

# **Formulation of a Mathematical Model to Evaluate the Training Needs for Resolving the Conflicts Existing in Organizations and Industrial Projects**

A dissertation submitted in partial fulfillment of the requirements for the

award of Degree of

Master of Engineering

in

Production Engineering

Submitted by

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2009-2011

## **Certificate**

I hereby certify that the work which is being presented in the dissertation entitled “**Formulation of a Mathematical Model to Evaluate the Training Needs for Resolving the Conflicts Existing in Organizations and Industrial Projects**”, submitted in partial fulfillment of the requirements for the award of the degree of Master of Engineering in Production Engineering, submitted in the Department of Mechanical and Production Engineering, Delhi College of Engineering, Delhi is an authentic record of my own work carried under the supervision of **Shri V. Kamal**, Associate Professor Department of Production and Industrial Engineering, Delhi College of Engineering, Delhi.

I have not submitted the matter embodied in this project report for the award of any other degree.

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# Abstract

Conflicts in project management are inevitable. The potential for conflict in projects is usually high because it involves individuals from different backgrounds and orientations working together to complete a complex task. The causes of conflict in team projects can be related to differences in values, attitudes, needs, expectations, perceptions, resources, and personalities. Proper skills in dealing with conflict can assist project managers and other organization's members to handle and effectively resolve conflicts which can lead to a more productive organization as a whole.

In this case study I have studied the hourly output (number of shirts) on a daily and hourly basis of three selected sections a shirt manufacturing firm. The number of shirts output per hour was noted for seven hours of work in a day for a period of thirty days. Then  $\bar{X}$  and R control charts were plotted using statistical software "**MINITAB**". After the analysis of the  $\bar{X}$  chart it was found that the overall mean output was much less than scheduled, also many of the days the mean output per hour was observed to be lying outside the Lower Control Limit (LCL).

It was also noted, after the analysis of R-chart that many a days the variability of hourly output on a day is very high and lying outside the Upper Control Limit (UCL). Hence, the variations in the process cannot be attributed to the chance variations, but there exist assignable causes to which these variations can be attributed.

I have tried to attribute these variations and low output, to the various conflicts existing in the firm like *conflicts over schedules, activity conflicts, interpersonal conflicts, intergroup conflicts, asymmetric conflicts* etc. By comparing the observed time taken and the scheduled time flow, a **TRAINING NEED INDEX** was obtained after doing mathematical analysis of the data. A formal training procedure for resolving conflicts existing in the firm is suggested and techniques to further improvement of output and reducing variations of daily and hourly output are recommended.

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# **CHAPTER-1**

## **THEORY OF CONFLICTS IN ORGANIZATIONS AND**

### **INDUSTRIAL PROJECTS**

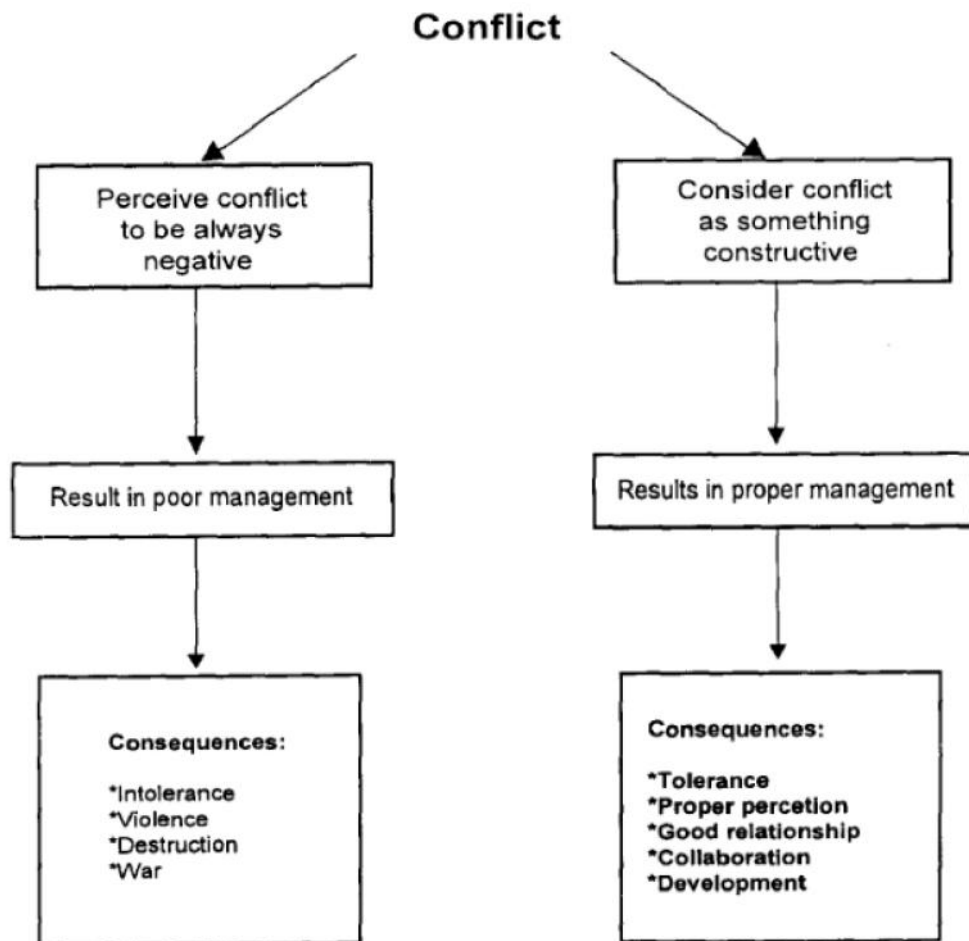
#### **1.1 INTRODUCTION**

Conflicts exist in all organisations despite the finest formal organisational system and the most cohesive informal organisations. Conflict is opposition or dispute between persons or groups within the firm. Conflict in some form and degree is a part and parcel of virtually every part of human life and organisations are no exceptions to this [7]. It may mean different things for different people because it occurs in different settings and may take several forms. With all the development and changes that take place among managers and workers, it is reasonable to expect differences of opinions, beliefs and ideas. The causes of conflicts in team projects can be related to differences in values, attitudes, needs, expectations, perceptions, resources, and personalities. So conflict is inevitable [2, 5, 21]. Project conflict inevitability is because project teams are populated with diverse team members whose perceptions differ, projects are complex and come well-equipped with aggressive deadlines and budgets.

Since conflict is inevitable, a helpful approach to the manager is to use it so that an appropriate and effective means for achieving goals can be followed. Such an approach require acceptance of the view that even the perfect organisation is not free from conflict and that conflict is helpful in bringing about needed changes. Conflicts affect an organisation's overall personality, performance and productivity. It might not bring about the demise of a firm, but it certainly can hurt an organisation's performance as well as lead to the loss of many good employees. Stephen Robbins suggests that there are two types of conflicts in organisations: Functional and Dysfunctional.

Functional conflict usually occurs between two or more groups within a firm and improves the organisation's performance and output. Without functional conflict in organisation, there would be stagnation and almost no commitment to organisational changes and improvement. On the other hand dysfunctional conflict hinders and prevents organisation's goals from being achieved. Sometimes

functional conflict can evolve into dysfunctional conflict, and management must put great efforts to prevent and eliminate this destructive disorder. When one group of persons, seeks to achieve his or her own objectives at the total expense of or with disregard for others, usually dysfunctional conflict will result. For any organisation to be successful, this dysfunctional conflict which affects its overall performance must be resolved.



**Fig 1.1: The Nature of Conflict Transformation [13]**

Unresolved conflicts can create serious and quite varied consequences. For example, employees' conflicts create project delays that can result in missed market opportunities. Customers' relations can be damaged when conflicts result in confused communications or inconsistent information. The development of effective workgroups and teams can fall as a consequence of disputes between their members. Companies with chronic conflict often find it difficult to attract and keep good people.

## 1.2 MOTIVATION & OBJECTIVES OF THE PROJECT

Management of conflict is one of the important roles played by managers in organizations, as managing workplace conflict is one of the crucial investment for long term viability and success for a business. In addition, it was found that *managers spent in excess of 20% of their time dealing with conflicts* [4]. Proper skills in dealing with conflict can assist project managers and other organization members to handle and effectively resolve conflicts which can lead to a more productive organization as a whole.

### **Objectives**

1. To acquaint the reader with theory of conflicts in organizations and industrial projects.
2. To reinforce the leaders with the skills in conflict management and conflict prevention to properly settle disputes that could arise in their work place. [13]
3. To develop a mathematical model for detecting conflicts existing in the organisation.
4. To evaluate the training needs of employees of all levels using "*Performance Appraisal technique*".

## 1.3 DEFINITION OF CONFLICT

There is no one comprehensive definition of conflict as it depends on which perspective one is looking from. Definitions have been given from various disciplines such as Psychology, Behavioural Sciences, Sociology, Communication and Anthropology. However, the common dominant theme in these definitions are the aspects of differing needs, goals or interests and the perceived or real interference from one party unto the other party to achieve these needs, goals or interests[19]. Problem exists when there is a divergence of opinion that does affect behaviour, decisions or the ability to accomplish a task. If there is a belief that the interests or goals of the parties involved con not be achieved simultaneously, then the problem can become a conflict. Perception plays an important role in conflict. If the conflict is not perceived by either party, then it does not exist. However, when the conflict is perceived, it occurs whether or not the perception is real.

March and Simon (1993) defined conflict as “A breakdown in the standard mechanisms of decision-making so that an individual or group experiences difficulty in selecting an action alternative”. Individuals in conflict may either continue to solve the problem, elect to do nothing or seek the involvement of a third party to assist in conflict resolution. [20]

Süheda Özben defined conflict as “Behaviour by one member of a dyad that is incongruent with the goals, expectations, or desires of the other members, resulting in mutual opposition”. [8]

### ***Key Messages about Conflict [22]***

- Conflict is neither good nor bad
- Conflict is inevitable
- Conflict does not have to result in winners and losers
- In conflict both parties tend to believe that their opinion is fact
- Too often both parties see themselves as innocent victims who represent the side of truth and fairness
- Too often both parties perceive all destructive acts carried out by others completely blind to identical acts carried out by self or those on ‘my’ side.

### ***Some basic features of conflict can be identified as follows [7]:***

- Conflict is a process, which suggests that it contain some activities leading to certain end result.
- Conflict occurs when two or more parties pursue mutually exclusively goals, values or events. Since these goals, values and interests are incompatible; these can be achieved by one party at the cost of the other. Similarly, conflicting goals may also exist before an individual and he may face conflicting situation as he can pursue only one goal at the cost of other.
- Conflict can exist either at latent or overt level but generally speaking conflict is a term that is limited to overact, that is some action has been taken by parties concerned to the conflict. Mere thinking incompatible goals or values, is not sufficient for conflict.

- Conflict is different from competition. In conflict one party sees an opportunity to interfere the others' opportunity to acquire resources to perform activities. In competition both parties may try to win but neither party actively interferes with the other.

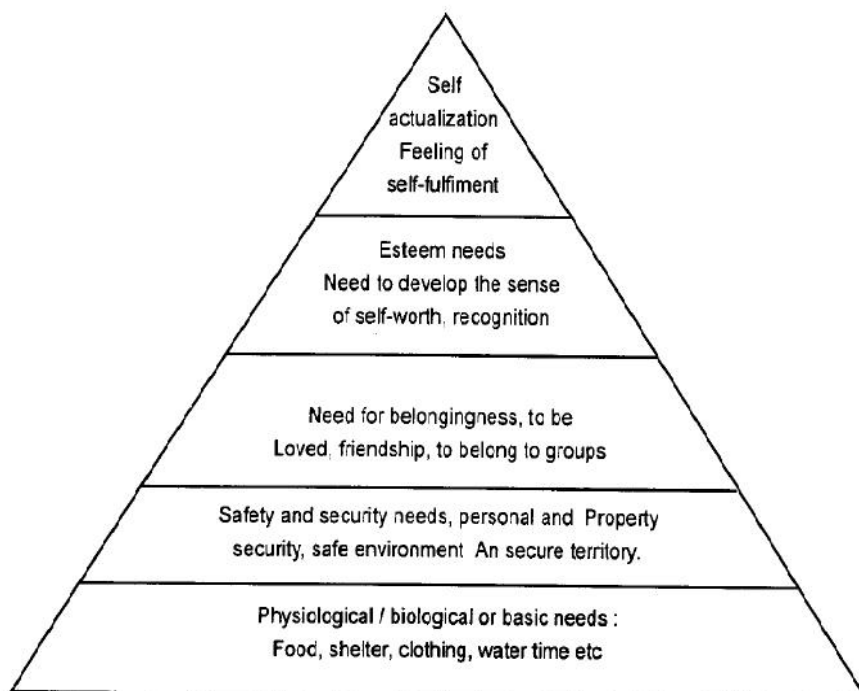
### 1.3.1 The ingredients of conflict [7]:

**Needs:** Needs are things that are essential to our well being. Conflicts arise when we ignore others' needs, our needs or group's needs. Be careful not to confuse needs with desires (things we would like, but are not essential).

#### **The hierarchy of needs by Abraham Maslow [13]**

This hierarchy of needs consists of classifying the Fundamental human needs according to a pyramidal disposition. According to Abraham Maslow, if the behaviour of a person is motivated to attain or reach a certain goal, it is because that person has a need engendered to attain that goal by himself. The frustration of all or some of those needs usually results in or becomes a source of conflict. The figure below indicates structurally the hierarchy of those needs ranging from the basic biological needs to the most highly esteemed ones.

**Fig1.2: Maslow's Hierarchy of needs [13]**



**Perceptions:** People interpret reality differently. They perceive difference in the severity, causes and consequences of problems. Misperceptions of differing perceptions may come from self perceptions, others' perceptions, differing perceptions of situations and perception of threat.

**Power:** How people define and use power is an important influence on the number and type of conflicts that occur. This also influences how conflict is managed. Conflict can arise when people try to make others change their actions or to gain an unfair advantage.

**Values:** Values are beliefs or principles we consider to be very important. Serious conflicts arise when people hold incompatible values or when values are not clear. Conflicts also arise when one party refuses to accept the fact that the other party holds something as a value rather than a preference.

**Feelings and Emotions:** Many people let their feelings and emotions become a major influence over how they deal with conflict. Conflicts can occur because people ignore their own or others' feelings and emotions. Other conflicts occur when feeling and emotions differ over a particular issue.

### **1.3.2 Causes of conflict**

Causes for conflict are applicable across the entire project cycle. Conflict can arise in schedules through disagreements about task durations and sequencing. They can arise based on project priorities stemming from the requirement to learn new skills to do work that have never been done before or underestimating the need for continual project communication. Manpower is an area where conflict can arise where people are spread across several projects or have conflicting commitments. Conflict surrounding technical issues can surface due to budget restraints, cost estimates and payment/funding schedules that designed inadequately in the view of others, compared to the view of the project manager or vice versa. Project management and administration can become a conflict in and of itself in organizations that do not have a strong project management processes. Among other causes of conflict are poor distributions of resources, lack of basic human needs or their frustration, ideological differences based on religion or culture. [13, 22]



Breakdown in communication is the overarching, most common, and most obvious source of conflict in projects. A lack of trust, respect, effective listening skills, and perceptual differences can lead to serious communication problems. Misinterpretation of a design drawing, a misunderstood change orders delays in delivery of critical components, and failure to execute instructions are all results of some type of communication breakdown. The communication skills of project managers are often put to the test by overlapping areas of responsibility, gray lines of authority, delegation problems, complex project organizational structures, and conflicts among participants. Project managers and their teams must also develop effective communication skills (especially listening skills) to resolve project conflicts. They must learn to create an atmosphere that encourages open communication in order to deal with conflict and gain team members' acceptance of and commitment to project goals. [16]

## **1.4 ASPECTS OF CONFLICT**

A basic question that arises is whether conflict has only dysfunctional aspect or it generates functional utility to the organisation under some conditions. This question becomes important because for long, conflict has been held as villain for the organisational functioning but at the same time behavioural scientist has been trying to use conflict in a constructive way. It is suggested that under some situations, conflicts can generate positive response in the organisation, thus a conflict may have both positive and negative aspects [7, 21].

### ***1.4.1 Functional aspect of conflict***

Most experts today view conflict as a potentially useful aspect of organisation. It is claimed that an organisation void of constructive conflict is an organisation void of excitement, diversity and viability. Conflict prevents stagnation, stimulates interest and curiosity. The benefits of conflict should not be underestimated. Conflict which is managed effectively and appropriately would add substantial value to an organization. Conflicts which are managed well will create a conducive workplace for its workers where relationships, trust and respect will prevail among its employees. Having such working environments will result in stimulated team spirit and increased productivity. Furthermore, with strengthened working relationships, the “us” versus

“them” polarization can be eliminated. This is crucial as good working relationships are important to achieve organizational goals. Thus a minimum level of conflict is necessary because it helps organisation in the following ways:

***Stimulant for change:*** Conflict provides stimulus for change in the systems which are not conducive to the organisation. The existence of conflict means that there is something wrong with the systems of working. Thus it spotlights problems that demand attention, forces clarification of their nature and sources and channels organisational efforts towards finding better solutions of the problems. This way conflict can focus the areas where changes should be brought about.

***Creativity and innovation:*** Normally a conflict of certain degree arouses creativity and innovation in an atmosphere of open confrontation; people tend to put forward more imaginative solutions to problems. A climate of challenge compels people to think through their own ideas before airing them out. Thus a conflict can help people to test their capacities to learn and develop.

***Group cohesion:*** Generally a group shows more cohesion when it faces threat from external sources in the form of intergroup conflict. Group cohesiveness is a situation in which all members of the group work together for a common goal, or where everyone is ready to take responsibility for group cause. If group cohesion is high, interaction among members and the amount of agreement in group opinion will be high. Thus members can derive more satisfaction from group activities.

***Conflict is constructive when it [19]:***

- Results in clarification of important problems and issues
- Involves people in resolving issues important to them
- Causes authentic communication
- Helps release emotions, anxiety and stress
- Builds cooperation among people through learning more about each other
- Helps individuals develop understanding and skills

### **1.4.2 Dysfunctional aspect of conflict**

While the positive aspects of conflict are few and limited, negative aspects are many and serious. Conflict to the extent of healthy competition may produce better results but beyond that it may be destructive [7]. For example, conflict between management and workers has led the closure of many organisations or has turned them into loss-making units. In general conflicts may create following problems:

***Disequilibrium in organisation:*** Conflict affects equilibrium of the organisation and produces disequilibrium. Every individual contributes something to the organisation and gets inducement in return. An organisation is said to be in equilibrium when contribution matches inducement for all or most individuals. When there is conflict, this equilibrium is affected adversely because the individual's contributions do not match their inducement as they are using some of their energies in conflictful behaviour. So, conflict creates disequilibrium in organisation.

***Stress and Tension:*** While group cohesion provides satisfaction, conflict creates tension and stress. It affects the physical and mental health of parties to the conflict. Intense conflict generates feeling of anxiety, guilt, frustration and hostility.

***Diversion of energy:*** The most important dysfunctional aspect of conflict is that it leads to diversion of energy from constructive activities to destructive. People try to focus more on their personal goals rather than organisation's goals. They spend more time on designing tactics for winning in conflictful situations rather than pursuing organisation's goals. Long term goals of the organisation begin to suffer as short term problems become more important.

#### ***Conflict is destructive when it:***

- Takes attention away from the important activities
- Undermines morale or self-concept
- Polarizes people and groups, reducing cooperation
- Increases or sharpens differences
- Leads to irresponsible and harmful behaviour, such as fighting, name calling, gossiping, etc.

Thus it can be seen that conflict will ultimately result into destructive activities. Therefore, it is necessary that management takes adequate steps either to eliminate the emergence of unnecessary conflicts or, if generated, to turn them into constructive ones. This requires understanding of conflict and its management. Though conflict may arise at various levels and in various forms, its intensity is felt in terms of individual and group level. Thus conflict can be analysed at individual level conflict (goal conflict & role conflict), interpersonal and intergroup level conflict.

## 1.5 TYPES OF CONFLICT

### 1.5.1 Individual level conflict

The analysis of conflict may start at individual level because organisation is composed of individuals and many conflicts may arise at this level. Though there should be two parties to a conflict, it may arise within an individual because of lack of smooth progression of the need-driven-goal cycle. Within an individual there are usually a number of competing goals and roles. There may be *goal-conflict and role-conflict* within an individual. Besides, there may be interpersonal conflict when two individuals interact [2, 6, 7].

#### 1.5.1.1 Goal conflict:

Goal conflict occurs at individual level when an individual faces the problem of choosing among two or more goals, which are mutually competing in some way. Existence of mutually competing goals may lead to three possible alternatives: *approach-approach conflict, approach-avoidance conflict and avoidance-avoidance conflict*.

- **Approach - Approach conflict:** This conflict arises when a person faces the problem of selecting among two or more equally attractive goals, which are mutually exclusive. Conflict arises in the mind of the person because he can choose only one alternative at the cost of other equally positive alternative. However, this type of problem is not very serious in the context of organisational functioning.

- **Approach - Avoidance conflict:** This conflict arises when a person has an alternative, which has both positive and negative aspects. For example, if a person gets job (positive aspect), but does not like the place of job (negative aspect).
- **Avoidance - Avoidance conflict:** This conflict arises when a person has to choose between two mutually exclusive goals, each of which possesses equally negative aspect. In such a case, unless another alternative is available, the conflict remains unresolved. For example, a person may not like his present job but the alternative of leaving and looking for another job may be equally unattractive.

#### ***1.5.1.2 Role conflict:***

A role is a set of expectations people have about the behaviour of a person in a position. Such behaviour may be formally prescribed by job description, delegation, organisational manuals, and the likes, and is derived from tasks, missions, procedures or instructions. Roles may also be derived from informal activities in which members may be engaged. Role conflict occurs when expectations of a role are materially different or opposite from the behaviour anticipated by the person in that role.

#### ***Reasons for role conflict:***

Normally all those factors, which are associated with the determination of role expectations may be responsible for the role conflict because role conflict arises due to mutually exclusive role expectations. Such factors responsible for role conflict may be grouped broadly in three categories: role ambiguity, organisational position and personal characteristics.

- **Role ambiguity:** Role ambiguity occurs when an individual is not clear regarding his job duties and responsibilities. As a result, he experiences difficulties in deciding the actual expectations from his roles. For example, the role of medical/sales representatives is not defined properly and they are not clear whether they have to sell the products or merely meet the doctors to

convince them about the products of their company. In such a case, they may experience role conflict because they are not clear about what to do.

- **Organisational position:** Organisational positions also affect the role ambiguity and consequently role conflict. This happens because there are different expectations from a position, each individual or group of individuals has particular expectations, which may not be compatible.
- **Personal characteristics:** Role conflict may also arise because of personal characteristics. Certain personality characteristics are more prone to experience role conflict. Role conflict has serious dysfunctional effects as it provides conflicting situations where the effort of human beings can go in waste because they do not work the way in which they should apply themselves. Therefore, management should take steps to avoid role conflict as possible by prescribing role expectations clearly. This can be done by proper job description, clarity in authority and responsibility, and setting proper organisation climate.

### ***1.5.2 Interpersonal conflict***

Interpersonal conflict involves two or more individuals rather than only one individual with different goals or roles. It arises due to interpersonal interactions; such interactions take place between superior and subordinate, between two functional specialists, two professionals and so on. Since people interact in two types of relationships: vertical relationships & horizontal relationships, such a conflict may take place in these two dimensions. Further the organisations may have provisions for diagonal interactions in which conflict may also arise [2, 6, 7].

Vertical conflict arises between a superior and his subordinates. The conflict arises because the superior tries to control the subordinate and later try to resist such control. Horizontal conflict at interpersonal level is among the persons of different functions. Similarly, diagonal conflict may take place between two persons of different levels but not having direct superior subordinate relationship. However, in all these relationship, it is not necessary that conflict will always arise but it will arise because of the operation of certain factor as discussed below:

- **Nature of persons:** The type of persons involved in a particular relationship will determine the extent to which whether relationship will be conflicting or cooperative. Differences among persons may lead to interpersonal conflict. Such differences may arise because of the following reasons: differences in ego states, value systems and socio-cultural factors.
- **Situational variables:** Besides differences in personal factors, situational variables may also generate interpersonal conflict. Situational variables include those factors which affect the interpersonal relations at workplace like grouping of activities, interdependence on each other, role ambiguity, etc., if these factors are not conducive, these may create situations for conflict.

### ***1.5.3 Intergroup conflict***

Groups exist in every organisation both at formal as well as at informal level. There may be conflict within the group or conflict among groups. The first kind of conflict is mostly interpersonal. Intergroup conflict arises because of interaction of various groups [2, 6, 7]. There are various factors, which determine intergroup relationship. They may either create harmonising situation or conflicting situation among groups. These factors are as follows:

- **Incompatible goals:** The goals of two groups may have powerful impact on their relationship. Each group tries to accomplish its own goals. Intergroup conflict arises when goals of two or more groups are incompatible, i.e. goal attainment by one group may prevent or reduce the level of goal attainment of one or more groups. The conflict between production and marketing is a classic example of such conflict.
- **Resource sharing:** Each party to the conflict has an interest in making total resources as large as possible but also in securing as large a share for them as possible. Since resources are scarce and limited, most of the groups (departments) jockey for resources. In the anxiety of achieving their goals groups try to cut a bigger slice of the common pool of resources. This tendency leads to intergroup conflict.

- **Task interdependence:** A dependent task relationship may result in one group having the ability to dictate or unilaterally determine the outcome of interactions between two groups. This happens when one group exceeds its authority and conflict arises.
- **Absorption of uncertainty:** Conflict arises when absorption of uncertainty by one group is not in accordance with the expectations of other groups. For example, accounting department may prescribe the rules for travelling expenses for marketing department personnel so that they know how to spend on travelling. Condition for conflict exists when marketing department finds that travelling rules prescribed by accounting department are not adequate or efficient.
- **Attitudinal Sets:** The sets of attitudes that members of various groups hold towards other can be a cause of conflict among groups. If the group relations begin with the attitudes of distrust, competitiveness, secrecy and closed communication, there is a possibility that group relationship will become hostile rather than cooperative.

#### **1.5.4 Symmetric and Asymmetric conflicts**

So far conflicts of interest between relatively similar parties are considered. These are examples of *symmetric* conflicts. Conflict may also arise between dissimilar parties such as between a majority and a minority, an established government and a group of rebels, a master and his servant, an employer and her employees. These are *asymmetric* conflicts. Here the root of the conflict lies not in particular issues or interests that may divide the parties, but in the very structure of who they are and the relationship between them. It may be that this structure of roles and relationships cannot be changed without conflict. In a symmetric conflict, the contradiction is defined by the parties, their interests and the clash of interests between them. In an asymmetric conflict, it is defined by the parties, their relationship and the conflict of interests inherent in the relationship.

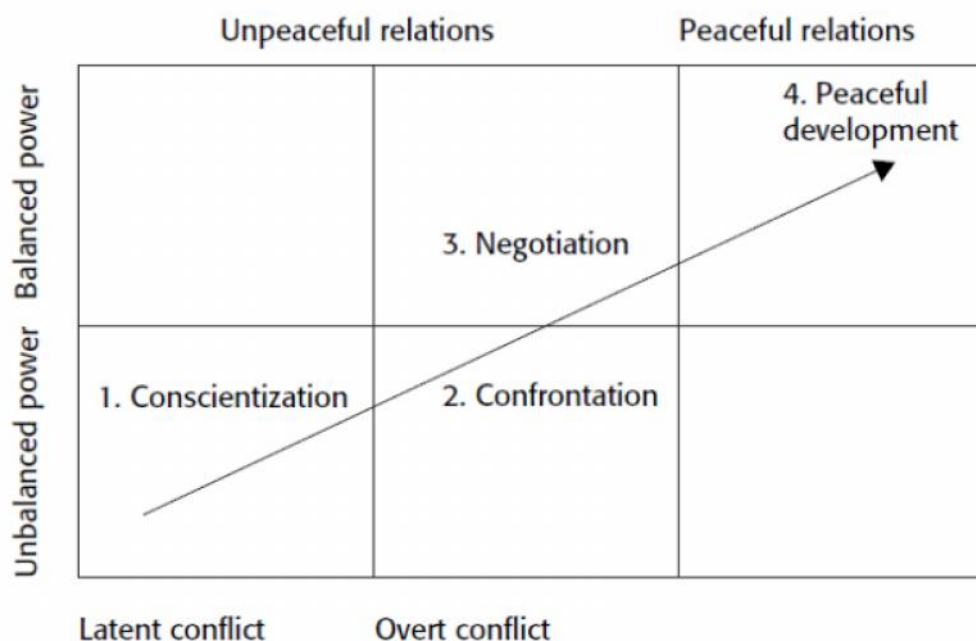
Classical conflict resolution, in some views, applies only to symmetric conflicts. In asymmetric conflicts the structure is such that the top dog always wins, the underdog always loses. The only way to resolve the conflict is to change the



structure, but this can never be in the interests of the top dog. So there are no win-win outcomes, and the third party has to join forces with the underdog to bring about a resolution.

From another point of view, however, even asymmetric conflicts impose costs on both parties. There are costs for the top dogs in sustaining themselves in power and keeping the underdogs down. In severe asymmetric conflicts the cost of the relationship becomes unbearable for both sides. This then opens the possibility for conflict resolution through a shift from the existing structure of relationships to another. The role of the third party is to assist with this transformation, if necessary confronting the top dog. This means transforming what were un-peaceful, unbalanced relationships into peaceful and dynamic ones. Figure below illustrates how the passage from un-peaceful to peaceful relationships may involve a temporary increase in overt conflict as people become aware of imbalances of power and injustice affecting them (stage 1, education or 'conscientization'), organize themselves and articulate their grievances (stage 2, confrontation), come to terms in a more equal way with those who held a preponderance of power over them (stage 3, negotiation) and finally join in restructuring a more equitable and just relationship (stage 4, resolution). [14]

**Fig 1.3: Transforming Asymmetric Conflict [14]**



Source: from Curle, 1971 and Lederach, 1995

There are many ways in which this can be approached without using coercion. There is the Gandhian tactic of ‘speaking truth to power’, influencing and persuading the power-holders. Then there are the tactics of mobilizing popular movements, increasing solidarity, making demonstrations of resolve, establishing a demand for change. Raising awareness of the conflict among those who are external or internal supporters of the top dog may start to weaken the regime. The unequal power structure is unbalanced; it is held up by props of various kinds; removing the props may make the unbalanced structure collapse. Another tactic is to strengthen and empower the underdogs. The underdogs may withdraw from the unbalanced relationship and start building anew: the parallel institutions approach. Non-violence uses soft power to move towards a more balanced relationship.

## **1.6 THE CONSEQUENCES OF UNRESOLVED CONFLICT**

W. Edward Deming said that it is impossible to predict the long-term consequences of poor quality. The same can be said of unresolved conflict. For example, when a major project has been seriously undermined and delayed as a result of festering disputes among project members. It may be easy to measure the cost of increased expenditures of resources and the cost of extended time to completion. In the product (or service) development world, it is also possible to measure the loss of revenue and profit resulting from a delayed completion. But it is much more difficult to measure the cost of missed windows of opportunity, lost market dominance, damaged customer relations or the continued poor productivity of a “team” that doesn’t function well [7, 11, 16].

A reduction in productivity of disputants and their peers is one of the more serious consequences of unresolved conflict. Tension and stress reduce motivation and disturb concentration. A loss of simple productivity of 25% results because of doing things other than work related activities, such as discussing the dispute etc. Besides suffering increased supervisory overhead, the conflict saddled manager is in danger of losing credibility in the eyes of peers, subordinates and superiors. Subordinates feel a sense of disappointment when conflicts are allowed to continue. Peer managers may begin to look at the disputing group as badly managed and uncooperative. There may be following consequences of unresolved conflicts:

- Increased levels of absenteeism
- Excessive employee turnover
- Missed market opportunities
- Confused communication or inconsistent information
- Low employee morale and motivation
- Reduced productivity
- Quality problems
- Delayed and missed deadlines
- Increased supervision overhead
- Reduced collaboration
- Fractionated activities
- Passive/aggressive/abusive behaviour
- Decreased customer satisfaction
- Negative upward attention
- Split alliances (factions & cliques)
- Increased legal costs
- Relational strain in the workplace
- Negative consequences for health and stressed-related medical claims
- Poor judgement and decision making by the decision makers

## **CHAPTER-2**

# **MANAGING CONFLICTS IN ORGANIZATIONS AND**

# **PROJECTS**

### **2.1 THE ROLE OF PROJECT MANAGER**

Because of the significant impact that conflict can have on project success, managing it well is one of the most important skills a project manager must possess. An American Management Association study of middle- and top-level executives revealed that the average manager spends approximately 20% of his or her time dealing with conflict [4, 17]. The importance of conflict management is also reinforced by a research study of managers that analyzed twenty-five skills and personality factors to determine which, if any were related to managerial success. Of the twenty-five factors, the ability to handle conflict was most positively related to managerial success.

Project managers must identify, analyze, and evaluate both positive and negative values of conflict and their effect on performance. They must learn how and when to stimulate conflict and how to use it to increase the performance of project team members. Conflict need not have destructive consequences. Attitudes and conflict management styles play an important role in determining whether such conflict will lead to destructive or mutually beneficial outcomes. [9]

Project managers must not only be aware of various interpersonal conflict resolution modes and their strengths and weaknesses in order to choose an appropriate approach but must also manage conflict using some practical guidelines that involve preparing for the conflict, facing it, and then resolving it by developing win-win strategies. They must also recognize that it is sometimes good to stimulate conflict in order to encourage self evaluation, creativity and innovation.

To manage conflict effectively, the management team first requires the skills to identify potential grievances or conflicts. Processes to resolve these issues must be in place and effective and it is important to have an identified person or persons within the organisation to take responsibility for managing these issues. A formal

procedure must also be in place so employees know how and when to air their grievances. It is an inevitable part of any manager's job that you will, at some time, need to resolve a conflict situation in your workplace.

## **2.2 CONFLICT RESOLUTION ACTION**

Conflict beyond certain level is dysfunctional. Therefore, an attempt should be made to develop organisational procedures and practice through which organisations function in a cooperative way and reducing conflict. However, if conflict generates in the organisation for whatever the reason, management should take effective steps to resolve it. Thus there can be two approaches of managing conflict: *preventive measures and curative measures*.

In preventive measures, attempts are made to create situations in which conflict does not take place while curative measures deal with resolving conflict amicably so that its dysfunctional aspect is minimized. Such preventive and curative measures may be taken in terms of establishment of common goal, change in structural arrangement, and conflict-resolution action. Application of these techniques will depend on the nature and causes of conflict in the organisation.

Conflict-resolution actions are curative methods to overcome the problems of conflict. There may be several types of conflict resolution actions. For example, March and Simon have given four measures to overcome conflict: *problem solving, persuasion, bargaining and politics*. As against this, Lawrence and Lorsch have suggested these measures: *confrontation, smoothing and forcing*. There may be other actions also which can be taken to resolve conflict in the organisation. The major conflict resolution action may be as follows which can be taken depending on the situation [1, 3, 5, 7, 13, 16, 19].

### **2.2.1 Compromise**

Compromise is a traditional technique of resolving conflict in which neither party is a definite loser or distinct winner. Each party is expected to give something of value in exchange to get something. Compromising is primarily bargaining - receiving something in exchange for something else. It involves considering various

issues, bargaining, using trade-off negotiations, and searching for solutions that bring some degree of satisfaction to both parties. Neither party wins, but both get some satisfaction out of the situation. Both may temporarily feel hurt because they had to give up something that was important to them, but compromising usually provides acceptable solutions. A definitive resolution to the conflict is achieved when a compromise is reached and accepted as a just solution by both parties. The only problem with compromising in a project situation is that sometimes important aspects of the project might be compromised in order to achieve short-term objectives.

### ***2.2.2 Collaborating***

Collaborating is an effective technique to manage conflict when a project situation is too important to be compromised. It involves incorporating multiple ideas and viewpoints from people with different perspectives. It offers a good opportunity to learn from others. Active collaboration by both parties in contributing to the resolution makes it easier to get their consensus and commitment. Collaboration is not very effective when more than a few players are involved and their viewpoints are mutually exclusive.

### ***2.2.3 Confrontation/ Problem Solving***

Confrontation is a technique in which parties to the conflict are left free to settle their score by mobilizing their strengths and capitalizing on the weaknesses of others. It implies a direct confrontation, with disagreement addressed directly. Conflict is treated as a problem for which both parties are interested in finding a mutually acceptable solution. This approach requires a give-and-take attitude between the parties, meaning that both are somewhat assertive and somewhat cooperative. It involves pin pointing the issue and resolving it objectively by defining the problem, gathering necessary information, generating and analyzing alternatives, and selecting the best alternative under the circumstances. Confrontation requires open dialogue between participants, who must be mature, understanding, and technically and managerially competent. This technique is adopted specially when both parties adopt very rigid stand and common superior does not want to interfere in their working.

#### ***2.2.4 Withdrawing /Avoidance:***

It involves avoiding, denying, giving up, pulling out, or retreating and as such constitutes a refusal to deal with the conflict by ignoring it as much as possible. When parties to the conflict fail to arrive at mutually agreed solution, they may detach from the problem believing that conflict avoidance is more mature and reasonable rather than involving into wasteful arguments and actions. This style is appropriate when a cooling-off period is needed to gain better understanding of the conflict situation and also when the other party is both unassertive and uncooperative. It is a passive, stopgap way of handling conflict, generally fails to solve the problem. Therefore, this style should not be used if the conflict deals with an issue that is of immediate concern or is important to the successful completion of the project.

#### ***2.2.5 Smoothing/Accommodating***

Smoothing is the process of playing down the differences that exist between parties to the conflict and emphasizing common interests. Differences are suppressed and similarities are accentuated. It is appropriate to keep harmony and avoid outwardly conflictive situations. It works when the issues are more important than the personal positions and aspirations of the parties involved. Since smoothing tends to keep peace only in the short term, it fails to provide a permanent long-term solution to the undying conflict. Generally conflict reappears again in another form. Both smoothing and withdrawing incline toward ignoring or delaying tactics, which do not resolve conflict but it will temporarily slow down the situation. Project managers must remember that if the conflict is not handled and resolved in a timely manner, it will likely lead to more severe and intense conflict in the future.

#### ***2.2.6 Forcing/Competition:***

It implies the use of position power and dominance to resolve the conflict. It involves imposing one viewpoint at the expense of another and is characterized by a win-lose outcome in which one party overwhelms the other. Forcing is used when there is no common ground on which to bargain or negotiate and when both parties are uncooperative and strong willed.

Project managers may use it when time is of the essence and issue is vital to the well-being of the project, and they believe they are right based on the information available. Under such circumstances, project managers take the risk and simply dictate the action in order to move things forward. This approach is appropriate when quick decisions are required or when unpopular issues such as budget cuts, fast-tracking, or staff cutbacks are essential in a project.

Forcing usually takes less time than compromise and negotiation, but it leaves hard feelings because people dislike having others' views imposed on them. Competition is usually used when negotiations and peaceful talks have hit a deadlock or one of the parties fails to accommodate the others' views. It also happens when one party is unwilling to give up some interests and is always positional on whatever he wants. Conflict resolved by force may develop again and haunt the enforcer at a later date. Although forcing definitely resolves the conflict quickly, it should be used only as a last resort.

**Table 2.1: Relative merits of different conflict management styles [2]**

Style	Description	Effect
Withdrawing/ Avoiding	Retreats from an actual or potential conflict situation	Does not solve the problem
Smoothing/ Accommodating	Emphasizes areas of agreement rather than areas of difference	Provides only short-term solution
Compromising	Searches for and bargains for solutions that bring some degree of satisfaction to all parties	Provides definitive resolution
Forcing	Pushes one's viewpoint at the expense of others; offers only win-lose situations	Hard feelings may come back in other forms
Collaborating	Incorporates multiple viewpoints and insights from differing perspectives; leads to consensus and commitment	Provides long-term resolution
Confronting/ Problem Solving	Treats conflict as a problem to be solved by examining alternatives; requires give-and take attitude and open dialogue	Provides ultimate resolution



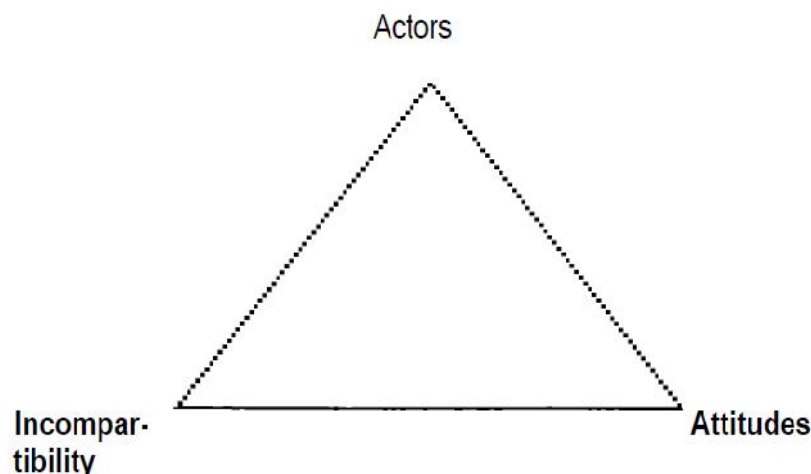
**Table 2.2: Conflict response behaviours or attitudes [13]**

Attitude	Objective	Behavior.
Avoidance	All of us lose	Retreating, hiding, silence due to fear
Competing	Personal interests	Hot debate, egoism
Accommodation	Opportunity cost for peace	Sacrifice and persistence
Compromise	Both parties accept to lose something	Perseverance
Collaboration	No party feels like losing	Tolerating one another.

### 2.3 CONFLICT ANALYSIS

It has to be noted that Conflict is manifested externally to people by its consequences or its symptoms than through its real causes. Its real causes are always hidden; one cannot easily see or recognize them not until after deep analysis. Thus most people tend to be concerned quickly in its symptoms rather than its causes. It is by paying particular attention to real causes of conflict than its symptoms that one can really resolve conflict efficiently. What lies beneath the surface are the real causes or most of the problem or conflict. But, unfortunately this is not usually conspicuous. Mostly, people like to make conclusions on what they see physically as proper causes of conflict yet are just symptoms. However, this way of apprehending and attempting to resolve conflict doesn't generally result into durable and efficient solution. [13, 24]

**Fig 2.1: Conflict Analysis [13]**



**Table 2.3: The analysis of conflict puts emphasis on the following issues [13]**

<b>Actors</b>	<b>Attitude</b>	<b>Incompatibility</b>
Who are the parties or groups	What is the spark or immediate cause of that conflict	What is the interest of either party? What is the matter in contention
Who are other parties that are not primary parties	What are / have been common characteristics of the parties	Are their interests too distinct? Where do they diverge?
Who will be the likely victims?	Is there any common way of resolving such conflicts?  How does their communication of negotiation process look like?	Is there any common way of reaching an agreement acceptable to all? What is that mechanism or criteria?
What kind of leaders are involved? How does their organizational structure look like?	How is the conflict getting transformed? What are the root causes of the conflict? How does the conflict escalate?	What are their common characteristics/needs?
How do they perceive such conflict themselves?	Who are those trying to prevent the conflict and what mechanism do they employ?	What sort of conflict resolution mechanisms is used to resolve it?
What are the issues of concern for a particular group of party?  How do their perceptions differ?		

## 2.4 FINDING THE BEST CONFLICT RESOLUTION APPROACH

Since each conflict situation is unique and dynamic, it is difficult to recommend the best conflict resolution approach. Choice of approach depends on these factors:

- Type and relative importance of conflict
- Time pressure
- Position of the players involved
- Relative emphasis on goals versus relationships

Forcing, smoothing, and withdrawing techniques are generally not effective in resolving conflicts because they fail to deal with the real cause of the conflict. They may be appropriate when it is important to create a period of peace and harmony while the parties think about their next move. Techniques involving compromise are usually used in labour-management disputes, but they have some potential problems. For example, in compromising, each party gives up something, and neither gets exactly what it wants. Consequently, both parties may be unhappy with the final decision.

Under some circumstances, the best solution for managing project conflicts is the confronting/problem solving or negotiation mode. Since project management involves solving problems as the project progresses through its life cycle, this type of conflict management is very practical. This approach aims for a win-win strategy, which is best for both the project and the parties involved. Project managers should acquire proper training in the procedures, nuances, and skills of professional negotiation. It is important to bear in mind; however, that negotiation and confrontation take time. They simply cannot be managed in a cursory or rapid manners but instead require a significant commitment from the project manager in terms of time and willingness to allow all parties to air their grievances.

Conflicts are managed effectively if they are resolved on a permanent basis. The relationship between the desire for achieving goals and the desire for maintaining good long-term relationships has a significant impact on the choice of a conflict resolution style.

**Table 2.4: Choosing the best conflict resolution approach [2]**

High	Use Force: When you are sure that you are right. When an emergency situation exists (Do or die) When stakes are high and issues are important When you are stronger: never start a battle you can't win To gain status or demonstrate position power When the acceptance is unimportant		Use Collaboration (Confrontation) When you both get at least what you want and maybe more. To reduce overall project costs To gain commitment and create a common power base When there is enough time and skills are complementary When you want to preclude later use of other methods To maintain future relationships When there is mutual trust, respect and confidence
Concern for Oneself		Use Compromise · For temporary solutions to · For backup if collaboration fails When you can't win or don't have enough time · when others are as strong as you are · To maintain your relationship with your opponent · When you're not sure you are right · When you get nothing if don't When goals are moderately high	
	Use Avoidance (Withdrawal): · When you can't win or the stakes are low · When the stakes are high, but you aren't ready yet · To gain status or demonstrate position power · To gain time · To discourage your opponent · To maintain neutrality or reputation · When you think the problem will go away by itself		Use Accommodation (Smoothing): · To reach an overreaching goal. · To create obligation for a trade-off at a later date · When stakes are low and liability is limited · To maintain harmony, peace, and goodwill · When any solution will be adequate · When you'll lose anyway · To gain time
Low	Low	Concern for the Other	High

Source: Verma, V. K. (1996). *Human resource skills for the project manager*. Upper Darby, PA: Project Management Institute, p. 122.

## **2.5 CONFLICT MANAGEMENT SKILLS**

Conflict management skills include negotiating skills, conciliation and mediation skills, an awareness of controlling difficult situations using legal remedies, knowledge of your own responsibilities, to whom you need to notify, the ability to work within specified time frames.

### ***2.5.1 Conflict prevention***

Conflict prevention means to anticipate problems ahead of their happening, and the capacity to prevent it from escalation so that it may not lead to mutual distrust, chaos or even war. It requires taking early proposals, instituting commissions of inquiry, investigations, proper distribution of resources, and respect for the rule of law and for human rights. [13, 15]

### ***2.5.2 Conciliation***

Conciliation is a skill that is used to resolve conflicts within an organisation. The role of a conciliator is to play an active part in trying to solve the dispute, often by suggesting options for solutions or paths to a solution. The conciliation procedure is flexible and can be as formal or informal as the situation requires. An advantage of this style of conflict resolution is that if it is successful, it should enable all parties involved to learn how to manage their relationships and solve their problems. [18]

### ***2.5.3 Mediation***

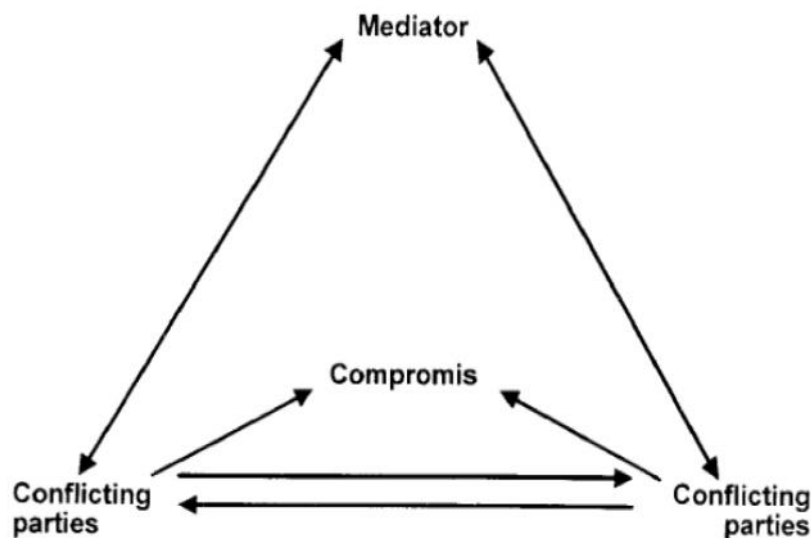
Mediation is a method of preventing and resolving interpersonal conflicts with the help of a neutral person agreed upon by both parties. He should be a person of integrity and acceptable by both parties involved in a dispute. This method is used when parties, institutions or families are not able to resolve conflicts on their own. The mediator can be a person, institution, country, or joint countries. Mediation can be between more than two parties. [13, 19, 22]

The mediator's role is to help the parties to negotiate an agreed solution. The mediator is neutral, makes no proposals and provides no advice. His or her role is to help the parties involved in the conflict talk their way through the problem and find a mutually agreed solution. This may be helpful within an organisation where employees are having problems working together or where there are claims of

discrimination or harassment. These problems can be very damaging to the individuals concerned, as well as to the company, and may be legally expensive to pursue. In these instances, successful mediation offers a structured negotiation, resulting in an agreed outcome by all of those involved. [18]

**Attributes of successful mediators have been identified as below [27]:**

- Conflict analysis and situational awareness;
- Persuasion;
- Listening actively;
- Gathering information through open - ended questions;
- Emphasizing without patronizing;
- Providing effective feedback;
- Dealing with emotional issues and difficult people; and
- Analyzing alternatives, creating multiple options, and maintaining momentum.



**Fig 2.2: Graphic Representation of Mediation [13]**

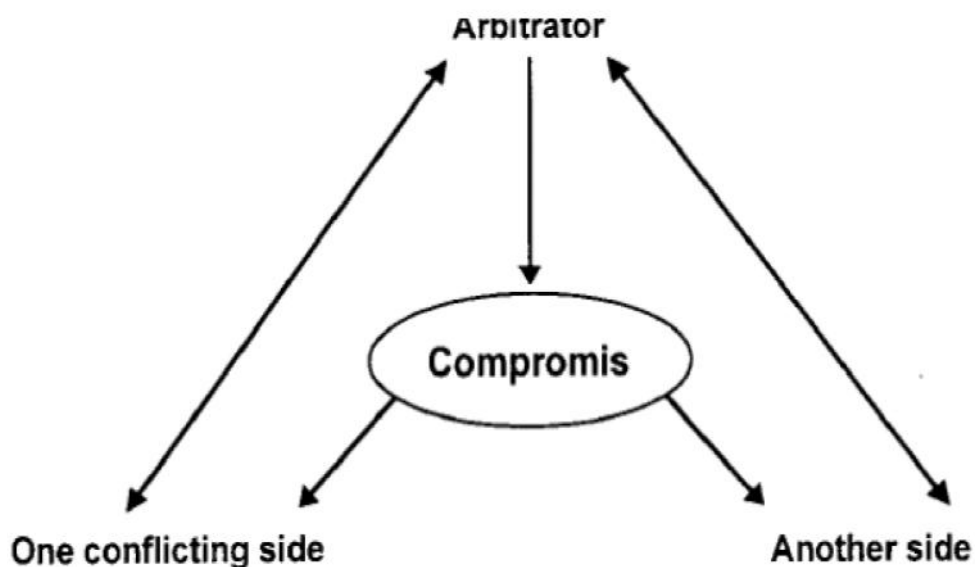
#### **2.5.4 Negotiation**

Negotiation is a process for establishing and building relationships, through which participants jointly try to reach agreement on issues of individual or mutual concern. Negotiation is one of the peaceful techniques used in conflict management through compromise. Parties to the conflict negotiate on how to conclude an agreement. Parties themselves dig-deep into the roots and nature of the conflict and

then mutually agree together to find a common ground acceptable to both or all parties in the conflict. Negotiating parties might reach an agreement by themselves or with the help of a mediator. A key attitude for anyone negotiating a conflict is to “walk a mile in my shoes”. Attempt to view the conflict through the other parties’ eyes. [22] This will help a great deal in getting past perceptions that block resolution. This method is used to settle disputes at work places, between employees and employers, between groups, labour organizations. [13, 19, 25, 26]

### **2.5.5 Arbitration**

Parties in conflict choose a mediator to reconcile them leaving him however with the power to take decisions on their behalf. The decisions he takes cannot be changed and should be followed as such. [13, 28]



**Fig 2.3: Graphic representation of Arbitration [13]**

### **2.5.6 Stimulating Conflict**

The whole notion of stimulating conflict is difficult to accept because conflict traditionally has a negative connotation. There is evidence, however, that in some situations, an increase in conflict actually improves performance. Stimulating conflict is considered a proactive approach that requires up-front initiative aimed at minimizing the impact of potential negative conflict and avoiding costly patching-up

operations later in the project life cycle. For example, certain policies regarding negotiating contracts and resolving disputes should be developed and agreed on at the beginning of the project [2]. Generally management and project managers can stimulate conflict in the following ways.

***Accept conflict as desirable on certain occasions:*** Conflict may result as the project manager insists on developing sufficient front-end planning and a basic framework with clear project priorities, scope definition, and administrative procedures. To a degree, conflicts at the front end should be viewed positively since a project manager's opportunity to participate in setting the project's budget and schedule (including arguing for objectives that may cause conflict) is likely to decrease conflicts down the road.

***Bring new individuals into an existing situation:*** Thoughtful questions and comments from newcomers or outsiders may provide a different, fresh perspective. They may encourage long-time team members to remove their blinders and think of new ways of doing things. For example, a project manager may bring in an outside expert to increase team effectiveness by introducing team partnering and a win-win conflict resolution strategy.

***Restructure the project organization:*** The project organization structure may have to be changed to suit the circumstances. For example, freeform structure is good during planning to allow active participation and creative expression, whereas strong matrix forms work better during the execution and termination phases. New reporting relationships may create uncertainty, but they may also motivate project participants to discover innovative and creative ways to get work done.

***Introduce programs designed to increase competition:*** A manager of projects may introduce competition to encourage task managers to accomplish their work packages ahead of schedule and under budget without compromising quality. Project managers must understand the difference between competition and conflict in order to get positive results. Competition may cause a conflict among task managers as they try to win against each other but overall organizational output will probably increase.

***Introduce programmed conflict:*** Some project participants may be keen in pushing their ideas. Project managers should play devil's advocate and use dialectical inquiry to develop and clarify opposing points of view. These approaches are designed to program conflict into processes of planning, decision making, and risk analysis, and thus make conflict legitimate and acceptable.



## **CHAPTER-3**

### **LITERATURE REVIEW**

#### **3.1 INTRODUCTION**

Conflict resolution as a defined specialist field has come of age in the post-Cold War era. As a defined field of study, conflict resolution started in the 1950s and 1960s. This was at the height of the Cold War, when the development of nuclear weapons and the conflict between the superpowers seemed to threaten human survival. A group of pioneers from different disciplines saw the value of studying conflict as a general phenomenon, with similar properties whether it occurs in international relations, domestic politics, industrial relations, communities, families or between individuals. They saw the potential of applying approaches that were evolving in industrial relations and community mediation settings to conflicts in general, including civil and international conflicts. [14]

Already in the sphere of the everyday language the term conflict has no positive intonation. Usually dysfunctional phenomenon like discord, dispute or fighting is associated with it. Therefore, with the omnipresence of conflicts it is not surprising that the debate about this topic takes on significance also in the political science. Although the branch of peace and conflict research owes even a part of its name to this subject, the disagreement over the exact notion of the conflict as a term dominates until today. This is however little amazing because it is about one of the most enigmatic and controversial terms, which itself triggers conflicts very often.

Conflict is as inevitable in a project environment as change seems to be [2, 5]. When project team members interact during the course of completing their tasks and responsibilities, there is always a potential for conflict. In fact, it is virtually impossible for people with diverse background skills and norms to work together; make decisions, and try to meet project goals and objectives without conflict. Almost every academic discipline has its theoretical approach of understanding conflicts – economists are focused on game-theory and decision-making, psychologist explore interpersonal conflicts, sociologists take status and class conflicts as the focal point, while political science is centered on intra-national and international conflicts. Therefore to review the conflict literature as a whole is an almost impossible task.[15]

## **3.2 VIEWS OF CONFLICT**

Over the years three distinct views have evolved about conflicts in projects and organizations [2].

### ***3.2.1 The Traditional view:***

The traditional view (dominant from the late nineteenth century until the mid-1940s) assumes that conflict is bad, always has a negative impact, and leads to declines in performance as the level of conflict increases. Conflict must therefore always be avoided. In this view conflict is closely associated with such terms as violence, destruction, and irrationality. The response to conflict in the traditional view is to reduce, suppress, or eliminate it. The manager was responsible for freeing the project of any conflict, often using an authoritarian approach. Although that approach worked sometimes, it was not generally effective; when they are suppressed, the root causes cannot be identified, and the potentially positive aspects of conflict cannot emerge. This traditional view of conflict is still widely held because industrial and business institutions that have a strong influence on our society concur with it. This negative view of conflict played a role in the development of labour unions. Violent or disruptive confrontations between workers and management led people to conclude that conflict was always detrimental and should therefore be avoided. [2]

### ***3.2.2 The Behavioural or Contemporary view:***

The behavioural or contemporary view, also known as the human relations view, emerged in the late 1940s and held sway through the 1970s. It argues that conflict is natural and inevitable in all organizations and that it may have either a positive or a negative effect, depending on how the conflict is handled. Performance may increase with conflict, but only up to a certain level, and then decline if conflict is allowed to increase further or is left unresolved. This approach advocates acceptance of conflict and rationalizes its existence. Because of the potential benefits from conflict, project managers should focus on managing it effectively rather than suppressing or eliminating it. [2]

### 3.2.3 The Interactionist view:

The interactionist view assumes that conflict is necessary to increase performance. While the behavioural approach accepts conflict, the interactionist view encourages conflict based on the belief that a harmonious, peaceful, tranquil, too-cooperative project organization is likely to become static, apathetic, stagnant, and unable to respond to change and innovation [2, 4]. This approach encourages managers to maintain an appropriate level of conflict, enough to keep projects self-critical, viable, creative, and innovative. Using these three views of conflict, the managerial actions to be taken can be decided by comparing the

$$\text{Actual level of conflict} = a$$

$$\text{Desired levels of conflict} = d$$

According to the traditional view, the desired level of conflict is always zero. If  $a = 0$ , do nothing, and if actual conflict rises above zero, it should be resolved. But the behavioural and interactionist views differ only in terms of the desired level of conflict, which could be equal to or above zero in the contemporary view and is always above zero in the interactionist view. If the desired level of conflict is above zero, then there are three possible outcomes depending on whether  $a$  is more than  $d$  or  $a$  is less than  $d$ . Summary of the three views of conflict, their effect on performance, and the recommended managerial actions is given in the following table.

**Table 3.1: A comparison of conflict views [2]**

	Traditional View	Contemporary View	Interactionist View
Main Points	Caused by troublemakers Bad Should be avoided Should be suppressed	Inevitable between humans Not always bad Natural result of change Can be managed	Results from commitment to goals Often beneficial Should be stimulated Should aim to foster creativity
Effect on Performance	Performance declines as the level of conflict increases	Performance mainly depends on how effectively the conflict is handled. Generally performance increases to a certain level as conflict level increases, then declines if conflict is allowed to increase further or left unresolved	Certain level of conflict is necessary to increase performance. Performance increases with conflict up to a certain level, then declines if conflict increases further or remains unresolved
Recommended Actions	Do nothing if $a = d$ Resolve conflict if $a > d$ (Where $d = 0$ )	Do nothing if $a = d$ Resolve conflict if $a > d$ (Where $d \sim 0$ )	Do nothing if $a = d$ Resolve conflict if $a > d$ Stimulate conflict if $a < d$ (Where $d > 0$ )

### **3.3 MODELS OF CONFLICT RESOLUTION**

Four models for conflict resolution have evolved and are commonly referred to as the professional, bureaucratic, legal, and mediation models (Neal and Kirp, 1985; Goldberg and Kuriloff, 1987). [20]

#### ***3.3.1 Professional model***

Conflict resolution within public education has traditionally followed the professional model. The professional model recognizes the expertise of educational professionals (school administrators and teachers) and defers the resolution of disputes to those individuals specifically trained within the profession. Similar to the practice of law and medicine, public education has traditionally been managed by the professionals trained within the discipline. The professional model emphasizes professional discretion and decision-making rather than strict adherence to rules. The recipient of services, be it medical treatment, legal representation or education services has little input into the decision regarding the service to be provided. Within the professional model, the recipient of services is generally passive, deferring to the expertise of the professionals (Neal and Kirp, 1985). [20]

#### ***3.3.2 Bureaucratic model***

The bureaucratic model is typical of federal or state programs that grant benefits to individuals (e.g. food stamps, public assistance, and social security). Employees of state and federal agencies that manage these programs have significant involvement in the development of eligibility standards, the specification of allowable services and the determination of the allowable provision or limitations upon appropriate services. Administrators of programs that operate under the bureaucratic model are expected to defer to regulatory standards and have much less discretion in determining eligibility, allowable services, etc., than within the professional model. Within the bureaucratic model, the recipient of services is granted limited procedural rights to challenge the decision of the person who administers the program. These rights are typically limited to an appeal to a higher level of authority within the organization and a showing that the decision was “arbitrary, capricious or otherwise a violation of the program’s standards”. [20]

### **3.3.3 Legal Model**

The legal model focuses on the “individual as the bearer of rights (who can) best safeguard their own interests” and “the use of legal concepts and court like procedures to enforce and protect rights.” The legal model is based upon a mistrust of the traditional bureaucratic model and its focus on top-down management, decision-making based upon the benefit to the organization, and “norms of fairness using statistical tests across classes of affected people”. The professional and the bureaucratic models grant limited rights to recipients of services who challenge administrative decisions. The bureaucratic model determines agency compliance through the application of procedural rights and generally accepted norms to specific groups of individuals. The legal model, with its adoption of court-like procedures, individual rights, and entitlements, shifts the focus of agency compliance to the provision of a substantive right to the individual, based upon the individual’s unique needs. [20]

### **3.3.4 Alternative Dispute Resolution / Mediation Model**

Mediation is a non-adversarial conflict resolution process that encourages joint problem solving, assists both parties to identify alternative solutions to their problem, and promotes effective communication between parents and schools. While both the complaint process and the hearing process typically result in a win / lose relationship between the parties, the mediation process, if successful, typically results in a win / win relationship through the development of a mutual agreeable solution (Goldberg and Huefner, 1995). [20]

## **3.4 DYNAMICS OF CONFLICT/ INTENSITY STAGES OF CONFLICT**

The level of incompatibility is the most important variable that impacts the intensity of the dispute and dynamic of conflict phases. Once conflict has emerged, it develops further with certain dynamic and intensity changing its courses and stages. In that sense understanding developing stages of conflict and their categorization is crucial because it may provide indications of what might happen next and what can facilitate the conflict management. [14]

The cornerstone, however, of the recent conflict analysis literature is the COSIMO 2.0 conflict categorization, developed at the HIIK (Heidelberg Institute for International Conflict Research). At the heart of the methodology stands the dynamic model of conflict, which incorporates five intensity stages, taking into account the phases of non-violent and violent conflict ranging from latent conflict to war. This categorization was developed upon the escalation dynamic, which was the basic criterion used by Pfetsch (1994: 216) when he established five-types conflict categorization: latent conflict, manifested conflict, crisis, severe crisis, and war. The most important difference between these conflicts is that the first two are of nonviolent nature, while the crisis, severe crisis and war include usage of violence during the conflict. Consequently, the conflicts can be divided into two main categories: nonviolent and violent conflicts. The major shortcoming in the conflict literature is that the most of the studies and available data are concentrated on violent conflicts, particularly on wars. Thus, there is lack of information and lack of researches on non-violent conflicts. [15]

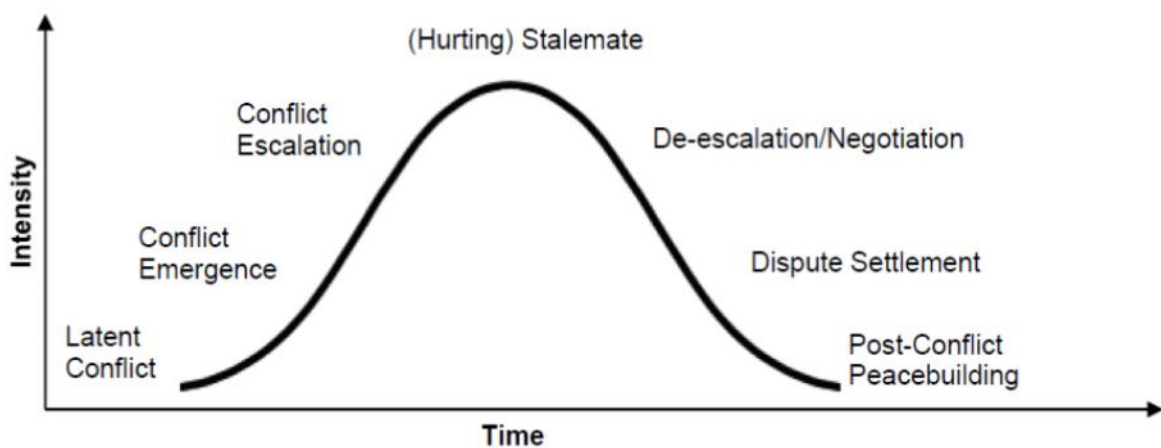
**Table 3.2: Overview and definitions of the conflict intensity [15]**

State of Violence	Intensity Group	Level of intensity	Name of intensity	Definition
non-violent	low	1	Latent Conflict	A positional difference on definable values of national meaning is considered to be a latent conflict if respective demands are articulated by one of the parties and perceived by the other as such.
		2	Manifest Conflict	A manifest conflict includes the use of measures that are located in the preliminary stage to violent force. This includes for example verbal pressure, threatening explicitly with violence, or the imposition of economic sanctions.
violent	medium	3	Crisis	A crisis is a tense situation in which at least one of the parties uses violent force in sporadic incidents.
	high	4	Severe Crisis	A conflict is considered to be a severe crisis if violent force is repeatedly used in an organized way.
		5	War	A war is a type of violent conflict in which violent force is used with a certain continuity in an organized and systematic way. The conflict parties exercise extensive measures, depending on the situation. The extent of destruction is massive and of long duration.

Source: Heidelberg Institute for International Conflict Research (HIIK 2005: 2)

Regarding the stages, the conflict is classified upon the dynamic of its own development; different authors have different typology systems that determine the level of conflict. The common thing is that the conflict is always described as passing through a series of phases – beginning, development, and end - with distinct intensity scale. A diagram by Brahm (2003) differentiates between seven phases of conflict dynamic. The phases begin with the existence of a latent conflict, followed by emergence, escalation, stalemate, conflict de-escalation and ending with settlement and the post-conflict peace building as the last stage. [19]

**Fig 3.1: Life cycle of a conflict [15]**



Source: Quelle: Brahm (2003).

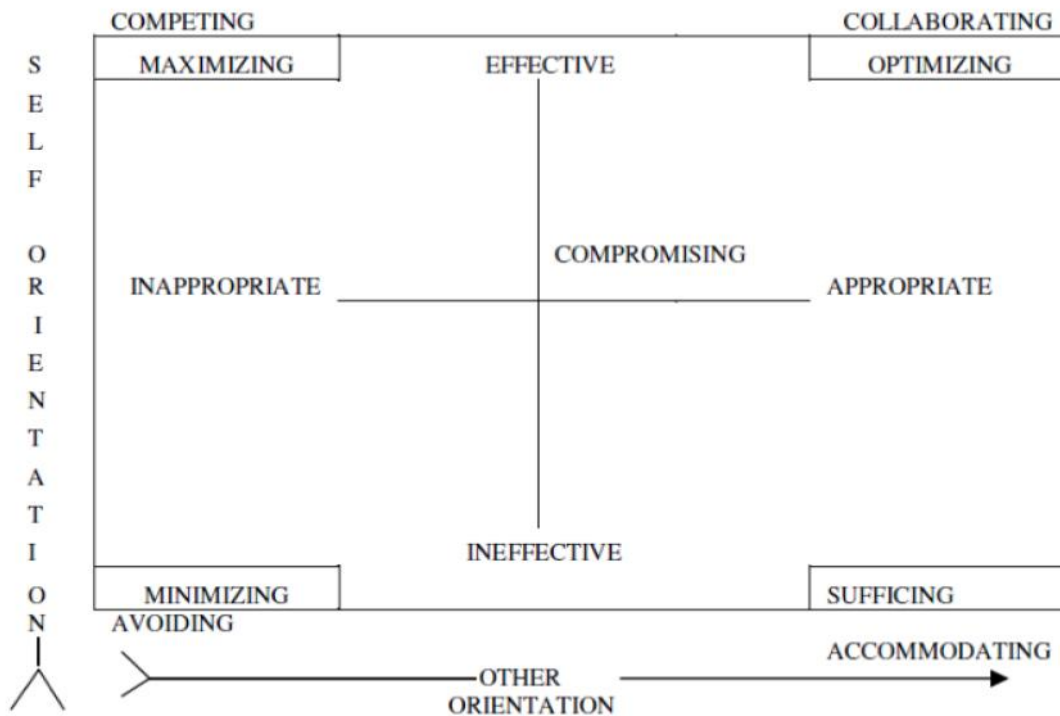
It should be noted that conflict literature in general describes conflict's dynamic-circle as basically composed of tension, escalation, de-escalation and settlement phase. That is the classical model of a conflict-dynamic. However, it is very important to bear in mind that these four basic phases neither do follow necessarily upon each other after certain period of time, nor does each conflict passes through all phases in its development.

### **3.5 CONFLICT MANAGEMENT TYPOLOGIES**

Blake and Mouton were the first to present the conceptualization of the five conflict styles for managing interpersonal conflict. They classified the five conflict management styles as Problem-solving, Smoothing, Forcing, Withdrawal, Sharing. These styles were based on two dimensions in relation to the attitudes of the manager; concern for production and concern for people. They drew up these

dimensions on nine-point scales to form the grid. The horizontal axis represents concern for production while the vertical axis represents concern for people. The end “1” represents low concern while the end “9” depicts the highest concern. Blake and Mouton also noted that though one of these styles may be dominant in an individual’s actions, however, it might be changed to another, if the first is not effective.

**Fig 3.2: Conflict Management Typologies [17]**



Source: Adapted from Spitzberg, Canary and Cupach.

These styles were later relabelled by Thomas as avoiding, accommodating, competing, compromising and collaborating based on two intentions of an individual; cooperativeness and assertiveness. In cooperativeness, one party attempts to satisfy the other party’s concerns, while in assertiveness the party attempts to satisfy its own concern. Using the conceptualization by Blake and Mouton as well as Thomas, Rahim and Bonoma categorized conflict management styles divided into avoiding, obliging, dominating, compromising and integrating. Their model was based on two orthogonal dimensions; concern for self and concern for others. Other researchers have also focused on the dual concern model by using different terminologies [1]. Among them, Conerly and Tripathi provided a dual concern model with the dimensions centered on how much one cared about achieving one’s goals –



how assertive one was and the second dimension on how much one cared about the relationships – how cooperative one was. Their five conflict management styles based on these two dimensions were withdrawing, forcing, smoothing, confronting and compromising. Masters and Albright presented a dual concern model which focused on what was valued: the relationship or the outcome. With this, they also proposed five conflict management styles; avoidance, competition, accommodation, collaboration and compromise.

# CHAPTER-4

## FORMULATION OF MATHEMATICAL MODEL TO EVALUATE TRAINING NEEDS FOR RESOLVING CONFLICTS

### 4.1 INTRODUCTION

Project environments are particularly vulnerable to generating conflict. Thamhain and Wilemon have identified seven major sources of conflict in project management based on their research conducted in a private manufacturing company. The table below shows a comparison between the rankings of frequency of occurrences of conflict, as suggested by Thamhain and Wslemon and by Posner.

**Table 4.1: Sources of conflict and their ranking by frequency of occurrence [2]**

Sources of Conflict	Conflict Intensity Ranking	
	Thamhain and Wilemon	Posner
Conflict over project priorities	2	3
Conflict over administration procedures	5	7
Conflict over technical opinions and performance trade-offs	4	5
Conflict over human resources	3	4
Conflict over cost and budget	7	2
Conflict over schedules	1	1
Personality conflict	6	6

Sources: Thamhain, W. I., & Wilemon, O. L. (1975). Conflict management in project life cycles. *Sloan Management Review*, 16(3), 31—50. Posner, 8. (1986). What's all the fighting about? Conflicts in project management. *IEEE Transactions on Engineering Management*, EM-33(4), 207—211.

The major difference in Posner's study as clear from Table 4.1 is the pattern of conflict over costs, changing from seventh to second place. Conflict over administrative procedures dropped from fifth to last position. Differences over cost can be attributed to tough global competition. Also, a shift in government contract pricing strategy (from a more flexible cost-plus basis to more rigorous fixed-price approach) has increased emphasis on cost issues. The decreased intensity of conflict over procedures can be explained by wider acceptance of project management concepts, strategies, and techniques [2].

The common thing in the ranking of both researchers is that both have given “**Conflicts over Schedules**” as the most frequently existing conflicts in the projects.

## **4.2 BACKGROUND FOR THE MATHEMATICAL MODEL**

### **4.2.1 Procedures to determine the training needs**

Training programs are directed towards maintaining and improving current job performance, while development programs seek to develop skills for future jobs. Both manager and non-manager may receive help from Training and Development programs, but the mix of experiences are likely to vary. Non-managers are more likely to be trained in the technical skills required for their current jobs; whereas managers frequently receive assistance in developing the skills required in future jobs particularly conceptual and human relations skills.

New employees have to learn new skills and since their motivation is likely to be high, they can be acquainted relatively easily with skills and behaviour expected in their new position. On the other hand, training experienced employees can be problematic. The training needs of such employees are not easy to determine. Managers can use following four procedures to determine the training needs of individuals in their organisation or sub-unit [7]:

- 1. Performance appraisal:** Each employee’s work is measured against the performance standards or objectives established for his or her jobs.
- 2. Analysis of job requirements:** The skills or knowledge specified in the appropriate job description is examined and those employees without necessary skills or knowledge are identified.
- 3. Organisation analysis:** The effectiveness of the organisation and its success in meeting its goals, are analysed to determine where differences exist.
- 4. Employee survey:** Managers as well as non-managers are asked to describe what problems they are experiencing in their work and what actions they believe are necessary to solve them.

### **4.2.2 Overview of $\bar{X}$ and R Control Charts [35]**

Control charts were made by physicist Dr. Walter A. Shewhart of Bell Telephone Laboratories in 1924. Dr. W.H. Shewhart impressed upon the fact that a manufacturing process should not be deemed to be in statistical control unless the stable pattern of chance or random variations persists for quite sometimes and for a reasonably good amount of production from the process. The control chart is one of the primary process monitoring techniques; when unusual sources of variability are present, sample averages will plot outside the control limits. This is a signal that some investigation of the process should be made and corrective action should be taken to remove these unusual sources of variability. Systematic use of control chart is an excellent way to reduce variability.

Quality characteristic that can be measured in terms of numerical measurement is called a variable. When dealing with variables it is necessary to monitor both the mean value of quality characteristic and its variability. Control of the process average or mean quality is usually done with the control chart for mean or the  $\bar{X}$  chart. Process variability can be monitored with either a control chart for the standard deviation, called the S chart, or the control chart for the range, called an R chart. The  $\bar{X}$  and R (or S) chart are among the most important for statistical process monitoring and control techniques.

While using the control charts it is assumed that the distribution of the quality characteristic is normal. However if underlying distribution is non-normal then according to the central limit theorem the results of control charts are approximately correct.

#### ***Rational Subgroups***

The estimates in control charts are usually based on at least 20 to 25 samples and each sample size should contain 4, 5 or 6 observations. These small sample sizes usually result from the construction of rational subgroups and from the fact that the sampling and inspection costs associated with variables measurements are usually relatively large. Samples should be selected in such a way that maximises the chances for shifts in the process average to occur between samples, and thus to show up as out-of-control points on the  $\bar{X}$  chart. The R chart, on the other hand

measures the variability within a sample. Therefore, samples should be selected so that variability within samples measures only chance or random causes. Another way of saying this is that the  $\bar{X}$  chart monitors between-sample variability (variability in the process over time), and the R chart measures within-sample variability (the instantaneous process variability at a given time).

### ***Control Limits for the $\bar{X}$ chart***

$$\text{UCL} = \bar{\bar{X}} + A_2\bar{R}$$

$$\text{Centre Line} = \bar{\bar{X}}$$

$$\text{LCL} = \bar{\bar{X}} - A_2\bar{R}$$

The values of constant  $A_2$  are tabulated in the standard statistical tables for various sample sizes.

### ***Control Limits for the $\bar{R}$ chart***

$$\text{UCL} = D_4\bar{R}$$

$$\text{Centre Line} = \bar{R}$$

$$\text{LCL} = D_3\bar{R}$$

The values of constants  $D_3$  and  $D_4$  are tabulated in the standard statistical tables for various sample sizes.

### ***Controlling process using $\bar{X}$ and R charts***

Suppose that one or more of the values of either  $\bar{X}$  or R plot out of control when compared to the initial control limits. Clearly, if control limits for current or future production are to be meaningful, they must be based on data from a process that it is in control. Therefore, when the hypothesis of past control is rejected, it is necessary to revise the control limits. This is done by examining each of the out-of-control points, looking for an assignable cause. If an assignable cause is found, the point is discarded and the trial control limits are recalculated, using only the remaining points. Then these remaining points are re-examined for control. (Note that points that were in control initially may now be out of control, because the new trial control limits will generally be tighter than older ones) This process is continued until all points plot in control, at which point the trial control limits are adopted for

current use. In interpreting patterns on the  $\bar{X}$  chart, one must first determine whether or not the R chart is in control. Some assignable causes should show up on both the  $\bar{X}$  and R charts. If both the  $\bar{X}$  and R chart exhibit a non-random pattern, the best strategy is to eliminate the R chart assignable causes first. In many cases, this will automatically eliminate the non-random pattern on the  $\bar{X}$  chart. Never attempt to interpret the  $\bar{X}$  chart when R chart indicates an out of control condition.

### 4.2.3 Six – Sigma [35]

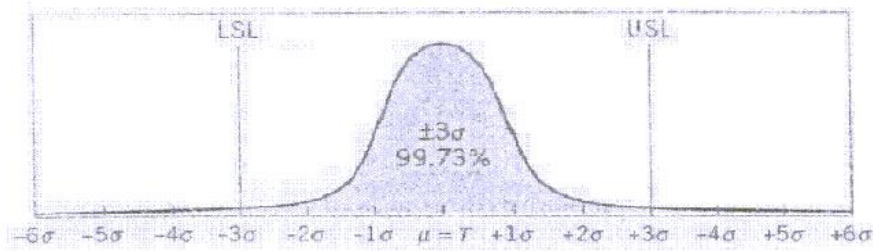
High-technology products with many complex components typically have many opportunities for failure or defects to occur. Motorola developed the six-sigma program in the late 1980s as a response to the demand for these products. The focus of six-sigma is reducing variability in key product quality characteristics to the level at which failure of defects are extremely unlikely.

Figure 4.1(a) shows a normal probability distribution as a model for quality characteristic with the specification limits at three standard deviations on either side of the mean. Now it turns out that in this situation the probability of producing a product within these specifications is 0.9973, which corresponds to 2700 parts per million (ppm) defective. This is referred to as three-sigma quality performance, and it actually sounds pretty good. However, suppose we have a product that consists of an assembly of 100 components or parts and all 100 of these parts must be non-defective for the product to function satisfactorily. The probability that any specific unit of product is non-defective is

$$0.9973 \times 0.9973 \times \dots \times 0.9973 = (0.9973)^{100} = 0.7631$$

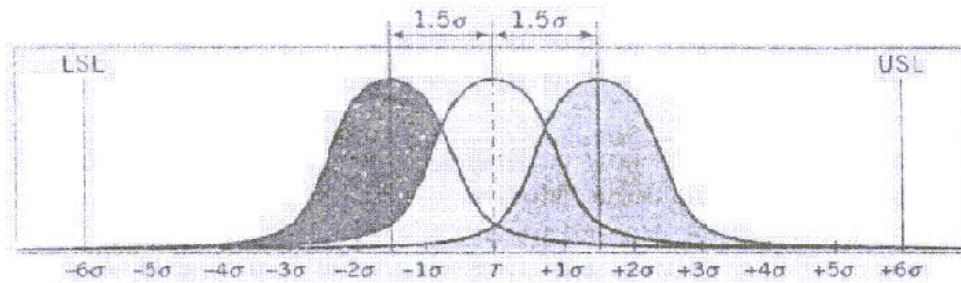
This is about 23.7% of the products produced using three-sigma quality will be defective. This is not an acceptable situation, because many high technology products are made up of thousands of components. The Motorola six-sigma concept is to reduce the variability in the process so that the specification limits are six standard deviations from the mean. Then, as shown in figure 4.1(b), there will only be about 2 parts per billion defective. Under six-sigma quality, the probability that any specific unit of the hypothetical product above is non-defective is 0.9999998, or 0.2 ppm, a much better situation.

**Fig 4.1: Six – Sigma Philosophy**



Spec. Limit	Percent Inside Specs	ppm Defective
±1 Sigma	68.27	317300
±2 Sigma	95.45	45500
±3 Sigma	99.73	2700
±4 Sigma	99.9937	63
±5 Sigma	99.999943	0.57
±6 Sigma	99.999998	0.002

(a) Normal distribution centered at the target (7)



Spec. Limit	Percent Inside Specs	ppm Defective
±1 Sigma	30.23	697700
±2 Sigma	69.13	608700
±3 Sigma	93.32	66810
±4 Sigma	99.3790	6210
±5 Sigma	99.97670	233
±6 Sigma	99.999660	3.4

(b) Normal distribution with the mean shifted by 1.5σ from the target

When the six sigma concept was initially developed, an assumption was made that when the process reached the six-sigma quality level, the process mean was still subject to disturbances that could cause it to shift by as much as 1.5 standard deviations off target. This situation is shown in figure 4.1(b). Under this scenario, a six-sigma process would produce about 3.4 ppm defective. There is a logical inconsistency in this that we can make predictions about process performance when the process is stable, when the mean (and standard deviation, too) is constant. If the mean is drifting around, and ends up as much as 1.5 standard deviations off target, a prediction of 3.4 ppm defective is not very reliable, because the mean might shift by more than the “allowed” 1.5 standard deviations. Process performance is not predictable unless the process behaviour is stable.

Motorola established as both an objective for the corporation and as a focal point for process and product quality improvement efforts. In recent years, six-sigma has spread beyond Motorola and has come to encompass much more.

#### 4.2.4 Theory of “*Permanent*” [36, 37]

The permanent of a square matrix in linear algebra, is a function of the square matrix similar to the determinant. The permanent, as well as the determinant, is a polynomial in the entries of the matrix. Permanent of a square matrix is a number that is defined in a way similar to the determinant. For matrix  $X = [x_{i,j}]_{1 \leq i,j \leq n}$ ,

$$\text{per } X = \sum_{\pi \in S_n} \prod_{i=1}^n x_{i,\pi(i)},$$

where  $S_n$  is the symmetric group on  $n$  elements.

The only difference with determinant is in the signs of terms as follows:

$$\det X = \sum_{\pi \in S_n} \text{sgn}(\pi) \cdot \prod_{i=1}^n x_{i,\pi(i)},$$

where  $\text{sgn}(\pi) \in \{1, -1\}$  is the sign of permutation  $\pi$ .

Thus the definition of the permanent is similar to that of the determinant except for the sign associated with each term in the summation. If one views the permanent as a map that takes  $n$  vectors as arguments, then it is a multilinear map and it is symmetric (meaning that any order of the vectors results in the same permanent). Unlike the determinant, the permanent has no easy geometrical interpretation; it is mainly used in **combinatorics** and in treating boson Green's functions in quantum field theory. However, it has two graph-theoretic interpretations: as the sum of weights of cycle covers of a directed graph, and as the sum of weights of perfect matchings in a bipartite graph.

### 4.3 METHODOLOGY

From the result of research carried out by Thamhain and Wslemon and by Posner, it is the “**Conflicts over Schedules**” which is the most frequent conflict existing in the industrial organisations. Hence, it is the “Flow Time” which needs to be studied to detect conflicts in the organisation. In this study I have studied the



hourly output (number of shirts) on a daily and hourly basis of three selected sections of a shirt manufacturing firm. The number of shirts output per hour was noted for seven hours of work in a day for a period of thirty days (excluding holidays and weekly off). Then **Performance Appraisal** of workers of selected section was done with the help of control charts.  $\bar{X}$  and R control charts were plotted using statistical software "**MINITAB**". After the analysis of the  $\bar{X}$  chart it was found that the overall mean output was much less than scheduled, also many of the days the mean output per hour was observed to be lying outside the Lower Control Limit (LCL).

It was also noted, after the analysis of R-chart that many a days the variability of hourly output on a day is very high and lying outside the Upper Control Limit (UCL). Hence, the variations in the process cannot be attributed to the chance variations, but there exist assignable causes to which these variations can be attributed.

I have tried to attribute these variations and low output, to the various conflicts existing in the firm like *conflicts over schedules, activity conflicts, interpersonal conflicts, asymmetric conflicts (between upper management and the workers)*. By comparing the observed time taken and the scheduled time flow, a **TRAINING NEED INDEX** was obtained after doing mathematical analysis of the data. A formal training procedure for resolving conflicts existing in the firm is suggested and techniques to further improvement of output and reducing variations of daily and hourly output are recommended.

## 4.4 PROFILE OF THE SHIRT MANUFACTURING FIRM

Name of the firm:	“ROBIN RIDER by NICEMAN”
Production Manager:	Mr. SULABH GUGANI
Address:	X/437, 1 <sup>st</sup> floor, Ram Nagar Market, Near Shastri Park Metro Station, Gandhi Nagar, Delhi-110031.
Mobile No.:	+91-9891073701, 9810059467
Email:	sulabh_gugani@yahoo.co.in
Profile:	Deals in the manufacturing of gents’ shirts (Formal and Casual) in four sizes – S (small), M (medium), L (large), XL (extra large).
Scheduled daily output:	1000 (including all sizes)
Working hours a day:	7 hours (excluding lunch and tea break)
Scheduled hourly output:	144 shirts per hour

### ***Selected Sections of the firm for Study***

#### ***Section 1:***

Name of the section:	Checking the shirts for manufacturing defects and tagging buttons
Number of workers:	18
Scheduled time used per shirt:	7.5 min

#### ***Section 2:***

Name of the section:	Ironing the shirts
Number of workers:	12
Scheduled time used per shirt:	5 min

#### ***Section 3:***

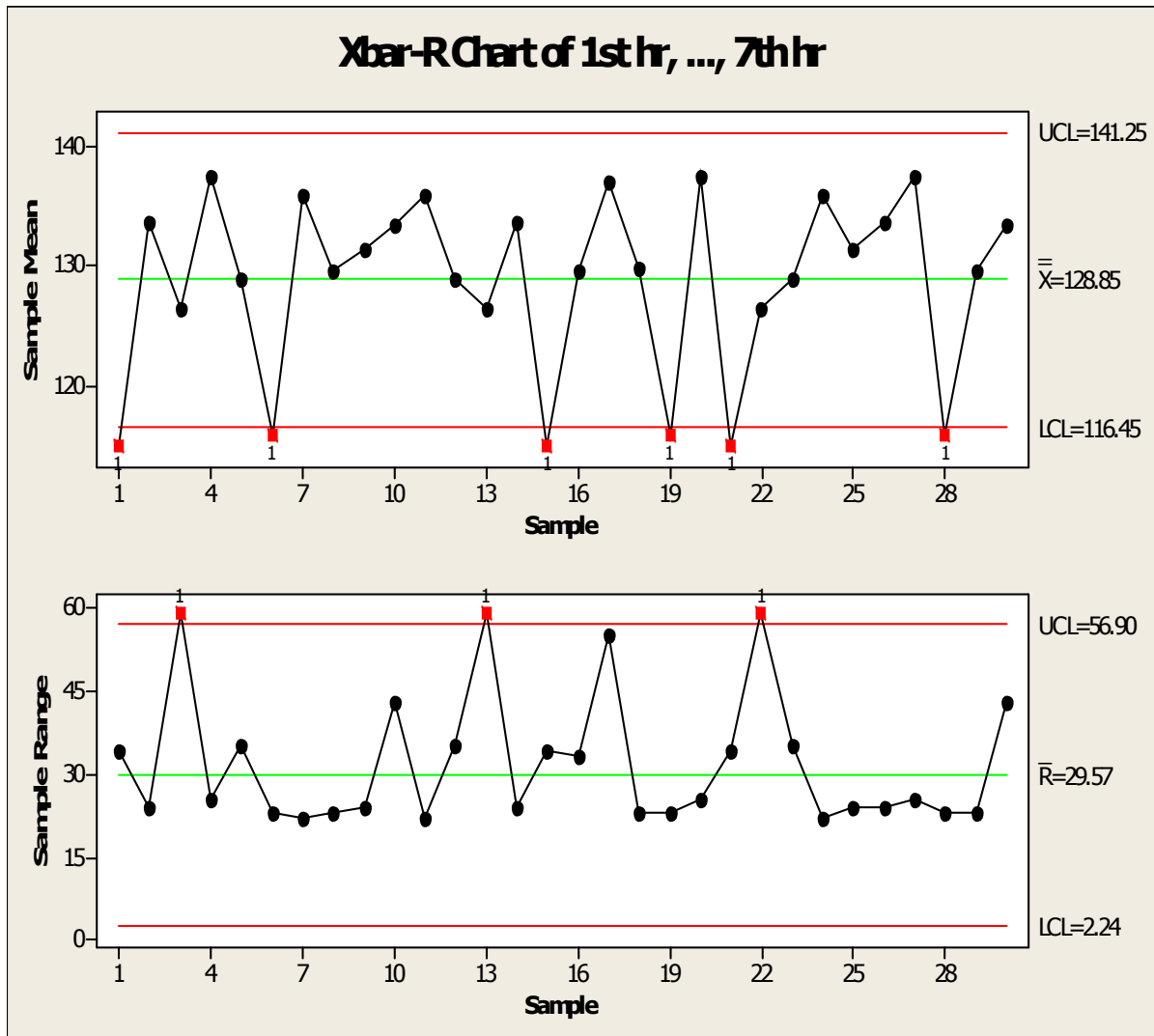
Name of the section:	Packing the shirt and making cartons
Number of workers:	9
Scheduled time used per shirt:	3.5 min

## 4.5 EXPERIMENTATION

**Table 4.2: Hourly output of “Section 1” for 30 days**

Working hour No. of Day	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	$\bar{X}$	Range (R)
Day 1	100	104	125	125	134	114	102	114.8571	34
Day2	130	146	137	122	132	134	135	133.7143	24
Day3	96	125	122	128	155	130	129	126.4286	59
Day4	141	142	137	125	150	131	138	137.7143	25
Day5	123	147	112	125	135	129	131	128.8571	35
Day6	114	107	126	120	103	119	121	115.7143	23
Day7	137	135	148	133	139	126	134	136.0000	22
Day8	115	138	138	124	126	131	136	129.7143	23
Day9	137	131	127	135	117	141	132	131.4286	24
Day10	109	152	134	134	127	136	142	133.4286	43
Day11	148	135	139	133	137	134	126	136.0000	22
Day12	112	147	135	125	123	131	129	128.8571	35
Day13	122	125	155	128	96	129	130	126.4286	59
Day14	137	146	132	122	130	135	134	133.7143	24
Day15	125	104	134	125	100	102	114	114.8571	34
Day16	134	125	127	134	109	142	136	129.5714	33
Day17	127	131	117	135	137	172	141	137.1429	55
Day18	138	138	126	125	115	136	131	129.8571	23
Day19	126	107	103	120	114	121	119	115.7143	23
Day20	137	142	150	125	141	138	131	137.7143	25
Day21	102	114	134	125	125	104	100	114.8571	34
Day22	129	130	155	128	122	125	96	126.4286	59
Day23	131	129	135	125	112	147	123	128.8571	35
Day24	134	126	139	133	148	135	137	136.0000	22
Day25	132	141	117	135	127	131	137	131.4286	24
Day26	135	134	132	122	137	146	130	133.7143	24
Day27	138	131	150	125	137	142	141	137.7143	25
Day28	121	119	103	120	126	107	114	115.7143	23
Day29	136	131	126	124	138	138	115	129.7143	23
Day30	142	136	127	134	134	152	109	133.4286	43
								$\bar{X} = 128.8524$	$\bar{R} = 9.57$

Fig 4.2:  $\bar{X}$  and R charts for "Section 1"



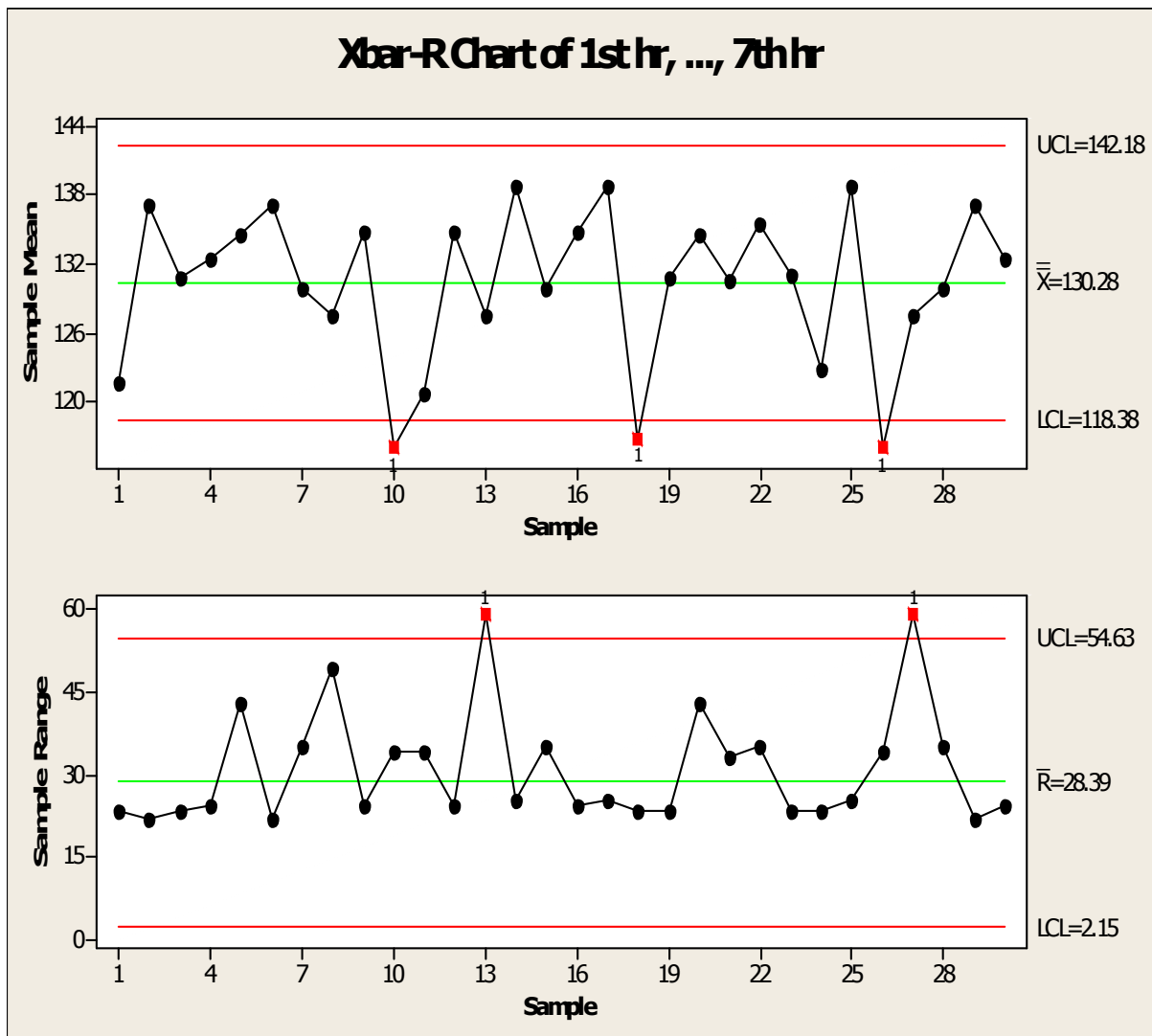
**Observations:**

- (1) The sample means for sample number 1, 6, 15, 19, 21 and 28 are lying outside the LCL.
- (2) The mean ranges for sample number 3, 13 and 22 are lying outside the UCL.
- (3) Actual time taken per shirt =  $18 \times 60 / 128.85 = 8.38$  min

**Table 4.3: Hourly output of “Section 2” for 30 days**

Working hour No. of Day	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	$\bar{X}$	Range (R)
Day 1	126	109	132	125	113	127	119	121.5714	23
Day2	134	140	149	127	136	135	138	137.0000	22
Day3	125	127	139	132	139	137	116	130.7143	23
Day4	136	118	128	142	132	133	138	132.4286	24
Day5	135	128	135	137	153	143	110	134.4286	43
Day6	134	138	140	135	136	127	149	137.0000	22
Day7	126	124	136	132	148	130	113	129.8571	35
Day8	129	102	151	130	126	131	123	127.4286	49
Day9	123	131	133	136	147	135	138	134.7143	24
Day10	126	101	135	103	105	115	126	115.8571	34
Day11	131	140	130	120	110	108	106	120.7143	34
Day12	123	133	138	135	147	136	131	134.7143	24
Day13	129	156	123	131	126	130	97	127.4286	59
Day14	126	151	138	132	143	139	142	138.7143	25
Day15	126	136	113	130	148	132	124	129.8571	35
Day16	123	138	133	147	135	131	136	134.7143	24
Day17	126	138	151	143	132	142	139	138.7143	25
Day18	121	127	104	108	120	115	122	116.7143	23
Day19	125	139	127	139	132	116	137	130.7143	23
Day20	135	135	128	153	137	110	143	134.4286	43
Day21	135	110	128	143	126	137	135	130.5714	33
Day22	136	138	118	153	132	142	128	135.2857	35
Day23	126	116	127	137	139	132	139	130.8571	23
Day24	126	118	109	124	127	123	132	122.7143	23
Day25	126	142	151	139	143	132	138	138.7143	25
Day26	126	126	135	105	115	101	103	115.8571	34
Day27	129	123	156	126	131	97	130	127.4286	59
Day28	126	113	136	148	130	124	132	129.8571	35
Day29	134	149	140	136	127	138	135	137.0000	22
Day30	136	128	118	132	142	138	133	132.4286	24
								$\bar{X}=130.281$	$\bar{R}= 28.39$

Fig 4.3:  $\bar{X}$  and R charts for “Section 2”



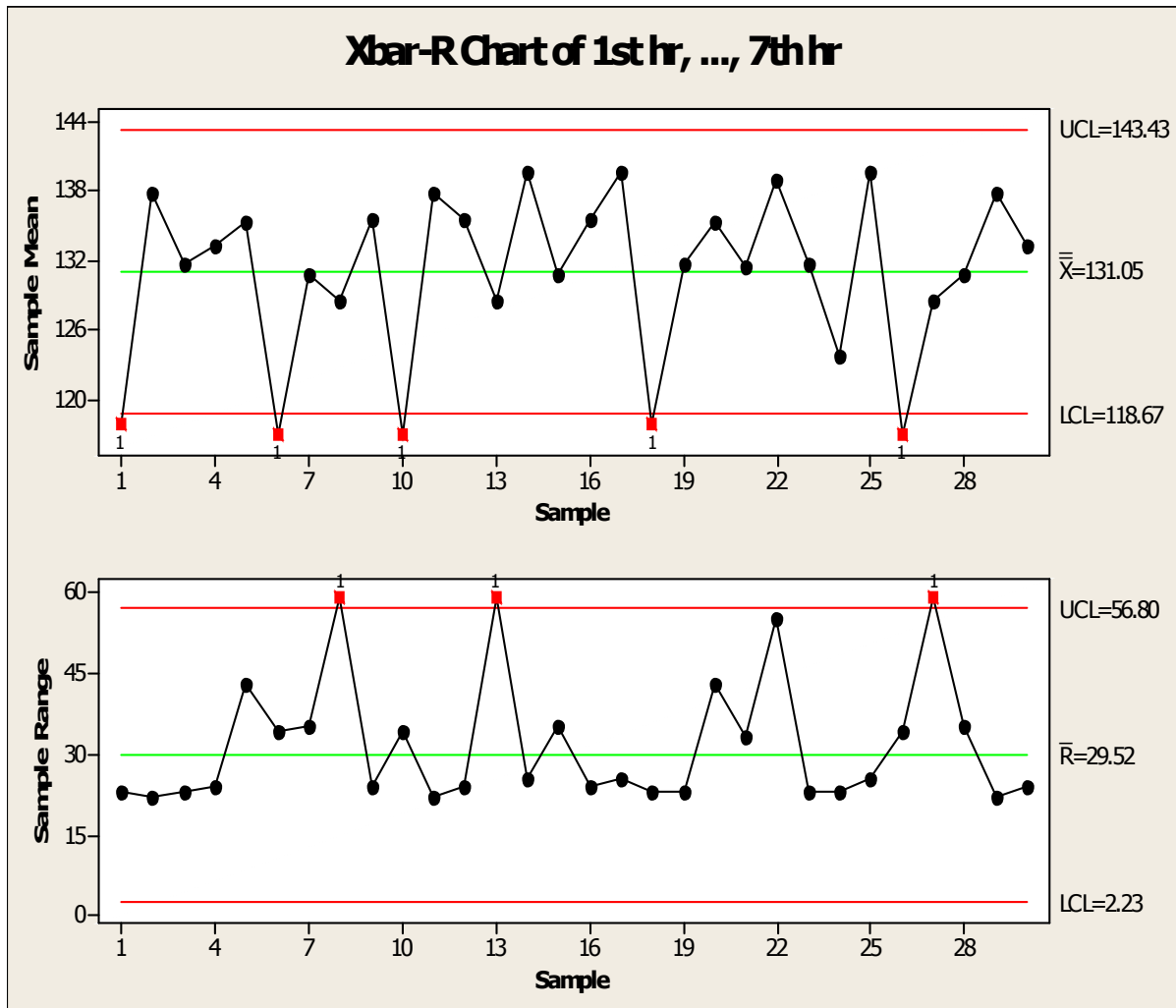
**Observations:**

- (1) The sample means for sample number 10, 18, and 26 are lying outside the LCL.
- (2) The mean ranges for sample number 13 and 27 are lying outside the UCL
- (3) Actual time taken per shirt =  $12 \cdot 60 / 130.28 = 5.52$  min

**Table 4.4: Hourly output of “Section 3” for 30 days**

Working hour No. of Day	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	$\bar{X}$	Range (R)
Day 1	122	105	128	121	109	123	116	117.7143	23
Day2	135	141	150	128	137	136	139	138.0000	22
Day3	126	128	140	133	140	138	117	131.7143	23
Day4	137	119	129	143	133	134	139	133.4286	24
Day5	136	129	136	138	154	144	111	135.4286	43
Day6	135	139	141	136	137	128	150	138.0000	22
Day7	127	125	137	133	149	131	114	130.8571	35
Day8	130	98	157	131	127	132	124	128.4286	59
Day9	124	132	134	137	148	136	139	135.7143	24
Day10	127	102	136	104	106	116	127	116.8571	34
Day11	127	136	127	116	106	104	102	116.8571	34
Day12	124	134	139	136	148	137	132	135.7143	24
Day13	130	157	124	132	127	131	98	128.4286	59
Day14	127	152	139	133	144	140	143	139.7143	25
Day15	127	137	114	131	149	133	125	130.8571	35
Day16	124	139	134	148	136	132	137	135.7143	24
Day17	127	139	152	144	133	143	140	139.7143	25
Day18	122	128	105	109	121	116	123	117.7143	23
Day19	126	140	128	140	133	117	138	131.7143	23
Day20	136	136	129	154	138	111	144	135.4286	43
Day21	136	111	129	144	127	138	136	131.5714	33
Day22	137	139	119	174	133	143	129	139.1429	55
Day23	127	117	128	138	140	133	140	131.8571	23
Day24	127	119	110	125	128	124	133	123.7143	23
Day25	127	143	152	140	144	133	139	139.7143	25
Day26	127	127	136	106	116	102	104	116.8571	34
Day27	130	124	157	127	132	98	131	128.4286	59
Day28	127	114	137	149	131	125	133	130.8571	35
Day29	135	150	141	137	128	139	136	138.0000	22
Day30	137	129	119	133	143	139	134	133.4286	24
								$\bar{X} = 131.0524$	$\bar{R} = 29.52$

Fig 4.4:  $\bar{X}$  and R charts for “Section 3”



**Observations:**

- (1) The sample means for sample number 1, 6, 10, 18, and 26 are lying outside the LCL.
- (2) The mean ranges for sample number 8, 13 and 27 are lying outside the UCL.
- (3) Actual time taken per shirt =  $9 \cdot 60 / 131.05 = 4.12$  min



## 4.6 EVALUATING TRAINING NEED INDEX (TNI)

### 4.6.1 Calculating Total Scheduled Time Delay

#### Assumptions

$S_{11}$  = Ideal time delay for section 1 = 7.5 min

$S_{22}$  = Ideal time delay for section 2 = 5.0 min

$S_{33}$  = Ideal time delay for section 3 = 3.5 min

$S_{12} = S_{21}$  = Relative ideal time delay between section 1&2 =  $|7.5 - 5|$  = 2.5 min

$S_{13} = S_{31}$  = Relative ideal time delay between section 1&3 =  $|7.5 - 3.5|$  = 4 min

$S_{23} = S_{32}$  = Relative ideal time delay between section 2&3 =  $|5 - 3.5|$  = 1.5 min

$$\text{Total Scheduled Time Delay} = \text{Permanent} \begin{vmatrix} 7.5 & 2.5 & 4.0 \\ 2.5 & 5.0 & 1.5 \\ 4.0 & 1.5 & 3.5 \end{vmatrix} = 280$$

### 4.6.2 Calculating Total Actual Time Delay

$A_{11}$  = Actual time delay for section 1 = 8.38 min

$A_{22}$  = Actual time delay for section 2 = 5.52 min

$A_{33}$  = Actual time delay for section 3 = 4.12 min

$A_{12} = A_{21}$  = Relative Actual time delay between section 1&2 =  $|8.38 - 5.25|$  = 2.86 min

$A_{13} = A_{31}$  = Relative Actual time delay between section 1&3 =  $|8.38 - 4.12|$  = 4.26 min

$A_{23} = A_{32}$  = Relative Actual time delay between section 2&3 =  $|5.52 - 4.12|$  = 1.40 min

$$\text{Total Actual Time Delay} = \text{Permanent} \begin{vmatrix} 8.38 & 2.86 & 4.26 \\ 2.86 & 5.52 & 1.40 \\ 4.26 & 1.40 & 4.12 \end{vmatrix} = 375$$

### 4.6.3 Calculating Training Need Index

$$\text{Training Need Index} = \frac{\text{Total Scheduled Time Delay}}{\text{Total Actual Time Delay}} = \frac{280}{375} = 0.746$$

## CHAPTER-5

### RESULTS, DISCUSSIONS, RECOMMENDATIONS & FUTURE SCOPE OF WORK

#### 5.1 RESULTS

The mathematical model to evaluate training needs is devised and Training Need Index (TNI) for the workers of shirt manufacturing firm under study was found to be 0.746. The significance of Training Need Index (TNI) can be interpreted in the following way:

- |                                      |   |
|--------------------------------------|---|
| If, $0 \leq \text{TNI} \leq 0.5$     | The workers are unsuitable for the given job, they may not have received any formal training for performing their jobs. Hence, it is highly recommended that they should immediately be imparted to training. |
| If, $0.5 \leq \text{TNI} \leq 0.75$  | The workers may have received formal training for performing their jobs but are not applying it properly. Hence, it is highly recommended that they should immediately be imparted to training.               |
| If, $0.75 \leq \text{TNI} \leq 0.90$ | The workers have received formal training for performing their jobs but are not able to follow completely. Hence, it is recommended to impart them to training to brush up and further develop their skills.  |
| If, $0.90 \leq \text{TNI} \leq 1.0$  | The workers are able to perform their jobs good enough but periodically training should be given to them for maintaining their performance level and enthusiasm required to perform their jobs.               |

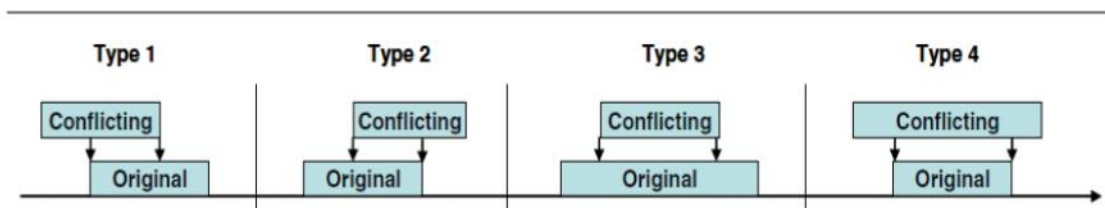
The  $\bar{X}$  and R charts of the three sections show that some points are lying outside the control limits; these points indicate the following characteristics about the firm:

- Low employee morale and motivation
- Low productivity
- High absenteeism of workers
- Delayed and missed deadlines
- Increased supervision overhead
- Passive/aggressive/abusive behaviour
- Decreased customer satisfaction
- Negative consequences for health and stressed-related medical claims

These characteristics can directly be attributed to the various conflicts existing in the firm as discussed in the section 1.6. Also the Training Need Index (TNI) shows that there is an urgent requirement of training for employees of all levels of the firm to resolve conflicts and improve production. The following conflicts were found existing in the firm after the **Performance Appraisal** done with the help of  $\bar{X}$  and R charts:

1. **Conflicts over schedule or activities** i.e. workers are not informed about the standard time and work procedure required to finish their jobs. According to Joshua Auld, et al. the following four types of activity conflicts may exist in the organisation:

**Fig 5.1: Types of activity conflicts [6]**



Type 1 and Type 2 conflicts are edge conflicts, where the conflicting activities partially overlap either the start or end of the original activity. Type 3 conflicts occur when a small conflicting activity is inserted within the original activity, and Type 4 conflicts occur when the original activity is entirely overlapped by a larger conflicting activity [6].

2. **Asymmetric conflicts or vertical conflicts** between management and workers about salary, bonus, job security, and facilities available at their end
3. **Individual level conflicts** due to their personal characteristics like person's age, ego state, employment status, gender, etc.
4. **Interpersonal conflicts** among workers of the same section due to differences in styles of doing their jobs.
5. **Intergroup conflicts** due to the task interdependence of section 2 on section 1 and of section 3 on section 2. This type of conflict is also due to ambiguity in sizes of shirt being manufactured in the firm.

## 5.2 DISCUSSIONS

Since human beings by their very nature are unique, in the same vein, there is quality each one of us possesses: we perceive reality differently and so is conflict in our societies. Having or experiencing conflict is natural and should be understood as normal, meaning that conflict is part of life and is eternal [13]. What is important is to have the capacity to manage it or minimize and contain its potential for escalation. Hence it is essential to organise training for conflict resolution for all levels of people in the company, including senior management personnel [12]. The key to successful training design is answering three questions: (1) who is the audience? (2) What is the intended outcome? (3) How much time will be devoted to the training? [23] The requirements would, of course vary according to their nature of work, type of responsibility and previous background. Conflict management within a team environment requires the ability to solve problems, set goals, compromise, settle personality differences, and resolve conflicts. Training for project managers in this area is necessary for their success, as they are typically responsible for handling conflict during a project. [30]

## **5.3 RECOMMENDATIONS**

### ***5.3.1 Training and development***

Training and development are complementary to each other and constitute an essential part of human resource development. Training involves preparing employees to carry out their responsibilities effectively. It also enables to improve their skills, proficiency or capability with a view to produce goods of high quality with a high level of productivity. Development is connected with activities through the employees which are prepared to share higher responsibilities, perform their existing duties and responsibilities more effectively and also enables them to improve their career prospects, thereby helping them a better quality of work life [7].

Total quality management and particularly, requirements of ISO 9000 lay special emphasis on training of personnel at all levels, which broadly may be arranged for four different categories of people [7]:

#### ***5.3.1.1 Training of senior management personnel***

This category may include president, vice president, general manager and senior managers who are in overall charge of various functions. Their training may comprise of knowledge about quality systems, quality implementation procedures, quality evaluations and quality audit. They can participate in ISO seminars, quality meets and quality related conferences or special programs can be organised for them within the company by specialist or consultants in this field.

#### ***5.3.1.2 Training of middle management personnel***

This category may include engineers, technologists and managers who play a vital role in controlling production. The areas of training for these people are Marketing, design, purchase, process engineering, product engineering and product testing, Implementation of ISO 9000; covering quality policies, quality systems, documentation procedures, statistical sampling, statistical process control, data collection & analysis and problem solving techniques.

### **5.3.1.3 Training of production supervisors**

Supervisors form the core group, who are directly responsible for getting output from the workers and achieving results. Their training and re-training from time-to-time is very crucial for the development of an organisation. With the changes in materials, methods, practices and technologies, training is vital. The training may be in three broad areas:

- (1) Design of products, PPC, Process Engineering
- (2) Production methods, technology of production, Process Control, SPC, Data Collection and Analysis, Quality Procedures etc.
- (3) Leadership, behavioural science, communication, human relations, motivational techniques and quality circle organisation

### **5.3.1.4 Training of workers**

Workers perform their work according to the directives received from the supervisors. Their ability and skill invariably affect the quality of production. These persons therefore have to be imparted training in their own trade to improve their skills and capabilities.

## **5.3.2 Use of ISO 9000 in resolving conflicts [32-34]**

### **5.3.2.1 Conflict at employee level towards company mission**

The employees may not be very clear about what the company mission and vision is, hence a situation of conflict may arise. There can be a conflict among them towards what their organisation wants to offer to the customer [7]. For example, a section of employee wants to produce highest quality of product while other section of employees wants to produce optimum quality of product with higher productivity.

### **ISO 9001:2000 Resolution (5.1, 5.3)**

As per the standard requirement organisation shall define a quality policy. Policy describes organisation's attitude towards quality, including objective for quality and its commitment to quality. Quality policy has to be relevant to the expectations and needs of its customers. The standard also requires that the quality policy should be understood, implemented and maintain at all levels of the organisation. The above clause will help in resolution of the conflict at employee level towards clarity of the company mission.

### **5.3.2.2 Conflict towards responsibility and authority**

There can be a situation where two employees may have a conflict over who is responsible for a particular job. Employee 'A' believes he is responsible while, employee 'B' believes he is responsible or employee 'A' believes employee 'B' is responsible and at the same time employee 'B' believes 'A' is responsible. In these cases either the job is duplicated or is not done at all, in both the cases there is loss of the organisation [7].

### **ISO 9001:2000 Resolution (5.5.1)**

As per the standard, ensure that responsibility and authorities are defined and communicated within the organisation. Appoint a member of management who, irrespective of the other responsibilities, shall have responsibility and authority that includes:

- (a) Ensuring that processes needed for the quality management system are developed
- (b) Reporting to the top management on the performance of the quality management system and any need for improvement, and
- (c) Ensuring the promotion of awareness of customer requirements throughout the organisation

Also ensure that the appropriate communication processes are established within the organisation and that communication takes place regarding the effectiveness of the quality management system. The above clause helps in resolution of the conflict towards responsibility and authority among employees. Hence, clarity among employees emerge, what exactly they have to perform and whom to report.

### **5.3.2.3 Conflict among sales and production employees**

Both sales and production employee work efficiently towards achieving their goals. However, during their working there may be situations where there can be conflict among sales and production over following issues [7]:

- What exactly are the customer requirements and specification
- Despatch period of finished products to the customer. Sales employees insist on early delivery while production employees may have other priorities. For example, a machine involved in production might have been planned for annual maintenance.
- Capability of producing a new product
- Frequent amendments done by the customer for specification, delivery dates, quality etc. not transferred to production.

### ***ISO 9001:2000 Resolution (5.2, 7.2)***

The 5.2, 7.2 clauses of ISO 9001:2000 help in resolution for the above mentioned conflicts. Ensure that customer requirements are determined and are met with aim of enhancing customer satisfaction. Determine:

- (a) Requirements specified by the customer
- (b) Requirements not stated by the customer but necessary
- (c) Statutory and regulatory requirements related to the product and any additional requirements determined by the organisation

Review the requirements related to the product. Conduct review prior the commitment of the organisation to supply a product to the customer and shall ensure that:

- (a) Product requirements are defined
- (b) Contract or order requirement deferring from those previously expressed are resolved and
- (c) The organisation has ability to meet the defined customer requirements

#### ***5.3.2.4 Conflict among employees over document and data***

There can be a situation where two employees may conflict over similar documents containing similar information but one of them is obsolete. Also consider a situation where a production employee has a conflict with quality control employee over dimensions of a product. May be one of them is referring to obsolete drawing or specification. These conflicts arises due to the circulation of the documents within the organisation is not controlled [7].



### ***ISO 9001:2000 Resolution (4.2)***

The 4.2 clause of ISO 9001:2000 helps in resolution for the above mentioned conflicts. The standard requires the organisation shall

1. Establish and maintain the documented procedure to control all documents and data like quality policy, quality objectives and quality manual
2. Organisation shall also establish the method for the document and the data changes within the organisation
3. Establish control over the documents required by the quality management system. Establish a documented procedure to define the controls needed for the identification, storage, protection, retrieval, retention time and disposition of records.
4. Develop records to provide evidence of conformity to requirements and effective operation of the quality management system. Records shall remain legible, readily identifiable and retrievable.

### ***5.3.2.5 Conflict over Purchasing***

A situation where situation conflict among employee develops is on from whom to purchase. Also a situation may arise that the purchased products supplied by the vendor are of the specification as mentioned in the purchase order, but they does not meet the requirements of quality control specifications. Also there may be a situation of conflicts among employee and the vendor over cost, delivery, quality and quantity of the product to be supplied [7].

### ***ISO 9001:2000 Resolution (7.4)***

The 7.4 clause of ISO 9001:2000 helps in resolution for the above mentioned conflicts. The standard requires the organisation shall:

- (a) Ensure that the purchased product confirms to the specified purchase requirements
- (b) Evaluate and select suppliers based on their ability to supply product in accordance with the organisation's requirement.
- (c) Establish the criteria for selection, evaluation and re-evaluation.
- (d) Maintain the reports of the results of evaluations and any necessary actions arising from the evaluations.

- (e) Develop purchasing information describing the product to be purchased
- (f) Establish and implement the inspection or other activities for ensuring that the purchased product meets specified purchased requirements.

#### **5.3.2.6 Conflict over customer supplied property**

Occasions may arise where the customers give material or equipments to be used in producing the items or delivering the services. Examples include:

- A dressmaker being provided with material the customer's wants made up into a dress
- A role of film provided for film procedure to develop and provide prints
- Instruments provided by the for measurement purposes
- A motor vehicle left for servicing or repair

Under these circumstances if the customer supplied product is lost, damaged or are unsuitable for use then a situation for conflict is created [7].

#### **ISO 9001:2000 Resolution (7.5.4)**

The 7.5.4 clause of ISO 9001:2000 helps in the resolution for the above mentioned conflict. The standard requires the organisation shall exercise care with the customer's property while it is the organisation's control or being used by the organisation. Identify, verify, protect and safeguard customer's property provided for use or incorporation into the product. If any product is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the customer and records maintained

#### **5.3.2.7 Conflict over product identification and traceability**

There may be a situation where employees may conflict for the product identification or where the product is at present. The production-planning department may have hard time locating the product in shop floor and hence a situation of conflict may arise [7].

### **ISO 9001:2000 Resolution (7.5.3)**

The 7.5.3 clause of ISO 9001:2000 helps in resolution for the above mentioned conflicts. The standard requires the organisation shall:

- (a) Establish and maintain documented procedures for identification and traceability of the product from receipt and during all stages of production, delivery and installation. Identification is to knowing what the product is, where you need to identify product, the methods used and records to be kept need to be defined e.g. part number, bar codes, colour codes etc. Traceability is to knowing where the product came from and where it is now e.g. job card, tagging etc.
- (b) Identify the product by suitable means throughout product realization.
- (c) Identify the product status with respect to monitoring and measuring requirements.

Where traceability is a requirement, the organisation shall control and record the unique identification of the product. The above discussion shows that ISO 9000 if implemented within the organisation will certainly reduce conflicts directly or indirectly.

### **5.3.3 Evaluation of training effectiveness**

Evaluation of training effectiveness is a highly desirable step in total training program so that one can judge the value or worth of the training. Hamblin has defined training evaluation as any attempt to obtain information (feedback) on the effect of a training program and to assess the value of the training in the light of that information [10]. However, it is very difficult to measure the effectiveness of training because of its abstract nature and long term impact on the trainees and the organisation. There cannot be some concrete quantitative proof of training effectiveness, at best; there can be some qualitative measurements [7, 29]. However, training evaluation can be more meaningful if the following process is adopted: determination of training objectives, fixation of evaluation criteria and collection of information relevant to training evaluation and analysis. [31]

**Training objectives:** Training objectives should be fixed in clear terms because all training program do not contribute in all areas. Hamblin has classified training objectives into four categories:

- (1) Reaction objectives: Intended to stimulate a high level of involvement and interest
- (2) Learning objectives: Concerned with acquiring knowledge, skills and attitudes
- (3) Job-Behaviour objectives: Learning to bring about desired changes in job behaviour and
- (4) Organisation objectives: Intended to promote overall result

Since, a particular training program emphasizes on a particular objective or multiple objective, its selection will be governed by the objectives of training. At the same time, these objectives can be used for evaluation of training also.

**Evaluation Criteria:** Based on the objectives of training, criteria for training evaluation can be fixed. Ideally speaking, training should meet its objectives, since training objectives can be defined either in terms of its immediate objectives like learning, behaviour change, etc. and in terms of its ultimate objective like achieving organisational objectives through learning, training evaluation criteria can also be fixed in these two terms. Normally, ultimate criteria are long-terms perspectives like increase in productivity, reduced employee turnover, reduced labour and human relation problems, etc. Therefore, these can be used for the overall effectiveness of training program over the period of measuring the overall effectiveness of training program over the period of time.

**Collection of information:** After fixing the factors to be measured and criteria fixed in respect of these, evaluator has to collect the relevant information, which may be helpful in arriving at certain conclusion. Information can be collected on the basis of facts like production records, post controls, etc. This may be used for measuring the achievement of ultimate objectives of training. For measuring immediate objectives, information may be collected on various aspects through observation of employee's behaviour on job, conducting interview and administering psychological tests to unearth behavioural changes which cannot be observed or which cannot be measured by interview.

**Analysis:** Collected information can be analysed to interpret the impact of training on various aspects, and consequently its effectiveness. If a particular aspect is being affected by several factors, the analysis may be carried out further to identify the contribution of training. Two points are important in information collection and its analysis. First, information to measure the immediate impact of training should be collected immediately after training because employees may tend to observe the old behaviour even after training if the new behaviour is not gratifying due to various organisation constraints. Second, there should be feedback of such evaluation to employees concerned so that they are also able to know the results of their training.

#### **5.4 FUTURE SCOPE OF WORK**

1. The study can be extended to other or all departments/sections of the organisation to get an effective evaluation of training needs for the overall organisation. [11]
2. The training needs can also be evaluated by using other techniques as: *“Analysis of job requirements, Organisation analysis, and Employee survey”*.
3. Other statistical techniques like  $\chi^2$  test, F-test, t-test, ANOVA, etc. may be applied for hypothesis testing framed to reach a conclusion about the data collected by survey or the interview of the employees.
4. The proposed mathematical model can be combined with other models to increase its applicability and reliability.

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