5) campaigns to raise awareness of specific risks or safety processes (AR 2010-11, p.14).

Safety Organization

Safety Officer of the plant is reporting to General Manager HR and is responsible for continuance of H&S activities. A team of executives consisting of senior manager assists him. Safety managers (12 Nos.) are responsible for the H&S issues at Block/shop level. Each block/shop is suitably divided into bays on the basis of nature of work. A bay owner is looking after it through the network of safety members/ Stuarts. Safety members monitor the H&S issues at work place. Welfare Managers are responsible for the activities of various

committees including safety committee. Supervisors and production managers have direct control over workers and are responsible for compliance.

Communication

Safety Maha-communication, Bulletin, Safety week and safety meetings have been playing key role in the company to improve awareness. During 22 – 24th May 2011 more than 6000 employees have taken participation in the Maha-communication. Safety oath is being given to all employees intermittently. Safety orientation program and training is given to new employees. Tata code of conduct and SHE policy is well written and displayed at conspicuous places. The world leader in safety Du Pont Corporation is working for implementation of H&S in the plants. Tata Motors is at the 1st rank in the H&S activities. The target of suggestions for 2011-12 was 21 suggestions per head, which received overwhelming response from employees; where 100% employees had participated, resulting into 22.44 suggestions per head.

Safety reports are displayed over the notice board of each shop. The analysis of accident/injury is carried out using various techniques and discussed with managers, supervisors and operators. It is communicated to other shops also through the line of authority. Emergency meetings are conducted depending upon severity of the incident. The promotion is based on safety performance of the supervisor / manager.

3 MAHINDRA VEHICLES AND MANUFACTURING LIMITED

Mahindra Vehicles and Manufacturing Limited is an ambitious project of Mahindra and Mahindra, situated at Chakan Industrial Area, 15 Km away from Pimpri Chinchwad. The plant is being constructed in three phases over the land of 700 acres. The construction of the plant started in January 2008 and the production of phase-I started in 9/2010. The phase –I production aims to produce 1.5 lakh vehicles per annum; whereas, the overall plant would produce 6.5 lakh vehicles per annum. It comprises the product lines for multipurpose vehicles, utility vehicles and commercial vehicles.

The production activity is disaggregated over the four main shops known as Press shop, Body-in-white, Paint shop and Trim-Chassis-Fitment. The total manpower employed in the plant was 3600 consisting 2800 (78 %) operators, 200 (5 %) team leaders and 600 (17 %) officers. Operators were 12th or ITI holders and were working on two years apprenticeship

basis. Hence, 78 % employees were working as an apprentice and remaining 22% on regular basis.

Health and Safety

The safety department comprising of safety officer and assistants are responsible for H&S activities in the premises. The higher level OSHA standards are followed in the maintenance of safety. Safety-First is the motto of the company. Safety committee is established and it meets quarterly. Team leaders are responsible to look after H&S of their operators. Behaviour Based safety training program has conducted to sensitize employees about taking ownership of their safe as well as unsafe behaviours. Material safety and Data Sheet training program aimed to spread awareness among employees about safe handling of chemicals.

4 FORCE MOTORS

As on today company has its manufacturing base at Akurdi, Pune of Maharashtra and Pithampur, District-Dhar in Madhya Pradesh. The Pune facility comprises of shops namely: 1) Transmission, 2) Engine Shop, 3) Small commercial Vehicles, 4) Tractor Plant, 5) Research and development and 6) Production Engineering. There were 0.94 % female at the end of 31/03/2011. The permanent employees are 66 % whereas temporary, contract and trainees are 34 % working in the Akurdi plant.

Health, Safety and Welfare Situation in the Company

Safety officer and assistant safety officer are responsible for maintenance of H&S activities in the premises of the company. Work permit system is followed in the company for each of the activity. A questionnaire consisting of items under HSW of the F.A. is printed and it has been filled by employees every month. The record of these are maintained at the shop level and reported to the safety officer monthly. The combined monthly report is then submitted by the SO to the plant head. In the quarterly apex body meeting the SO presents the safety details and decisions are taken accordingly. Near miss and incidents are also reported. Detailed plant inspection is carried out once in two years by experts. SO and welfare officer visit the premises with check list. A full time medical officer and compounder are available at the health centre in the company premises. An ambulance with driver is kept ready at the entrance of plant.

Emergency Preparedness and Response Plan is communicated to the employees and safety zones are demarcated in the premises. Supervisors/managers are asked to inform 2 unsafe conditions or acts every month. Safety training of four hours is given to 25-30 employees and three employees are sent to one week training at Central Labour Institute every year. Safety week is celebrated in the company in the first week of March. The reports of safety are displayed over the notice board at safety office. Induction training of one hour is given to the temporary workers. New managers have to go through four hour safety training.

Industrial Relation

The litigation connected with recognition of labour union of Akurdi plant is pending with Hon'ble Supreme Court of India. In 2000, the workers went on strike from May 26 at Akurdi plant through the Bhartiya Kamgar Sena union. At present multiple unions at Akurdi plant become hurdle in the cordial relationship between management and employees.

5 BAJAJ AUTO LIMITED (BAL)

The Registered head office of Company is at Akurdi, PCIA, Pune -35. Plants are situated at 1) Akurdi, Pune, 2) Chakan Industrial Area Pune, 3) Bajajnagar Walunj, Aurangabad and 4) Pantnagar (Udhamsinghnagar), Uttarakhand. The company (BAL) is second largest manufacturer of the two wheelers in India and largest exporter in two and three wheeler. In Pune the plants are located at Akurdi and MIDC Area Chakan, Pune. The Chakan plant employs 1100 person working in Paint Shop, Vehicle Assembly, Engine Assembly and Inspection & Finishing shop. The Akurdi plant employs 200 people working in R & D, Tools and Die maintenance and Warranty maintenance shops. 71% of employees have upto 5 years experience and remaining 30% have more than that. 50% of employees have education upto ITI and 36% are diploma holders. 90% of employees are operators and remaining 10% are supervisors and managers. The rate of attrition in year 2010-2011 was 12%.

Health, safety and Welfare Activities

Since resignation of the Safety Officer in 2011, there is no full time safety officer/manager in the company till December 2012 ends. The charge of safety has entrusted to the HR head. Two hour safety training is given to the new worker. National safety week is celebrated every year during - 4th to 11th March.

One important point to mention is Company had initiated Total Productivity Maintenance 10 years back and in 2007 it received TPM excellence Award. As theory affirms quality and safety principles are similar, it is hoped that health and safety activities in the company are upto the mark. However, the objective of the both is different.

Health checkups of employees are carried out once in a year. Safety committee comprising of 6 members from workers and the equal from management is functioning at organizational level. Regular quarterly safety meetings are conducted. Safety captain is responsible for the maintenance and communication of H&S situation in his domain. One week safety training is given to 25 employees per year.

6. PIMPRI CHINCHWAD INDUSTRIAL AREA

The Pimpri-Chinchwad Industrial Area is one of the pioneer industrial areas in Maharashtra, established in the year 1962. It is spread over 1224.02 hectores. Total 3247 plots are allotted as industrial units and more than 98% unit-holders have started production activity. Pune district consists of 14 industrial estates where Pimpri Chinchwad is the largest having 22% area of the total industrial area of Pune District.

The source of water supply to this area is Pawana River. The Large scale Industries situated in the PCIA are: TATA Motors (PCBU Plant), TATA Motors (CVBU Plant), TATA Motors (Foundry and TAL), Force Motors (formerly Bajaj Tempo), Premier Automobiles Limited, Bajaj Auto Limited Akurdi and Jugwar Land Rover. Apart from these other automobile companies are situated in Pune District are: General Motors, Fiat India Limited, JCB, Piaggio Greaves Vehicles Ltd., Volks Wagon India and Mercedes Benz.

7. PIMPRI CHINCHWAD MUNICIPAL CORPORATION

The Pimpri Chinchwad Municipal Corporation (PCMC) is established in 1982 and now spread over 176.81 sq. Km. area. The Population as per 2011 census is about 17.00 lakh inhabiting in 16 suburbs. The PCMC area comes under the administrative control of four zonal offices namely: A) Nigadi B) Chichwad C) Bhosari and D) Rahatani. About 81 % residential, 11% non-residential and 1.8 % industrial properties are situated in this area. The main drivers of economy in this region are: Auto and auto ancillary industries, higher educational center, strong development of the IT industry, potential to emerge as the Bio-technology (BT) hub and growing agro and food processing industry.

Pimpri Chinchwad New Town Development Authority is established in 1972 with an aim to provide planned development of housing on 4323 hectares area. It has control over 46 sectors and areas comprising of about 5 lakh population. It has executed 34 housing complexes and developed about 1800 hectares land. It is one of the richest authority providing infrastructural facilities to the residents.

APPENDIX-XI

THE FACTORIES ACT: A BRIEF VIEW

Table 1: Contents of the Factories Act, 1948					
Ch	Title	Sections	Ch	Title	Sections
(1)	(2)	(3)	(4)	(5)	(6)
I	Preliminary	Sect. 1 to 7	VI	Working hours of adults	Sect. 51 to 66
II	The Inspecting staff	Sect. 8 to 9	VII	Employment of young persons	Sect. 67 to 77
III	Health	Sect. 11 to 20	VIII	Annual leave with wages	Sect. 78 to 84
IV	Safety	Sect. 21 to 41	IX	Special provisions	Sect. 85 to 91 A
IV - A	Provisions relating to hazardous processes	Sect. 41 A to 41 H	X	Penalties and procedure	Sect. 92 to 106 A
V	Welfare	Sect. 42 to 50	XI	Supplemental	Sect. 107 to 120

Table 2 : Schedules	
Schedule No.	Title
(1)	(2)
The first Schedule	List of industries involving hazardous processes
The second Schedule	Permissible levels of certain chemical substances
The third schedule	List of notified diseases

Table 3 : A Brief View of The Factories Act and Rules

Sect	Provisions	Brief description	RQ* No.
(1)	(2)	(3)	(4)
A) HEALTH			
11	Cleanliness	Applicable when space is less than 75 sq. mtr. /head. Daily sweeping, Weekly washing, painting once in 5 years, white wash once in 14 months and washable water paint once in 3 years.	H11
12	Disposal of waste and effluence	Approval to arrangements made for treatment and disposal from Maharashtra Water (Prevention and Control of Pollution) Board.	H12
13	Ventilation and temperature	Temperature shall not exceed 30°C and air movement of at least 30 mtrs/min at 1.5 mtr height from floor. Hygrometer shall be installed.	H13 a & H13 b
14	Dust and fumes	Injurious or offensive to the workers. No stationary internal combustion engine shall be operated unless proper exhaust.	H14
15	Artificial humidification	Diameter of pipe carrying steam shall not exceed 50 mm. steam pressure shall not exceed 5 kg/cm ² .	H15
16	Overcrowding	Space 14.2 Cum/worker shall be provided. Height upto 4.2 m shall be considered.	H16
17	Lighting	Depending upon nature of work minimum 20 Lux to maximum 1000 Lux. No brightness more than 5 Lambarts at 30mtr away. Prevent glare.	H17
18	Drinking water	At least 5 ltr/worker. Storage tanks sterilized once in a week. Water testing once in 6 months. Coolers shall be operated where more than 250 workers are working. Sufficient water centers provided.	H18
19	Latrines and urinals	Latrines- At least one for every 10 females and one for every 25 males. Further to 100 one latrine for 50 males. Urinals- One urinal for 50 males and part thereof. Three full time sweepers shall be provided for 500 to 1000 workers.	H19
20	Spittoons	-	H20
	Noise		H20E
B) SAFETY			
21	Fencing of machinery– Dangerous parts	Any mounting part of the machinery shall be securely fenced. It should be safe for operation, examination, adjustment and maintenance.	S21
22	Work on or near machinery in motion	Wear tight fitting clothing provided by occupier. No young person or woman shall be allowed.	S22
23	Employment of young person on dangerous	No young person shall be allowed.	-

	machine		
24	Striking gear and devices for cutting off power	Used to move driving belts on transmission machinery. On and Off key shall be properly placed. Locking shall be provided and maintained to equipments.	S24
25	Self acting machinery	Distance from fixed structure shall not be less than 45 cm.	S25
26	Casing of a new machinery	Effectively guarded so as to prevent danger. All spurs, worms, gear shall not require frequent adjustment.	S26
28	Hoists and lifts	Inspection at least once in every 6 months. Maximum safe working load shall be marked.	S29
29	Lifting machines, chains, ropes and lifting tackles	Examined by competent person for safe work load. Register shall be maintained. Inspection of Chains, rings, hooks carrying molten metal slag shall be carried out at least once in six months. In general case it shall be once in a year. Material shall be malleable CI.	S29
30	Revolving machinery	Mark- maximum speed and shall not exceed. Board.	S30
31	Pressure plant	Provide safety valves. Dial range shall be less than 2 x maximum safe working pressure. 3) Hydraulic test – once in 4 years. Reduces strength after five year use. Not used after 25 years.	-
32	Floors, stairs and means of access	Clean, safe, ease in movement.	S32
33	Pits, sumps, openings in floors	Minimum diameter of manhole chamber, tanks shall not be less than shoulder width + 8 cm. Covers, protection.	S33
34	Excessive weight	Limited to – 55 kg for adult male and – 30kg for female including materials, tools, articles and appliances.	S34
35	Protection of eyes	Risk of eye injury from particles, fragments, excessive light, excessive heat and handling dangerous liquids and gases. Provide goggles.	S35
36	Precautions against dangerous fumes	As per Sect.-33. Competent person should do the work. It shall be marked as confined place.	S36
37	Precautions against explosive or inflammable dust, etc.	Precaution against ignition, accumulation of flammable dust, gas, gas, and fume shall be avoided. Protected against direct sunrays and temperature. Keep minimum stock of flammable liquids.	S36
38	Precautions in case of fire	Provide at least two safe escapes, fire extinguishing facilities, training to workers and framework of sound policies. Use fire resisting materials. Formula for water requirement. Storage tank capacity-4.5 lakh liters. Water pipe – 150mm dia., discharging 4500 lit/min.	S38

39	Power to require specification of defective parts.	If it appears to the inspectors, they may demand drawing, specifications and other particulars or carry out tests.	
40	Safety of building & machinery	If it found imminent danger to human life or safety the Chief inspector may serve order in writing to repair or alter the same.	S40
40 a	Maintenance of building	-	
40 b	Safety officers	B.E./Diploma in Engineering, MBA in safety, experienced, open recruitment. Safety officers for factories employing - 1) 1000-2000 workers – 1 No. 2) 2000 – 5000 workers – 2 Nos. and 3) 5000 – 10000 workers- 3 Nos.	
41	Power to make rules to supplement the above provisions	Safety committee – 250 or more workers for general operations and 50workers or more for dangerous process. Tenure – 2 years, Meeting once in quarter, supported by ‘Health and safety Policy’. Description of MSDS and labeling.	S41
C) WELFARE			
42	Washing facilities	Where injurious or obnoxious substance, dusty process involved. Washing facility upto 200 workers – one for every 20 or part thereof. Exceeding 200 workers – 10+ one for every 50 or part thereof. Water requirement – 30 lit/head maximum and minimum 5 lit/head at the discretion of chief inspector.	W42
43	Facilities for storing & drying clothing	Separate rooms for males and females. Adequate space, pegs, lockers shall be provided.	W43
44	Facilities for sitting	Adequate. Chief Inspector shall see whether the work can be carried out efficiently in sitting position?	W44
45	First aid appliances	First-aid box consisting of 25 items shall be maintained for every 150 workers. Drenching showers shall be provided in sufficient numbers. Health checkups after every six months.	W45
46	Canteens	Canteen shall be provided for 250 or more workers. Dining room shall accommodate 30% workers working at a time. Space 1.1 m ² /head. 15 meter away from latrines and urinals. Rules of accounts.	W46
47	Shelters, rest rooms and lunch rooms	Height-3.75 meters, Area- 1.1 m ² /head. It shall have impervious floor, sound construction, heat resisting roof and waterproof rooms.	W47
48	Crèches	Provided where 30 or more women are working.	
49	Welfare officers		
RQ: Research Question			

SOME IMPORTANT SECTIONS OF THE F.A.

Sect. 91: Allows an inspector to take sufficient number of samples of raw material/ substances used in the factory.

Sect. 91A: Allows undertaking safety and occupational health survey, examination and testing of plant, machinery and worker.

Sect. 97: Imposing punishment of fine if an employee's act found against obligations mentioned in Sect. 111.

Sect. 108: Abstract of the F.A. shall be displayed in the understandable language on the notice board or at conspicuous and convenient place.

The organizations have to submit certificates, licenses and registers of health of workers, painting, humidity, accidents, poisoning, inspections and annual reports in the prescribed format to the Department of Industrial Safety and Health at the end of every calendar year.

Following operations in automobile company come under hazardous process as mentioned under Schedule II of the F.A.:

Sr. No. 3: Foundries- casting & forging, cleaning, smoothing/ roughening by sand or shot blasting,

Sr. No. 14: Painting operation,

Sr. No. 16: Electroplating,

Sr. No. 23. Grinding or glazing of metals and

Sr. No. 24: Manufacturing and handling of Asbestos and its product

Schedule III gives notified diseases and illness. Some of the diseases relating to automobile industry are Silicosis (12), Oil acne or dermatitis due to mineral oil and its base (18), Asbestosis (20) and Noise induced hearing loss (22).