ORGANIZATIONAL CLIMATE FOR TECHNOLOGY CAPABILITY BUILDING IN SMALL FIRMS

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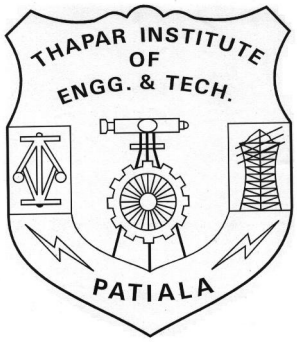

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CERTIFICATE

This is to certified that the thesis entitled "**ORGANIZATIONAL CLIMATE FOR TECHNOLOGY CAPABILITY BUILDING IN SMALL FIRMS**" submitted by **Mr. Rajwinder Singh**, Registration No. 8048205, in partial fulfillment of the requirements for the award of the degree of **MASTER OF ENGINEERING (PRODUCTION & INDUSTRIAL ENGINEERING)** at **Thapar Institute of Engineering and Technology, Patiala** is a bonafide work carried out by him under my supervision and guidance.

This thesis report is of desired standard and has not been submitted in any other University or Institution for the award of the degree.

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(Rajwinder Singh)

ABSTRACT

The advent of liberalization and globalization has brought forth profound economic, social, environmental and technological pressures on the organizations. The fierce competition situation arising because of globalization and liberation is forcing the organizations across the globe to realize that their survival is not feasible in the absence of R&D and innovation practices. If developing countries are to compete effectively in the world market, they must make every effort to develop new technologies.

The objective of the present work is to analyze the technology development capabilities of small scale manufacturing industry especially the cutting tool and machine tool industry in the state of Punjab. The issues explored include, present status and future scope of R&D capabilities of small scale manufacturing industry regarding infrastructure facilities, support from government and academic institutes, reasons for low performance in the area of technology development etc.

The present research work is divided into three phases. The first phase consists of extensive literature survey to determine the essential elements of a technology development programme. These include manpower, infrastructure facilities, government and interaction with external agencies. The first phase also reviews the conditions that encourage creativity culture at the firm level. The second phase presents a detailed survey conducted in cutting and machine tool small scale manufacturing units in the northern region of India. The survey explores the present status of R&D capabilities of this class of industry with regards to R&D policies, infrastructural facilities, investments in R&D, organization for R&D, support from government and academic institutes etc. and the reasons for the low performance of small scale sector in the area of technological innovations. The final phase comprises of a case study. The general objective of building this case study is to prove that employee behavior has a significant relationship with culture employed in the organization. The work has been carried out at “N.S. Enterprises, Panchkula”. The study has used the analysis of variance (ANOVA) technique in an attempt to prove that employee behavior is significantly related to organizational climate.

CONTENTS

1.1 GENERAL

In this modern age, technology is the most important resource to any nation. It is the main driver of a nation's economic development (Beets 1994). The fierce competition situation arising because of globalization and liberation is forcing the organizations across the globe to realize that their survival is not feasible in the absence of R&D and innovation practices. It is high time that the industries wake up and gear up for R&D initiatives to develop cutting edge technologies.

Technology development is considered to be essential for the survival and growth of individual firms. The pressure of competition, which at one time makes some firms innovators, forces others, who are driven by the instinct of survival and growth, to seek to catch up and remove the initial competitive advantage of the innovating firms (Pawl W Hyland 2004). Competition and long-term growth are achieved through efficient technology management, innovation and technological progress. The less developing countries are disposed to learning from technologies obtained from industrial countries, the less their chance of success will be in terms of development of technological capability and the growth of their respective market share.

It has been noted that technology development has become essential because of the acceleration of technological progress stoked by information and communication technology. This has prompted expansion in global production capacities and heightened competition for resources and market. If developing countries are to compete effectively in the world market, they must make every effort to develop new technologies. As globalization intensifies this task will become more urgent and necessary to stay in the market (Mozammel Huq, 2004).

1.2 SIGNIFICANCE OF TECHNOLOGICAL INNOVATION

Technological developments in the area of both product and process technologies are taking place at a very fast pace. The only way a country can survive is through technological innovation. It is not only the means to increase production, improve quality

and develop new products but also increases competitiveness, expands exports and ultimately ensures uninterrupted economic growth. Innovation demands unceasing R&D efforts (Choi, 1989). Major international product breakthroughs have been achieved because of technology push rather than market pull. Companies, which do not have the will and capability to innovate, inevitably end up producing obsolete products (Humble. et. al., 1989).As international competition intensifies and life cycles shorten, the pressure to innovate heightens. Successful innovation has become critical to adjusting and adapting to changes in technology, markets and competition (Pervaiz K. Ahmed, 1998).

The process of developing technology by a company on its own using its R&D and internal resources is called "Technology Development" or "Innovation from Inside". This is the best option for technological growth of the company. Technology development is similar to building a house according to one's own requirements and designing it in such a manner that gives full satisfaction, Technology acquisition is more likely buying an already built older house or going in a rented house. Because internal personnel are more aware of company's motives and resources, the developed technology satisfies company's needs perfectly.

The greatest advantage that indigenous technology gives is the competitive edge over others because it is not available to other companies in the market. An indigenously developed technology is the exclusive property of the company and it strengthens the company internally.

1.3 TECHNOLOGY STATUS IN INDIA

According to Global Competitiveness Report, 2003 India ranks at 64 out of 102 nations on technology index. India ranks 31st in the export performance among exporting countries in the world. India's share in the world export is 0.75% (Economic Survey 2004-2005).

The number of patents obtained by the Indian firms is almost negligible when comparing with the developed countries of the world. India is nowhere in the first 25 core technology innovating economies (Global Compitiveness Report, 2003).

The investments in R&D are very low, ranging between 0.2-0.5 % of the total turnover. The total investment in R&D in U.S is about 80 times, in Japan about 45 times, in France and Germany about 20 times, in South Korea about two times as compared to what is in India.

An analysis of R&D expenditure in India shows that government funding for technology in specific sectors is not in proportion with the size of domestic or global market of different sectors.

The gross domestic product for the year 2004-2005 was 1430.5 thousand crores. The total development money allocated for all different sectors was 162947.24 crore i.e. only 11.4 % of GDP. The spending in agriculture and allied services 2.8%, rural development 4.3%, energy 28.7 %, transportation 18.4%, and social service 23.3%. Spending in industrial development was just 5.1% from which 4.2 % was invested in large and medium scale industries and only 0.9 % in small-scale industries.

Over 80% of the funding for R&D in India comes from the government and almost all of this is invested in government run organizations. According to global competitiveness report 1999, India stood at number 39 on private spending on R&D among 52 developed and emerging economies.

India as a whole is in an advantageous position by way of having an extraordinary large pool of trained scientific and technological manpower. The quality of technical education available to small sector of students is also high with the IIT's being of international standard. But almost thirty percent of the better graduates from IIT's eventually go abroad.

1.4 SMALL SCALE MANUFACTURING INDUSTRY IN NORTH INDIA

Small scale industries are undertaking having investments in fixed assets in plant and machinery whether held on ownership terms or by lease or by hire purchase not exceeding Rs. 1 crore. In India, the small scale industries assume special significance because of their employment potential. They also serve as a useful ancillary to large industrial units. The capital investments required per unit of output and per unit of input for small scale units is very low. This is of particular importance to labour abundant and

capital scarce economy like India. It has been estimated that turnover to capital invested is approximately 4.62. SSMI contributes almost 40% of the gross industrial value added in the Indian economy. It plays a major role in India's present export performance. About 45% of Indian exports are contributed by this sector.

Though there have been striking increase in the number of small scale units,, industrial sickness in this sector has assumed very serious proportion. Among the main causes are shortage of raw material and power, lack of space for expansion, shortage of finance, under utilization of capacity, apathy of management towards timely modernization and renovation programs, product and market diversification and technological obsolescence. The absence of state of the art technology which alone can ensure high quality, high productivity and competitiveness is one of the major handicaps. To overcome this, the industry needs to create an innovative culture in the organization which is conducive for technological innovations.

1.5 OBJECTIVES OF THE WORK

The objective of present study is to analyze the technology development capabilities of small scale manufacturing industry in north India. The following issues will be explored.

i. Present status and future scope of R&D capabilities of small scale manufacturing industry regarding infrastructure facilities, workforce availability, and support from government and academic institutes.

ii. Reasons for low performance of small scale industry in the area of technology development.

iii. Correlation between determinants of organizational culture with employee behavior to enhance organizational creativity.

CHAPTER - 2
LITERATURE SURVEY

2.1 INTRODUCTION

Technology development is a very important issue for organizations to survive in today's competitive world. In this chapter extensive literature survey has been presented to determine the essential elements of a technology development program. The literature reveals that to assess the status of technology development efforts of an organization, there are four key areas which have to be taken care of. These include workforce for creative input, technology infrastructure facilities available for experimentation and analysis, government support to the technology development efforts and collaboration of the organization with external agencies to generate innovation. The chapter also reviews the conditions that encourage creativity culture at the firm level.

2.2 WORKFORCE

There should be adequate availability of multi-skilled labor with good education level

and technical know-how. The organization should provide formal training to the employees to enhance their creativity and innovation skills. The employees in the organization should appreciate the importance of developing new processes and products through indigenous research to meet the existing cut-throat competition. The organization should have adequate scientific and technical manpower to carry out R&D work. There should be high encouragement to employees and workforce to undertake R&D work/innovative work and obtain patents. In case, the company makes profits as a result of innovative efforts of employees, their contribution should be recognized by some means like share in profits made on account of

innovation, increment in salary, promotion in designation, fixed monetary reward, recognition through appreciation letter etc. In case an R&D project failure occurs, there should not be strict action against members of the project team. The management should advise employees to learn lessons from current failures to improve for future.

The following paragraphs bring a detailed review of literature on manpower for creative input.

The dynamics of workforce skill levels has a considerable impact on plant-level performance that is commonly overlooked by managers of manufacturing operations. Assigning skilled permanent workers to upstream build operations is superior to other policies deploying temporary workers, regardless of lot size or product complexity (Jeff K. Stratman et al., 2003).

A national survey conducted by LSU's Public Policy Research Lab reveals that workforce issues such as labor productivity, availability of skilled labor force and labor costs are the chief concerns of business leaders.

An important prerequisite of technology capability building is a labor force which can select, install, maintain, assimilate, design, manufacture and even create the technology. The mass educational development which took place in South Korea (and also in Singapore, Taiwan and Hong Kong) preceding their success in industrialization is often cited as a model of appropriate preparation (Mozammel Huq., 2003).

Over the last decade, a consensus has emerged that a skilled workforce lies at the heart of the Nation's economic vitality. Perhaps the largest challenge facing today's employee and employer is the need to continually upgrade job skills during the course of a career. Large companies are the most likely to have formal worker training programs. Small companies, which employ the majority of the workforce, typically do not have the resources for comprehensive workforce training programs. There is consensus about the importance of a knowledgeable, flexible workforce as a key to economic performance.

Successful enterprises are capable of discovering business opportunities and thus of investing in useful knowledge, innovative ideas and entrepreneurial behavior of all employees. Creative and flexible employees would be able to satisfy the needs of

industry and high value added services (Report on implementing EU Charter., 2002).

In both services and manufacturing sector appropriate training of the employees is essential. A well trained employee can increase the productivity of the company thereby increasing its competitiveness (Abhijeet Karkare et al., 2004).

As knowledge resides only in the human mind, it can only be harnessed by focusing on increasing human capabilities through the process of increased communication, cooperation and linkages, both within the enterprise as well as across enterprises and knowledge producing organizations (Dhawal et al., 1999).

Human capital is an intangible asset with the capacity to enhance an economy's productive ability, the inventiveness of local industry and the attractions of a particular investment by raising work related skills. For long term sustainable development investment in human capital and acquition of technological know how should be there.

In order to be competitive in today's world of globalization and liberalization Indian organizations have to use of advanced technology, technical manpower, and innovative research and development (Rakesh Narain et al., 2004).

Successful organizations in today's business environment are those who manage their human resources well. It includes effective manpower planning, recruitment and selection process, realistic performance plans and development oriented performance appraisal, effective learning system providing ample learning opportunities with the help of training, performance guidance and other mechanism such as mentoring. It also consist of mechanism to inculcate sense of pride in work, high degree of organization commitment, introducing such organizational development systems as personal growth labs, creativity workshops, quality circles, Kaizen team building exercises etc (Arif Hassan et. al., 2006).

Organizations perform better when they are making investment in training their employees and broaden their skills (Hollbeche., 1998).

In order to increase employee's creativity and innovation skills is by giving them appropriate recognition and reward for their creative work (John W. Koning., 1998).

Employee training had direct and positive effect upon technological innovation in firms. In order to achieve long term gains variety of practices for facilitating employee's high performance, intrinsic motivation, teamwork attitude and enhancing cross functional and cross cultural competencies are required in order to achieve high compatibility among work teams and technology innovation (Zhongming W., 2005).

2.3 INFRASTRUCTURE FACILITIES

Appropriate funding should be available for the small scale industries for technology related work. Dedicated laboratories available with state of the art equipment for experimentation and subsequent analysis. State of the art production equipment, workstations, machining centers, CNC machines, robots etc. should be available for R&D work in the organizations. Management should clearly earmark funds for R&D activities aimed at innovations for new product and process developments.

Government should increase spending on infrastructure through more public-private participation. Old laws should be replaced with newer ones which are more liberal and foster growth e.g., Electricity Act (2003) which increases private sector participation is a step in right direction (Abhijeet Karkare et al., 2004).

Financial development affects industry growth. Poor financial development results in credit constraints, limiting the growth of firms dependent on external finance. This reduces the competitive threat to other firms in the industry, inducing changes in prices and output (James Costantini., 2005).

To enhance employee's creativity organization structure should be such that it should have adequate funds, materials, facilities, and information support system to support innovation and technological advancement (Amabile., 1996).

For better technological advances new infrastructures, mainly telecommunication, information technology, modern production systems, new strategic thinking practices are needed for hypercompetitive environment (Carlos Sheel., 2002).

Highly innovative companies put processes in place readily to accommodate new ideas. To accommodate new ideas there should be adequate funds to support innovation (Jack Mc Gourthy et. al., 1996).

The key success factor for technological innovation systems is through developing adequate financial program that support training and educational programs for innovation, and building physical infrastructure for enhancing organizational capabilities (Mathews.,2001)

Infrastructure i.e. advanced equipments and resources is one of the most important factor which is to be employed to support public and private projects regarding research and development, innovation and technology modernization. (Smilor et al. 1988).

New innovation system includes process capability and architecture development. Process capability is defined as people with knowledge, tools, technology, and process that organizations practice where as architecture constitute the physical infrastructure i.e. modern production facilities and systems (William L. Miller., 1995).

2.4 GOVERNMENT CORROBORATION

The government can support small scale sector through the following initiatives.

There should be adequate supply of raw materials and power at reasonable prices. The government should support the R&D initiatives of industry by allocating fixed funds to each industry as a proportion of its annual turnover, rewarding entrepreneurs for contributions in the field of technology development, organizing seminars for industry employees to increase awareness about new & raw technologies, providing government laboratories for developmental projects at subsidized rates, helping the industry in acquiring imported technologies, sponsoring employee training programmes etc.

The following paragraphs bring forth the literature review in this regard.

Factor conditions such as government policies, private research laboratories etc. are the main source of organization learning. Government policies in most countries assist organization to innovate through funding, assistance, consultancy, and other policies (Afuah., 1998). The government policies should be such that they support technological innovation as they are the important for social and economic growth of the nation. Government must increase funding for R&D projects for achieving technological advancement in the country (Brief A.P., 1996).

Government can help organization by providing funds for R&D project, by rewarding the organizations who are performing well, and by providing laboratories for carrying R&D work (Pawl W. Hyland., 2004).

Increase in technological innovation demands that government should increase spending on research and development, as now it is an important factor for economic and social development (Shantha Liyanage., 2003).

Government can support the organization by providing funds for developmental activities at low rates of interest and by building laboratories for carrying out R&D work (Thomas., 1993).

The Government can play an important role in enabling all industries to be creative. It can do this through: correction of market failures, providing support where the benefits of creativity and design are wider than those for the firm itself or where there are gaps in the efficient supply of finance by the market. There may be an important role for the government in facilitating networks between creative services such as design and other sectors; the formal education system, the supply of creativity and design skills etc (DTI Economics Paper No.15., 2005).

2.5 COLLABORATIONS

The process and product technologies to be employed in the organization can be acquired from abroad, within the country or may be developed in collaboration with some external agency. The industry should have interaction with regional academic institutes as it would help in solving technology related problems of the organizations. Experts from academia on how to make R&D an integral part of firm's working, expert lectures by academicians on upcoming key technologies, training of firm's employees at academic institutes in specialized fields and skills through short term courses, formation of R&D teams comprising of members both from industry and academic institutes to work mutually on R&D projects by sharing their specialized knowledge, use of academic institutes labs by industry for conduct of experiments and analysis of results, combined supervision of M.E., Ph'D dissertations by industry-institute personnel on industry oriented problems etc are other benefits of interaction. University-industry collaboration also has a positive

influence on productivity as measured by the production function (Motohashi., 2004).

Collaboration with universities is expected to promote greater firm-level technical innovation resulting in greater output and product quality. Innovation has long been recognized as a social process shaped by the institutional structures in which it is embedded. Although the increases in workers' productivity in industrial countries have been driven largely by technological advance, investments in physical capital and the growth of human capital, are factors profoundly shaped by institutions. The institutions that support technological advances are thus extremely important for long-term economic growth, since technology mediates the introduction of new products and processes into the economy (Oyeyinka., 2005).

In order to achieve the goal of improving industrial infrastructure, to provide support and incentives for the firm to learn, innovate and lead to world class competitiveness, the organizations have to interact with external organizations (Cook P., 2001).

In order to increase organization's R&D performance and effectiveness, organizations must interact with the external R&D laboratories. This interaction calls for clear communication so that problem of the industry is clearly defined and full involvement of the external laboratory is obtained. In order to achieve success in building new technologies, R&D performance is a must and best results can only achieved by interacting with external R&D laboratories (Easterby et. al., 1998).

Organization should start building social interaction culture for building and adapting new technologies. Organization must interact with universities in order to know about the new technologies in the market and R&D institutes for building the same (Kling et. al., 2000).

There are many works by academics and practitioners on the need to find a symbolic relationship between academia and industry i.e. organization are implementing those strategies that are build by the academicians (K.C. Chan et al., 1994).

For developing new technology, it requires a whole range of new skills and dynamic competencies. These competencies are often renewed in the process of managing innovation through organizational changes within and outside the firm.

Technological solutions are often costly and results are unpredictable, so there has to be collaboration with other R&D institutes for developing and implementing new technologies (Patric S. Poon et. al., 2003).

Organizations and individuals dedicated to industrial development agree that one of the main producers of wealth and prosperity of industrialized countries has been existence of well coordinated and sustainable system that supports interaction with other organizations and forming networks, capable of converting technological innovation assets into building new technology (Scheel., 2002).

In order to convert new ideas into technological breakthrough, there must be inter-industry collaboration. This is because R&D carried out within the industry includes activities of different nature. Managerial studies have shown positive relation between building inter-industry relation and doing effective R&D in building new technological advances (Vittoria et. al., 2000).

2.6 CREATIVITY CULTURE

The atmosphere of the workplace or, to put it another way, the corporate culture directly affects employee's ability to work effectively and efficiently and therefore determines the productivity of the company. (Alexander., 2006). The culture of an organization has been defined as 'the shared assumptions or ways of doing things of people working in that organization'.

The ability to make or otherwise bring into existence something new, whether a new solution to a problem, a new method or device, or a new artistic method or form is defined as creativity. Creativity is not a tangible asset like mineral deposits, something that can be hoarded or fought over or even bought or sold. Creativity is a common good like liberty or security. It's something essential that belongs to all of us, and that must always be nourished, renewed, and maintained—or else it will slip away. (Michael Devine 2006)

2.6.1 CREATIVITY DEFINED

Creativity itself has been defined in many different ways over the years. Three particular definitions seem relevant to the economics of creativity in a business context:

> **'S*eeing what everyone else has seen, and thinking what no one else has thought.'*(Einstein, Feynman, 2005)**
>
> **'I*maginative activity fashioned so as to produce outcomes that are both original and of value.'* (NACCCE, 1999)**
>
> **'C*reativity is … the production of novel, appropriate ideas in any realm of human activity from science, to the arts, to education, to business or to everyday life.'* (Amabile, 1997)**

First of these definition provides some insight into what it takes to be creative. The second and third descriptions share a sense of imagination fashioned and re-fashioned until something valuable emerges.

2.6.1 FOSTERING CREATIVITY

Successful companies will look not only to R&D or design as specific creative inputs, but seek to promote creativity in all parts of the organization. Management practice and behavior have a strong influence on creativity and the effective integration of design. More successful outcomes tend to be generated where creativity and design are aligned with strategy. Technology can support creativity by making it easier to collaborate and to acquire knowledge, and through supporting design prototyping.

The extent to which a firm develops effective networks will influence its ability to collaborate and to be creative. Networks can embrace users as well as suppliers, with some exciting innovation coming from closer involvement of customers in the process. Firms also benefit from other creative firms through knowledge spillovers if they have the capacity to absorb and exploit this knowledge.

Factors that influence creativity beyond a firm's direct control include culture and place, education, and competition and regulation. The ability of firms to protect their investments in creativity and design is important to ensure that they have the right incentives to innovate. Recent years have also seen new emphasis on the role of culture and diversity in attracting a creative workforce.

2.7 CREATIVITY CULTURE FACTORS

Swann and Birke (2005) emphasises the role of a creative workplace culture or climate. Figure 2.1 suggests the factors that will contribute to organizational creativity. The factors are divided into two broad categories.

(i)Determinants of creative culture

(ii)Employee behavior

2.7.1 DETERMINANTS OF CREATIVE CULTURE

1. Reward and Recognition

Establishing a reward-for-creativity program in the organization is an old strategy for encouraging creative endeavors by organization's members. These programmes have been known to increase innovation by executives and employees.

Organizations that aim to support the value of creativity within their environments should consistently reward creativity, but at the same time they should avoid using money to ``bribe'' people to come up with innovative ideas. Financial rewards can have a negative effect on creativity, especially when employees perceive the financial incentive as a means of being bribed or controlled (Wayne Morris., 2005).

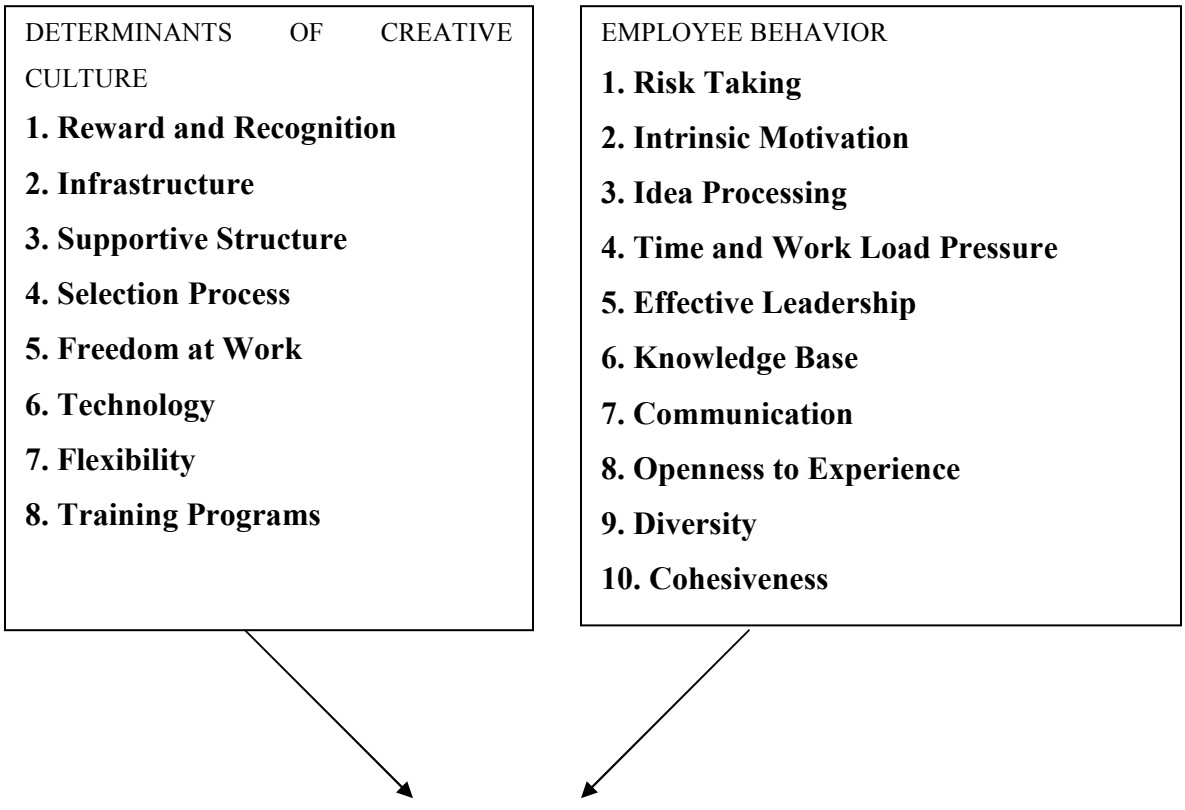


Fig. 2.1 Organizational Creativity Culture

Rewarding individuals for their contribution to the organization is widely used by corporations. However, while recognition can take many forms there is a common distinction: rewards can be either extrinsic or intrinsic. Extrinsic rewards are things such as pay increases, bonuses shares and stock options. Intrinsic rewards are on internal feelings of accomplishment by the recipient. Personnel should also be rewarded for risk taking, experimenting and generating ideas. Intrinsic rewards like increased autonomy and improved opportunities for personal and professional growth may support the innovation process (Arad et. al., 1998).

2. Infrastructure

There should be adequate resources in organization to promote creativity culture. There should be laboratories for experimentation, modern production systems, and availability of funds for carrying out projects.

Employees will be creative when they are given adequate resources to conduct their work (Delbecq and Mills., 1985).

Lack of such resources as time, materials and information can damage commitment to the assigned objectives (Francisco et al., 2003).

Innovation and creativity of workforce is enhanced by having appropriate resources. Researchers have always related infrastructure positively with organization creativity. In order to build organization culture that stimulates creativity and innovation, availability of adequate infrastructure is important (E. C. Martin et. al., 2003).

Managers must decide on the funding, people, and other resources that a team legitimately requires to complete a project. There is a 'threshold of sufficiency', and when resources are added above this threshold, creativity is not enhanced. Below that threshold, a restriction of resources can limit creativity since employees will be

more occupied with finding additional resources and not with actually developing new products or services (Amabile., 1998).

The key success factor for technological innovation systems is through developing adequate financial program that support training and educational programs for innovation, and building physical infrastructure for enhancing organizational capabilities (Mathews., 2001).

3. Supportive Structure

Innovation should begin with support from management. The top echelons should promote an organizational climate in which workers are recognized for their efforts towards innovation, which, though contrary to the short-term achieving of objectives, should be encouraged and valued for the long-term results of their efforts in terms of innovation (Francisco et al., 2003)

Organizational structures that provide a mechanism for developing and sharing new ideas facilitate creativity (Amabile et al., 1996).

It has been seen that innovation is enhanced by organic structure rather than mechanistic structure i.e. innovation is increased by highly participative structure and culture. A flat structure, autonomy and work teams will promote innovation, whereas specialization, formalization, standardization and centralization will inhibit innovation (E. C. Martin et. al., 2003).

4. Selection Process

Values-based companies are aware that hiring new members with a mature psychology is an important proactive strategy in preserving their organizational culture. Their hiring practices may give greater priority to values and attitudes than to skills and formal education (Harald S. Harung, 1999).

The values and beliefs of management are reflected in the type of people that are appointed. Apart from personality traits like intelligence, knowledge, risk taking, inquisitiveness and energy, a value like diversity is of utmost importance in the appointment of creative and innovative people (E. C. Martin et. al., 2003).

It has been seen that if the staff of the organization is competitive, the organization is in a better position to generate better ideas in order to address the top competitive

issues. By having a competitive staff, the organizations can rely on them and can push the boundaries of there technical competence into the areas of the unknown or the new – to come up with creative and innovative ideas (Elspeth Mc Fadzean., 1998).

5. Freedom at Work

To find original solutions to the problem employees require to have the freedom to break the rules (Nemeth, 1997) and feel safe about their ideas (McGowan, 1996). This means building an organization where failure is tolerated, with no fear of submitting a foolish idea, where creativity is encouraged in staffing, strategy, branding and business processes too (O'Reilly., 1997).

One can say that the need for autonomy, i.e. freedom in participation in decision making which falls between self-esteem and self-actualization should be positively related to creativity (Tarik Mikdashi., 1999).

Employees will be creative when they are given a high level of autonomy and control over their own work (King and West., 1985).

Management should believe in personnel and encourage them to be more creative by allowing them more freedom. In other words empowering them instead of controlling them (E. C. Martin et. al., 2003).

The literature study reveals that the degree to which employees have freedom and authority to participate in decision making and solving problems determines the level of empowerment, which is positively related to the level of creativity and innovation in an organization (Wayne Morris., 2005).

6. Technology

Technologies such as computer simulation enable designers to speed up design iterations and also reduce their costs. In the automotive industry for example, computer generated crash tests reduce development times by avoiding the need for as many prototypes in the design process. They also provide better data than that derived from physical prototypes. A set of technologies such as high bandwidth internet, modeling and simulation tools, virtual reality and rapid prototyping are

emerging to enable, create and implement innovation. The emergence of these complementary technologies is leading to an intensification of the innovation process This is important to inventors, researchers and small entrepreneurs looking to develop innovative technology, as well as technology firms striving to create new innovations, manufacturers conducting research and development (R&D) to generate new products, investors looking for new growth companies, and government officials seeking to find ways to spur and support economic development (Russell W. Bessette., 2004).

The rapid technological advancements and the fierce competition for market share have contributed to the unprecedented increasing pace of change. Therefore organizations should be ready to rearrange their resources to meet the new demands (Constantine Andriopoulos., 2000).

Companies can achieve competitive advantage by fitting their business strategies to the way in which new technology implementation is managed. Thus appropriate use of technology can assist the innovation process and overall competitiveness (Damian Hine., 1999).

7. Flexibility

For economies to be successful in this competitive environment everything possible must be done to ensure that management and staff are truly flexible in their attitudes, work practices and systems. A flexible approach involves greater emphasis on features like multi-skilled workforces, reintegration of work tasks, short-run batch type production and the development of market niches (Damien Garrihy., 1997).

Unnecessary or perceived constraints in the workplace such as complicated rules, procedures, slow decision-making processes etc interfere with daily work and prevent new ideas from being accepted. So, flexibility should be there for enhancing innovation (Alaxzander Karpidis., 2006).

8. Training Programs

There should be effective training programs in the organization to improve employees skills and to develop their knowledge.

Organizational culture that supports a continuous learning orientation should encourage creativity and innovation. By focusing on being inquisitive, encouraging personnel to talk to one another (e.g. to clients within and outside the organization to learn from them), keeping knowledge and skills up to date and learning creative thinking skills, a learning culture can be created and maintained (Elspeth Mc Fadzean., 1998).

Due to technological enhancement there is a great pressure on organization in order to develop and adapt new technologies to sustain competition. For this, there must be an effective training program. Creativity training involves both individual and group problem-solving techniques (Scott W., 2001).

An organization culture that has an effective training programme for enhancing employee's creativity is in better position in developing new technologies (Elspeth Mc Fadzean., 1998).

Innovative firms are found to have introduced more computerized systems and incremental and technological changes, to have more interactions with their external environments, to have organized more training programs aimed at encouraging creativity and innovation, and to have more creative climates when compared to the less innovative ones (M. Zain Mohamed. , 1999).

2.7.2 EMPLOYEE BEHAVIOR

1. Risk Taking

Research has shown that creative people are risk takers and enjoy the work they do. They have the knowledge to do original work, the intellectual style to judge the values of ideas and generate novel ideas (Sternberg et al., 1997).

To engage in creative efforts is not a risk free proposition. Risk can be defined as the extent to which there is uncertainty about whether potentially significant and/or disappointing outcomes of decisions will be realized (Sitkin et al., 1992). Edison invented many useless contraptions. In science in general, it has been suggested that the search for new discoveries carries with it the inherent possibility of failure, a prospect which may threaten the innovators' economic and or social status (Silver., 1983).

Similarly, one might expect that employees in organizations could experience such a risk when they consider the manner in which to pursue their work (Deming., 1986).

It is important to note that when employees produce creative efforts they assume risk, while, technically, creative outcomes do not imply risk. Conversely, creative outcomes, which by definition are deemed novel and useful by relevant others, do not entail risk. However, in reality an employee engaged in creative effort does not have a prior knowledge of the outcome of his or her work. They are likely cognizant of the possibility that, ultimately, their work may or may not be judged to be creative (Todd Dewett., 2004).

The assumption that risks may be taken as long as they do not harm the organization will not encourage personnel to be creative and innovative by experimenting and taking risks. It is important that a balance should be reached in the degree to which risk taking is allowed (E. C. Martin et. al., 2003).

The issue of perceived risk must be central to the discussion of employee's creative efforts. While this topic has received some attention in the study of work roles explicitly requiring creativity, it has received scant attention in the examination of employee creativity among employees in general. Specifically, it is suggested that one's WTR (Willingness To Take Risk) should be a central predictor of employee's creative efforts (Todd Dewett., 2004).

Even where design is of a high quality, some projects will fail. Where the market for design is competitive, some failures are inevitable – it is part of the creative process (DTI Economics Paper No.15, 2005).

2. Intrinsic Motivation

Several authors have noted that motivation is an essential precondition for creative action although the origin of the motivating force may differ from one creative act to another. Crutchfield, for instance, suggested that not all creative acts are motivated in the same way, but can be broadly categorized into extrinsic or 'ego-involved' and intrinsic, or 'task-involved' creative acts (Crutchfield., 1962). This distinction was emphasized by Amabile (1996), and is broadly equivalent to Heinzen's (1994) two categories of creativity: reactive and proactive. Reactive creativity occurs as a function of some external stimulus, and is often goal oriented.

This problem-solving goal is associated with a deductive reasoning process which will depend for its success on close consideration and analysis of the available facts. Proactive creativity, on the other hand, is internally driven and produces results that may be less directly related to the solution of a particular problem. The products of this cognitive style may be more revolutionary than evolutionary, and may not always be directly applicable to an immediately identifiable need. Employees within creative environments increasingly look for autonomy so that they can use their personal initiatives. Therefore, creative organizations are required to identify ways for motivating, and developing their high caliber employees (Constantine Andriopoulos., 2000).

However capable people are, there is no guarantee that just being employed will cause the full application of that capability. The motivation to contribute must be there. Studies show repeatedly that the most important motivator is the nature of work itself and its appeal and interest to the person. Matching people to roles that brings interest and enjoyment is thus a key process. Many resignations has come about because ``they asked me to do something I didn't want to do'' - and an asset is lost. However, every individual has his or her own set of drivers - that which they seek in work and life; their ambitions and goals. Some seek special recognition; others are driven by money or power - each individual has to be understood (Andrew Mayo., 2000).

3. Idea Processing

There should be effective idea processing in the organization. Ideas should be judged and evaluated properly defining merits and demerits of it. Culture developed should be such that ideas come from every corner of the organization. By developing this type of a culture organizational creativity and participative climate can be enhanced.

Creative ideas need to be implemented effectively in order to succeed Managers should ensure that employees are committed to achieve a first-rate performance. This can be undertaken by developing achievable objectives (both as an organization and as individuals) and by producing a strategy for fulfilling them (Anderson et. al., 1992).

Evaluation of creative performance should be fair and supportive (Amabile et al., 1996), and should be chiefly informational (Oldham et. al., 1996).

4. Time and Work Load Pressure

Drazin et al. (1999) suggest that the explicit or implicit question generally posed by the workers is "How do you increase creative outputs in organizations?" An interesting oversight in this dialogue has been the failure to realize that creative outcomes are not easily obtained. Creativity often requires considerable time (Amabile et al., 1987; Burnside et al., 1988; Gruber et al., 1988; Sethia, 1989). Stated differently, creativity in the organizational sense – ideas or actions deemed by relevant others to be sufficiently novel and useful – is not a frequently occurring phenomenon relative to the maintenance of the status quo.

There should be appropriate amount of time to think about a problem and to explore perspectives and alternatives – as opposed to being required to employ a prescribed approach (Amabile et al., 1988).

Time pressures are positively associated with aspects of performance such as usefulness, innovation, and productivity, although pressures that are perceived as too great are defeating in that they are associated with lower performance (Farris., 1972).

Two main resources that affect creativity are time and money. Ambile stresses explicitly the importance of the quantity of time and money that should be given to employees, since there can either support or constrain creativity. For instance, when managers do not allow time for proper experimentation, they are unwittingly standing in the way of the creative process (Amabile., 1998).

5. Effective Leadership

Leadership is defined broadly as the process affecting the choice of objectives of the group or organization and the perceptions of followers (e.g. creative individuals) (Yukl., 1981).

High quality leadership is a major asset of an organization. Conversely, poor leadership not only affects the morale but may also give rise to complacency, failure to respond to markets, poor strategic choices and many other evils. We see

immediate effects on market valuations when key leaders leave or join organizations - measurable in real value (Andrew Mayo., 2000).

Effective leadership is a critical factor to enhance organizational creativity. In fact, without effective leadership very few other factors will work for success of creativity in an organization. Leaders have a big part to play in enhancing organizational creativity. It is the task of organizational leaders to provide the culture and climate that nurtures and acknowledges innovation at every level (E. C. Martin et. al., 2003).

Leaders should possess the ability to constitute effective work groups. Work groups should reflect a diversity of skills and consist of individuals who trust and communicate well with each other, challenge each other's ideas in constructive ways and are mutually supportive. Leaders should also be in a position to balance employee's freedom and responsibility, without domination or control, while at the same time they have to show concern for employee's feelings and needs, generously recognize creative work and encourage employees to voice their own concerns, provide feedback, and facilitate skill development (Amabile., 1998).

The leader's vision is therefore a key factor when managing creative individuals (Locke et al., 1995).

The relationship between leader moral development and ethical climate is moderated by two factors: the extent to which the leader utilizes his or her cognitive moral development (i.e., capacity for ethical reasoning), and the age of the organization. Specifically, the influence of the leader's moral development is stronger for high utilizing leaders, those whose moral actions are consistent with their moral reasoning (Marshall et al., 2005)

The outcomes of authentic leader–follower relationships include heightened levels of follower trust in the leader, engagement, workplace well-being and veritable, sustainable performance (William L. Gardner., 2005).

6. Knowledge Base

Simon places considerable emphasis on "extensive background knowledge in potentially relevant areas" and regards expertness as the prerequisite to creativity. His reasoning is that creativity arises from new insights, and "the ability to achieve

sudden insights into situations by recognizing familiar features in them depends on having stored a great deal of knowledge" (Simon, 1988).

Research evidence and practical experience indicate that creative individuals are noticeably more intelligent than average and that a high IQ is especially important in scientific and technical fields. However within any particular field, there are no systematic differences in the intelligence levels of more highly creative individuals and comparatively less creative individuals (Firdaus E. Udwadia., 1990).

7. Communication

There should be maximum communications across all departmental and hierarchical boundaries for creative performance (Andre P. Walton., 2003).

Open flow of communication is crucial for encouraging creativity in social settings and, thus, norms that promote open information exchange should facilitate creative performance (Amabile., 1988).

Earlier there was lack of information system in the organization, but nowadays because of technological advancement there is electronic mail, electronic news feeds and intranet facilities which have enhanced the organization's information system. Effective communication determines the personnel's understanding of the vision, mission and values of the organization and how these can be transformed into measurable individual and team goals and objectives (E. C. Martin et. al., 2003).

Organizations should be encouraged to promote open channels of communication among all levels of management so that no ideas are brushed aside.

8. Openness to Experience

Openness to experience is a personality trait associated with individual creative performance in organizations (George et al., 2001; Woodman et al., 1993). Open individuals actively seek out new and varied experience, and are inclined to be reflective and thoughtful about the ideas encountered (McCare et al., 1997).

Across a number of studies, individuality was found to correlate with openness to experience including aesthetic openness and intellectual curiosity, and such similar constructs as breadth of interest, divergent thinking and permeable boundaries (Dollinger et al., 1996).

Group members who share goal congruence will work towards their objectives together rather than working with hidden agendas and conflicting interests, which will ultimately reduce the efficiency of the group. In addition, the group will work more effectively together if it is supported by a competent facilitator. The facilitator helps the group to reach its objectives and can help the group to look at the situation from different perspectives by using a variety of creative problem solving techniques (McFadzean and Nelson., 1998).

Managers can influence creativity in the way they design work groups. Work groups conducive to creativity have diversely skilled members, an openness to new ideas, high levels of interpersonal trust, commitment to the work, and communication where members constructively challenge each other's ideas (Martins., 1996).

9. Diversity

Creative employees are encouraged to get involved in a diverse range of projects or teams related to the projects. The portfolioing process is of high importance to the financial survival of any creative organization. It is a crucial issue in any organization to maintain a high level of cash flow so that all employees are kept financially satisfied. This can only be achieved as long as the creative organizations are involved in different projects (Constantine Andriopoulos., 2000).

10. Cohesiveness

An organizational climate characterized by strong cohesion, open communication and freedom to express opinions is required. Cohesion among the organization's members is vital, since innovation requires the integration of the dispersed pieces of knowledge within the area. Therefore, in order for the necessary knowledge in the innovation process to be in the physical and mental place in which it is to be used, there needs to be an organizational climate of cohesion, since the transactions on knowledge have a high degree of uncertainty and it is difficult to establish effective formal controls on them (Constantine Andriopoulos., 2000)

CHAPTER- 3
TECHNOLOGY DEVELOPMENT SURVEY

3.1 INTRODUCTION

In this chapter a detailed survey carried out in small scale manufacturing units in north India particularly in the state of Punjab with the objective to assess the status of technology development through indigenous research is presented. The survey explores the present status of the R&D capabilities of the specified industry with regards to R&D policies, investments in R&D, infrastructural facilities, organization for R&D, support from government, academic institutes etc. and the reasons for the low performance of Indian industry in the area of technological innovations.

3.2 METHODOLOGY ADOPTED

For survey, the first task was to design a questionnaire which seeks information on the status of technology development and its various aspects in the small scale engineering industry.

The survey was conducted by undertaking personal visits and by mail. The responses are compiled and are analyzed to find the status of various companies with regards to technology and its development, the status of each aspect as represented by a question or a set of questions and the existence of departments, facilities and programs in the industrial units aimed at developing technology through indigenous research. Correlation tables for technology development and the various factors that affect it have been obtained. Statistical techniques of standard deviation, central tendency etc. has been used in the analysis.

3.3 RESPONSE TO THE SURVEY

A lot of efforts were made to get maximum response from the industry. The questionnaire was sent to 76 small scale manufacturing units belonging to cutting tool and machine tool industry. The response of the industry is presented in Table 3.1.

Table 3.1 Response of the Industry

S.No.	Type of Industry	Questionnaire sent to	Response	
		No. of Companies	Number	Percentage
1.	**Cutting Tool & Machine Tool Industry**	**76**	**35**	**45**

A total of 35 cutting tool and machine tool industries out of 76 responded to the questionnaire.

The analysis of the response has been carried to assess the following:

1. **The main factors impairing the performance of the small scale manufacturing industry.**

2. **The overall standing of each company, leading to classification of companies into very good, good, fair, poor and very poor classes.**
3. **How each aspect as represented by a group of questions is being looked after in industry.**

3.4 FACTORS IMPAIRING INDUSTRY PERFORMANCE

Section 2 of the questionnaire contains a question (Q. No. 16) seeking information regarding factors considered responsible for causing sickness in the small scale manufacturing industry (SSMI). The information has been tabulated and presented in the table 3.2 and Fig. 3.1. Table 3.2 shows the scores achieved by different organizations in different factors. The number of companies scoring 4, 3, 2 and 1 on a 4 point scale has been shown and total points secured by all the 36 companies in a particular aspect has been calculated and its percentage score based on the calculations has been made and tabulated in the last column of the table.

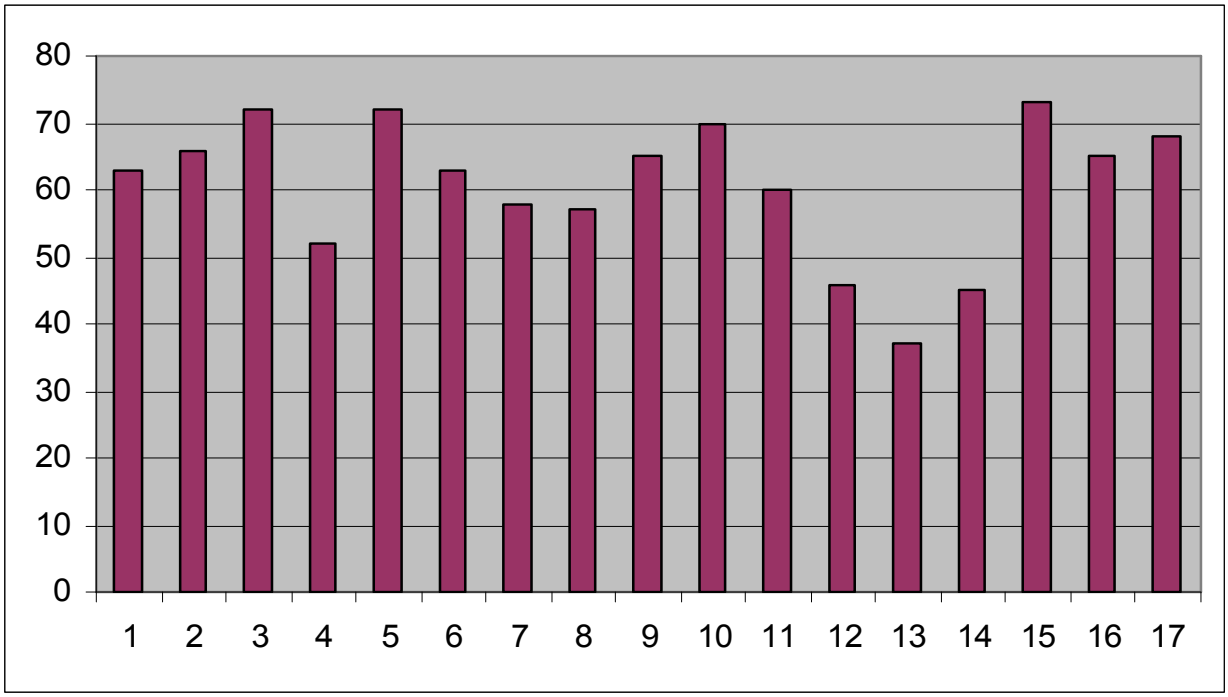
There are seventeen factors mentioned here which are considered to be impairing the performance of the small scale manufacturing industry (SSMI). Out of these seventeen factors, 3 have got a score of more than 70%, 4 between 65% and 70%, 6 between 55% and 65% and 4 factors have got a score below 55%.

Lack of government support and the use of old process technology by the industry are the prime reasons causing sickness in the SSMI. This fact also justifies the need of carrying out the present research work. Absence of large scale manufacturing organizations in the state of Punjab is also a major reason impairing SSMI competitiveness. Shortage and cost of power, high prices of raw materials, inability to reduce the cost of manufacturing, absence of modernization programs, unorganized structure of this sector are factors placed in the next range of scores depicting that these factors also need to be addressed seriously to improve the performance of SSMI in this region of India. Lack of financial support to R&D activities, shortage of raw material, competition from other countries like China etc. and underutilization of capacity are also considered as important reasons needing attention.

Table 3.2 Factors Impairing SSMI Performance

S. No.	Factor	No. of Companies Scoring Points				Total	Points Scored	Percent Point Scored
		4	3	2	1			
1.	**Shortage of Raw Material**	**10**	**7**	**7**	**9**	**84**	**63**	
2.	**High prices of raw material**	**9**	**8**	**9**	**6**	**84**	**66**	
3.	**Shortage and cost of power**	**11**	**10**	**6**	**4**	**80**	**72**	
4.	**Non availability of multi skilled labor**	**2**	**9**	**9**	**10**	**63**	**52 .5**	
5.	**Old process technology**	**12**	**9**	**8**	**4**	**95**	**72**	
6.	**Shortage of finance**	**6**	**11**	**7**	**7**	**78**	**63**	
7.	**Poor technical know how of workers**	**6**	**7**	**9**	**9**	**72**	**58**	
8.	**Under utilization of capacity**	**5**	**10**	**7**	**10**	**74**	**57**	
9.	**Absence of modernization programs**	**7**	**12**	**7**	**6**	**84**	**65**	
10.	**Absence of large scale industry**	**12**	**8**	**8**	**5**	**93**	**70**	
11.	**Competition from other countries**	**7**	**10**	**6**	**10**	**80**	**60**	
12.	**Poor transportation infrastructure**	**5**	**2**	**8**	**17**	**59**	**46**	
13.	**Geographical location**	**0**	**4**	**7**	**21**	**47**	**37**	
14.	**Poor marketing management**	**3**	**4**	**10**	**15**	**59**	**45**	
15.	**Lack of government support**	**13**	**8**	**6**	**5**	**93**	**73**	
16.	**Unorganized sector**	**9**	**8**	**10**	**6**	**86**	**65**	
17.	**Inability to reduce cost of manufacturing**	**10**	**9**	**4**	**7**	**82**	68	

Fig. 3.1 Factors Impairing SSMI Performance



However, poor technical know how of workers, non availability of multi skilled labour, poor marketing management, poor infrastructure of rail and road transportation and geographical location are not considered as significant factors impairing SSMI performance by the industry.

3.5 CLASSIFICATION OF COMPANIES

The process of technology development depends upon four basic components. These are workforce for creative input, technology infrastructure facilities, government corroboration and collaboration with external environment. Total score of each company in the individual components of workforce, technology infrastructure, government corroboration and collaborations has been calculated from the raw scores. The gross total of each company i.e. all components taken together has also been calculated. The total score of each company is divided by its maximum possible score to arrive at the percentage score of each company in each component as well as in all components take together.

Table 3.3a Criteria for categorization of Companies

Category No.	% Score	Inference	Grading
1	**25 - 35**	Industry at the lowest stage. Nearly all responses to the lowest choice box on an average.	Very Poor
2	**36 - 55**	Industry at a poor stage. Nearly all responses to the third or fourth choice on an average.	Poor
3	**56 - 75**	Nearly all responses to the second or third choice on an average.	Fair
4	**76 - 90**	Industry at a good stage. Nearly all responses to the first and second choice on an average.	Good
5	**91 - 100**	Industry at the highest stage. Nearly all responses to the highest choice box on an average.	Very Good

Table 3.3 b Status of Companies in Various Components

S. No.	Range of % Score	Category	Number of Companies				Overall
			Workforce	Technology	Govt. Corroboration	Interaction	
1	**25-35**	**V. Poor**	**-**	**2**	**2**	**4**	**-**
2	**36-55**	**Poor**	**10**	**19**	**9**	**10**	**16**
3	**56-75**	**Fair**	**20**	**9**	**17**	**17**	**19**
4	**76-90**	**Good**	**-**	**-**	**2**	**2**	**-**
5	**91-100**	**V.Good**	**-**	**-**	**-**	**-**	**-**
Avg. Score of Companies			**59%**	**52%**	**60%**	**56%**	

Table 3.4 Classification of Companies

S. No	Component of TD	Percentage of the organizations under				
		V.Good	Good	Fair	Poor	V. Poor
1.	**Workforce**	**-**	**-**	**67**	**33**	**-**
2.	**Technical Infrastructure-7**	**-**	**30**	**63**		
4.	**Govt. Corroboration**	**-**	**6**	**57**	**30**	**7**
5.	**Collaboration**	**-**	**6**	**52**	**30**	**12**
6.	**Overall**	**-**	**-**	**54**	**46**	**-**

The following important facts have emerged:

i) **A total of 46% of the companies fall in poor grade. About 54% of the companies are doing fairly well. No company is at a level where every company should be.**

ii) **Performance of the companies is worst in Technology Infrastructure where the average score is only 52%. 7% of the companies are at a very poor level, in this component. The percentage score achieved by different organizations in infrastructure component is depicted in Fig. 3.2 a.**

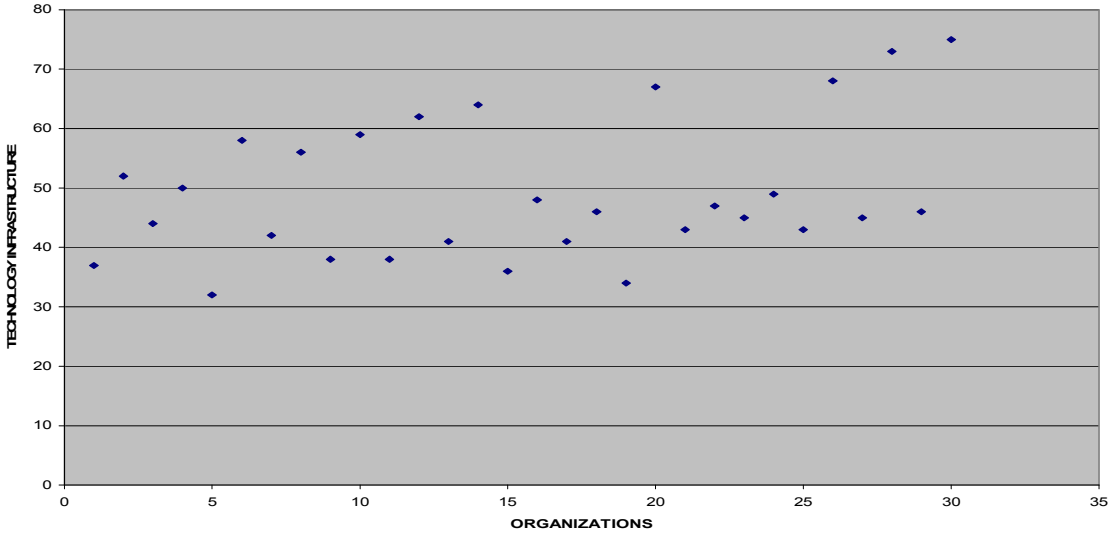


Fig. 3.2 a Level of Technology Infrastructure in Different Organizations

iii) Corroboration with an average score of 56% is the next critical area. 29% of the industries get poor grade and another 12% are managing this component very poorly. The percentage scored achieved by different companies in this component is depicted in Fig. 3.2 b

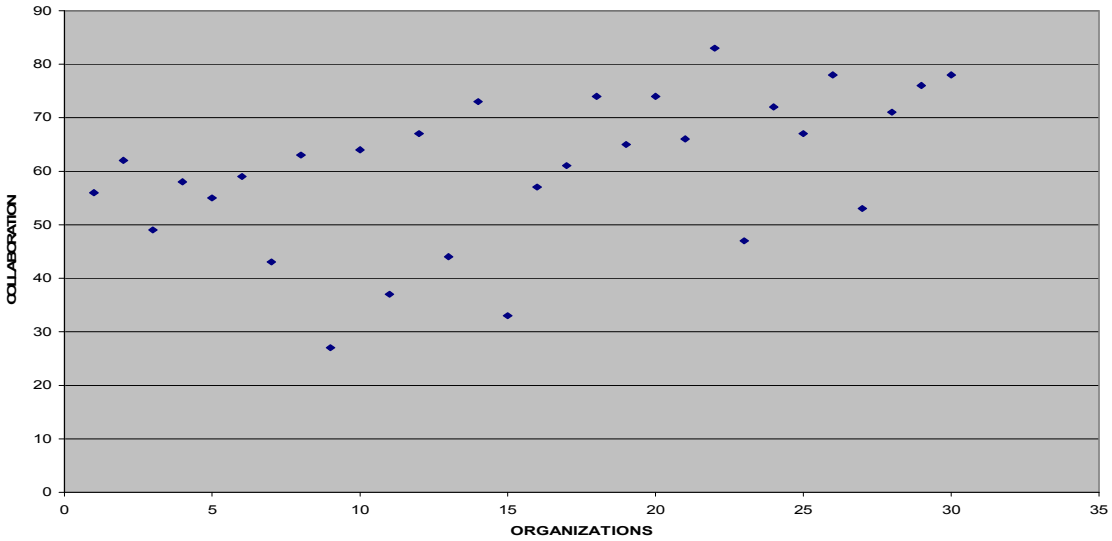


Fig. 3.2 b Level of Corroboration in Different Organizations

iv) In case of workforce, an average score of 59% has been received. One third of the industries adopt those measures for management of manpower which render them a poor scorer. The remaining companies are at a fairly good level. The percentage score of different units in manpower is depicted in Fig. 3.2 c.

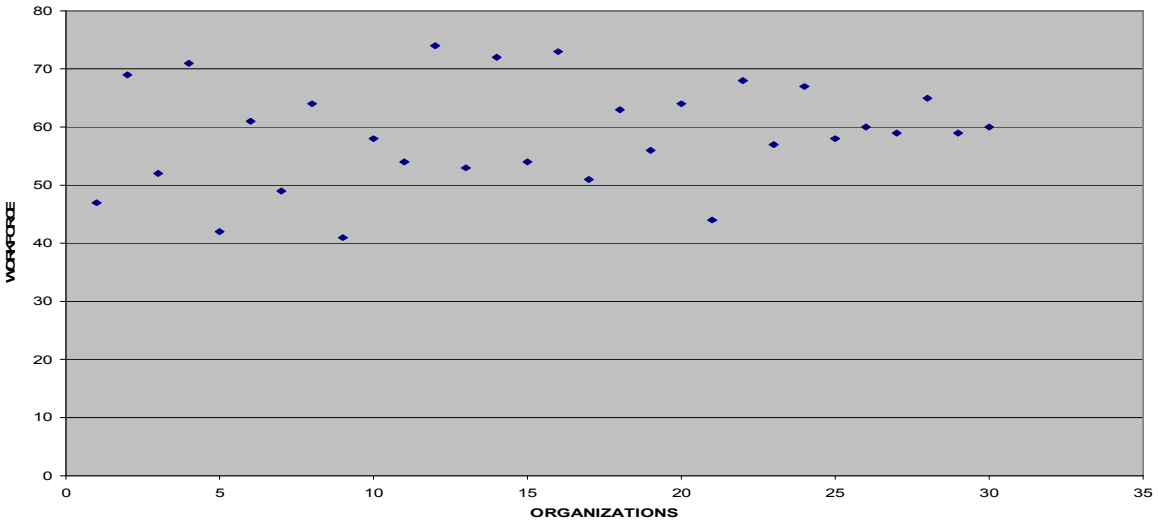


Fig. 3.2 c Level of Workforce in Different Organizations

v) **Government Corroboration appears to be the least critical with an average score of 60%. 7% of the organizations are managing this resource very poorly and 30% are at a poor level. A very large proportion of the units (about 60%) are doing fairly well in seeking government support for developmental activities. However, only 6% of the units are at a good level. The percentage score of different units in this component is depicted in Fig. 3.2 d.**

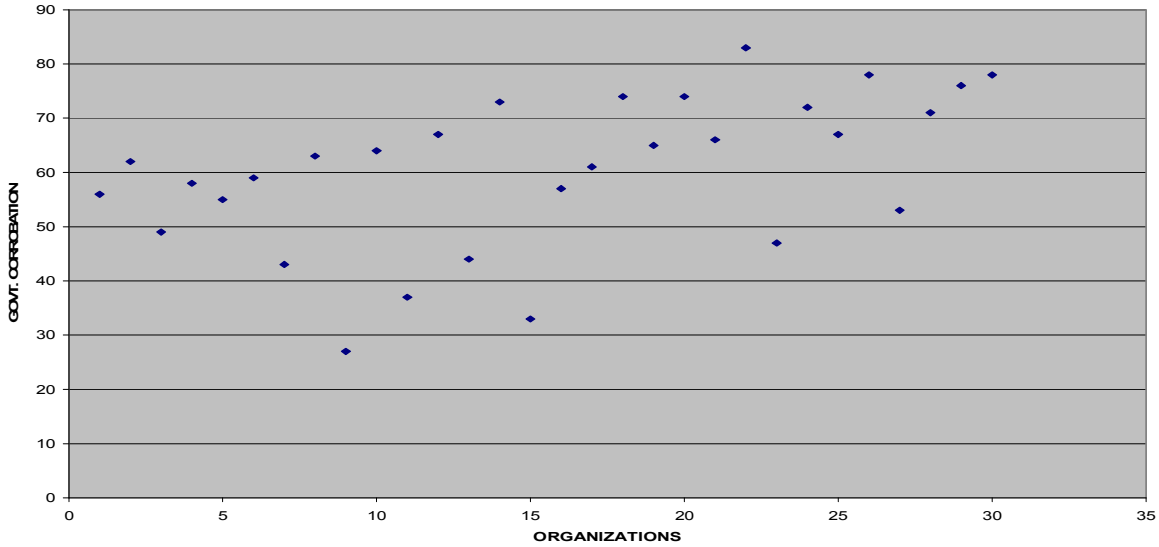


Fig. 3.2 d Level of Government Corroboration in Different Organizations

3.6 STATUS OF VARIOUS ASPECTS

From the files of raw data, the sum of scores of each question in all the responding companies is found out. The score is divided by the maximum possible score the question could have got. The fraction score, thus arrived at is multiplied by 4 to find out the mean or central tendency of each question.

This has been done separately for each resource. Table 3.5 gives a brief description of the area represented by each question on workforce. Tables 3.6, 3.7, 3.8, depict the same for technology infrastructure, government corroboration and collaboration respectively.

The average score of each question reflects as to how area represented by a question is being looked after. The results are discussed below.

The grand average of score of workforce, technology infrastructure, government corroboration, and collaboration are 2.42, 2.00, 2.17and 2.25 respectively as depicted by figure 3.2. Figures also depict the status of each aspect contained in a question in comparison to other aspects. Further, a score close to 1 show that the status of the aspect is such that techniques listed at the fourth choice in the questionnaire are generally in use. Similarly a score near 2 reflects the use of third level techniques, score of 3 reflects use of second level techniques and a score of 4 shows the use of the best techniques listed at choice number one.

3.6.1 Workforce

This section discusses the status of manpower aspect which is an important component of the technology development process in any organization.

The response to individual questions on this component is presented in Table 3.5.

Technical know how and education level of the workers is reported to be extremely well and helpful in R&D initiatives in about one third of the industries. For about one tenth of the industries, these factors are at a poor level.

In one third of the companies, non availability of multi skilled labour is there which impairs the technology development efforts.

About two third of the responding industries do not provide any formal training to the employees to enhance their creativity skills. Only about 7% of the organizations provide formal training to employees just after their induction into the organization. The remaining organizations either provide training during orientation period through senior executives or provide on the job training where employees are believed to learn through experience.

The industry does not have adequate technical and scientific manpower to carry out R&D work. Only about 23%of the organizations have satisfactory strength of competent manpower.

In about 53% of the organizations there is no pressure on the employees to put efforts for technology up gradation. 30% of the small scale industrial units provide some encouragement in this area. Not even 4% of the industries strongly urge the employees to undertake research oriented work for product and process innovations.

Table 3.5 Score of Various Questions – Workforce

S. No.	Q. No. (In Questionnaire)	Topics in the aspect	No. of Responses	No of companies scoring				C. T.
				1	2	3	4	
1	**16d**	**Non availability of multiskilled labour**	**30**	**2**	**8**	**10**	**10**	**2.93**
2	**16g**	**Education level of workers**	**30**	**3**	**8**	**9**	**10**	**2.90**
3	**16g**	**Technical know how of Workers**	**30**	**3**	**8**	**9**	**10**	**2.90**
4	**28**	**Formal training to employees to enhance innovation skills**	**31**	**19**	**0**	**10**	**2**	**1.83**
5	**35**	**Awareness of significance of technology up gradation**	**31**	**10**	**6**	**7**	**8**	**2.41**
6	**36**	**Adequate scientific and technical manpower**	**31**	**14**	**10**	**4**	**3**	**1.87**
7	**37**	**Encouragement to undertake R&D work**	**31**	**16**	**9**	**5**	**1**	**1.70**
8	**37**	**Encouragement to obtain Patents**	**31**	**16**	**9**	**5**	**1**	**1.70**
9	**39**	**Reward schemes for innovative efforts**	**31**	**1**	**3**	**24**	**3**	**2.94**
10	**40**	**Reactions to R&D project failures**	**31**	**3**	**0**	**21**	**7**	**3.03**
		Overall average						**2.42**

Patents can be used as a strategic tool for technological innovations but small scale industry does not seem to appreciate this fact. In the last 15 years, none of the units in the cutting tool and machine tool sector has obtained a patent The level of encouragement given to the employees to undertake R&D work and obtain patents is very low.

Majority of the organizations properly recognize the contributions of the employees in case the company makes profits because of their innovative efforts. Majority of the companies either give a fixed monetary reward, an increment in salary or a share in the profits made on account of innovation. A few companies go

to the extent of giving promotion in designation for contributions in the area of technology development. Still fewer organizations give recognition is in the form of an appreciation letter. About one tenth of the organizations do not provide any recognition or reward to the employees.

However, in about 7% of the units strict action is taken against members of the project team when a failure occurs. Surprisingly, none of the organizations discourage R&D initiatives despite failures which are encouraging. In majority of the units the management's role has been supportive in case an R&D project fails. In case a R&D project fails, majority of the units either conduct a through analysis, pin point the root causes of failure and plan a future action by consensus advise the to learn lessons from current failures to improve for future.

3.6.2 Technology Infrastructure

This section presents the status of financial support provided by the organizations to their R&D function and the availability of technology infrastructure for R&D work.

The response to individual questions on this component is presented in the Table 3.6.

About 20% of the industries face acute shortage of funds for developmental work and treat it as the most significant reason causing sickness. However, 27% do not consider shortage of finance as a reason for poor performance of small scale units in the area of technology development. The rest 53% of the organizations have little to reasonable amount of financial support for developmental activities. As far as earmarking of funds specifically for R&D activities is concerned, the state of affairs in the industry is discouraging. 71% of the industries do not clearly earmark funds for R&D activities. In 7% of the organizations some earmarking is done subject to availability of funds. About 16% of the organizations have clubbed these funds with other developmental activities. It is only the remaining 6% of the organizations where management has clearly earmarked funds for R&D activities.

Manufacturing organizations in developed economies spend on average 2.5–18% of annual turnover on technology development. The number of units whose

spending compares the global standards is less than 7%. These units have investments in R&D more than 5% of their annual turnover.

For 71% of the units the main or major source of funds for technology development activities is the organization itself and not the government or any other agency.

The absence of modernization and renovation programmes is an important factor preventing the development of this class of industry. About 27% of the units consider this factor most significant in causing sickness in the small scale industry. Another 53% of the industries feel that this factor is important. However about 20% of the industries regularly implement modernization and renovation programmes and consider this factor as least significant in impairing performance of the cutting tool, machine tool and auto components industry.

Table 3.6 Score of Various Questions – Infrastructure

S. No.	Q. No. (In Questionnaire)	Topics in the aspect	No. of Responses	No of companies scoring				C. T.
				1	2	3	4	
1	**16f**	**Funds for R&D activities**	**30**	**6**	**9**	**7**	**8**	**2.56**
2	**16i**	**Modernization and renovation programs**	**30**	**8**	**10**	**6**	**6**	**2.33**
3	**27a**	**Dedicated labs for experimentation and analysis**	**30**	**24**	**4**	**1**	**1**	**1.30**
4	**27b**	**State of the art production Facilities**	**31**	**23**	**4**	**4**	**0**	**1.38**
5	**27c**	**Latest software's for modeling and analysis**	**31**	**15**	**9**	**4**	**1**	**1.83**
6	**29**	**Earmarking funds for R&D Activities**	**31**	**22**	**2**	**5**	**2**	**1.58**
7	**30**	**Investments in R&D as a fraction of annual turnover**	**30**	**18**	**8**	**2**	**2**	**1.60**
8	**31**	**Main source of funds**	**31**	**2**	**3**	**4**	**22**	**3.48**
		Overall average						**2.00**

State of the art production equipment, workstations, machining centers, CNC machines, robots etc. are not available with most (74%) of the industries. Another 13% of the industries have these facilities only to a small extent. Only less than 13% of the industries have such facilities at an acceptable level.

80% of the industries do not have dedicated laboratories for experimentation etc. 13% of the industries have these facilities to a small extent. Only about 7% of the industries have proper R&D infrastructure for experimentation, testing etc.

The average score of this aspect is 2.00 (out of 4) which is very discouraging. Industry must understand that its survival is not feasible in the absence of R&D practices and for that infrastructure is needed.

3.6.3 Government Corroboration

This section discusses the role of government in the region supporting small scale industry in its technology development efforts. The response to the individual questions on this component is presented in Table 3.7.

Table 3.7 Score of Various Questions – Government Corroboration

S. No.	Q. No. (In Questionnaire)	Topics in the aspect	No. of Responses	No of companies scoring 1	2	3	4	C. T.
1	**16b**	**Raw material prices**	**30**	**7**	**10**	**8**	**5**	**2.36**
2	**16c**	**Shortage and cost of power**	**30**	**9**	**9**	**7**	**5**	**2.26**
3	**16l**	**Transportation infrastructure**	**34**	**18**	**10**	**2**	**4**	**1.53**
4	**16o**	**Policies regarding subsidies**	**30**	**14**	**7**	**5**	**4**	**1.90**
5	**31a**	**Funding for R&D activities**	**31**	**22**	**4**	**3**	**2**	**1.41**
6	**41a**	**Funding related to R&D performance**	**31**	**6**	**6**	**5**	**14**	**2.87**
7	**41b**	**Funding related to annual turnover**	**30**	**8**	**3**	**4**	**15**	**2.86**
		Overall score						**2.17**

23% of the units consider raw material prices as exceptionally high, and most significant in causing sickness in the manufacturing industry. Another 33% consider raw material prices to be very high. 27% of the industries feel this factor to be less significant in causing sickness in the industry. The remaining industries have no problems with the raw material prices and are satisfied with the government policies on pricing of raw materials.

Shortage and cost of power is a major problem impairing the performance of small scale industry. 30% of the industries hold shortage and high cost of power as the most significant reason hitting the performance of industry. About 17% of the industries are not facing any problem as far as availability and cost of power is concerned.

Small scale industry, wherever it may be, needs government support in terms of funds for developmental activities, loans at low rates, assistance in import of technologies, favorable excise duties etc. Unfortunately, for SSMI in India lack of government support is one of the biggest factors causing sickness in the industry.

71% of the industries do not receive any financial help from the government for R&D. For 13% of the organizations government is only a minor source of R&D funds. There are 16% units which consider government as the major or main source of funds for R&D related work.

45% of the industries are of the view that government should allocate funds for R&D to different industries based on their performance of previous years. 19% of the industries totally disagree and suggest that allocation of the funds should be independent of the performance of previous years.

3.6.4 Collaborations

This section presents the level of interaction of the industry with external agencies viz. academic institutes, R&D agencies etc. for technology development. The response to individual questions on this aspect is presented in Table 3.8.

Small Scale manufacturing industry is largely dependent on external help for its process technology needs. However the dependency is mainly on Indian organizations rather than foreign firms. 80% of the firms do not buy any technology

from abroad. 13% of the small scale units depend partially on foreign industry. The remaining 7% of the firms depend largely or completely on foreign industry for technology acquisition.

Small scale manufacturing Industry in India is not working much in collaboration with external R&D institutes and agencies. 80% of the units have never worked in collaboration with external agencies. 13% of the units have partially developed some technologies through collaborations.

Table 3.8 Score of Various Questions – Interaction

S. No.	Q. No. (In Questionnaire)	Topics in the aspect	No. of Responses	No of companies scoring				C. T.
				1	2	3	4	
1	**21a**	**Technology acquired from abroad**	**30**	**24**	**4**	**0**	**2**	**1.33**
2	**21b**	**Technology from within the country**	**30**	**3**	**3**	**4**	**20**	**3.36**
3	**21c**	**Technology developed in collaboration**	**30**	**24**	**4**	**0**	**2**	**1.33**
4	**42**	**Interaction with academic institutes**	**30**	**6**	**6**	**9**	**9**	**2.7**
5	**43**	**Industry institute tie on R&D**	**30**	**24**	**2**	**2**	**2**	**1.4**
6	**44a**	**Academia for preparing the road maps**	**30**	**3**	**6**	**10**	**11**	**2.97**
7	**44b**	**Expert lecture by academicians**	**30**	**3**	**7**	**8**	**12**	**2.96**
8	**44c**	**Training through S.T. courses**	**34**	**5**	**8**	**9**	**12**	**2.82**
11	**44f**	**Combined supervision of dissertations**	**30**	**6**	**12**	**5**	**8**	**2.56**
12	**46**	**Collaborations with R&D institutes**	**30**	**18**	**4**	**3**	**5**	**1.83**
		Overall						**2.25**

70% of the units suggest that experts from academia can prepare roadmaps for industries for making R&D as an integral part of firm's working which definitely or to a large extent would be helpful.

43% of the industries feel that combined supervision of M.E, Ph.D dissertations by industry and institute personnel on industry oriented problem would definitely or to a large extent help the small scale industry. However the remaining industries do not consider this activity to be very useful.

3.7 Correlation of Various Factors with Technology Development

This section aims to analyze the extent of contribution of various components viz. workforce, technology infrastructure, government corroboration and collaborations toward the organization's level of technology development practices. The level of technology development practices is being assessed by four factors namely (i) Level of technology development (ii) Response to the market (iii) Strategy for technology development and (iv) Organization for R&D.

Table 3.9 to 3.12 shows the correlation between each of the components and level of technology development.

Table 3.9 Correlation between Workforce and Technology Development

	Level of Technology Development	Response to the Market	Strategy for T.D.	Organization for R&D
Non availability of multiskilled labour		**0.20**		**0.04**
Poor education level and technical know how of the workers				**0.14**
Formal training to enhance innovation	**0.18**	**0.15**	**0.25**	**0.34**
Adequate scientific and technical manpower for r&d work	**0.34**	**0.02**	**0.02**	**0.29**
Reward schemes for innovative efforts of		**0.09**	**0.2**	**0.08**

employees				
Reactions to R&D project failures	**0.24**			

Table 3.10 Correlation between Technology Infrastructure and Technology development

	Level of Technology Development	**Response to the Market**	**Strategy for T.D.**	**Organization for R&D**
Investments in R&D function			**0.25**	
Investment in R&D as % of total turnover	**0.33**	**0.25**		**0.06**
Modernization programmes		**0.2**	**0.26**	
State of the art prods. facilities	**0.24**	**0.36**		**0.37**
Earmarking funds for R&D activities	**0.06**	**0.17**		**0.25**

Table 3.11 Correlation between Collaborations and Technology Development

	Level of Technology Development	**Response to the Market**	**Strategy for T.D.**	**Organization for R&D**
Higher prices of raw materials		**0.07**	**0.05**	
Shortage and cost of Power	**0.08**	**0.04**		
Poor transportation infrastructure	**0.05**			**0.02**
Lack of govt. support			**0.21**	
Govt. funds for R&D			**0.10**	**0.13**
Do you Seek help				

from external organizations		**0.00**		**0.16**
Are external organizations providing help	**0.02**			

Table 3.12 Correlation between Govt. Corroboration and Technology Development

	Level of technology development	**Response to the market**	**Strategy for T.D.**	**Organization for R&D**
Technology acquired from abroad		**0.24**		**0.21**
Technology acquired from within country	**0.2**			
Developed in collaboration with external agency		**0.00**	**0.08**	**0.27**
Academic institutes interaction	**0.08**			**0.10**
Industry-institute collaboration	**0.02**			**0.02**
Collaboration with R&D institutes		**0.07**	**0.41**	**0.23**

CHAPTER - 4

ORGANIZATIONAL CULTURE FOR CREATIVITY - A CASE STUDY

4.1 GENERAL

The general objective of building this case study is to prove that determinants of creative culture have a significant relationship with employee behavior. The various factors discussed in the preceding chapters on how to develop an organizational climate that fosters creativity are being used here. The work has been carried out at "N.S. Enterprises, Panchkula". This small scale unit has an annual turnover of 6 crores.

4.2 METHODOLOGY

This particular study is aimed to explore the effect of creativity culture on the employee's behavior. The study has used the analysis of variance (ANOVA) technique in an attempt to prove that employee behavior is significantly related to creativity culture of the organization.

The case study has been built at "N.S. Enterprises, Panchkula". To examine the culture of the organization, the KEYS build by Amabile (Amabile., 1996) and (Lee Zhuang., 1995) have been used. The KEYS have been attached in Appendix I. These keys are specially designed to judge the organizational climate. The KEYS have been filled by 37 employees at the said industry.

4.3 HYPOTHESES DEVELOPMENT

The literature survey suggests that employee creativity is positively related to organizational climate. It follows that:

H1. **Employee behavior is significantly related with culture employed in the organization.**

4.4 DATA COLLECTION

The sample used in this study is made up of the employees at "N.S. Enterprises, Panchkula". This method gave a high internal representativity, since we were able to ensure that the information supplied by the firm is correct. The employees included in the

sample were given the questionnaire after a detailed explanation about the research objective. The employees were asked to respond to the questions, valuing aspects related to their job experience.

4.5 PROCEDURE

The keys in the questionnaire are divided into two broad categories viz. determinants of organizational culture and employee behavior. All keys under organizational culture have been grouped together in Table 4.1. The determinants of organizational culture comprise of keys (1, 4, 9, 10, 13, 18, 21, 22, 23, 25, 26, 27, 29, 31, 33, 34, 36, 37, 38, 39, 43, 45, 56, 58, 59, 62, 64, 65, 66, 67, 68, 71, 72, 74, 81). All keys under employee behavior have been grouped in Table 4.2. Individual characteristics comprise of keys (2, 3, 5, 6, 7, 8, 11, 12, 14,1 5, 16, 17, 19, 20, 24, 32, 35, 40, 41, 42, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 60, 61, 63, 69, 70, 73, 75, 76, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87) Each of the characteristic viz. organizational culture, employee behavior are then further subdivided into different factors. Determinants of organizational culture have been subdivided into four factors viz. reward & recognition, supportive structure, infrastructure availability, freedom and openness. Employee behavior has been subdivided into six factors viz. risk taking abilities, knowledge & intelligence, cohesiveness, workload pressure, idea generation and intrinsic motivation. A total of 37 employees participated in this research program. Each employee was given a separate questionnaire and responded to each 87 keys/statements.

From the file of raw data, the sum of scores of each key was calculated. The score was divided by the maximum possible score each key could achieve. This was done

separately for each key. Table 4.1, 4.2, gives the description of the score achieved by each key used under each characteristic.

Table 4.1 Score of Keys in Organizational culture

Key Q[a]	Reward & Recognition	Supportive Structure	Infrastructure Availability	Freedom & Openness
1				.722
4		0		
9				.833
10		.388		
13				1
18		.833		
21				.444
22	1			
23				.166
25			.833	
26		.777		
27				.777
29		.777		
31			.944	
33	0			
34	1			
36		.388		
37				.944
38				.388
39		.833		
43		.777		
44		.833		
45		.722		
56		.388		
58		.944		
59		.722		
62				.944

64		.722		
66		.666		
67				.777
68				.944
71	.888			
72		.888		
74			.944	
81			.444	
Q[a] text of question is attached in appendix I				

Table 4.2 Score of Keys in Employee Behavior

Key Q[a]	Risk Taking Abilities	Knowledge & Intelligence	Cohesiveness	Work Load Pressure	Intrinsic Motivation	Idea Generation
2						1
3				.111		
5					1	
6			.944			
7						.888
8					.833	
11					.611	
12				.4		
14			.888			
15			.833			
16			.333			
17					.388	
19			.611			
20			.277			
24			.833			
32			.444			
35		.833				
40		.833				
41					.888	
42	.444					
44	.777					
46		.944				
47		.833				
48		.944				
49	.833					
50				.888		
51		.833				

52				.722		
53		.722				
54						.666
55						.444
57			.833			
60						
61						
63						
69			1			
70			.944			
73			.944			
75						.833
76						.4
77						.722
78						.611
79	.277					
80						.888
82					.888	
83			.444			
84			.166			
85	.444					
86					.888	
87					.777	
Q[a] text of question is attached in appendix I						

After tabulating the data in tables a correlation matrix was obtained to judge the relationship between organization culture and employee behavior. The results are shown in Table 4.3.

4.6 RESULTS & DISCUSSION

The results obtained from the correlation matrix are discussed as follows:

Results shows that risk taking abilities of the employees are significantly related with the supportive structure of the organization. The results also show that risk taking abilities of the employees are positively related with the reward and

recognition strategy of the organization, infrastructure availability in the organization and environment in the organization.

Knowledge and intelligence of employee play an important role in fostering a creative culture in the organization. Results show that knowledge and intelligence of employees is highly dependent on the strategy employed in the organization and structure of the organization. Results also state that reward & recognition and facilities available are also important for enhancing knowledge and intelligence of employees.

Results state that reward strategy and culture employed in the organization play a major role in increasing cohesiveness in the organization.

Table 4.3 Correlation Matrix

FACTORS	Reward & Recognition	Supportive Structure	Infrastructure Availability	Freedom & Openness
Risk Taking Abilities	0.133	.439	0.119	.109
Knowledge & Intelligence	0.118	0.212	0.192	0.341
Cohesiveness	0.421	0.117	0.08	0.347
Work Load Pressure	.1004	0.142	-.204	-.041
Idea Generation	0.180	0.174	0.404	0.484
Intrinsic Motivation	0.286	0.244	0.494	0.123

Table 4.4 Results of the ANOVA Test

a) Summary

Groups	Count (N)	Sum (∑X)	Average ($\bar{X}$)	Variance (σ)
Column 1	**6**	**1.2384**	**0.206417**	**0.014401**
Column 2	**6**	**1.349**	**0.224833**	**0.013292**
Column 3	**6**	**1.176**	**0.196**	**0.076944**
Column 4	**6**	**1.363**	**0.227167**	**0.038002**

b) ANOVA TABLE

Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean Squares (MS)	F_{calc}	F_{crit}

Between Groups	**0.00403**	**3**	**0.001343**	**0.037379**	**3.098393**
Within Groups	**0.718694**	**20**	**0.034934**		
Total	**0.722724**	**23**			

Intrinsic motivation plays a major role in developing the creativity culture in the organization. Results show that employees are motivated to work creatively when they are provided with adequate infrastructure facilities. Results also relate intrinsic motivation positively with reward & recognition strategies of the organization.

After obtaining the correlation matrix and discussing its results, ANOVA (Analysis of Variance) test was performed on the data to check again whether the determinants of organizational culture are significantly related to employee behavior or not. The findings of the results are presented in Table 4.4. As from the results the calculated value of F is less than the table value (F_{crit}), therefore hypothesis is accepted.

The result supports the hypothesis H1 which states that "Employee Behavior is significantly related with culture employed in the organization". Thus the analysis prones that by having a suitable organizational climate employee's behaviour can be significantly influenced to obtain more creative and innovative outcomes.

CHAPTER – 5
CONCLUSIONS AND RECOMMENDATIONS

The study has been conducted with the objective to analyze various aspects of the working of small scale industry with regard to various functional elements of technology development. With the help of survey through a specially designed questionnaire, status of various industrial organizations with regard to technology development is presented. Status of various resources viz. workforce, technology infrastructure, government corroboration and collaboration has been brought to light. A case situation has been represented to show the relationship between various factors needed to build a culture in the organization conducive to creativity and innovation in employee behaviour.

5.1 RESUTS OF THE SURVEY

a) General

i. **The response has been about 45%.**

ii. **Major factors causing sickness in the small scale units are use of old process technology and lack of government support.**

iii. **More than half of the companies fall in poor category with respect to technology development.**

iv. **In case of workforce, nearly one third of the companies fall in poor class. Technology infrastructure has two third of the companies in poor class and about 6% in very poor class. In government corroboration, 24% of the companies are in poor class and another 6% in very poor. Corroboration component has 30% companies in poor category and another 12 % in very poor category.**

b) Workforce

i. **Technical know how of workers, their education levels are not major problems as far as technology development is concerned.**

ii. **Only very few industries are providing formal training to employees to enhance their innovation skills.**

iii. **More than half of the industries do not have the adequate scientific and technical manpower to carry out R&D work.**

iv. **Majority of the organizations properly recognize the contribution of the employees in case the organization makes profits because of their innovation efforts.**

v. **In case of an R&D profit failure, majority of the organizations don't discourage R&D initiatives but direct the employees to learn from current failures.**

c) Technology Infrastructure

i. **Non availability of funds for developmental activities is a major problem faced by small scale units.**

ii. **In majority of the organizations, there is no clear earmarking of funds for R&D activities.**

iii. **The investments in R&D by the companies is very low. There are less than five percent units whose spending compares global standards.**

iv. **Absence of modernization and renovation programs is also an important factor causing sickness in this class of industry.**

v. **In majority of the organizations, state of the art production equipment is not available.**

vi. **Only very few organizations have a proper R&D infrastructure for experimentation, testing and subsequent analysis.**

d) Government Corroboration

i. **Shortage and cost of power are major problem impairing the performance of small scale industry.**

ii. **The condition of rail and road transport is to the satisfaction of industry.**

iii. **Government has failed in providing funds to the industry for R&D activities. Majority of the industries don't receive any financial help from the government for R&D related work.**

e) Corroborations

i. **Majority of the small scale units purchase technology from other (bigger) Indian firms.**

ii. **Majority of the organizations have never worked in collaboration with external agencies for technology development.**

iii. **A very few firms have experienced industry-institute ties to solve technology related problems.**

5.2 RESULTS OF THE CASE STUDY

The results obtained from the correlation table and ANOVA analyses are discussed below.

i. **Risk taking abilities of employees have a very strong correlation with supportive structure of the organization.**

ii. **Knowledge & intelligence of employees is strongly correlated to freedom & openness, supportive strategy and adequate resources available in the organization.**

iii. **Cohesiveness between employees is strongly correlated with a suitable reward system employed in the organization.**

iv. **Idea generation has strong correlation with the freedom & openness and availability of good infrastructural facilities present in the organization. Idea generation is also good correlated with reward system and supportive structure.**

v. **Intrinsic motivation is strongly correlated with infrastructure availability in the organization. Intrinsic motivation has also significant correlation with reward system, supportive structure and freedom & openness present in the organization.**

5.3 LIMITATIONS OF THE STUDY

I. **The study has been limited to small scale cutting tool and machine tool engineering industry of a specific region.**

II. **The study involved all the resources viz. workforce, infrastructure, government corroboration and corroboration. Because of this the domain of the study has become very large and involved varied areas. Because of the multifacet areas included, the study has been restricted to analysis of resources. Implementation of the suggestions has not been carried out.**

5.4 SCOPE OF FUTURE WORK

The work can be extended for medium and large scale industries and can be extended to other sectors of small scale industry.

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APPENDIX II

QUESTIONNAIRE

This questionnaire has been specially designed to collect information regarding the organizational attitude towards creativity. The aim of this study is to check whether organization supports the employees to work creatively, and to build a culture of an organization that will support creativity.

The questionnaire is divided into two sections; section 1 solicits the general information regarding the employee and section 2 consists of keys specially designed to collect the information from the employee regarding the organizational climate. The each question has two options kindly encircle [O] the appropriate option.

We assure the confidentiality of the information provided by you. It is hoped that the results of the study and the analysis being carried out by us will help the small scale industry of Punjab in building a organizational climate that will support creativity.

SECTION 1

General information about the employee

Name of the employee	
Name of the organization	
Designation of the Respondent	
E-mail Address	
Phone Number	
Working experience	

KEYS

(1) I have the freedom to decide how I am going to carry out my projects.	YES	NO
(2) I feel that I am working on important projects.	YES	NO
(3) I have too much to do in too little time.	YES	NO
(4) This organization is strictly controlled by upper management.	YES	NO
(5) My area of this organization is innovative.	YES	NO
(6) My co-workers and I make a good team.	YES	NO
(7) The tasks in my work are challenging.	YES	NO
(8) In this organization, there is a lively and active ow of ideas.	YES	NO
(9) My supervisor clearly sets overall goals for me.	YES	NO
(10) There is much emphasis in this organization on doing things the way we have always done them.	YES	NO
(11) I have sufficient time to do my project(s).	YES	NO
(12) I feel considerable pressure to meet someone else's specifications in how I do my work.	YES	NO
(13) Overall, this organization is effective.	YES	NO
(14) Overall, the people in this organization have a shared "vision" of where we are going and what we are trying to do.	YES	NO
(15) There is a feeling of trust among the people I work with most closely.	YES	NO
(16) People in this organization are very concerned about protecting their territory.	YES	NO
(17) There are too many distractions from project work in this organization.	YES	NO
(18) New ideas are encouraged in this organization.	YES	NO
(19) Within my work group, we challenge one another's ideas in a constructive way.	YES	NO
(20) There is destructive competition within this organization.	YES	NO
(21) My supervisor has poor interpersonal skills.	YES	NO
(22) Performance evaluation in this organization is fair.	YES	NO
(23) I do not have the freedom to decide what project(s) I am going to do.	YES	NO
(24) People in my work group are open to new ideas.	YES	NO
(25) The facilities I need for my work are readily available to me.	YES	NO
(26) My supervisor serves as a good work model.	YES	NO

(27) In this organization, top management expects that people will do creative work.	YES	NO
(28) In my work group, people are willing to help one another.	YES	NO
(29) Procedures and structures are too formal in this organization.	YES	NO
(30) There are unrealistic expectations for what people can achieve in this organization.	YES	NO
(31) Generally, I can get the resources I need for my work.	YES	NO
(32) My supervisor's expectations for my project(s) are unclear.	YES	NO
(33) People are quite concerned about negative criticism of their work in this organization.	YES	NO
(34) People are recognized for creative work in this organization.	YES	NO
(35) The tasks in my work bring out the best in me.	YES	NO
(36) My supervisor plans poorly.	YES	NO
(37) The organization has an urgent need for successful completion of the work I am now doing.	YES	NO
(38) People in this organization feel pressure to produce anything acceptable, even if quality is lacking.	YES	NO
(39) There is an open atmosphere in this organization.	YES	NO
(40) There is a good blend of skills in my work group.	YES	NO
(41) Ideas are judged fairly in this organization.	YES	NO
(42) Top management does not want to take risks in this organization.	YES	NO
(43) In my daily work environment, I feel a sense of control over my own work and my own ideas.	YES	NO
(44) Failure is acceptable in this organization, if the effort on the project was good.	YES	NO
(45) The budget for my project(s) is generally adequate.	YES	NO
(46) My area of this organization is creative.	YES	NO
(47) My area of this organization is productive.	YES	NO
(48) People are encouraged to solve problems creatively in this organization.	YES	NO
(49) People are rewarded for creative work in this organization.	YES	NO
(50) My supervisor supports my work group within the organization.	YES	NO
(51) Overall, my current wok environment is conducive to my own creativity.	YES	NO
(52) I feel challenged by the work I am currently doing.	YES	NO
(53) My area of this organization is effective.	YES	NO
(54) A great deal of creativity is called for in my daily work.	YES	NO
(55) People in this organization can express unusual ideas without fear of being called stupid.	YES	NO
(56) I can get all the data I need to carry out my project(s) successfully.	YES	NO
(57) The people in my work group are committed to our work.	YES	NO
(58) My supervisor does not communicate well with our work group.	YES	NO
(59) I get constructive feedback about my work.	YES	NO
(60) This organization has a good mechanism for encouraging and developing creative ideas.	YES	NO
(61) People are encouraged to take risks in this organization.	YES	NO
(62) I have trouble getting the materials I need to do my work.	YES	NO
(63) I feel that top management is enthusiastic about my project(s).	YES	NO

(64) Overall, this organization is productive.	YES	NO
(65) People are too critical of new ideas in this organization.	YES	NO
(66) There is free and open communication within my work group.	YES	NO
(67) My supervisor shows confidence in our work group.	YES	NO
(68) Overall, my current work environment is conducive to the creativity of my work group.	YES	NO
(69) I feel a sense of time pressure in my work.	YES	NO
(70) Overall, this organization is efficient.	YES	NO
(71) My supervisor values individual contributions to projects.	YES	NO
(72) My supervisor is open to new idea.	YES	NO
(73) My area of this organization is efficient.	YES	NO
(74) The information I need for my work is easily obtainable.	YES	NO
(75) I believe that I am currently very creative in my work.	YES	NO
(76) Other areas of the organization hinder my project(s).	YES	NO
(77) Destructive criticism is a problem in this organization.	YES	NO
(78) Do you get bored with doing things the same old way?	YES	NO
(79) Are you afraid of making mistakes?	YES	NO
(80) Do you get satisfaction from making improvements?	YES	NO
(81) Are you discouraged from acting because of lack of resources?	YES	NO
(82) Do you like solving problems in unorthodox ways?	YES	NO
(83) Do you mistrust your own or other people's intuition?	YES	NO
(84) Do you find it hard to accept disorder or confusion?	YES	NO
(85) Are you afraid of having your ideas ridiculed?	YES	NO
(86) Do you welcome other people's idea?	YES	NO
(87) Are you quick to point out why an idea will not work?	YES	NO