Chapter Objectives: This chapter aims at creating 'High reliability organization' by the deployment of reliable employees who can create reliable systems from the point of view of functioning of the systems and adoption of safety culture. Further, an attempt has been made to develop a mathematical model, using graph theoretic approach for expressing the reliability of an organization by single numerical index.

6.1 Introduction:

In the competitive business environment, the staff structure is becoming leaner and leaner with increasing work loads. Employees are expected to complete their tasks in time performing at the best of their abilities. Unreliable employees and systems become unacceptable or unbearable and must be discarded or eliminated. In general, the term 'reliability' refers to the ability of a person or a system to perform and maintain its functions in routine as well as in hostile or unexpected circumstances. Reliability is the probability that an item will perform as intended, under specific conditions, for a specified time. It can be measured in several ways, the most common being probability of success and Mean Time Between Failures (MTBF), which is calculated by dividing the total performance time of a group of items by the total number of malfunctions incurred. This definition of reliability is in reference to the service rendered by a machine or component or an inanimate system. The Institution of Electrical & Electronics Engineers (IEEE) defines reliability as “the ability of a system or component to perform its required functions under stated conditions for a specified period of time".
In order to increase the reliability, variability must be brought down. Fig 6.1 clearly shows that with the variability declining, the reliability goes up.

Figure: 6.1 Relationship between Reliability and Variability

This implies that for an ideal situation there should be no variability. The execution of policies and procedures must be consistently done. Bad or ill executed policies or routines or systems will fail even when the best performing organizations implement them. The firms that execute well framed policies and procedures in time may compensate for sub-optimal strategies. It is necessary to have reliable employees for high performance organizations. The expected qualities of a reliable employee include:

- Reliability or dependability
- Quality of work
- Overall job performance
- Integrity
- Attendance & punctuality and,
- Organizational abilities etc.

Figure: 6.2 Qualities of a Reliable Employee / Employee Reliability Profiler
Figure 6.2 represents the factors which contribute to the employee’s reliability and constitutes “Employee Reliability Profiler”. This was developed by the Industrial Psychologists. These are the accurate predictors of accurate personality traits. The employees with high degree of reliability and having virtues as stated above take the organization upwards through the process of organizational development. The area of organizational development is concerned with the performance development and increased effectiveness of the organization. The organization development has positive impact on most of the factors that contribute to high performance levels. The organizational development creates the desirable impact on several factors which steer the organization to high degree of reliability and performance standards. Performance is a multi-dimensional construct Boyne (2002), Carter, Klein & Day (1992); Quinn and Rohrbaugh (1983); Venkataraman and Ramanjum (1986). Further, enough research evidences / focus have lead to the belief that strong culture enhances the firm’s performance. Culture largely defines how people behave in terms of their willingness to accept risks, comply with the chain of command, delegate authority, act independently, and take personal responsibility for organizational performance Hofstede (1980). There is a dire need to study as to how do strong culture, employee and system reliability and personality traits affect and enhance the organizational performance.

6.2 Development of High Reliability Organization (HROs) for Enhanced Performance: Such organizations which have fewer than normal accidents and incidents with the employees and the organizational systems as compared to the similar types of organizations are called “High Reliability Organizations” (HROs). It becomes absolutely necessary to first investigate or evaluate the existing norms of safety and reliability. Safety and reliability of an organization is thoroughly linked to organization’s culture and safety and reliability levels achieved by an organization can be assessed by some study linked to:

- Number of accidents that have taken place over a period of time.
- Monetary losses to the organization in terms of money paid as compensation to the employees.
- Study regarding supervisory styles.
- Job design, and
- Group norms and expectations etc.

The study can be related to the norms of occupational safety and health and some observations must be made about the organizational behaviour and human resource management, for example:

- Management’s commitment to safety.
- Vertical communication.
- Inter-unit coordination.
- Characteristics of work units eg, cooperation, team work, work-group efficacy, supportiveness and goal emphasis, working environment, psychological environment, condition and soundness of equipment etc.
- Job related factors like overloading, nature of tasks, involvement of challenge in task and task clarity etc.
- Safety related factors eg., accident investigation procedures and employee recognition etc.,

Figure 6.3 represents the model of a “High potential employees working for high reliability and high Performance organization”.

Figure: 6.3 Developing high potential high performance employees for High Reliability Organization and improved performance-Model.
Development of an organization into a ‘high reliability organization’ requires:

- Employee and employee reliability development
- Organizational Development
- Adoption of principles of Reliability engineering, and
- System reliability development
- Development of safety culture & organization’s cultural development to create high potential employees.

The effect of organization culture cannot be ignored and its role cannot be understated. Investing efforts in creating a safety culture is an exercise worth it, besides other measures. It is necessary that safety be planned for every job, function, employee and the systems.

Such employees as are developed are called “high potential” and “high performance employees”. These high performance employees when adopt seriously the safety culture, principles of Reliability engineering, then ‘system reliability ‘is increased, and a “High reliability organization is generated”, which is always a high performance organization.

6.2.1 Employee and employee’s reliability development: From ‘employee performance development’ is meant the creation of talent pipelines and high-potential employees in order to remain competitive in the global economy. Due to global competition for customers and dollars (means financial gains), companies have become more “dependent on their top performers to innovate and provide services that differentiate them from their fierce competitors” Kaye and Jordan-Evans (2002, 32). High potential employees’ identification is not a new phenomenon. High potential employee development requires the use of the principles of talent management. Talent management is “the process of recruiting, on-boarding and developing, as well as strategizing activities associated with in the organization” Hartley (2004, 20). Studies by Peperman et.al, (2003) reveal that high potential employees are a ‘specific category within the group of employees, with different needs, motivation and behaviours than regular employees’. High potential employees have the capabilities to handle relationships well, understand other’s view and are able to cope with ambiguities of leadership demands, and possess more self awareness, McCauley et.al, (1994). In the last few years many industrial/organizational psychologists and career development practitioners concur, there has been a resurgence
of interest in use of personality assessment and a greater number of organizations turning
to personality inventories to both develop and select employees. Across employment
sectors, concerns about employee integrity have bred the development of honesty and
integrity testing, one version of personality assessment. And the current corporate
emphasis on team work, communication and cooperative problem solving paves the way
for how personality affects people's ability to work together. A reliable employee must
essentially possess certain qualities as for example:

- Quality of work
- Punctuality & regularity
- Integrity
- Organizational abilities and
- Good overall job performance, etc.

Employee reliability development is a strategic tool organizations have at their
disposal to improve organizational effectiveness, expand the commitment of their
workforce, manage change and optimize organizational processes. Employee
reliability or unreliability is often conceptualized quite narrowly. Leadership culture
is an important factor for the development of the employees' reliability because it is
all that they learn from their leader and get inspired and motivated to become the
reliable employees of the organization. Managers and supervisors should be
encouraged to become leaders. Directive, autocratic management styles are
becoming the things of the past. The leaders of tomorrow will need to be facilitative.
Establishing agreed upon results with individual performers, the managers will
provide needed resources, support, and coaching. Part of the leader’s role will be to
help people reach their full potential, then raise the bar to keep them growing.
Leaders inspire, rather than direct. They coach, encourage, and guide. Effective
leaders earn agreement with their people about what has to be done. They determine
with their team members, what resources are needed to get the job done. They
arrange those resources and then get out of the way so their people can perform.
Employee screening procedures and a number of other indicators of unreliability may
include:
• Substance abuse,
• Insubordination,
• Absenteeism,
• Excessive grievances,
• Bogus worker compensation claims,
• Temper tantrums and,
• Various forms of passive aggression, Hogan Joyce et.al April, (1989).

By the elimination of these factors through good leadership one can restore the employees' reliability.

6.2.2 Organizational Development: The process of organizational development is concerned with the performance improvement and effectiveness of an organization through a planned intervention in organizational functioning, operation and behaviours. Organization development is a relatively new practice in today's business environment. Longstanding research, education, and guidance are not generally available. An appropriate description of organizational development would be, “It is concerned with the performance, development, and effectiveness of human organizations”. Organizational development can help groups and individuals improve various aspects of organizational life necessary for success, including culture, values, systems and behavior. The goals of organizational development are to increase organizational effectiveness and organizational health, through planned interventions in the organization’s processes, operations, and behavior. Most often, organizational development services are requested when an organization (or a unit within an organization) is undergoing a process of change. Organizational Development Services (ODS) can assist in having a positive impact on most, if not all, factors that contribute to high performance. These include:

• Accountability
• Team interactions
• Strategic planning
• Skill alignment
• Professional development strategies
• Effective use of technology
• Workplace climate
• Employee morale

Figure: 6.4 Model for improved performance through Organizational Development.
As is evident from figure 6.4 incorporating these factors improve organizational performance through organizational development. Strong cultures, defined as "a set of norms and values that are widely shared and strongly held throughout the organization" O'Reilly and Chatman (1996), enhance firm performance. This hypothesis is based on the intuitively powerful idea that organizations benefit from having highly motivated employees dedicated to common goals (e.g., Peters and Waterman (1982), Deal and Kennedy (1982), Kotter and Heskett (1992). In particular, the performance benefits of a strong corporate culture are thought to derive from three consequences of having widely shared and strongly held norms and values:

- Enhanced coordination and control within the firm,
- Improved goal alignment between the firm and its members, and
- Increased employee effort.

In support of this argument, quantitative analyses have shown that firms with strong cultures outperform firms with weak cultures Kotter and Heskett (1992), Gordon and DiTomaso (1992); Burt et al., (1994). One of the key consequences of a strong
corporate culture is that it increases behavioral consistency across individuals in a firm. Organizational culture defines a normative order that serves as a source of consistent behavior within the organization. In this sense, organizational culture is a social control mechanism O'Reilly (1989); O'Reilly and Chatman (1996). At the same time, organizational cultures frame people's interpretations of organizational events and basic assumptions about organizational processes. Schein (1991: 15) emphasized that organizational cultures "provide group members with a way of giving meaning to their daily lives, setting guidelines and rules for how to behave, and, most importantly, reducing and containing the anxiety of dealing with an unpredictable and uncertain environment." Widespread agreement about basic assumptions and values in the firm should increase behavioral consistency Gordon and DiTomaso (1992) and thereby enhance organizational performance, which is a function of the potential return to an organization's activities and its ability to carry out those activities. The impact of consistency on execution is important, since firms with excellent strategies (high potential return) may perform poorly if they fail to execute well, and firms that execute their routines extremely well may compensate for suboptimal strategies.

Organization must run frequent safety training programmes, spend necessary funds and bring forward safety concerns for its people. There should be disciplinary amnesty for promptly reported safety infractions. Prompt investigations and enforcement of safety rules and regulations is necessary.

Some of the indicators of the need for organizational and cultural developments are for example:

- Difficulty in staff retention.
- Abnormal events taking place in the organization very frequently with the system, employees and equipments.
- Demoralized staff.
- Poor or no communication between staff and management / lack of transparency.
- Discriminatory / partial treatment with the employees.
- Lack of mutual trust and confidence between management and staff and there can be several other factors.
Eliminating above factors and incorporating culture of 'accountability', 'group cohesiveness', 'strategic planning', and effective adoption of latest technologies help in making organizational culture rich. Organization's climate and 'employee's morale' etc. contribute to raise the performance levels. Organization culture has been characterized as the "glue that holds organization together" Goffee et al (1996), and is not just one aspect of game Gerstner. Jr. (2002). Culture can support linkage between technology adoption and organizational growth, Chatman et al, (1994). It can be critical success factor in manufacturing strategy, Bates et al, (1995), and plays a crucial role in success and failure of merger and acquisition Weber et al, (1996) and Javidan (2001). Culture constitutes a part of organizational life for most of the managers and must be treated as an integral part of organization development programs. Culture of an organization is dependent on several factors out of which some are changeable and some are intractable. An organization can have a variety of cultures framed by differences in professional orientation, status, history, power, visibility and other factors. Culture gives rise to the expectation of behaviours some of which can result into non constructive interactions and that retards knowledge exchange. Different styles of culture can have different types of impacts on the employees of the organization. The impact can be either positive or negative. Positive outcome for the employees can be 'motivation' and 'satisfaction' O, Reilly,C (1989) and Cooke, et al (1993). Knowledge based change for organizational development is one very powerful strategy and it generally relies on the use of quantitative measures. Huse et al (1985) and Nadler (1998).

6.2.3 Adoption of the Principles of Reliability Engineering: Reliability engineering is the discipline of quantifying a product's reliability requirements, ensuring that practices are in place to design in reliability and verifying that reliability requirements are met through design analysis and testing. Design for reliability can be accomplished most effectively by integrating reliability engineering activities with other design engineering tasks throughout all phases of product development, Greenberg (1990) and Heydrick (1991). It is important to apply established reliability engineering techniques concurrently with the product design and development phases. The figure 6.5 represents the model for high reliability organization for enhanced performance.
Periodically, reliability testing programmes must be conducted and theme of the reliability program should be to identify potential problem areas and to incorporate effective preventive measures to preclude the occurrence of hardware or software failures. The primary elements of the program must be the establishment of quantitative reliability and safety requirements, design analysis, and verification of reliability through analysis and testing. Failure mode, effects, and criticality analysis (FMECA) and fault-tree analysis are commonly used during medical device development to assess potential safety hazards Elahi (1993).

6.2.4 System Reliability: A system is a collection of components, subsystems and/or assemblies arranged to a specific design in order to achieve desired functions with
acceptable performance and reliability. System reliability is critical for the success of most organizations, regardless of whether they are in manufacturing, service, government, education, non-profit, or otherwise. The level of reliability that is achieved by any system must meet the requirements of its users in all foreseeable contexts. Systems that don’t meet these reliability thresholds face either rejection by the market or lawsuits from dissatisfied customers. It is therefore imperative for system designers and managers to understand all precursors to system reliability. Historically, most efforts have focused on reliability in the design process Taksakulvith, et.al (2004). However, more recent analysis has established that reliability is determined throughout the product life cycle, including many of the stages that precede and follow design, Resnick (2005). There is considerable evidence that organizational culture affects system reliability at many of these stages, including requirements specification, design, operations CAIB, (2003) and incident investigation Fazel et.al, (2001). The concept of ultra reliability Resnick (2005) identifies many opportunities for reliability improvement that may not be discovered during traditional reliability analysis. One area that has not received sufficient attention with respect to its effect on reliability is organizational culture. One might think that engineering decisions are largely defined by quantitative cost-benefit analyses; however the effects of corporate culture and organizational climate can have large and unpredictable effects on the development of systems and their subsequent reliability. An examination of the system reliability context illustrate that culture can interact with many aspects of reliability. Organizational culture can be conceptualized as a combination of the attitudes, experiences, beliefs, values, and norms of an organization. It develops over time as the people and the environment change and organizational processes and procedures, both explicit and tacit, evolve. Culture largely defines how people behave in terms of their willingness to accept risk, comply with chains of command, delegate authority, act independently, and take personal responsibility for organizational performance Hofstede (1980).

6.2.5 Development of organization’s culture and Safety culture: Strong cultures, defined as “a set of norms and values that are widely shared and strongly held throughout the organization” O’Reilly and Chatman (1996: 166), enhance firm performance. The
benefits of strong corporate cultures emphasize the virtues of internal consistency resulting from internal agreement about core values and norms. Strong cultures should affect the variability of firm performance and have more reliable or consistent performance in relatively stable environments. Behavioural theories of the firm suggest that risk taking by managers depends on firm performance relative to aspiration levels Cyert and March (1963); Bromiley (1991) and highly variable performance may therefore increase risk-taking behaviour. Reliability is then a function of organizational learning processes March (1991); Levitt and March (1988); Levinthal (1991b). Organizational cultures and organizational learning are closely related. Strong culture firms should generally be better at avoiding internal threats to reliable performance, or breakdowns in coordination and control. Efficient and consistent firm functioning in the face of environmental change depends on both appropriateness and coordination. Strong cultures minimize heterogeneity in beliefs about the state of the environment and thereby enhance internal reliability. Organizational cultures can codify the organization's understanding of itself and its environment, and thereby clarify the organization's beliefs and goals for members Weick (1985), Schein (1992). In strong culture firms most members work from a shared knowledge base and common beliefs, which enhances organizational reliability. As March (1991) argues, "knowledge makes performance more reliable". There is a trend for safety culture to be expressed in terms of attitudes or behaviour. Glendon et al, (2006, p. 367) highlight that when defining safety culture the premise of some researchers is to focus on attitudes, where others emphasize safety culture being expressed through their behaviour and work activities. In other words, the safety culture of an organization acts as a guide as to how employees will behave in the workplace. Of course their behaviour will be influenced or determined by what behaviours are rewarded and acceptable within the workplace. For example, Clarke (2006, p. 278) states that the safety culture is not only observed within the "general state of the premises and conditions of the machinery but in the attitudes and behaviours of the employees towards safety". The U.K. Health and Safety Commission developed one of the most commonly used definitions of safety culture, which describes safety culture as: "The product of individual and group values, attitudes, perceptions, competencies, and
patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization’s health and safety management” (HSC, 1993a, p. 23).

6.2.5.1 **Key Attributes of a Sound Safety Culture. UK HSC (1993)**

- Espouse safety as a core value
- Provide strong leadership
- Establish and enforce high standards of performance
- Maintain a sense of vulnerability
- Empower individuals to successfully fulfill their safety responsibilities
- Provide deference to expertise
- Ensure open and effective communications
- Establish a questioning/learning environment
- Foster mutual trust
- Provide timely response to safety issues and concerns
- Provide continuous monitoring of performance

6.2.5.2 **Perform a gap analysis.** Learn/evaluate how your culture is performing in contrast with the 11 key attributes. Identify where the gaps are and prioritize a risk-based response to closing these gaps. This is simply stated and difficultly done. Gaining a full understanding of the dynamics of your culture and determining the root causes of any problems is likely not an overnight exercise. However, there are likely to be some readily apparent first steps that could be taken to start the process. All this will enhance organizational performance

6.3 **Creation of ‘High Reliability Organizations’.** The level of reliability that is achieved by any system must meet the requirements of its users in all foreseeable contexts. In fact, high levels of reliability have become a baseline for entry into many markets, an expected characteristic before a product or system will even be considered by customers, rather than a value added that can be used as a differentiator. In many cases, system reliability does not achieve its potential because opportunities for improving reliability are not addressed. Adequate emphasis must be laid on organizational
development and employee development. Both these factors go a long way in the creation of a High Reliability Organization. Figure 6.6 also shows the digraphic representation of the interrelationship of the attributes of a “High Reliability Organization”.

Figure: 6.6 Digraphic representation of the Interrelationship of attributes of “High Reliability Organizations”

6.4 Graph theoretic approach to Mathematical modeling and determination of “Sahai-Grover High Reliability Organization’s Performance Index” (SGHROPI).

6.4.1. High Reliability Organization’s digraph representation.
A graph theoretic model helps to understand and analyze the system and the related sub-systems up to the core level. Figure 6.6 also represents the digraph of attributes of a High Reliability Organization (HRO)
Various attributes of a High Reliability Organization continuously interact with one another. It becomes necessary to understand their interactions/interdependencies for systematic analysis and to evaluate overall performance of High Reliability Organization.
These interactions are schematically represented in digraph in Figure.6.6. Although this conventional representation is suitable for visual analysis and understanding interactions, it is restricted from any further analysis. Since the overall contribution is twofold:

(i) One through the inheritance of the factors and,

(ii) Other through their interdependence.

It is proposed to represent these factors and their interactions in form of a digraph, which models the identified attributes or factors, and their interactions. The digraph consists of nodes and edges. The nodes (Ci’s) represent the identified attributes and edges (Cij’s) represent the interaction among human resources. Ci indicates the inheritance of factors and Cij indicates the degree of dependence of jth factor on ith factor. In the digraph Cij is represented as a directed edge from node i to node j. To demonstrate the HRO digraph, the four identified factors are taken into consideration: Employee Reliability, Principles of Reliability Engineering, System Reliability and Organization and Safety Culture. Based on the interactions amongst the attributes, figure 6.6 also represents the corresponding digraph of the attributes. A brief description of interdependencies and interactions is given (page 86-87) under the heading ‘connectivity........core values’.

The graphical representation of factors given through the digraph is suitable for visual analysis. But it becomes complex when a number of nodes in a given case (i.e. the factors) increase. Moreover, it is not suitable for computer processing. For this, the digraph is represented in matrix form.

6.4.2 High Reliability Organization’s Matrix representation.

Matrix representation shows the connectivity in matrix form and the elements thereof represent the numerical values assigned to the parameters for their inheritances and interdependencies on suitably chosen scale. The nodes (Ci’s), (Cj’s) or (Ck’s) and (Ci’s) etc. represent the components of, Employee reliability, Reliability engineering, System reliability and Safety and organization culture or any other parameter considered for that matter. Identified edges (Ci’s), (Cij’s) or (Cik’s) and (Cil’s) represent the interaction among the components of Employee’s Reliability, Principles of Reliability Engineering, System Reliability Development and Adoption of safety culture. ‘Matrix representation’ is useful for computer processing. A permanent multinomial function characterizes the
system uniquely and permanent value of a multinomial represents the system by a single numerical index which is useful for comparison and ranking or grading. The diagonal elements in the matrix refer to the inheritance of factors and off-diagonal elements refer to interaction among factors. The row represents inheritance of a factor and its influence on other factors. Similarly, the column represents the inheritance of factor and its dependency on other factors.

As a general case, if interaction among all four factors is considered, the ‘High Reliability Organization Performance Index’ (HROPI) matrix is written as:

\[
C_1 = \begin{pmatrix}
C_i & c_{ij} & c_{ik} & c_{il} \\
C_{ji} & C_j & c_{jk} & c_{jl} \\
c_{ki} & C_k & C_{kl} & C_l \\
c_{li} & C_{lj} & C_{lk} & C_l
\end{pmatrix}
\]

\[ \text{Vertex} \]

6.4.3 **High Reliability Organization’s Permanent function representation**:

To have the net effect of sub factors on HROPI, it is proposed to find the permanent of matrix \(C_1\). The permanent of matrix \(C_1\), is a multinomial and a standard matrix function used and defined in combinatorial mathematics Jurkat and Ryser (1966). The permanent of matrix \(C_1\), also called per \(C_1\) is written as:

\[
\text{Per}C_1 = C_i C_j C_k C_l + [c_{ij}c_{ji} C_i C_j + c_{ik}c_{ki}C_j C_l + c_{il}c_{li}C_k C_l + c_{ij}c_{ji}C_i C_k \\
+ c_{ki}c_{ik}C_j C_l] \\
+ [(c_{ij}c_{jk}c_{ki} + c_{ik}c_{kj}c_{ji}) C_i + (c_{ij}c_{ji}c_{li} + c_{il}c_{li}c_{ji}).C_k + (c_{ik}c_{ki}c_{lj} + c_{li}c_{lk}c_{ki}).C_j \\
+ (c_{jk}c_{kl}c_{lj} + c_{jl}c_{lk}c_{kj}).C_i] \\
+ [(c_{ij}c_{ji}) (c_{kl}c_{lk}) + (c_{ik}c_{ki}) (c_{jl}c_{lj}) + (c_{il}c_{li}) (c_{jk}c_{kj})] \\
+ [(c_{ij}c_{jk}c_{ki}c_{li} + c_{ij}c_{lk}c_{kj}c_{ji}) + (c_{ik}c_{ki}c_{lj}c_{ji} + c_{ij}c_{ji}c_{lk}c_{ki}) + (c_{il}c_{li}c_{lk}c_{ki} + c_{ik}c_{ki}c_{lj}c_{ji})] \\
\]

\[ \text{-------------------- (6.2)} \]

113
The HRO permanent function i.e., expression (6.2) is a complete expression in itself as it considers all factors and all possible relative interdependencies.

Each term in the expression is useful to the management as all combinations of inheritance/interdependencies of factors and sub factors are covered. It contains N! terms, where N is number of factors (here N = 4). Moreover, the terms in permanent function are arranged in a systematic way in N + 1 grouping.

Quantification of Interdependencies and Inheritances of attributes of “High Reliability Organizations” (Please refer to table 5.1, & table 5.2, Grover et.al, 2006).

6.4.4 Digraph and matrix representation of the factors for determination of “High Reliability Organization’s Performance Index” (HROPI) by a simple arbitrary example:

The attributes considered are:

1 Employee Reliability
2 Principles of Reliability Engineering
3 System Reliability
4 Organization and Safety Culture

This would mean creation of 4*4 matrix written taking values from the scales as noted in the tables 5.1 & 5.2. Normally these values are decided by an expert opinion from the scales shown in the tables: 5.1 & 5.2. This index has been designated as: “Sahai-Grover High Reliability Organization Performance Index”, (SGHROPI).

\[
\begin{array}{cccc}
7 & 4 & 4 & 4 \\
2 & 7 & 3 & 3 \\
2 & 2 & 7 & 3 \\
3 & 2 & 2 & 8
\end{array}
\]

\[
\text{SGHROPI} = \begin{pmatrix}
1 \\
2 \\
3 \\
4
\end{pmatrix}
\]

\[
\begin{aligned}
1 &= 1546 \\
2 &= 114
\end{aligned}
\]
6.5. Concluding Remarks:

Due to global competition companies must provide consistent services that differentiate them from their fierce competitors. Inconsistency in service or performance is first step of failure. Inconsistency can be detected by performing ‘Gap analyses’. Variability in a process or system or a component’s performance is not desirable and must be brought down for performance upgradation. Variability tends to increase ‘risk taking behaviour’. High potential employees are able to bring down the variability. They also have the capabilities to handle relationships well; understand other’s view and are able to cope with ambiguities of leadership demands, and possess more self awareness. “High reliability organizations” (HROs) can be created by the high potential employees and are always rated as high performance organization. Leadership culture is an important factor for the development of the ‘employees reliability’. Employee development, employee reliability development, organizational development and strong safety culture are necessary to enhance the firm performance by creating HROs. Failure Mode, Effects, and Criticality Analysis (FMECA) must be conducted to assess potential safety hazards. Mathematical modeling of ‘High Reliability Organization’ has been done on the basis of four factors selected in this case. Identified factors for model are:

- Employee and employee reliability development
- Organizational Development
- Adoption of principles of Reliability engineering, and System reliability development’- is one stage
- Development of safety culture & organization’s cultural development to create high potential employees -stage two

Creation of high reliability organizations (HROs) means creation of as high performance organizations- stage three. Graph theoretic approach has been used in order to evaluate the, High Reliability Organization’s Performance and to express it by a single numerical value for the purpose of comparison or grading or sensitivity analysis. High Reliability
Organization (HRO) and improved performance—Mathematical model has been developed and “High Reliability Organization Performance Index” HROPI has been calculated. The index has been named as “Sahai-Grover High Reliability Organization Performance Index”. (SGHROPI).