procedure. It also to reduces scrap to an economic level and determines the optimal quality obtainable for the available process and to provide useful guides for specifications at the design stage in order to facilitate a procedure where incentive payments will be made for faculty output to make operators aware of the fact that their work is being monitored or inspected and for the origin of faults to be traced (this usually has a positive psychological effect in that operators pay more attention to the quality of their work) (caption,1978).

22.8 PERSONNEL IMPACT ON PRODUCT QUALITY

To look after the various functions set for the organization, adequate resources in men and materials have to be arranged by individuals who serve as managers or supervisors within organizations. Such people have to make things happen to aid in the achievement of the organizational objectives to coordinate the resources of the organization. Some of the resources or factors which help in improving product quality are:

i. Men (human resources)
ii. Materials
iii. Machinery
iv. Money e.t.c.

The success or failure of the organization depends on the effective combination and dovetailing of these factors or resources. The resources by themselves will not help the organization to accomplish the objective, unless there is an effective coordination and utilization of these human and non-human resources. While the human resources available to management in an organization are only one part of resources which must be coordinated, it is through the combined efforts of the people that monetary and material resources are utilized for organizational objectives.

Without human efforts, organization cannot accomplish their objectives. Adile, (2002) rightly observes, "all the activities of any enterprises are initiated and determined by the persons who make up that institution: plants, offices, computer automated equipment and all else that make a modern firm are

unproductive except for human effort and direction of all the tasks of management. Managing the human component is the central and most important task because all else depends on how well it is done". People are responsive, they think feel and act, and therefore they cannot be operated like machines or shifted and acted like a template in a room layout.

Manpower management is a most crucial job because "managing people is the heart and essence of being a manger". It is concerned with the activities relating to human elements or relations in the organization.

Apart from manpower motivation is also one of the key elements in personnel management. Two of the reasons why the Japanese are so successful in quality control is the motivation of the employees as well as their positive attitudes towards their organizations. The real answer to obtaining and sustaining quality and productive employees is to make them part of the organization: people of value that are essential to the success of the organization.

Proper training of employees as discussed earlier, contribute to quality products in the sense that once the employees have been selected and placed on the job, their performances may not be satisfactory because all persons are not perfect as at the times of being lined. Therefore, to develop them to fit adequately into both the job and organization, they need to be trained.

Through selection, qualified people are chosen for right job and this will help in improving product quality.

Once more, salary and wage administration also motivate employees. There is need for an organization to administer a proper wage system for employees to put in their best in order to meet the set organizational goals because "employees who do not have sufficient funds to support their reasonable need are distracted from their efforts".

Also through appraisal, the employees are able to learn the assessors opinion of their performance in addition to suggested changes in behaviour and attitude and consequently for improvement on job specifications.

Finally incoming materials which are raw materials and machines purchase must be checked by the quality control department to ensure that they meet the standards required by the company. Such activities are aimed at monitoring the process and eliminating causes of unsatisfactory products.

22.9 PROJECT QUALITY CONTROL MEASURES

Quality is a subject concept that guides the manufacturing of any product or rendering of any services. Quality is a concept that has no meaning except the user of the product or service gives complement after use, that the product or service satisfied him. This informs the reason why Kotler (2008:110) defines quality as the extent to which a customer's expectations, needs, demands are met by the use of the product or service. He notes that the concept of quality of a product is marginal as it is the difference between what the customer experts before using the product or receiving the service and what he actually received after the use. When this margin is wide, the product or service is said to be very poor, and when it is narrow, the product is said to be of high quality.

So, every country tries to effect control of quality as well as every organization. The country controls quality through several bodies. In Nigeria, these bodies include: Standard Organization of Nigeria (SON), National Drug Law Enforcement Agency (NDLEA), National Association of Food and Drug Administration and Control (NAFDAC) and many others. Each organization tries to retain a name or position of high repute by enforcing disciplinary measures whenever there is a threat to the quality of its services. To maintain uniform quality control, Nigerian bodies like Standard Organization of Nigeria (SON) and NAFDAC play prominent roles. There is also the Manufactures Association of Nigeria (MAN) that helps SON in the manufacturing sector to ensure standards. It is due to this that quality systems as: Zero Detects, Total Quality Management and National Awards were instituted.

Total Quality Management (TQM) in some form is increasingly practiced by organizations in the United States and throughout the world. One major impetus towards concern for quality has been fierce global competition from

Japan based companies offering products and services of higher quality, often at relatively low prices. There are many different views of total quality management (and in some cases, names other than TQM are used). For the purposes of our discussion, we define total quality management (TQM) as a management system that is an integral part of an organization's strategy and is aimed at continually improving product and services quality so as to achieve high levels of customer satisfaction and build strong customer loyalty. Although quality itself has been defined in many ways, the American society for Quality Control offers this standard definition: Quality is the totality of feature and characteristics of a product or services that bear on its ability to satisfy stated or implied needs. This definition recognizes that quality can involve every aspect of a product or service, that quality affects the ability of a product or service to satisfy needs, and that customer needs for quality may not always be explicitly stated. The Malcolm Baldrige National Quality award created by US Congress is the most prestigious recognition of quality in the United States. The award is given annually to U.S. companies in manufacturing, service, and small-business categories that represent the best in quality management. In examining the issue of quality and the need for quality control, we explore the strategic implications of quality, probe major assumptions underlying the philosophy behind TQM, examine TQM change principles and intervention techniques, and consider some issues related to the actual practice of TQM.

22.10 QUALITY CONTROL IN PRODUCTION INDUSTRY

Projects are carried out in every industry and profession and reflect not only the environment of rapid change which characterizes today's business world but also the move throughout industry and government towards defined goal-orientated divisions of work. In nearly every case the effort applied to the resultant project is across the boundaries of the organization and the reason for the upsurge in popularity of the multi-functional project team approach to management is that it provides the flexibility necessary for organizations to adapt amid constant change. Although on one level project management might

be thought of as a practical application, comprising techniques aimed at the control of time and cost, it uses and enhances many of the common practices of management. Team-working, cross-functional perspective, process orientation, logical progression and leadership are all important features of the project style of working and managing.

22.11 STRATEGIC IMPLICATIONS OF QUALITY

Quality expert, Garvin (2005:241), argues that quality can be used in a strategic way to compete effectively. Choosing an appropriate quality strategy depends on thoroughly understanding of the important dimensions of quality. Therefore we explore these dimensions before considering the issue of how to compete through quality.

22.11.1 Six Dimensions of Quality Control

From a strategic point of view, there are six dimensions of quality that are involved in a product's primary operating characteristics. For an automobile, performance would include acceleration, breaking, handling, and fuel usage. In service industries, such as fast- food restaurants, airlines, or hotels, performance is apt to mean prompt services. Features are supplements to the basic functioning characteristics of the product or service. Examples include complimentary newspapers for hotel guests, extra options on autofocus cameras, or stereo CD players in automobiles.

22.11.2 Reliability addresses the probability of a product not working properly or breaking down altogether within a specific period. Since a significant amount of usage is typically involved in assessing reliability, this quality dimension does not apply as readily to products and services that are used immediately.

22.11.3 Conformance refers to the degree to which a product's design or operating characteristics conform to pre-established standards. Typically, products and services are developed with some standards or specifications in mind. When the Michigan-based Van Dresser Corporation showed Toyota

engineers a prototype part designed for use in the automaker's Kentucky plant, one Toyota engineer got "down on his hands and knees measuring the gap" between the automobile's steel door frame and the interior panel by Dresser. The engineer said, "Look, the gap is a millimeter too wide". Van Dresser retooled the mold that produced the panel.

22.11.4 Durability is a measure of how much use a person gets from a product before it deteriorates or breaks down to such a point that replacement makes more sense than continual repair. For instance, durability for major home appliances varies widely, ranging from 5.8 to 18 years for washing machines and from 6 to 17 years for vacuum cleaners.

22.11.5 Serviceability refers to the promptness, courtesy, proficiency, and ease of repair. For example, General Electric has an 800 number that customers can call when an appliance breaks down. For easy-to-fix items, customers can purchase parts that are mailed with repair directions.

22.11.6 Aesthetics refers to how a product looks, feels, sounds, taste, or smells-all subjective issues highly dependent on personal judgment and preference.

22.11.7 Perceived quality refers to individuals' subjective assessments of product or service quality. Such assessments may be based on incomplete information, but often it is perceptions that count with customers.

22.11.8 Competing on Quality

While some dimensions of quality reinforce one another, others do not. For example, adding more features will often reduce reliability, while aesthetics sometimes interferes with durability. As a result, organizations do not usually attempt to compete on these bases.

22.12 TIME FRAME AND QUALITY PRODUCTION

Projects are always planned to have a time-frame or finite duration; this may well be related to a business plan or organizational need. If the target end date is to be met then the overall project duration will dictate the required start date.

So if the start and end dates are targeted then they have a direct effect on the resources needed to carry out the project. In many cases the people working on the project are a major part of the resource demand.

22.12.1 Unique and one-off

Projects are by their nature unique. A very similar project may have been done before but perhaps in a different environment and, although the technology may be much the same, the market might have moved on or changed in some way. It is useful to look at the type of projects that are undertaken by a business or organization and to categorize them into three major types: 'runners', 'repeaters' and 'strangers'. 'Runners' are projects that are common-place in the particular business environment and hardly differ one from another in (say) technology. They are frequently executed by a functional organization without much input from other parts of the organization. Product development where there is just a minor change to another is typical of runner projects, projects of this type are low risk.

'Repeaters' are more complicated than runners. A similar project will have been done well known. The new project is much the same, but any difference may require minor changes to the design or specification. Example includes situations where the product is larger or new materials are required or updated technology is needed.

'Strangers' are new to the organization. The technology is new, the market is new, or perhaps a completely new process design is required to cope with much higher production volumes. Such projects are commonplace in high-technology industries and by their nature are high risks. They are the most difficult to manage and, in extreme cases when poorly managed result in spectacular over-runs of time and or cost.

22.13 QUALITY GURUS

The development of TQM is credited to personalities like:

22.13.1 Deming's Philosophy

Deming is possibly the most famous of the quality gurus. Born at the beginning of the Twentieth century, he obtained his doctorate in mathematical physics in 1928. According to Abomihed (2001), Deming's began teaching statistical quality control in Japan shortly after World War II. Deming's perspective on quality is based on two definitions; Quality to him is multidimensional, to produce a product or to deliver a service that meet the customer's expectations so as to ensure customer satisfaction. The sources of his arguments are;

1. That quality must be defined in terms of customer satisfaction
2. Quality is multidimensional where it is impossible to define the quality of a product or service in terms of single characteristics or agent and
3. There are different degrees of quality, because quality is essentially equated with customer satisfaction.

Deming's quality philosophy centered on reduction of variation and uncertainty in the manufacturing process. Similarly inconsistency in services resulted in frustrated customers and a battered image for the company. In Deming' s view, higher quality led to higher productivity, which in turn led to long term competitive advantage.

The Deming chain reaction theory states that process improvements leads to lower costs due to less rework, fewer mistakes, delays and snags and more efficient use of materials. Lower costs, in turn, led to productivity improvements. With better quality and lower prices the firm can achieve a greater market share and remain competitive and provide more meaningful rewarding jobs.

Deming was also an advocate of change management. He envisioned the "New Climate" (Organizational culture) which consists of three elements; Joy in work, Innovation and Co-operation.

Deming is most popular for his 14 points for management which he suggested as the best way to help management understand and implement the necessary transformation.

22.13.2 Deming's 14 Points

1. Create constancy of purpose for improvement of product and services: He advocated a radical new definition for a company's role. To him, money is better made by staying in business and providing jobs through innovation, research, constant improvement and maintenance.
2. **Adopt the new philosophy:** Management needs to take leadership for change into leaning new and modern innovations.
3. **Cease dependence on mass inspection:** Eliminate the need for mass inspection by building quality into the products.
4. **End awarding business on price:** Aim at minimum total cost and aim towards single supplier.
5. **Improve constantly and forever the system of production and service:** Improvement is not a one-time effort. Management is obligated to continually look for ways to reduce waste and improve quality.
6. **Institute Training:** Too often, workers learn from others who are not also formally trained. This way mediocrity is enthroned and perpetuated.
7. **Institute Leadership:** The job of a supervisor is not to tell people what to do nor to punish them but to lead. Leading consists of helping people do a better job and to learn by objective methods.
8. **Drive out fear:** Fear often prevent people from expressing themselves or challenging existing stereotypes. To assure better quality and productivity, it is necessary that people feel secure.
9. **Break down barriers between departments:** Too often a company's department or units are competing with each other. They do not work as a team. They cannot come together and foresee and solve problems together. Improvement in one department may have deleterious effect on another department.

10. **Eliminate slogans, exhortations and numerical targets for the workforce:** Jobs are not done by hackneyed and slogans, but by a committed workforce. Let the workers chose their own slogans.
11. **Eliminate numerical quotas or work standards:** Most quotas take into account numbers without considering quality or method. Employees strive to achieve quotas even if it hurts the company in other ways. It is better to enthrone leadership.
12. **Remove barriers to taking pride in workmanship:** People are willing to do a good job and are often distressed when they cannot. Too often, faulty equipment, defective materials and misguided supervisors, stand in the way of good performance. These barriers must be removed.
13. **Institute a vigorous program of education:** Both management and the workforce will have to be educated in new knowledge and technology.
14. **Take action to accomplish the transformation:** It requires special top management involvement to carry out the quality mission. Everyone stakeholder needs to be adequately mobilized to realize this.

Deming last contribution to the quality movement was contained in his system of profound knowledge (Deming, 2003). Profound knowledge encompasses four interrelated dimensions.

22.14 APPRECIATION OF A SYSTEM

The emphasis here is to understand relationship between functions and activities. The strategic aim of the company is for all stakeholders (employees, shareholders, customers, suppliers and the environment) to win. While it may be easier to optimize sub-systems, this may not necessarily lead to optimization of the entire system.

One major source of sub-optimization is short term measures like

1. The monthly or quarterly results. Companies often make them look good by deferring repairs/maintenance, payments, orders of materials etc which end up hurting the company.

2. Ship out everything on hand towards the end of a financial year even if it does not meet quality standards
3. Investing pension funds immediately

22.15 KNOWLEDGE OF STATISTICS

This includes knowledge about variation, process capability, control charts, interactions and loss functions. All these need to be understood to accomplish effective leadership, teamwork and so on. There are two causes of variation; special and common. Special causes of variation in a product, process or service are those which prevent its performance from remaining constant. These special causes are often easily assigned, change of operator, shift or procedure. They can also easily be eliminated. Common causes on the other hand are those due to design, or the operation of the process or system which appear after special causes have been eliminated. These require management action to be eliminated.

Deming identified two kinds of mistakes

Error 1. To react to any fault, complaint, mistake, breakdown, accident, shortage as if it comes from special causes when in fact it comes from the random variation due to common causes.

Error 2. To attribute to common causes any fault, complaint, mistake, breakdown, accident, shortage when it comes from special causes.

22.16 THEORY OF KNOWLEDGE

The underlying theory and knowledge must be understood before success can be effectively copied. Operational objectives put meaning into concepts. We need to know precisely what procedure to use in order to measure or judge something, and we need an unambiguous decision-rule to tell us how to act on the result obtained.

22.16.1 Knowledge of Psychology

The science of human interaction must be understood by management.

Extrinsic motivations must not be allowed to smother intrinsic motivations. There must be the desire to learn irrespective of age and position.

22.17 JOSEPH M. JURAN'S PHILOSOPHY

Joseph Juran was born in the US about 1904. He started out as an engineer in 1924. Like Deming, Juran went over to Japan in the early 1950s, just after World War II. There, he conducted seminars for top and middle- level executives. His lectures had a strong managerial flavor and focused on planning and organizational targets for improvement. He emphasized that quality control should be conducted as an integral part of managerial control.

Juran, believed that the main quality problems were associated to management rather than workers. The attainment of quality requires activities in all functions of a firm.

Firm-wide assessment of quality, supplier quality management, using statistical methods, quality information system and competitive bench- marking are essential to quality improvement. Juran's approach has emphasis on teams (QC circles and self managing teams) and project work which can promote quality improvement, improve communication between management and employee co-ordination and improvement of coordination among employees. Juran also emphasized the importance of top management commitment and empowerment, participation, recognition and rewards.

It is very important to understand customer needs. This requirement applies to all involved in marketing, design, manufacture, and services. Identifying customer needs requires more vigorous analysis and understanding to ensure products specification. Thus, market research is essential for identifying customer needs. In order to ensure design quality, he proposed the use of techniques including quality function deployment, experimental design, reliability engineering and concurrent engineering. Juran, developed the idea of Quality Trilogy: Quality planning, Quality improvement, and Quality control. In his view, approach to managing quality, consists of: the sporadic problem is detected and acted upon by the process of quality control. The chronic problem requires a different process, namely, quality improvement: such problems are traceable to an inadequate quality planning process.

Another major contribution of Juran was his four broad categories for quality costs. The four quality costs are:

1. Internal failure costs (scrap, rework, failure analysis etc), associated with defects found prior to transfer of products to the customer.
2. External failure costs (warrantee charges, complaint adjustment, returned material, allowances etc) associated with defects found after product is shipped to the customer.
3. Appraisal cost (incoming, in-process and final inspection and testing, product quality audits, equipment calibration costs etc), incurred in determining the degree of conformance to quality requirements.
4. Prevention costs (quality planning, new product review, quality audits, supplier quality evaluation training, etc), incurred in keeping failure and appraisal costs to a minimum.

22.18 PHILIP CROSBY'S APPROACH

Philip Crosby was born in 1926, began his quality career as a reliability engineer. He participated in the Martin missile experience that led to the zero defects movement and later he worked in quality management for ITT. Crosby's name is best known in relations to the concepts of "Do it Right First" and zero Defects. Crosby defines quality as conformance to the requirements which the company itself has established for its products based directly on its customer's needs.

Crosby identified a number of important principles and practices for successful quality improvement program, which include, for example, management participation, management responsibility for quality, employee recognition, education, reduction of cost of quality (prevention costs, appraisal costs and failure costs), emphasis on prevention rather than after-the-event inspection, doing things right the first time and zero defects. Crosby presented the quality management maturity grid, which can be used by firms to evaluate their quality management maturity. The five stages are: Uncertainty, Awakening, Enlightenment, Wisdom and Certainty.

These stages can be used to assess progress in a number of measurement categories such as management understanding and attitude, quality organization status, problem handling, cost of quality as percentage of sales and summation of sales quality posture.

Crosby, offers a 14 step program that can guide firms in pursuing quality improvement. They are

1. **Management commitment:** Management stand on quality should be made clear.
2. **Quality improvement team:** To facilitate quality improvement program
3. **Quality measurement:** To monitor non-conformance problems in a way that permits objective evaluation and correction actions.
4. **Cost of Quality:** To define components of cost of quality, explain its use as a management tool.
5. **Quality Awareness:** To provide a method of raising the personal concern felt by all personnel in the company toward the conformance of the product or service and the quality reputation of the company.
6. **Corrective Action:** To provide a systematic method of resolving forever the problems that are identical through previous action steps.
7. **Zero defects Planning:** To investigate the various activities that must be conducted in preparation for formally launching the zero defects program
8. **Supervisor Training**: To define supervisor training in order to actively carry out their part of quality improvement program.
9. **Zero defects day:** To create an event that will make all employees realize, through a personal experience that there has been a change.
10. **Goal setting:** To turn pledges and commitments into actions by encouraging individuals to establish improvement goals for themselves and their groups.
11. **Error causal removal:** To give the individual employee a method of communicating with management the situation that makes it difficult for the employee to make the pledge to improve.
12. **Recognition:** To appreciate those who participate.

13. **Quality councils:** To bring together the professional people for planned communication on a regular basis.
14. **Do it again:** To emphasize that the quality improvement cycle never ends.

22.19 ARMAND FEIGENBAUM'S APPROACH

Feigenbaum, (2004) defines Total Quality Control as an effective system for integrating the quality development, quality maintenance and quality-improvement efforts of the various groups in a firm so as to enable, marketing, engineering, production, and services at the most economical levels which allow for full customer satisfaction. He goes on to state that effective quality management consists of four main stages:

1. Setting quality standards
2. Appraising conformance to those standards
3. Acting when standards are not met
4. Planning for improvement in these standards.

Feigenbaum established 9 fundamental factors affecting quality viz; Markets, money, management, men, motivation, materials, machines and mechanization, modern information methods and mounting product requirements (Feigenbaum 2002:59). These however, can be reduced to two broad categories;

1. Technological factors (including processes) and
2. Human factors.

Feigenbaum emphasized that the human factors were far more significant. He considered top management commitment, employee participation, supplier quality management, information system, evaluation, communication, use of quality costs, and use of statistical technology to be essential component of TQC. He insisted that effective employee training and education should focus on the following three main aspects: Quality attitude, Quality knowledge and Quality skills.

22.20 KAORU ISHIKAWA'S APPROACH

Professor Ishikawa was born in 1915 and by 1939 had graduated from the Engineering Department of Tokyo University. Ishikawa is best known as a pioneer of the quality Circle movement in Japan. Ishikawa, quality management extends beyond the product; it encompasses after-sales-service, the quality of management, the quality of individuals and the firm itself. Ishikawa advocate employee participation as the key to the successful implementation of TQM. Quality circles, he stated, was an important vehicle in achieving this. He has been associated with the development and advocacy of universal education in the seven QC tools. The tools are;

- Pareto charts
- Cause and effect diagram (Ishikawa diagram)
- Stratification chart
- Scatter diagram
- Check sheets and
- Histogram
- Control chart

Ishikawa (1985) goes on to state that the assessment of customer requirements serve as a tool to foster cross-functional cooperation, selecting supplier should be on the basis of quality rather than solely on price; cross- functional teams are effective ways for identifying and solving quality problems. Ishikawa's concept of TQM contains the following six fundamental principles;

- Quality first not short-term profit first.
- Customer orientation not producer orientation
- The next step is your customer-breaking down the barrier of
- sectionalism
- Using facts and Data to make presentations-utilization of statistical methods
- Respect for humanity as a management philosophy, full participatory management
- Cross-functional management

22.21 BRAINSTORMING AS A TOTAL QUALITY MANAGEMENT TECHNIQUE

According to Jones (2002), teams have a number of roles to play as a component in a process of continuous improvement. Teams can aid the commitment of people to the principle of TQM, provide an additional means of communication between individuals, management and their direct reports across functions with customers and suppliers providing the means and opportunity for people to participate in decision making concerning how the business operates improve relationships, develop trust and facilitate co-operative activity. Help to develop people and encourage leadership threats. Build collective responsibility and develop a sense of ownership. Develop problem solving skills. Facilitate awareness of improvement potential, leading to behavior and attitude change. Help to facilitate a change in management style and culture, solve problem, and facilitate awareness of improvement potential; leading to behavior and attitude change. Help to facilitate a change in management style and culture. Imbibe a sense of accomplishment. Improve the adoption of new products to the production line. Improve morale. Improve operating effectiveness as people work in a common direction through interaction and synergy. The American Society for Quality Control (ASQC) (1993) commissioned the Gallup Organization to assess employee attitudes on teamwork, empowerment and quality improvement. The survey of 1,293 adults focused on a variety of topics: including, extent of participation in quality teams, employee feelings of empowerment, and effects of technology and teamwork on empowerment.

Types of Teams

According to McDonnes (2004), in the superior performing organization teamwork is second nature. For example, the senior management work together as an effective team, managers of the various operating and functional units act as a team, people from different functions co-operate in the team activities which are needed in Unilever simultaneous engineering, benchmarking,

supplier development, quality management series registration and internal audits. In addition to teamwork within functions, it is common to find teams working together across the business.

In some cases teams are hierarchal in nature. A corrective action team is formed on a directive from a quality improvement team. Unless effective team working and cohesion is seen at the top of an organization, it is unlikely that the managers will be able to encourage their employees to work effectively in teams. The superior performing organizations use a variety of ways to facilitate teambuilding. Improve relations and reinforce the teamwork ethic.

22.22 QUALITY CONTROL TECHNIQUES

Quality Circle (QC) when operated in the classical manner, have characteristics which are different from other methods of teamwork. However, QC, in the classical sense, have not been too 'successful' in Western organizations. Hayward et al 1985) indicates that this is because they were introduced at a time in the West when organization did not fully understand the principles and practices of TQM. A vast amount of experience was however acquired in the operation of QCs, much of which has been well documented. It is suggested that any organization wishing to develop effective team work and resolve some of the issue which arise in the operation of teams should consult the written wisdom on QCs. There they will find many clues on facilitation, problem solving skills, organization of meetings and maintaining the momentum.

22.23 TOTAL QUALITY MANAGEMENT AS ORGANIZED PROBLEM SOLVING TECHNIQUE

People work in chains of activities that collectively form business processes. TQM focuses on how to collectively improve the process of delivering a service or product than individual or departmental performance or competence. Processes consist of a chain of customer/supplier relationships. System failure is when the link in the chain breaks, when the flow of work is disturbed. We have all learnt to live with and accept failures.

22.24 COMPETITIVE BENCHMARKING

Comparing one company's performance with that of another is a reflex of TQM. Reilly (2006) argues that competitive benchmarking is a continuous management process that helps firms assesses their competitiveness themselves and to use that knowledge in designing a practical plan to achieve superiority in the market place. To strive to be better than the best competitor is the target. The measurement takes places along the three components of total quality program; products and services, business processes and procedures and people. The idea is to benchmark performance, not only with ones direct competitors but with other firms as well to discover best practices and bring such practices back to one's own company. When done correctly, competitive benchmarking produces the hard facts needed to plan and execute effective business strategies that fully satisfy agreed customers requirement.

22.25 QUALITY CONTROL AS PERFORMANCE APPRAISAL TECHNIQUE

Relevance of an Appraisal Process

Organization needs to consider the relevance of an appraisal process to its short-and medium-term outlook. For organizations in deep trouble the introduction of an appraisal process is unlikely to be a top priority. If the organization has unacceptably high staff turnover, the causes need to be understood before judging whether appraisal will help. Organization undergoing major changes in reporting relationships need to settle a little before appraisal can contribute. However, when some stability emerges, the introduction of appraisal can help appraiser and appraisee develop mutual understanding of each other's roles and establish a foundation for high performance.

22.26 TEAMWORK DYNAMICS AS DECISION SPRINGBOARD IN QUALITY CONTROL

In Departmental Purpose Analysis (DPA), everybody is involved in the process of quality management from the managing director down the ranks of

management to the junior office clerk, the laborer and janitorial staff. Everybody in the company is responsible for producing quality goods and services and cutting the cost of quality. This comprehensive approach to total quality can capture the creativity and energy of the entire work force. Usually, this is done in teams. People are given some total quality training in the natural work groups and then unleashed in quality improvement teams.

22.27 THE OBJECTIVES OF QUALITY CONTROL (QC)

Total quality management has five objectives. They include the following:

22.27.1 The Obsession with Quality

The first objective of TQM is to create an obsession with quality in an organization. This obsession is created among employees of all kinds in all areas. Indeed, everything is affected; inputs, activities, processes, structures, procedure, relationship, result, everything. At this stage, it becomes necessary to give a broad explanation of what is meant by the word quality. At the heart of TQM is the conviction that it is possible to achieve defect free work most of the time. This assertion has been framed in different ways by different authorities of quality management. According to Edward Deming (1986) quality could be interpreted in terms of reliability, and as conformance to specification. Juran (1990) however disagrees with this interpretation. He talks about the possibility of doing things right the first time and all the time. TQM can only help an organization to create an obsession with quality first by radically redefining the meaning of quality and secondly by enabling an organization to put in place and sustain a continuous quality improvement. Under TQM, all employees come to understand that quality means consistently providing defect free products and services in a way that fully meets or exceeds the stated' agreed requirement of the customer.

22.28 FAILURE MODE AND EFFECTS ANALYSIS (FMEA) AS A PROCESS OF QUALITY CONTROL (QC)

The technique of FMEA is a systematic and analytical quality planning tool for identifying at the product, service and process design stage, what potentially could be wrong either with a product during its manufacture or end-use by the customer or with the provision of service. The use of FMEA is a powerful aid to advanced quality planning of new products and services. Its effective use should lead to a reduction in: defects during the production of initial samples and in volume production, customer complaints, failure in the field, Performance-related deficiencies and warranty claim. Improved customer satisfaction and confidence as products and services are produced from robust and liable production and delivery methods. According to Juran (2001), there are two categories of FMEA: design and process. Design FMEA assesses what could, if not corrected, go wrong with the product and service and during manufacturing as a consequence of a weakness in the design. Process FMEA is mainly concerned with the reasons for potential failure during manufacturing and in service as a result of non-compliance with the original design intent, or failure to achieve the design specification.

22.29 QUALITY FUNCTION DEPLOYMENT (QFD) AS QUALITY PROOF IN QUALITY CONTROL.

The QFD methodology was developed in Japan at Kobe Shipyard, at Mitsubishi Heavy Industries. It arose out of a need to achieve simultaneously a competitive advantage in Quality Cost and Delivery (QCD). All the leading companies in Japan use QFD. It is based on the philosophy that the voice of the customers drives all company operations. According to Tokyalk (2004), the technique seeks to identify those features of a product or service which satisfy the real needs and requirements of customers (market or customer required quality). This Analysis also takes into account discussions with the people who actually use the product, to obtain data on issues such as: What they feel about existing products? What bothers them? What features should new products

have? What is required to satisfy their needs, expectations, thinking and ideas? It is usual to express the customer's needs in their original words and then translate these needs into the technical language of the organization. The superior performing companies are using QFD to identify product and service features (including additional features) which customers will find attractive, and help to charm and delight them. In this way differentiating quality characteristics, features and or technical advantages can be established between the organization and its competition. These requirements, features and specifications are then translated into design requirements and then deployed through each phase in the 'manufacturing' style to ensure that what is delivered to the customer truly reflects his/her wants or needs. It provides the mechanism to target selected areas where improvement would enhance competitive advantages. QFD is a systematic procedure to help build-in quality in the upstream processes and in the early stages of new product development. In this way it helps to avoid problems in the downstream production and delivery processes and shortens the new product/service development time. It promotes pro-active rather than re-active development. QFD employs a step-by-step approach from customer needs and expectation through the four planning phases of: 1. Product planning 2. Product development. 3. Process planning and 4. Production planning through to manufactured products and delivered services. In endeavoring to meet the objective of delighting the customer, conflicting issues often arise and some trade-offs are made in a logical manner. Translating customer objectives and wants into product or service design how (i.e. the produce planning and design concept-phase 1) this voice of the customer' is the starting point for QFD and drives the process.

22.30 TQM CONCEPT AND WORKING FRAMEWORK

Having examined the contribution of the quality Gurus and the various quality awards, it is now appropriate to explore this labyrinth called TQM. Over time the frontiers of TQM has continued to expand, like a vortex, sucking-up new systems and developing new constructs. Perhaps the ambiguity in TQM lies in

the scope of meaning. TQM as a management system is a continuous change consisting of values, methodologies and tools

22.31 SUPPLIER QUALITY MANAGEMENT

Suppliers are major stakeholders in a business and thus are an important link in its drive towards TQM. This construct includes all management initiative aimed at the suppliers to help improve and sustain quality:

- Partnership with suppliers
- Supplier selection criteria
- Participation in supplier development
- Supplier performance evaluation
- Supplier quality Audits
- Supplier Communication Vision and plan Statement.

Vision statement is a detailed visualization of the desired future state of the overall business and serves as the target for which all strategies, goal and standards are established. Corporate vision is the high level or distant expectations, goals and aspirations of an organization (Onukogu, 2004).

This construct compasses all efforts at the strategic level to embed TQM into the organization

- Vision Statement
- Quality policy
- Overall business performance plan.
- Product quality Goal
- Quality improvement plan
- Formation of vision and plan Evaluation

According to Onukogu (2004), strategy deals with the choice of actions taken in order to achieve the set objectives defined within the corporate policies domain. The three levels of strategy hierarchy: corporate, business and departmental must be taken into account. Other areas include

- Evaluation of strategy
- Evaluation of overall business performance

- Evaluation of Department's performance
- Evaluation of Employee performance
- Quality Audits
- Bench-marking
- Quality costs
- Information systems

22.32 PROCESS CONTROL AND IMPROVEMENT

This construct examines all the activities taken to control or improve quality in the company; it includes the following

- Shop floor control
- Process capability (the extent of the measure of a firm's production systems ability to meet design specifications)
- Equipment maintenance innovation
- Inventory management
- Inspection
- Use of Quality tools

22.33 PRODUCT DESIGN

This involves all effort and activities at the design stage (e.g. assembly plant layout) aimed at controlling and improving quality. This construct includes the following: Concurrent engineering (corporate relationships throughout process design stage)

- Reliability engineering
- Designing for manufacturability
- Design of experiments
- Quality function deployment
- Value Engineering (aimed at reducing unnecessary cost before producing product or service)
- Computer aided design

22.34 QUALITY SYSTEM IMPROVEMENT

This is aimed at the improvement of the quality system. It examines those activities done to improve the quality systems and includes

- Quality manual
- Quality system Procedures
- Work Instructions

22.35 EMPLOYEE PARTICIPATION

This is aimed at measuring the participation of employees in quality management. The others include

- Cross-functional teams
- Quality control (QC) circle
- Within Functional team (team whose aim is to solve or investigate problems/opportunities within the same department and is normally disbanded after the risk is complete).
- Information communication
- Employee suggestion
- Improvement employee commitment
- Job rotation
- Worker's congress
- Trade union

22.36 RECOGNITION AND REWARD

This is a measure of how well instituted the recognition and reward programs are in a firm. The constituent are:

- Recognition and reward programs
- Working environment improvement
- Salary promotion
- Bonus Scheme
- Position Promotion

- Moral Awards: (Used to recognize the quality performance of employees or teams, usually in the form of thank you notes etc)
- Penalty

22.37 EDUCATION AND TRAINING

This is a measure of education and training initiative to foster quality management? It should include

- Education and training plan
- Team learning
- Quality awareness education
- Training for quality management Knowledge
- Job training
- Formal education promotion

22.38 CUSTOMER FOCUS

This is a measure of how customer-focused a firm's drive for quality management. This construct includes the following

- Customer complaint information
- Market investigation
- Customer satisfaction survey
- Quality warranty
- Customer service

  Customer information system

22.39 LEADERSHIP AND ORGANIZATION

Senior management commitment to the project management concept is vital for the success of the project. The project manager has the responsibility for delivering the project to its stated objectives. In an ideal situation the project manager has authority over the project team with the backing of the management of the organization. In less than ideal situations the project manager has to negotiate the provision of resources with functional managers,

often in competition with many other project managers and without either authority or adequate priority setting from senior management. A project normally involves people from several different disciplines working together as a team. They may belong to different parts of the organization and in international projects they may even be in a variety of countries. Where projects need to work across organizational boundaries, due to their temporary nature, a matrix organization is the most convenient organizational design for reassigning personnel, carrying out long-term personnel planning, and audit quality and skills improvement. The fashion for matrix management is still current in project management. In this type of project organization, the project worker is assigned by their functional manager (that is, a resource manager) to work on a particular project (or projects). They report to the project manager in relation to their project work, but belong to their owing organization for operational, personnel and development matters. However, it has different meanings for different organizations, so further definition as to the type of matrix is advisable; the types of matrix and other project structures are defined later. The leadership of the project should not be weakened by its organization. In many industries and companies the prevailing culture is functionally (or departmentally) orientated. In these cases the project organization is weak: the resources are owned and remain in their functional organization while the project manager has only a co-ordination role. This form of weak matrix does not engender good team-working and motivation of team members is difficult. The other end of the leadership spectrum has an all-powerful project manager with task forces whose members are co-located and highly project focus. Here the functional managers provide required resources and technical knowledge through resources. A project management needs to be adaptable; personality and type will influence the choice of the appropriate person for the project. But in all cases there can only be one responsible project leader. Projects can change in scope, often by very large factors because of changing needs and market conditions. Project teams must be able to cope with these changes in an effective and timely manner. They must be able to keep the client or owner

advised at all times on the current status of the project, especially schedule and cost.

22.40 HOW PROJECTS ARISE

Successful organizations gain competitive advantage through the achievement of their strategic plans. Most measures of success reflect the successful implementation of a form of change, such as introducing new products or creating new markets. All these changes are reflected by projects; therefore successful projects imply successful change. Typically the projects that are generated from within an organization arise from the various strategies that combine to form the overall business strategy of the organization. Those organizations that are aware that they can increase the effectiveness not only of their operational but also of their project processes will generate a set of change projects in addition to the projects outlined above. It is important to look at how the objectives of change are translated into a set of actions and how leadership in a project format is needed to implement these actions.

At the highest level, these actions will be a set of portfolios, those that arise from business area strategies (development' projects) and those that arise from the need to improve the implementation of operational processes (change projects). Some of these change projects will be directed towards business process improvements, others will be more radical and affect the form and size of the organization-in some cases drastically.

Development projects will comprise projects that arise from business needs, such as the need for new or improved products or facilities, and legislation-driven projects. Change projects will comprise projects that arise from business process improvements, such as new ways of working, new organizational forms, outsourcing and downsizing. Many of the pressures surrounding business as a whole are reflected at the manufacturing end of industry. Competition is becoming more intense and is driven by international as well as domestic markets. The key issues can be summarized as;

- The drive for high quality

- More efficient production
- Reduction in costs
- Faster time to market for products and services
- Extensive changes to manufacturing systems technology
- Team-driven manufacturing organizations and implied flexibility
- The trend to international working aided by communications technology
- Managing the supply chain

Most of the above issues are process-orientated and achievement of each of them is treated by many organizations as a series of projects. The projects themselves will aid manufacturing improvements as people employed on improvement projects return to an organization which is aimed towards flexibility. The most dramatic effects on business profits come reducing the time to market. This often requires a complete change not only in process but in culture. For many organizations have to break down organizational barriers to ensure the close integration of design, material purchasing and fabrication. The very principles of concurrent engineering are those of projects employed to help the process and its implementation. In essence, the management of the portfolio of projects and the projects themselves fall into separate categories and can be classified as strategic and tactical project management.

22.41 STRATEGIC PROJECT MANAGEMENT

The management of groups of projects is known as either programme management or multi-project management, but there are as yet no widely agreed consistent terms. It might involve: directing a set of projects which benefit from a consolidated approach; the coordinated support, planning, prioritization and monitoring of projects to meet changing business needs; or the coordinated management of a portfolio of projects to achieve a set of business objectives. Over the past few years there has been a move for some organizations to run themselves entirely in a project fashion, which has become known as management by projects'. Major conferences have been devoted to this theme and while the abandonment of the functional organization has

attraction for some organizations, for many it is too radical a step to take. Programme management as a way of managing groups of projects falls into three major areas:

1. Huge projects such as the Channel Tunnel or the strategic Defense Initiative (the so-called 'Star Wars' Programme);
2. Projects grouped together for a single client;
3. Projects grouped together for organizational or line-of-business reasons (this would include the management of projects grouped together for reasons of organizational change).

Programme management is not just a matter of combining projects and duration. The decision-making processes that link the projects together within the programme for selection, prioritization and allocation of resources are particularly important. Many organizations are treating these issues in an ad hoc manner, although information needs are served to an extent by the more sophisticated project management software packages.

22.42 TACTICAL PROJECT MANAGEMENT

Most organizations that carry out projects address issues at the tactical level. In the main, each project is treated as a single entity and its progression and success is the responsibility of its project manager. The project organization for each project may be different although there may be a preferred style that fits best with the culture of the company. There are a number of factors that affect the way in which projects are managed in an organization:

- The type of project – development or change?
- Its complexity – runner, repeater or stranger?
- The culture of the organization – is the project approach natural?
- The skill and competence of the project manager.

All these factors contribute to the choice of project form and why most organizations tend to operate a matrix and project team.

22.43 THE FUNCTIONAL FORM

It is convenient to further categorize the matrix into coordination, overlay and secondment matrices. The categorization indicates stages of commitment or movement of functional resources to the project. In reality there are no hard boundaries between any categories and the forms may be considered to be a continuum ranging from functional through matrix to projects team. As with all the matrix forms the roles and responsibilities of each direction need to be clearly defined for the balance to be effective. The project manager should specify what needs to be done in the project, while the discipline manager specifies how it should be done. The coordination matrix, in which all projects personnel remain within their disciplines and are managed directly by their line managers, The project manager coordinates the progression of the work and drives it through the disciplines and functions. In some cases the project manager may not even know who is assigned to the project by the discipline manager and relies on completion of the project activities in much the same way that delivery of work done by a sub-contractor may just be measured on its completion. The projects manager has little power in a coordination matrix and relies heavily on influencing skills to resolve issues. The overlay matrix has a form that implies a balance between the project and the discipline. People working on the project are responsible to the discipline manager for the quality of their output and to the project manager for production of the project deliverables. The project manager can identify the project team and has enough interaction with them to be able to give them a project identity in spite of their physical location within the discipline area. A close integration is needed between the resource planning aspects of the discipline and the activity planning aspects of the project.

With a secondment matrix, the project is staffed by mainly full-time team members who remain with the project for the duration of their involvement. Where there are many projects of this type in an organization the discipline managers have few staff to manage directly within the function. They retain the

specialists and their role is orientated towards maintaining the pool of resources in terms of career progression and performance. This is the strongest form of matrix and is frequently employed in contracting organizations and firms of consultants.

22.44 THE PROJECTS TEAM FORM

Organizations that work entirely as project teams are rare. A true management-by-projects organization will work in this form and all work will be defined as a project. No functional staff is retained, so that transference from one project to another will rely on organizational networking rather than a formalized resources allocation process. A version of the project team structure employs all project personnel within a projects division and retains the company administration outside this structure. Major contractors in the oils, gas and aerospace sectors operate in this way. Project managers in such organizations have a high profile and career progression through the organization is frequently through the project route rather than the functional route.

22.45 PROJECT MANAGEMENT TECHNIQUES

The major objectives of the project are to complete it on time, within budget and to its technical specification. All projects comprise activities or tasks that must be completed to achieve the overall goal. These activities require resources such as people, materials, equipment and money which all contribute to the cost of the project organization and the overall control fit together can be represented as a model of project management.

There are six major aspects to this model:

1. What needs to be done: the goals and objectives of the major input to the definition of the scope of the project, the detailed breakdown of the scope are often represented hierarchically by a work breakdown structure. This technique breaks the projects down into more manageable units of work. The lowest level is called a work package and within these work packages are the detailed activities that form the plan.

2. Who within the organization will do it: the organization is also frequently represented by a hierarchical breakdown. Only some sections of the organization will work on the project. Frequently in a large project it is useful to draw the project organization in a similar form.
3. Who does what in terms of responsibility and contribution: people from sections in the organization can be assigned responsibility for delivering the work packages, while other sections may contribute resources to work on the packages. The packages and the sections form the axes of a matrix termed a responsibility matrix.
4. How the work will be carried out: having defined who does what, the work is broken down further into activities. The sequence of activities can be put together as a plan and resources assigned to activities. Diagrammatically the logic is shown as a project network diagram.
5. When it will be done and how much it will cost: the critical path method produces the schedule of activities which is frequently represented as a bar chart. The resources allocated to the major input to the project budget. Linking costs to schedule also provides a budget phased through time.
6. Where the project is in terms of its progress: for the model to be dynamic the progress measured against the plan has to be constantly monitored and corrective action taken to ensure the forecast progress of the project is not impaired.

22.46 WORK BREAKDOWN STRUCTURES

A work breakdown structure (WBS) is a formal and systematic way of defining scope of a project. The project is broken (or decomposed) into natural elements (management and control purposes) into more manageable chunks of work. The process of determining the WBS helps to identify missing scope items and areas for further definition. The graphical representation is a hierarchical sub-division of the project, normally drawn in a top-down design. The process of drawing the WBS or at least finalizing its structure should be a consensus group process, so that the structure and content of the WBS are agreed by all the parties who will carry out the project. The hierarchical diagram that is

produced and the definition of the elements of the structure enable responsibilities to be identified and relate elements of work to each other and to the end product. The diagram also forms a logical, structured and organized base from which to integrate the work to be done in the organization, and the planning and control system, and is an excellent way to communicate the scope of the project. The WBS elements at the lowest level of breakdown are frequently referred to as packages of work and must be unique and clearly distinguishable from one another. This process of breaking down the work has to include all the project, so that the scope is fully defined in terms of what needs to be done to complete the project. At a later stage, during more detailed planning, each package is normally further sub-divided into lower-level elements of work- activities or tasks. These activities will be carried out by the appropriate part of the performing organization and determine how the project will be carried out in a number of ways.

Although primarily orientated towards identifiable self-contained end products or deliverables, information and other services together with project management tasks may also be included. The most common form of WBS is the product or component. This form is especially valuable for dividing the work of the project into manageable units for which individual responsibility can be assigned. In practice, the final WBS often shows a mixed approach; for example, the top levels may be functional and the lower levels product orientated.

The WBS can be used to establish the framework for an integrated project management information system. It relates the work to be performed, the organization structure and the individual responsibilities for the work. It is therefore an ideal basis for planning, estimating and budgeting. It can then be used for further detailed activity or task planning. It is also a way of identifying and isolating areas of risk within the project. It can be used to formulate packages of work that can then be sub-contracted to other organizations if the organization carrying out the project has neither expertise nor available resources to carry them out. Most modern project management information

systems provide analysis, reporting and control based on work breakdown structures.

22.47 PROJECT NETWORK TECHNIQUES

The primary use of project network techniques is to discover the minimum time necessary to complete a project and to determine when each activity should be carried out. The calculations required for this time analysis are simple and in principle can be done without the aid of a computer which can do the calculations more economically and conveniently. Similarly, when network analysis is used to schedule resources, the calculations involved increase enormously and a computer is essential. The technique is the subject of a British Standard, which covers in detail both charting techniques and specifics of calculations.

In order to find the minimum time necessary to complete a project, the longest sequence of activities from the beginning to the end of the project becomes the shortest possible time to complete the project. Since there can be many different paths of activities between these points, it is possible to have more than one critical path; it does not follow that they are the most important in a technical sense. If any activity is delayed, all subsequent activities on its path will also be delayed; if the activity is on a critical path, the project will take longer than the minimum time, unless remedial action is taken.

In project network analysis, the project is broken down into its constituent activities, which are then charted in logical sequence. The duration of each activity is estimated and the total duration of each path through the network is found by adding up the durations of its constituent activities. The path with the greatest total duration is the critical path. The difference between this duration and that for each of the other paths shows the spare time, or 'float' of the other paths.

The minimum time required for completion of the project is given by the critical path. If the work is to run on schedule, the activities in this path must take place at the time calculated for each of them. Activities on the other paths,

which have some float, can be scheduled to make best use of the available resources. The technique draws the attention of management to those activities whose prompt completion is essential in order to keep to a schedule.

The management of the steps is also important. Determining the constituent activities of the project should lead direct from the WBS, and determining the sequence is often done at a planning meeting. This should be a consensus process that takes account of the best way to carry out the project and involves the people who will be doing the work. It is always valuable to involve the operational users of final project deliverables in the planning process. In this way the operability aspects and the building aspects of the project can influence the design and reduce rework in the latter stages of the project. It is important that the project team 'owns' the plan and that it is not seen as belonging to the project planner, who is often responsible for forming and maintaining the plan on larger projects.

Estimating durations, as with any other type of estimating, will rely on both expert opinion and historical data. People are naturally reluctant to produce estimates and poor estimate often result from pressurized rapid estimating and from data gathering that involves completion of forms on a circulate and return basis. This final step of the process is mechanistic but can become very complex when different work patterns are involved within the network plan. In projects where multi-shift working occurs, such as a shut-down for maintenance of a facility, the calculations are ideally suited to computerization. The network plan is useful in monitoring project progress. When something goes wrong, perhaps because the durations of some activities were badly estimated or some extra job becomes necessary, the effects of the changes can be assessed rapidly and a revised schedule produced.

22.48 CHARTING TECHNIQUES

These are two ways of representing the logical sequence of activities: arrow diagrams and precedence diagrams. Both diagrammatic forms serve the same purpose, are drawn from left to right and each method has strong supporters

and proponents. The most commonly used form, precedence, will be described below. Details of the arrow method are well described in the literature. In precedence diagrams, each individual activity is represented by a node (conventionally) drawn as a rectangle) and sequential relationships between activities (known as constraints) are shown by connecting them with an arrow. Nodes can also be used to indicate certain milestone points (for example, the start and end) even though no activity takes place and no time is consumed. These are often drawn as a different shape or size so that they can be readily identified.

To take an example, the following group of activities might occur when dealing with a flat tyre on a car. Start and end nodes should be included to facilitate the subsequent time analysis:

1. Remove wheel with punctured tire;
2. Repair puncture with emergency kit;
3. Bring spare wheel from storage compartment;
4. Fit spare wheel to hub;
5. Place repaired wheel in compartment

In determining the logical sequence, resource limitations are ignored- it is assumed that as many resources as needed are available. Scheduling of activities, taking account of resources, is part of the subsequent analysis. The most common constrain on activities is between the completion of one activity and the start of the succeeding one; this is known as a 'finish' to start' constraint (FS). Other constraints that can be used to describe activity sequencing are situations where: activity B can start at the same time as A but not before (SS); the end of activity B depends on the end of activity A (FF); and the end of activity B depends on the start of activity A (SF). Each node must be identified by a unique number or code, so that it is possible to describe it by its code as well as by its description.

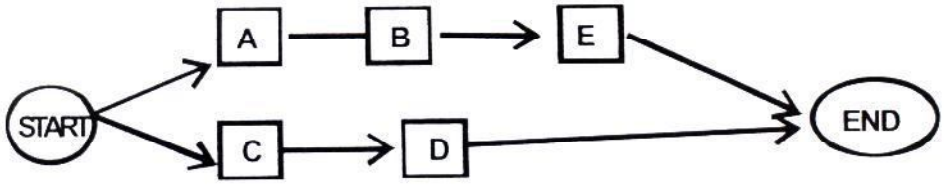

Figure 22.1. *A simple precedence diagram*

Codes can be devised for easy location of any node (for example, a grid system) or to include department codes and other information. Where no other consideration interferes, it is usual to number progressively from left to right (in steps of ten). It is often difficult to draw a network diagram which is neat and easy to follow. Practical experience is necessary for good results but even with practices, the draft network for a project nearly always needs redrawing and tidying up, often more than once. Sometimes lists of the activities to be included in a network will be available in advance, but if not, much time can be wasted in compiling them. It is preferable to construct the rough network and expand the detail as the information becomes available. Many project management software packages provide graphical facilities for building the network. Amendment and changes are thus easier to make. When the network diagram is complete it gives a picture of the logical sequences of activities, in itself a useful aid to management. The next step in the process is to add durations to the activities and calculate the overall project duration and when each activity should happen. The critical path in a small network can be found fairly easily by inspection. For large networks, a systematic procedure is essential to calculate the earliest and latest times at which each activity starts and finishes. The calculation process is split into two distinct phases, the forward and backward passes. In the forward pass, the early dates (or times) are calculated, while in the backward pass, the latest dates are calculated. Where no target dates have been imposed on the network, the difference between the early and the late dates is the float available to each activity. The critical path has no float, so that a delay to any activity on the critical path will delay the project as a whole.

22.49 THE INFLUENCE OF RESOURCES

Lack of sufficient resources will obviously delay the project. The two basic questions are what resources will be required to complete the project in the minimum time? And how long will the project take if the resources are limited? The effect and extent of delay can only accurately be qualified by resources loading the network at activity level. The resources needs of each activity are usually estimated on a rate basis (for example, two engineers and a manager for each day of the activity's duration). The overall resource load for the project is determined by aggregating the activities through the project on a periodic basis, that is, week or day by day. The overall availability level and the time span for each resource and the dates for each level are then compared with the resource load.

Overloads and under-loads can be adjusted by adjusting activities, if possible, within their float. There are numerous computer programs available for scheduling resources in a network. More advanced project management software programs allow resources to be allocated via a variety of priority rules. There are also modern graphics-based packages that allow manual manipulation of the plan to show the effect of movement, of activities on the resource loads. Whatever method is used, resource requirements are smoothed by delaying the timing of selected activities. Training in the way the scheduling options can be chosen and if the intricacies of the scheduling algorithms are highly desirable.

Once the effect of resource limitations have been fully appreciated, the adjusted plan is fully published and communicated. This is now the basis for comparison with what happens through the project. Activity progress is usually measured as a percentage completed or an assessment of the time remaining at the status date. This data is fed back into the computational cycle and the plan is amended as needed or recovery plans are put in place.

All the project costs can be associated with activities within the network plan. The costs of resources can be determined via a day rate, for example. Material and equipment costs can be allocated to activities as can overheads and other charges. Using aggregation techniques both the overall project costs and its time phasing can be determined. When costs and durations are interlinked, the network acquires a flexibility which makes it much more useful as a control tool. Costs can be manipulated so as to adjust the completion date to a required valued or, conversely, the overall duration can be varied so as to minimize costs. In summary, the result of network analysis of a project is a graphical illustration of the sequences of activities determining when each should be done, which dictates the duration of the project and how much float is available to the others. This can be used as a basis for: efficient allocation of resources; monitoring progress as the project proceeds; comparing alternative costs and durations of activities.

22.50 COST MANAGEMENT

The cycle of managing costs within the project starts with the estimating process and ends with a historical cost report. Estimating is a skill that can be developed but good estimating will be very dependent on data and therefore the accurate recording of project costs to produce a meaningful historical report is essential if any organization is to improve the quality of its estimates.

Most projects go through a similar pattern of phases or life cycle that relate to a major deliverable and level of estimate refinement. Throughout each phase, information contributes to the definition of the estimate and increases its accuracy. The approaches to estimating vary from industry to industry and organization to organization. Some mature industries, such as the petrochemical contracting industry, have commercial databases that contain information about process parameters, geography, equipment and materials costs. These allow a very rapid and reasonably accurate estimate to be produced. Software development projects can also be estimated using models based on the experience of many projects. The building industry also has

similar models. All these parametric models need some degree of care when applying the specifics of the project to the generations who will build up their own databases and in some cases develop the skills of expert estimators. Another approach is via the work breakdown structure; many projects have similar work packages and it can be easy and swift to create a WBS and add the work packages together to create the cost estimate.

A formal review should be standard for any project at the time that the estimate is submitted, be it for a tender or internal approval. At this review the following actions should be taken to ensure the quality of the estimate:

1. The basis of the estimate should be evaluated;
2. The methods and data used should be reviewed;
3. The caliber of the people involved need to be assessed;
4. The quality of the documentation must be evaluated;
5. The scope should be made absolutely clear.

At the beginning of the implementation phase the estimate becomes a budget and costs start to be incurred. Estimating continues throughout the projects and each estimate will be made up from budget. Actual costs management is focused at this stage on the elements that make up the budget and they are normally divided into a number of categories: hours of work (labour), materials, equipment and overheads. As the project progresses costs will be calculated: hours or weeks via timesheets, and purchases via requisitions or orders. Much of the data will be processed within the organization's financial accounting system which in principle can transfer data to and from the project accounting system.

Table 22.1 Phases of Cost Management

Phase	Phase deliverable	Estimate
Concept	Verified idea Request for funds for next phase	Order of magnitude (ballpark)
Feasibility	Business case Technical verification	Preliminary(25per cent)

Planning-basic design	Request for approval or tender	Tender price
Implementation	Completed project	Continuous estimates/ forecasts
Design/procurement/ installation		
Operations		Historical cost report

As with all information systems, data integrity and timelines are important and adhering to agreed cut-off dates is vital for the projects system to be accurate. There are differences between projects and financial systems when counting costs. Many industries count the costs of purchases at the time the purchase order is placed, a practice known as commitment accounting. Finance systems are more interested in when the money has to be paid and so the time phasing of payments for equipment must also be monitored and reported.

Throughout the life of the project, at each project review, the cost is re-estimated and becomes a combination of the costs spent to date and the amount left to spend. This value can come either from an estimate from the responsible budget holder or from a forecast derived from mathematical methods based on trends. Some cost management systems are also concerned with measuring actual not just in cost terms but in performance as well, so that the physical progress of the work achieved is measured and expressed as a cost value or earned value. The techniques of performance measurement have come from standards developed by the US military for monitoring complex defense project (see Fleming and Fleming), they are now widely used in a number of industries. Comparing cost actual to budget is not a meaningful comparison because the actual cost may represent less or more achievement of work. Therefore a more accurate comparison is a quantification of the value of the work done'. It is an objective measure of how much work has been accomplished and in principle relies on methods to measure work achieved and to equate this to the same value scale as the budget and actual. This is normally

money but could be hours of work or even a nominal point's value. Performance management has a specific terminology which relates to the time phasing of costs and is best illustrated graphically, as in the figure below.

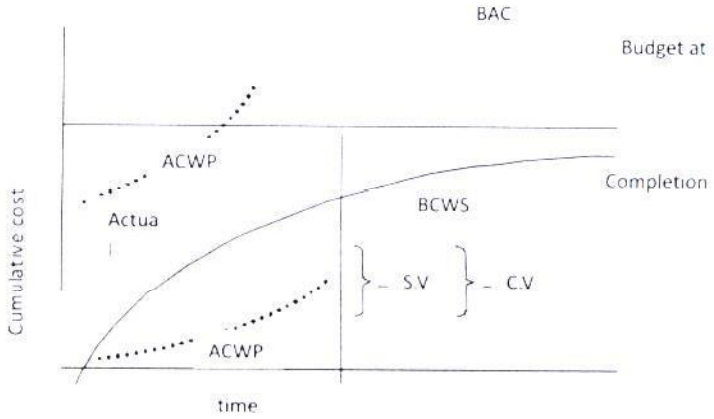

Figure22.2. *The Cost of a Project in Performance Management Terms sources: Shahani and Stainton (1989) note: ACWP = actual cost of work performed; BCWS = Budget cost of work scheduled; BCWS =budget cost of work perform (the earned value); CV = cost variance; SV = schedule variance*

The above plot of the cumulative values of the costs show a project that is not only overspending but also underperforming and will almost certainly overrun both time and cost. There are some useful ratios or indices that are recorded throughout the project and which indicate the health' of the project.

Cost Performance Index (CPI) = BCWP/ACWP (<1 Represents poor performance)
Schedule Performance Index (SPI) = BCWP/BCWS (<1 Represents Poor Performance) = (BAC-ACWP)/(BAC –ACWP) (<1 Represents good performance)
To complete Performance Index (TCPI)

The key to the use of the technique relates to the methods for assessing earned value. These can range from just a subjective assessment to methods for counting physical accomplishment units of work completed.

CHAPTER TWENTY THREE

PROJECT STAKEHOLDERS CONFLICT MANAGEMENT

23.1 REAL ESTATE CONFLICTS

Real estate management is one of the major professional practices whose activities revolve around managing people's interests. Our focus is channeled towards managing interest in landed property. Conflict management is an indispensable force that propels the wheel of success in every organization, since we know success and failure are two opposing forces on a straight line that lead to manageable conflicts. The success or failure of individuals, groups and organizations breed conflicts that must be managed to avoid total system collapse. According to Nzotta, (2010) conflict management is an integral part of the organizational development process. Regardless of size, nature of operations and the type of services rendered every organization experiences one form of conflict or the other in the course of its operations. Thus, there is need to examine these conflicts and how to manage them, taking into consideration the fact that it could be destructive if not properly managed.

Conflicts arise as a result of misunderstandings or communication breakdown between the parties involved in professional organizations. Conflict is defined as a mental struggle resulting from incompatible or opposing needs, drives, wishes, internal or external demand. Furthermore, conflict is defined as a disagreement through which the parties involved perceive a threat to their needs, interest or concern. According to Nwachukwu (2003) conflict could be described as troubleshooting arrows that fly in-between stakeholders in a development process especially in a project management environment or organization. Nzotta (2010) sees conflict as a dynamic process, which arises from a clash of interests or feelings between two or more persons or a struggle between opposing ideas, principles or aims. Conflicts occur when two or more

parties (individuals, groups, organizations, nations) believe that what each wants is incompatible with what the other wants. Conflict is "a situation of competition in which the parties are aware of the incompatibility of potential future positions and in which each party wishes to occupy a position which is incompatible with the wishes of the other." Conflict is viewed as a cycle: "As with any social process, there are causes; also, there is a core process, which has results or effects. These effects feed back to affect the causes." To understand conflict further, the situation must include elements of interdependence, emotions, perceptions, and behaviors. For example, conflict occurs between parties whose tasks are interdependent, who are angry with each other, who perceive the other party as being at fault, and whose actions cause a business problem. In fact, conflict tends to be accompanied by significant levels of misunderstanding that exaggerate the perceived disagreement. Considerably if we can understand the true area of disagreement; this will help us solve the right problems and manage the true needs of the parties. From another perspective, conflict refers to a situation where there are perceived incompatible differences, (whether real or imaginary) which result in crisis, blocking, disagreement, frustration, interference, intolerance and opposition. In the industrial environment, conflict breeds riots, strikes, demonstrations, terrorism, looting, work to rule actions etc. Conflicts can be productive or destructive in nature. Productive forms of conflict are functional in nature. According to Nzotta, functional conflicts are characterized by problem solving, innovation and creativity. This form of conflict may lead to resolution and integration, which eventually improves organizational performance. Functional conflicts assist in the rapid growth of organizations. Unproductive forms of conflict are destructive in nature and may work to enhance the organizational efficiency or reduce the unsought consequences or various actions of the managers. Some positive effects of conflict in organizations include:

- Social change
- Increase in group cohesion, solidarity and performance

- Stimulation of genuine search for new facts
- Useful for assessing the strengths of the other party.

23.2 CONFLICT SITUATION

According to Nzotta (2010) an understanding of the conflict situation is very important in conflict management. Basically, three parties are easily distinguishable:

- The individual.... (I)
- A group of individuals (union)...(G)
- The organization...(O)

These three parties give rise to nine different pairs of conflict situations represented in a matrix form.

TABLE 23.1 . CONFLICT MATRIX

Parties	Individual	Group	Organization
Individual	I.I	I.G	I.O
Group	G.I	G.G	G.O
Organization	O.I	O.G	O.O

From the table above, we could reclassify our conflict situations as follows:

- Individual versus Individual
- Individual versus Group
- Individual versus Organization
- Group versus Individual
- Group versus Group
- Group versus Organization
- Organization versus Individual
- Organization versus Group
- Organization versus Organization

Conflict arises when stakeholders try to protect their personal or collective interest in real estate project construction. Major stakeholders in real estate construction include: The client (who may be an individual, a group, public or private agency, organization etc); Project Manager and his building team, The internal and external staff; The internal and external environment; all direct and indirect beneficiaries of all aspects of real construction processes, and all who may suffer directly or indirectly during and after the construction process.

23.3 MAJOR SOURCES OF CONFLICTS AMONG STAKEHOLDERS IN BUILDING CONSTRUCTION ENVIRONMENT

The nature of the environmental conditions, the makeup of the social systems and subsystems, the developmental contradictions in the economy especially in developing countries, the lopsided pattern or resource mobilization and distribution etc, all create the bases for conflicts among stakeholders in many professional organizations or organizational lines in construction project implementation in Nigeria. Stakeholder's interest in real estate construction could result from a wide range of internal and external factors, including:

- Racketeering among professionals, blackmails, upholding unscreened rumors as facts, envy threats, incompetence in practice, shortchanging of ideas and personnel, unverified gossips, personality threat, lack of exposure and environmental unfriendliness etc. These do not only create room for conflict among project construction stakeholders but encourage quackery in many professional activities.
- Leadership: position seekers, struggle to emerge as a leader, the style of leadership adopted by those who emerge as leaders in an organization are sometimes major sources of conflicts among stakeholders in real estate construction organizations and in building sites.
- Trouble shooters: Many individuals and groups have a specialized character to feed on trouble waters. They derive joy and financial benefits from conflict environments. They always fan and insinuate trouble among individuals, groups and organizations for their own selfish ends.

- Class struggles and differences, personality clashes, interpersonal differences, personality differences, difference in perceptions, values, attitudes, expectations.
- Shortage and scarcity of resources. Incompatible resource allocation.
- Environmental conditions.
- Social-cultural differences, religion, language and social status concerns.
- Socio-Political differences, difference in ideology
- Economic considerations- Poverty, changing economic circumstances, dwindling incomes, limited access to the resource base, poor compensation packages, lopsided forms of income and resource distribution etc.
- Un-standardized rules and norms of behavior; absence of standard procedures and un-formalized structures.
- Incompatibility of goals; differences in perception of goals structured between employer and employee, conflicting goals. The employer or management could desire more profits and thus a smaller work force, while labor expects more pay and fringe benefits, thus generating conflict.
- Dissatisfaction with management due to favoritism, bias in promotion at work place, loss or seniority, irregular transfers, lopsided or poor decision making processes, poor communication network, lack of participative management etc.

23.4 PARTIES INVOLVED IN CONFLICTS

There are often disparities in our sense of who is involved in the conflict. Sometimes, people are surprised to learn they are a party to the conflict, while other times we are shocked to learn we are not included in the disagreement. On many occasions, people who are seen as part of the social system e.g. work team, company etc. are influenced to participate in the dispute, whether they would personally define the situation in that way or not. In the above example, people very readily "take sides" based upon current perception of the issues, past issues, relationship and other factors. The parties involved can become an elusive concept to define.

23.5 PERCEIVED THREAT

People respond to the perceived threat, rather than the true threat facing them. Thus, while perception doesn't become reality, parse, people's behaviors, feelings and ongoing responses becomes modified by that evolving sense of the threat they confront. If we can work to understand the true threat (issues) and develop strategies (solutions) that manage it (agreement) we are acting constructively to manage the conflict.

23.6 MANAGING CONFLICT AMONG REAL ESTATE CONSTRUCTION STAKEHOLDERS

Conflict is an indispensable source of organizational success, strength and profitability when properly managed. The techniques identified for conflict management according to Nzotta (2010) in work settings have varying degrees of effectiveness and are discussed below.

- **Unilateral Truce**; This is a situation where one of the parties to the conflict makes peace moves, which of course would be acceptable to the other party. The success of this method depends on an accurate perception of the other party's possible reaction to the peace moves.
- **Placating the parties.** Depending on the type of conflict, placating one or both of the parties may involve granting some concessions to the other party. It may also involve removing or eliminating the source of irritation that generated the crisis. Conflicts over ideology or conflicts arising from faulty interpersonal relations cannot be contained by the concession method.
- **Third party intervention.** When parties to a conflict find it difficult to resolve their conflicts or reach an agreement especially during the process of collective bargaining (as a result of obvious factors known or unknown to them) it may be necessary then to have a third party intervention. Third party intervention may be in the form of mediation, conciliation or arbitration.

- **Avoidance.** The parties to a conflict may use the avoidance device in resolving conflicts. One form of avoidance is the use of delay tactic. This calls for more time to study the problem, calling for more facts or merely shifting decision responsibility to other people. However, the avoidance option may only postpone the evil day, since the conflict may resurface at a later time if not properly handled.
- **Joint Consultation/Negotiation** The joint consultation mechanism is one of the important tools used in conflict management. It entails holding meetings between practitioners and stakeholders at which various issues are discussed and agreements reached. This improves communication between the parties and ensures the harmonization of various positions.
- **Persuasion.** This is based on the spirit of "give and take". A compromise is difficult to be undertaken by either party when fundamental issues are involved. However, compromise does not offer a permanent solution as the parties may often not be satisfied with the compromise made by the other party in collective bargaining.
- **Smoothening Over or Passage of Time.** Passage of time leads to diffusion of explosive situations, Effort is then made to resolve the conflict through the passage of time.
- **Use of Force.** Sometimes force could be used in resolving conflicts. In situations where there is disagreement between two parties who have unequal power, the more powerful party could use its power to intimidate the other party and thus resolve the conflict. A good example is the Conflict between an organization and an individual in the same organization or small group in the organization.
- **The Use of Authority, Laws, Rules and Formal Procedures.** Real estate professional practice have rules and regulation, code of professional conduct that guide us in managing stakeholders conflict. The success of this method depends on how the parties view the rule or law in place in the organization and the authority possessed by the management.

- **Improved Communication Theory of Conflict Management.** This theory assumes that improved communication or the fact of an improved provision of information flow, is capable of influencing the conduct of the parties in a dispute. Here, the organization's management, for example may attempt to define the issues at stake through newsletters, bulletins, lectures etc.
- **Participative Management.** The installation of participative management in an organization tends to reduce conflicts. Here, the idea is to bring the contending parties on board in the decision making process.
- **Enthronement of Responsible Leadership.** Responsible leadership evokes confidence. Various research evidence point to the fact that a major plank to the resolution of conflicts lie in the quality of leadership.
- **Confrontation.** Confrontation represents an open recognition of a conflict and an evaluation of the causes, as well as the implication of the conflict. The use of confrontation could lead to problem solving. Here, the parties express their various perceptions and offer alternative courses of action. At the end of the day, a much better solution acceptable to all the parties emerges. The parties are also more keen to implementing the terms of agreements. Confrontation is however constrained by time limitations, group norms, (which prevent individuals from expressing their feelings) and role concepts. Confrontation may become destructive in a situation where the parties may harden their positions and further deepen the conflict.

23.7 WORKPLACE CONFLICT RESOLUTION STRATEGIES

Conflict can be constructive and healthy for an organization. It can aid in developing individuals and improving the organization by building on the individual assets of its members. Conflict can bring about underlying issues. It can force people to confront possible defects in a solution and choose a better one. The understanding of real interests, goals and needs is enhanced and ongoing communication around those issues, induced. In addition, it can prevent premature and inappropriate resolution of conflict. Constructive conflict occurs when people change and grow personally from the conflict. involvement of the individuals affected by the conflict is increased,

cohesiveness is formed among team members, and a solution to the problem is found. However, if conflict is not managed properly, it can be detrimental to an organization by threatening organizational unity, business partnerships, team relationships, and interpersonal connections.

Deconstructive conflict occurs when a decision has not been found and the problem remains. Energy is taken away from more important activities or issues, morale of teams or individuals is destroyed, and groups of people or teams are polarized.

Destructive conflict has a predictable pattern known as the Drama Triangle. By learning how to identify these unproductive roles and how to effectively handle each role player, managers can prevent some conflicts from occurring and resolve the existing ones. Most individuals know how to assume the following three roles:

1. Persecutor refers to a person who uses aggressive behavior against another person, attacking the intended victim. An attack can be direct or indirect and be physical, verbal, or both. The persecutor's actions deliver a message that "you are not okay" while making the persecutor feel righteous and superior.
2. Victim refers to a person who uses nonassertive behavior, so others view them as "I'm not okay." This behavior encourages others to either rescue or persecute the victim. Victims will feel helpless, inadequate, sad, scared, or guilty. The victim role is often used because the individual is feeling stressed, has low self-esteem, or is being persecuted by another.
3. Rescuer refers to a person who uses either nonassertive or aggressive behavior. Individuals become rescuers because they will not say "no" and unwillingly assume the responsibility of solving the victim's problem. In contrast, others will assume the rescuer role to demonstrate superiority over the victim.

These roles are learned in early childhood and are used throughout adulthood. They involve the perception of oneself or someone else as inadequate or not acceptable. The aggressive and nonassertive behaviors that are present in these

roles lead to win-lose outcomes and do not provide an opportunity for a win-win resolution.

23.8 THE INTEREST-BASED RELATIONAL APPROACH

Interest-Based Relational (IBR) Approach is a type of conflict resolution which respects individual differences while helping people avoids becoming too entrenched in a fixed position.

In resolving conflict using this approach, you follow these rules:

• Make sure that good relationships are the first priority: As far as possible, make sure that you treat the other calmly and that you try to build mutual respect. Do your best to be courteous to one-another and remain constructive under pressure.

- Keep people and problems separate: Recognize that in many cases the other person is not just "being difficult" real and valid differences can lie behind conflicting positions. By separating the problem from the person, real issues can be debated without damaging working relationships.
- Pay attention to the interests that are being presented: By listening carefully you'll most-likely understand why the person is adopting his or her position.
- Listen first; talk second: To solve a problem effectively you have to understand where the other person is coming from before defending your own position.
- Set out the "Facts": Agree and establish the objective, observable elements that will have an impact on the decision.
- Explore options together: Be open to the idea that a third position may exist, and that you can get to this idea jointly.

By following these rules, you can often keep contentious discussions positive and constructive. This helps to prevent the antagonism and dislike which so-often causes conflict to spin out of control.

23.8.1 Conflict Resolution Process

Based on these approaches, a starting point for dealing with conflict is to identify the overriding conflict style employed by yourself, your team or your organization. It is good to recognize when this style can be used effectively. However make sure that people understand that different styles may suit different situations.

Look at the circumstances, and think about the style that may be appropriate. Then use the process below to resolve the conflict:

23.8.2 Step One: Set the Scene

If appropriate to the situation, agree the rules of the IBR Approach (or at least consider using the approach yourself.) Make sure that people understand that the conflict may be a mutual problem, which may be best resolved through discussion and negotiation rather than through raw aggression.

If you are involved in the conflict, emphasize the fact that you are presenting your perception of the problem. Use active listening skills to ensure you hear and understand other positions and perceptions. Restate, paraphrase, summarize and make sure that when you talk, you are using an adult, assertive approach rather than a submissive or aggressive style.

23.8.3 Step Two: Gather Information

Here you are trying to get to the underlying interests, needs, and concerns. Ask for the other person's viewpoint and confirm that you respect his or her opinion as you need his or her cooperation to solve the problem.

Try to understand his or her motivations and goals, and see how your actions may be affecting these.

Also, try to understand the conflict in objective terms: Is it affecting work performance? Damaging the delivery to the client? Disrupting team work? Hampering decision-making? and so on. Try to focus on work issues and leave personalities out of the discussion.

- Listen with empathy and see the conflict from the other person's point of view.
- Identify issues clearly and concisely.
- Remain flexible.
- Clarify feelings.

23.8.4 Step Three: Agree the Problem

This sounds like an obvious step, but often different underlying needs, interests and goals can cause people to perceive problems very differently. You need to agree the problems that you are trying to solve before you will find a mutually acceptable solution.

Sometimes different people will see different but interlocking problems - if you can't reach a common perception of the problem, then at the very least, you need to understand what the other person sees as the problem.

23.8.5 Step Four: Brainstorm Possible Solutions

If everyone is going to feel satisfied with the resolution, it will be good for parties to have fair input in generating solutions. Brainstorm possible solutions, and be open to all ideas, including ones you never considered before.

23.8.6 Step Five: Negotiate a Solution

When conflicting parties negotiate for solution, both sides may better understand the intention of the other, and a mutually satisfactory solution may be clear to all. Also, negotiation will help in uncovering real differences between your positions. This is where a technique like win-win negotiation can be useful to find a solution that, at least to some extent, satisfies everyone. The good news is that by resolving conflict successfully, you can solve many of the problems that it has brought to the surface, as well as getting benefits that you might not at first expect which include:

- **Increased understanding:** The discussion needed to resolve conflict expands people's awareness of the situation, giving them an insight into

how they can achieve their own goals without undermining those of other people.

- **Increased group cohesion**: When conflict is resolved effectively, team members can develop stronger mutual respect and a renewed faith in their ability to work together.
- **Improved self-knowledge:** Conflict pushes individuals to examine their goals in close detail, helping them understand the things that are most important to them, sharpening their focus, and enhancing their effectiveness.

However, if conflict is not handled effectively, the result can be damaging. Conflicting goals can quickly turn into personal dislike, teamwork break down and talent is wasted as people disengage from their work.

CHAPTER TWENTY FOUR

ENVIRONMENTAL IMPACT ASSESSMENT OF PROJECTS

A project can be said to be a success or a failure depending on the project output conformance to the project design plan. A successful project is one which is completed within the time frame and resources (budget) allocated to it, meet the original quality and performance standard specified for it as well as satisfy the need of the intended users or clients, otherwise the project is considered a failure (Cleland et al, 1998). These observations buttress the importance of efficient time management and effective budget implementation for the successful delivery of any project.

There has been remarkable growth of interest in the integration of environmental impact assessment in the appraisal and management of developmental projects, where there seems to be proper harmony of projects with the environment. EIA was developed as a result of the failure of the traditional project appraisal and management technique to account for environmental impacts. Many development projects in the past were designed and implemented (constructed) in isolation from any consideration of their impact to the environment, resulting in higher cost, failure of the projects, significant environmental change and negative social impacts, with litigation littered in various courts. Project implementation or execution as a phase in the project life cycle is strongly influenced by EIA, which is evident in the design and implementation of mitigation measure and environmental strategy, where the monitoring of environmental impacts can be built into the overall project monitoring process. According to Nwachukwu (2009), project constraints as a system are inter-related and have significant effect individually on both public and private sectors of the economy.

A project may be defined as a series of jobs that have to be completed in order for the system (project) to be satisfactorily consummated. The execution of projects by practice is anchored on putting to work the best laid down plan which consist of those processes performed to complete the work defined in the project management plan and to satisfy the project specifications (PMI, 2008). This makes it an indispensable phase for project delivery. While project planning can take a considerable amount of time, depending upon the project deliverables, project implementations can take as long as or longer than the planning phase, which is the time the project stakeholders spend the bulk of money and other resources.

As a result of this facts established above, EIA is perceived by various stakeholders and agencies of development project as a decision making tool for efficient project execution and delivery especially in its role in establishing and strengthening the communication mechanism within a project. This is because during the execution phase of a project, the project manager spends a considerable amount of time in communication, making sure that the resources, people, equipment and material are available to do their work, know what work needs to be completed; and also ways to keep the project stakeholders informed of the project progress. Environmental impact assessment (EIA) has been identified as a valuable tool for bringing harmony between successful implementation of qualified development projects and the environment (physical, social and economic). EIA assist to identify, predict and evaluate the foreseeable environmental consequences of proposed developmental projects, plan and policies. It seeks to ensure that the project plan is both environmentally and economically sound and thus represents the best approach to planning for development projects in a sustainable manner.

However, it has become clear that development activity without regard to environmental consequences is unsustainable. Sustainable development has been defined as a form of development that meets the needs of the present without compromising the ability of future generations to meet there own

needs. Consequent upon this, different countries of the world evidently now make conscious effort to protect their environments by demanding and enforcing sustainability practices at the heart of their developmental activities.

In spite of EIA's intended role in improving the project planning and implementation process, it has been severely criticized in some parts of the developing world as being inappropriate for application. Some of this criticism includes:

(1). EIA is too complex
(2). EIA is too expensive
(3). EIA delays projects
(4). EIA will be misused to stop development

These criticisms are misconceptions about EIA, as implementation of mitigation measures (which is a process in EIA) often result in reduced cost and time of project implementation, increased project acceptance, improved project performance, avoided impacts, violations of laws and regulations, and fewer conflicts over natural resources use; which if not adhered to, may lead to sanctions, project delay, and overall project failure. EIA is much more than a regulating procedure; however good EIA's have their findings integrated into the iterative process planning and implementation, making it an important part of development instruction and operations in the environment.

24.1 THE CONCEPT OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Gradually, the environment is constantly changing, both naturally and due to man's utilization of the resources of the environment. The main focus of EIA is on man-induced changes which result from man's interference with the environment. There is no universally accepted definition of the concept of environmental impact assessment, as there are many views on it. According to Munn (1979), EIA is an activity designed to identify and predict the impact of the bio-geophysical environment on man's health or well being.

In 1987, United Nations Environment Program (UNEP) draft guidelines for assessing industrial environmental impacts and criteria for industry setting defines EIA as an aim to identify, predict and describe in an appropriate term the pros and cons (penalties and benefits) of a proposed development. The environmental impact assessment (EIA) according to them compares alternatives which could be used to realize a project and identifies one with the best combination of economic and environmental costs and benefits. The first form of assessment was first introduced in the USA which was known as the National Environmental Policy Act(NEPA), of 1969; with the mandate of publishing an environmental impact assessment statement (EIS) describing in detail the environmental impacts likely to arise from project developments. Since then, majority of countries have adopted similar procedures with Nigeria's first ever promulgation on EIA known as EIA Act 86 of 1992.

Glasson *et al.*, (2005) defines EIA as a technique and a process by which information about the environmental effects of a project is collected, both by the developer and from other sources, and taken into account by the planning authority in forming their judgment on whether the development should go ahead. According to the draft guideline prepared by the United Nation Environmental Program(UNEP) for assessing industrial environmental impacts, EIA predicts and describes in appropriate terms the pros and cons of proposed projects. Larry (1997), in his own view, sees EIA as an attempt to evaluate the consequences of a proposed action on each of the descriptors of the environmental inventory. These definitions echo the relationship between the environment and project. EIA identifies ways of improving projects environmentally, while minimizing, mitigating or compensation for their adverse impacts (World Bank, 2005).

24.2 SOME OF THE OBJECTIVES OF EIA STUDY

EIA is important for incorporating environmental concerns at the project planning level. It is conventionally carried out as early as the project planning stage (pre-feasibility and viability) thus ensuring that the project will be environmentally feasible.

The general objectives of the EIA study according to federal ministry of environment (FMENV) EIA Act of 1992 are to provide;

(1) Baseline information concerning the environmental, biophysical, socio-economic and health conditions in the project area.
(2) Information and evaluation on the potential significant positives and significant negatives of the impacts of projects and the characteristics of the impact, magnitude, distribution, which will be the effected group and their duration.
(3) Information on the potential mitigation measures, proffer cost-effective mitigation measures for the negative impacts, and where possible, enhance the positive impacts that will further assure the environmental and social sustainability of the project.
(4) To assess the best alternative project of most benefit and least cost financially, socially and environmentally in addition to consideration for alternative location of the project, project design and project management.
(5) Appropriate and cost-effective Environmental Management Plan(EMP)
(6) Incorporate the recommendation of EIA process into the detailed project decisions.

From the above reasons, the need for project appraisers, and environmental managers to appreciate the need for EIA becomes obvious, as EIA enhances the efficiency of decision making, throws light on areas most susceptible adversely and therefore gives guide in site selection, if appreciated in the early stages of project planning and design.

24.3 THE EIA PROCESS

Fundamentally, EIA is a process, a systematic process that examines the environmental consequences of developmental activities before they are carried out. The emphasis compared with many other mechanisms for environmental protection, works on the premise "prevention is better than cure" (Glasson et al, 1999).

24.4 PROJECT SCREENING PROCESS

The aim of screening is to determine if a project requires an EIA . The EIA act sets out three possible outcomes that may arise from the screening exercise, which determine what further action is to be taken.

a. The project is not likely to cause significant adverse environmental effects or such effects can be mitigated
b. The project is likely to cause significant adverse environmental effects or such effects cannot be mitigated, or public concerns respecting the environmental effects of the project warrant it ; and
c. The anticipated adverse environmental effects are considered to be significant and cannot be mitigated.

With decision (a), the project is permitted. Federal Ministry of Environment has the responsibility to ensure that measures required to prevent, reduce or mitigate the identified adverse environmental impacts are implemented.

Decision (b) requires a mediation or review process including all stakeholders as applicable in mandatory study procedure while decision (c), The project is rejected.

24.5 SCOPING AND TERMS OF REFERENCE (TOR)

On receiving the screening report from Federal Ministry of Environment, the proponents must carry out a scoping exercise to cover all likely significant impacts and present the result known as the Terms of Reference (TOR) to the FMEnv. Additional report may be required if deemed necessary by the FMEnv to enable it come to a decision. It is good practice to make available all pertinent information to the public at this stage to address any concerns they may raise.

24.6 MANDATORY STUDY REPORT

As summarized by Nchefu and Akpofure (2003)' the minimum requirement of an EIA report includes not only the description of the activity, potential

effected environment, practical alternatives, and assessment of likely potential environmental impact, but also identification and description of the mitigation measures, indication of gaps in knowledge, notification of trans-state adverse environmental effects (if any) and a brief non technical summary of all the above information`.

When the project proponent submits its report to FMEnv, it is also made available for public comments. After consideration of the report and public comments, any of the following decisions may be made by FMEnv.

a. Refer the project to a mediation or review panel if the project is considered likely to cause significant adverse environmental impact that cannot be mitigated or the public shows concern about the environmental effects of the project.
b. Give approval for the project to be undertaken if it is not likely to cause significant adverse environmental effects or such effects can be mitigated. Here FMEnv ensures that the mitigated measures are implemented.

24.7 MEDIATION AND REVIEW PANEL

Where conditions are not met, the project is referred to a review panel. The mediator working on FMEnv council's terms of reference helps the participants;

a. To reach a consensus on the likely environmental effects from the project and any mitigation measures for significant adverse environmental effects.
b. Prepare a report showing the conclusions and recommendations.
c. Submits the report to FMEnv.

However, the FMEnv may terminate the mediation process through its council if it considers that the result will not satisfy both parties. To this effect, the project is referred to the review panel. In this situation, it may be the president or governor of any interested state that may initiate the review process. The review panel working on FMEnv councils term of reference prepares a report setting out its conclusions and recommendations on the environmental effects

of the project, mitigation measures and follow up programs. After the above procedure must have been observed the agency replies as stated above accordingly.

24.8 EIA IN NIGERIA

The EIA process in Nigeria is not a one-off process which terminates in the production of a report on the effect of the project and associated mitigation measures. It also deals with monitoring the non- structural and operational phases, and acting on the result of such monitoring till final project termination. The post-closure care is also an integral part of the EIA process. In summary, the EIA procedure in Nigeria according to the Federal Ministry of Environment, Housing and Urban Development (FMEH&UD) involves the following steps:

(1) The submission of project proposals to the Federal Ministry of Environment for screening to determine the need or otherwise for EIA.
(2) The vetting of Terms of Reference (TOR) for the EIA studies to ensure that only significant issues (impacts) are studied in the EIA. A site verification exercise may be required to aid the process.
(3) Submission of draft EIA report for review.
(4) Review of draft EIA report.
(5) Submission of final EIA report, which addresses all the issues arising from review exercise.
(6) Decision making by the Federal Ministry of Environment technical committee and the honorable minister.
(7) Certification (issuance of Environmental Impact Statement(EIS) and certification)
(8) Mitigation and compliances monitoring to ensure compliance with all stipulated mitigation measures and project specifications in the project EIA report.

The EIA process cuts across the various stages a project undergoes from proposal to approval for implementation, resulting in the issuance of an

Environmental Impact Statement(EIS) and certification (Echefu and Akpofure, 2007). Flowchart over leaf is the flowchart of the Federal Ministry of Environment, Housing, Urban, and development EIA procedure, formally known as the Federal Environmental Protection Agency(FEPA).

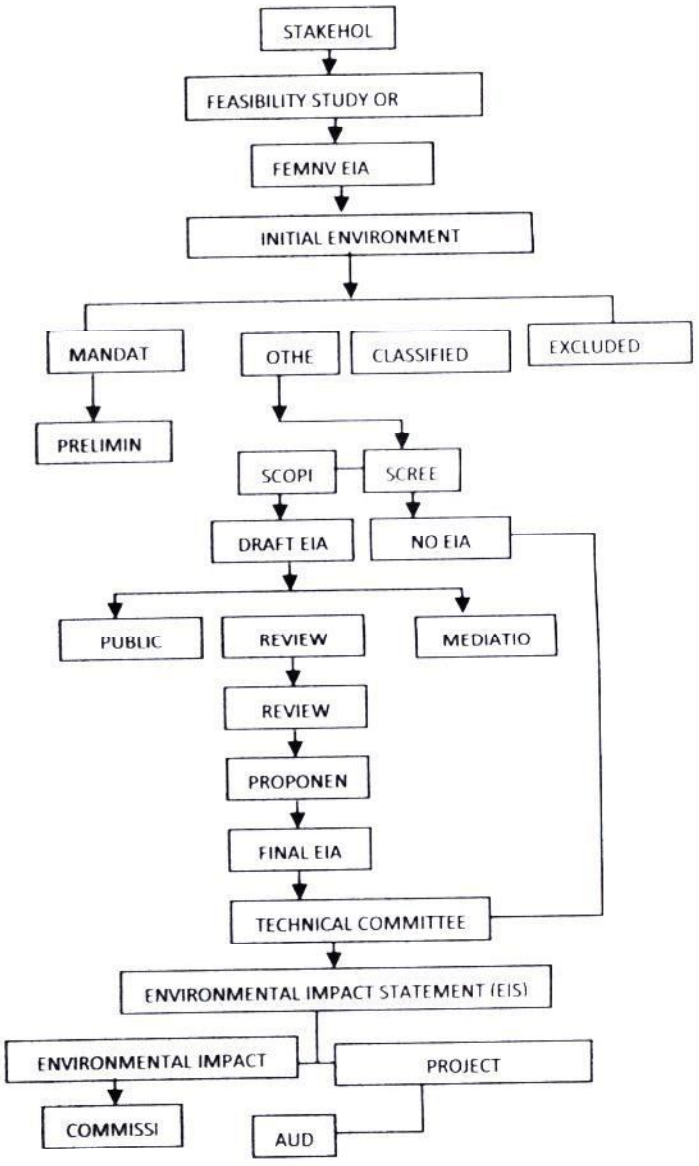

FIGURE 2.4. 1 Flowchart of FEPA
Source: (Echefu and Akpofure, 2008)

24.9 EIA PERFORMANCE IN NIGERIA

There has been however some criticism on EIA practices in Nigeria, which are capable of undermining the successful implementation of projects in Nigeria. For instance, the issue of duplicity of function in some cases specifically for the oil industry were the department of petroleum resources (DPR) and the states' Environmental Agencies have enabling powers that allows them conduct EIA has been raised; this could increase the cost and time required to conduct an EIA. However, as pointed out by Echefu and Akpofure(2003),the FEPA(FMEnv) remains the apex regulator with regards to EIA and other agencies necessarily monitor on its behalf. Current efforts on follow-ups and monitoring of approved projects is also not encouraging with only 30% monitoring level reported (Dayo *et al.*,2002). Monitoring is very critical to achieving the aims of the EIA and needs to be strengthened to ensure that recommendations and mitigation measures are strictly applied as stated in the EIS. More worrisome is the existence of several unwholesome practices, ranging from forged EIS and a wanton disregard to the implications of EIA as required by the EIA Act. Many developers often engage the services of non EIA specialists, who often either out rightly falsify EIA reports or conduct incompetent EIA, disregarding proper investigation of environmental components (soil, water, air) and the attendant adverse environmental, social and economic consequences.

24.10 LEGAL FRAMEWORK FOR EIA

Projects until recently were often formulated, designed and assessed based on technical, economic and political criteria while the potential environmental, health and social impacts of projects were rarely considered in a rigorous manner. Even when considered, such assessment usually took the form of cost benefit analyses (CBA), which only attempts to place a monetary value upon non-economic variables such as the destruction of the marine ecosystems, the social and health impacts of air pollution. However, in recent years there has been a remarkable growth in awareness of environmental and sustainability

issues as well as the better management of development in harmony with the environment. Associated with this growth of interest has been the introduction of new legislation which seeks to improve the environmental aspect of developmental projects. Most countries including Nigeria now demand that environmental concerns must necessarily form part of economic development where the latter is considered to have likely significant impacts on the environment. In 1988, the then Military Government of General Babangida promulgated Decrees 58 and 59 (amended) of 1988 which established the Federal Environmental Protection Agency (FEPA). The statutory (legal and administrative) frameworks within which EIA study are executed for any developmental project is based on three levels, namely; State, National and international standards. On the National platform, The Federal Ministry of Environment (FMENV) is the authority regulating the environment. These are provided by the following regulations, guidelines and standards:

24.11 ENVIRONMENTAL IMPACT ASSESSMENT Act (EIA Act No. 86) Of 1992

The provisions of this Act according to FEPA (later FMENV) restrict public or private development of projects without prior consideration of the environmental impacts of such development. Specifically, the public and private sectors of the economy, (except where they are exempted pursuant to the Act) are not permitted to undertake or embark on, or authorized projects without prior consideration at an early stage of their environmental effects (section 2(1)). An EIA must be undertaken where the extent, nature or location of a proposed project or activity is such that it is likely to significantly affect the environment.

The stakeholders of such project or activity are required prior to commencement of the project to apply in writing to the Federal Ministry of Environment (now Federal Ministry of Environment, Housing and Urban Development). Within this Act are other guidelines which include among others.

(i) Federal Environmental Protection Authority act 58 of 1985. Federal Environmental Protection Agency (FEPA)
(ii) National Environmental Protection Regulation of 1991
(iii) Endangered Species (control of international and traffic) Act 1985.
(iv) Land use Act of 1978.
(v) National Inland waterways Authority Act 13 of 1997.
(vi) Nigerian Urban and Regional Planning Decree (Act) No 88 of 1992

Section 33 of the Nigerian Urban and Regional Planning Decree (Act) makes it mandatory for a developer /designer to submit a detailed environmental impact statement for application for;

a. A residential land in excess of 2 hectares or
b. Permission to build or expand factory, or for the construction of an office building in excess of four floors or 5,000 square meters of a gettable space, or
c. Permission for a major recreation development.

24.12 STATE REGULATORY BODIES

- State Ministry of Environment
- State Ministry of Land Survey and Urban planning
- State Environmental protection Agency
- State Environmental and Sanitation Authorities
- State/Local Government Development Authorities
- States department of Petroleum Resources
- State Ministries of Petroleum (if any)
- And any other State relevant agencies/authorities needed, according to the type and category of project required.

24.13. Relevant International Conventions and Guidelines

- Convention on International Trade in Endangered species of fauna flora (CITIES) 1973
- Convention on Biological Diversity (Rio summit) 1992

- United National conference on the Environment (UNCHE) (Stockholm) 1972 and many more.

Federal Republic of Nigeria, states in part A, section 20 that "The state shall protect the Environment and safeguard the water, air and land, forest and wildlife in Nigeria. The National policy on Environment (1989) is a document that contains guidelines and strategies for achieving the policy goal of sustainable development in Nigeria by:

1. Securing for all Nigerians a quality of environment adequate for their health and well being
2. Conserving and using the natural resources for the benefit of present and future generations.
3. Restoring, maintaining and enhancing the ecosystems and ecological processes essential for the preservation of biological diversity;
4. Raising public awareness and promoting understanding of the essential linkages between the environment, resources and development;
5. Collaboration with other countries, international organizations and agencies to achieve optimal use of trans-boundary co-operation in other to protect environmental resources.

The practice of EIA in Nigeria was given effect by the EIA act, which was created by Act no 82 of 1992 and makes EIA mandatory for all new major public and private projects in Nigeria. The Act sets out to:

1. Consider the likely impact and the extent of these impacts on the environment before the commencement of the project or activity.
2. Promote the implementation of appropriate policy in all federal lands consistent with all laws and decision-making processes through which the goal of the Act may be realized;
3. Encourage the development of procedures for information exchange, notification and consultation between organizations and persons when the proposed activities are likely to have significant environmental effects on

boundary or trans-state or on the environment of bordering towns and villages.

24.14 LEVELS OF EIA

EIA can be undertaken at the following levels.

i. Specific project Environment Assessment

Specific project or program environmental assessment is made for any particular project or program in which a detailed as required or substantial adverse impact on the environment are anticipated. For such projects, the examination of alternative sites and suitable technologies and designs aimed at avoiding or mitigating adverse effects should form an important part of the EIA process.

ii. Sectorial Environmental Assessments

Sectorial assessments are carried out to asertain the possible impact of major changes in sectorial policy or sectorial investment programs like for example the industrial and agricultural sectors. Such investigation and decision makers develop environmentally sound approaches to project selection, design and implementation.

iii. Regional Environmental Assessment

In the area of construction industrial activities, regional environmental assessment is needed. Wallies (1998) stated that regional EIA provides important insight into situations where strong interaction and competition (for resources) is likely to occur.

iv. Strategic Environment Assessment (SEA)

This covers assessment of policies, plans and programs (PPP). It is particularly aimed at decision makers, who are encouraged to include environmental considerations as an integral part of the development of new policy and plan proposals (Fuller, 2011). In other words, EIA is first carried out for policies, then for plans, programs and finally projects (Glasson et al., 1999).

24. 15 DURATION OF EIA

Pallen (1997) stated that EIA done at the start of the project should not take longer to complete than the project design phase. However, this does not include the time required to implement and monitor the mitigation measures proposed by the EIA team. Therefore the EIA duration depends on:

i. The size and complexity of the proposed project.
ii. The extent of co-operation received from the project sponsor and the third parties such as local governments.
iii. The level of interest and support demonstrated by the community.
iv. The ability of the project team to sustain interest in the EIA
v. The skill level of the EIA team
vi. The EIA techniques employed by the team.