CHAPTER -10
CONCLUSION

10.1 INTRODUCTION

Every study or research work ends with a conclusion, the same has happened with the present research work also. On the basis of professional experience and knowledge gained through the reading of various books, journals, reports and case studies, scholar concludes that all the under mentioned nine stages of construction activity should be optimized to its maximum level

(1) Project Definition
(2) Preliminary Planning
(3) Hiring of Human Resource
(4) Project Design and Development
(5) Procurement of Material
(6) Project Construction or Implementation
(7) Project Completion
(8) Project Commissioning
(9) Winding Up or Divestment

Now conclusion and recommendations are being summarized in following text, for the different stages of construction.

10.2 PROFILE OF CONSTRUCTION INDUSTRY

Construction industry is one of the oldest industries providing ample employment to the people from village level to metropolitan cities. The size of construction industry ranges from small company owned by one or two individual to a large industry employing thousand of people.

On analyzing overall economy of a developing country it can be fairly said that construction industry is the infrastructure industry or capital formation industry. An effort to optimize and/or indirectly leads to saving of capital goods and all types of resources.

Consumer of this very industry ranges from individual to countries. Thus ample opportunity of international contracts also exist. A construction company can be started with little investment also.

Owner, consultant and contractor form the total construction industry; a successful construction needs action by all the three in unison.

Government has direct interference in construction activity right from acquisition of land to commissioning of the project. Therefore, government
regulations should not be violated for the smooth functioning of constructing activity.

Like any other industry, construction industry also faces temporal variation in demand and supply. Such conditions invoke the mind to learn managerial practices, specific to construction. Today, systematized management is necessary for the survival of construction industry. If one fails in any business it means he could not understand the total commerce of that business. The same is true for construction industry also.

In business, failure is the part of the game. One should not be discouraged by failures. What important is: one should learn lessons from such failures. Success is never final and failure is never fatal. It is the courage that counts. It is not failure but low aim is a crime.

10.3 INHERENT NATURE OF CONSTRUCTION PROJECT

In common parlance project means, any programme involving multiphaseous activity. The idea of any project should be technically feasible, economically viable, politically suitable and socially acceptable.

Project has been defined in so many ways by different agencies like UNIDO. They all agree in principle that every project has definite mission, definite starting and ending dates, involving, participation of different agencies of varied skills and talent.

Every project uses human and material resources along with scarce resource of capital. Therefore, importance of project need not to be over emphasized. Today there is no dearth of project management software but scholar himself and Hegazy (1999) of the view that every day improvement in their versions provides better interfaces for integrated planning and control along with internet capabilities but basic project management function such as resource allocation, resource leveling and time cost trade off analysis have hardly been improved. Still few practitioners are of the view that software system provide only a powerful presentation capabilities and saving in real terms can be achieved only by putting a hammer to a nail.

Project may vary in size. It can be a village level activity and it may be an activity at international level. Every stage of project right from conceptual stage to divestment or winding up phase is important.
Knowledge of project management is equally applicable to construction projects also. Every construction project is unique experience in itself. Utility of any construction Project cannot be assessed in cost benefit ratio terms alone. It needs SCBA basis. However, in India, Planning Commission has framed its own procedure for planning, evaluation, implementation and appraisal of the project.

10.4 THE COST OPTIMIZATION

When we are trying to optimize cost, the very first step in this direction will be thorough understanding of phenomenon of cost. There is general agreement on AAA definition of cost that cost is a foregoing measured in monetary term incurred or potentially to be incurred to achieve a specific objective. The term cost is generic in nature. It is always used with a qualifier to designate various types of cost.

In construction we broadly deal with cost involving direct labour, direct material, overhead and indirect cost. For accounting purposes we use concepts of job costing, contract costing as completion of a construction project may involve more than one financial year. The unique feature of construction industry is “Cost Plus” basis of contract that is hardly used in any other industry.

Today one cannot ignore, advances in manufacturing process, information technology, and consumer attitude and total quality management.

The direct economic part of construction activity begins with preparation of estimate. It is well said that estimate is an opinion, price is a policy and cost is a fact. So in preparing estimate one should be very clear about the required accuracy.

Cost optimization had been always a human yen. Cost optimization techniques have diversified use, right from household management to a management of a big project. Theory of optimization looks behind the curtain where human eye is unable to see.

In broader sense optimization is basically determination of extreme values over some range. In any optimization process physical interpretation is a must without which result is not of much use. The theoretical field of optimization is vast. So it is really difficult to have all the techniques on finger tip but technique, which is applicable to specific problem, should always be learnt.
10.5 NEED TO BUILD COMPETENCE

The second half of 20th century has witnessed rapid growth in size and complexity of industrial organizations. Industrial and business activities have achieved unprecedented growth. Advances in information technology and use of computer in all walks of life have changed the approach of managing things. Large organization cannot be managed without knowledge. On applying managerial knowledge, one should not forget that epistemology of management is approximate. Books do not give ready-made solution to managerial problems. Theories and books only give clues and indication for the right path and its application depends on skill, art and wisdom of manager. Acquisition of knowledge should be a permanent feature for the managers of today. Large organization cannot be managed without thorough knowledge. So there is dire need to build managerial competence.

10.6 THE OPTIMAL PROJECT DESIGN

When the techno-economic feasibility report has been prepared the next stage is hiring of key human resource like appointment of architect and consultants. Although consultation fee of consultant adds to the sunk cost of the project yet it has to be reconciled as they are the people who will give the shape to the “Blue Print”. However, most suitable type of architect /consultant is decided by an experienced person only who has understood the problem clearly in totality.

Location, functional plan, technology all has bearing on the productivity of the project in long run.

Specifications need thorough analysis as over specification is a continuous hidden drain and under specification has disastrous effect. The specification should be most balanced, rational and appropriate. Specification is an important piece of information as it is used in preparing estimates, as a tender document, for ordering the material and lastly in organizing and execution of work.

In optimal designing of the structure the functional plan and purpose of structure should be known beforehand. The object of optimized design is to provide required strength at minimum possible cost without compromising on quality, beauty and functional utility.

In achieving the aforesaid objective, full advantage of locally available material should be taken. In designing the foundation system, full advantage of
sub-soil characteristics should be taken and most suitable foundation type should be adopted. Optimal design of structure is a separate area of structural design.

Wherever possible pre cast members should be used to avoid variation in quality of in-situ concrete.

Time motion studies should always be done at site. Material should be unloaded as close to the place of consumption as possible. Maximum use of learning curve should be made.

It is obligatory upon designer to repeat the sections to save extra shuttering cost.

Implementation stage of project is the most critical phase in the lifecycle of project. This is a stage in which a company suffers loss or earns profit. In this stage every day monitoring is needed and corrections are made to deviations.

In any construction work details of specification and quantity of work should be thoroughly studied. On the basis of these two factors, cost break down of CPM network should be prepared. This cost break up should be within the framework of the contract and should also be realistic because it is to be used for progress payments also and it decides pattern of cash flow.

Cash requirements of the project can be predicted on a time basis with the use of CPM cost estimates by computer. The predictions can be used as a guide for the investment of construction fund, as well as a guide to contractor’s finances.

If cost expediting is done vigilantly then there are cases when a project can be completed at earlier date with lower cost. Certainly it needs an accurate cost estimates by using computerised CPM based cost system.

For ripening of fruits of cost expediting, cost collection and accounting system should be compatible and should be directly related to construction activities.

For most of the practical purposes of planning and scheduling of the project, CPM technique is sufficient. There are certain situations where CPM alone is inadequate and resources are to be analysed e.g. management of heavy construction equipment.

Take the case of earth fill dam or highway such jobs require heavy equipment. Careful scheduling of equipment across one or several projects gives an immediate pay off. Contractors owning equipment have been found usually in
a constant "rental quandary i.e. in what situation they should rent out their equipment and in what situation they should hire extra equipments.

In most of the cases number of heavy construction equipment is a limiting factor e.g. in one of the high way project of 220 working days, the increase of five more equipment reduced the project duration by forty days. This reduction in duration by around 20 percent was achieved just by increasing less than 10 percent increase in construction equipment. Now returns from this type of ‘equipment use’ analysis need not to be over emphasised.

Resources like money, men, material and machine can be very well allocated to various CPM activities. Thus CPM network not only represents sequence of activities but it can also be applied for other purposes like levelling of manpower resources. When resources are limited then duration of project may exceed beyond a certain limit.

The manual handling of network technique is limited to small network, big projects or large network can not be handled without computer but to have a feel of network analysis user has to do few networks by hand computation.

These techniques have been used for highway construction, naval shipyard, housing projects etc. Now it is needless to say that network analysis is a practical, proven and tested management tool.

In fixing the priorities, one should expedite early activities or those activities where the numbers of people are fewer.

The planner and construction engineer keeps his workforce levelled by juggling his float activities. In doing this, he must work out the critical and low float activities (i.e. semi-critical activities) first. Those activities with more floats are worked as fill in jobs. As the project progresses, these float value will change, which makes regular updating important in the scheduling of activities.

Site selection and purchase of land is an important stage in life of an individual or company or country as some time it involves savings of entire life or big capital outlay. Success of any project or industry is also affected by location of a site. A site or a land should be seen from all angles i.e. a generalised approach is needed in the site selection. Persons from different field having unity of purpose should be involved in examining the site because construction is an immobile asset whatever has happened that is forever.
Site selection is an important stage in planning. Sometimes, it is very critical decision as in case of bridges and dam. In such situation site selection plays a vital role in the success of project. Site selection for residential houses is also of paramount importance as it has direct influence over quality of life of an individual.

10.7 ECONOMICS OF BUILDING AND PURCHASE OF EQUIPMENT

In the recent years several factors like ecological and environmental awareness, social acceptance of locality, complex legal processes and multiple plan reviews by various regulatory agencies can reduce the efficiency of working team, leading delay in the start of the project. So a systemised approach is needed to handle the situation. The problem can be solved in three stages.

1. By reviewing the previous land development process.
2. By formulating an appropriate preliminary planning model.
3. By developing a decision support system.

The whole land development process can be summarized in Fig. 10.1

To facilitate the decision-making process a model is necessary, such a model is called Decision Support System (DSS), which is a computational or computerized environment for assisting human decision-making.

Economics of planning directly affects the cost of the building. Any decision at initial stage will affect continuing series of inter-related development throughout the design process or in brief it will have multiplier effect. Thorough investigation should be done for key decisions, as these decisions are irreversible in nature. However incidental decisions can be changed up to the time of construction without causing any basic change in building plan/design.
Fig 10.1 THE PROCESS OF SITE SELECTION

The square plan is the cheapest feasible plan. Depth of building should not exceed 15 m because of natural lighting requirement. Bigger building block should be preferred over small blocks. Irregular plan shapes should always be avoided. Storey height should not exceed beyond 3 m if air-conditioned building is being planned.

Circulation space in building should not exceed ten percent of the carpet area. Cost of the building varies with the addition of number of storeys.
Detailed cost analysis of foundation reveals that foundation cost drops rapidly up to three or four storey and then stabilises and again start rising as number of storeys increases or when it becomes essential to install piling or basement construction. Cost of frame directly increases with increase in number of storeys.

Staircase should be located at suitable place, which is equally accessible from all parts of the building.

The cheapest type of roof treatment is brick ballast with neat cement finish. It is a myth that presence of mud on terrace reduces inside temperature of the building.

For designing air conditioning system of the building base temperature should always be taken 2°C less than the outside temperature.

Today radical changes are being made in existing equipment by taking the advantage of improved hydraulics, electronics, chip-technology, computer and power trains. These advances make guidance and positioning of equipment very precise, which is beyond the capability of the man and control, can come from remote corner. It was the long cherished yen of man. Today the trend is towards rental rather than outright purchasing.

Fleet management will be easier if technology adjusts as per the requirement of productivity, efficiency and maintenance.

Improper handling of equipment halts the production and shortens machine life. Such practice should be discouraged day one, not weeks later, to avoid core damage. Fuel consumption is a pointer, which determines maintenance periodicity, thus optimising too frequent oil changes. Therefore construction equipment is identified by its production rate, durability of parts and life cycle cost.

Purchasing of construction equipment is a critical decision as it involves huge sum of money and depreciates quickly. So unless until it is established in advance that a unit of equipment will earn more than the cost, it should not be purchased. Specialised specific purpose equipment needs lead-time. It is not an off the shelf product. If construction equipment purchased wisely and operated efficiently it generates profit for its owners. For accounting purposes it is treated as non-current assets and its productivity is judged by life cycle casting.
Operating characteristics, engineering features, useful life, ease of maintenance and repair are few factors, which must be considered in selection of the brand of equipment.

It is always not necessary only new capital equipment should be purchased. If analysis of pay back or return on-investment reveals that a piece of used equipment is a better buy than a new machine in terms of finances, availability and economic use.

In scholar's opinion, if new equipment is to be purchased even then one should visit, used equipment market to know the future condition of equipment under consideration. Used equipment explicitly shows weaknesses and robustness of different parts. Used equipment can be purchased from dealers, brokers, owners and auctioneers. There is no set rule in selecting the option. Every option needs groundwork.

User has to do maximum groundwork in every purchase done in Indian market, as there is no dearth of cheat and pirates in the market. It is good practice to consult a man specialised in used equipment or consult an experienced foreman.

**10.8 COST OPTIMIZATION IN MATERIALS MANAGEMENT**

In a residential construction, material cost amounts to 60 to 70 percent of total construction cost. Thus, the importance of cost optimisation in materials management needs thorough investigation, firstly at technical level and secondly at managerial level.

Material is lifeblood of construction. Materials manager should procure material at right price at right time in right quantity at the right place. Every rupee saved in purchasing is a new rupee of profit. Therefore, the group involved in procurement, distribution and logistics of material has the responsibility to reduce the total material cost. Any cost control mechanism can work in totality only. Inefficient materials management is a direct loss, which cannot be discovered in cost accounting records of the firm.

In the parlance of everyday life quality means intrinsic excellence of material but in industrial use quality means suitability of material for specific purpose with lowest possible cost. Therefore, in industrial purchasing quality comes first, price comes next or in other words quality determines the price.
In the field of construction material, fixation of appropriate quality for specific structure is really a difficult task as most of the materials are natural material. Materials manager should always refer to relevant IS code.

In selecting a supplier, competitive pricing, reliable quality, timely delivery and good technical service should be the prime criteria. Company should always try to maintain a symbiotic relationship with supplier as it has real capital value, which is noticed during periods of short supply.

All the properties of construction material cannot be quantified such properties can be predicted by past experience and historical facts only.

Since purchasing operation is repetitive in nature. So record of purchasing activity should always be maintained to save time and confusion. For complex high dollar value purchases, a detailed analysis is needed. These include visits to plant, financial, managerial, and service capabilities.

Too often buyers feel that consummating a contract with a carefully selected supplier ends their major responsibility but in case of construction material in India supplier should always be looked upon with suspicion, as suppliers are not much interested in maintaining a very long-term relationship. The buyer should always search for new and better supplier and should always keep an alternate supplier in his pocket.

Whatever is the market condition, obtaining the material at right price, which suits, to both buyer and seller is essential, for the buyer company. The evaluation of right price must be made in consonance of total circumstances, surrounding a specific purchase at a specific point of time.

In construction industry materials manager operates in a sort of pure competitive market where forces of demand and supply alone govern the price. For bargaining it is necessary to know margin of profit on a particular product, a seller earns.

The skill of price estimation is a science as well as an art. What is needed, a little wisdom and knowledge of different material and processes and a knack of cost accounting.

If the purchaser is novice then buyer can request to seller to submit a cost break up along with quotation at the time of negotiation. The simplest way to obtain such break up is inclusion of clause “quotations without cost break up will
not be considered". This is necessary to arrive at a price, which is reasonable and acceptable to both parties. A poorly equipped buyer in the field of cost concept hardly exploits price negotiation to its fullest potential. However, to pay higher profit margin for truly distinctive product is a good buying while paying higher profit margins for competitive product is a poor buying such precedents reflect a lack of fundamental purchasing analysis. After considering purchasing activity in totality, a buyer should try to purchase at prices as close as possible to the bottom of the estimated price range. Moreover, buyer should always explore possibility of various discounts.

Quality of raw material and performance of external suppliers have direct impact on the quality of product produced by the company. Conversion of raw material into a usable finished product involves, network of activities of different nature. A superb quality is possible when each activity is done in best possible manner.

Physical inspection of material is needed to control the quality. In construction, inspection should be done while material is being unloaded because of weight and volume of material, it becomes really trouble some to send back the defective material when delivered, in every purchasing contract, clause for delivery, return of defective material should be included. Penalties and deductions in payments should be explicitly written and told in advance in every purchasing contract.

Thus defective, unacceptable material should be detected as early as possible; otherwise supplier may misinterpret an order or a specification. At last frequently encountered ship shod or dishonest supplier may cut corners, jeopardizing the quality of construction. In all cases it is less costly to detect defective material at the initial stages rather than after its consumption.

The inspection of material should be done by methods of attributes. The supplier should be informed in advance about the procedure of inspection. Buyer Company should always try for the reduction in inspection cost by suitable means as inspection cost adds to Sunk cost of the product.

A sound inventory management is necessary to reduce the investment in inventory. Inventory catalogue must be prepared with utmost care as inventory cost always encroaches profit. Today professional managerial skills are needed to
control inventory, as sometimes inventory constitute 15 to 25 percent of its invested capital. JIT are the practice, basically developed for reducing production inventories.

On Sundays and holidays one should avoid purchasing of building material in local market as on these days demands are more and prices are high. A keen observation and analysis of market condition are essential for good purchasing. This is the insight of purchaser which guides hand to mouth, forward and speculative buying.

Value analysis of product should be a regular feature of purchasing department. Value analysis always requires participation of persons from different background.

Purchasing department sometimes confronts with the problem of ‘Make or Buy’.

There is no straightforward rule exists for make or buy decision. Analysis of historical cost, review of present economic and labour considerations decide make or buy decisions with the sole objective of saving in cost.

Warehousing and store management is essential for safety and check on pilferage. An efficient store operation saves attendant cost in price, in paper work and in handling. The specific responsibility of store’s function is to inspect, identify and receive the material only when found suitable. A capable person who can take decision should always supervise receiving operation. Five minutes of inspection can save hours for rectification. Material received should always be placed at marked proper location and also records should be updated.

10.9 THE LABOUR ECONOMICS

In construction activity also labour acts as a factor of production. The cost of labour in ordinary residential construction amounts to around 30 percent of cost of the building. Thus knowledge of labour economics is essential for the wage optimisation.

In construction industry, labour market has characteristics similar to competitive market.
Every construction manager faces labour shortage during harvesting period of April and May. It is obligatory upon him to schedule construction activity accordingly.

10.9.1 THE MINIMUM WAGE

Any deviation from minimum wage policy is direct violation of the law of the land. Money given in advance to any labourer and work being taken as repay, amounts to bonded labour which is an offence and can not be ignored in the eyes of law.

Construction manager should not offer any opportunity for the activation of labour union and trade union.

Company should run incentive and welfare programmes to motivate the employees. Education, training and skill development should be the regular feature of the human resource maintenance.

There is no ready-made solution to tackle labour management conflict. It is the wisdom of manager who formulates the solution. Employees should be always treated as an asset not a liability. In dealing the human resource one should not forget that man will not be happy just with bread and butter. Studies have shown that beyond a certain point productivity depends only on people.

In Indian context influence of behavioural feeling, emotions, empathetic perceptions, impressions have greater influence over people than anything else.

10.9.2 THE OPTIMAL HUMAN RESOURCE MANAGEMENT

HR policy of the company should attempt to make a balance between boss and sub-ordinate relationship. A healthy uniform, transparent policies should be rendered at all levels of organisation for higher productivity and growth of the organisation to meet the challenges of 21st century. HRM strategies have to focus on better individual organization interface and greater emphasis on organizational effectiveness rather than on personal success.

The head of the business organisation must check that people in the organization are the right men for right job.

HRP should act as interface between a large range of external organizational factors and specific personnel policy. A company should try for symbiotic relationship with employees rather than a commercial relationship.
Need forecasting for human resource is an important part of HRP, as training of personnel has substantial cost.

Assessment of performance should be done on specific job rather than overall personality. Right talent is always in short supply. Therefore individual career development should be given greater importance. Full utilization and retention of talent should be preferred over external recruitment. HRP should develop every individual talent to its full potential and should arrange opportunities in which he fits best. However prospects of individual career development, largely rests with the employee himself. Companies must learn to manage employees career especially of managers of high expectations on the other hand companies should offer voluntary retirement schemes for employees facing retirement or desirous of career change.

Today the most fragile, living and critical asset in business enterprises is the human resource. This is the quality of human resource, which differentiates between a profit making and loss giving company.

The role of human resource is to help management in optimising the use of material resources. Therefore, presence of right people, at right place at right time is necessary to obviate the failures of company’s strategic plan. Therefore, a continuous monitoring of human resource is necessary.

The problem of surplus manpower in organization is much more serious than the future manpower planning. This problem should be tackled very cautiously. The solution to such problem is redeployment in the form of transfer or long-term orientation or training or retrenchment or attrition. Every care should be taken to avoid industrial disputes and distaste.

A good human resource management is essential for the success of project. A project should not be considered only as a technical entity. Unfortunately human side of the project has not received due weightage. Recently Adnane (1998) has concluded that human resource management in the context of construction project is still elementary.

10.10 THE OPTIMAL MAINTENANCE MANAGEMENT

Today because of complexity of equipment, material and the cost involved the maintenance activity has received paramount importance in pursuit of increasing economic life or reducing life cycle cost of capital equipments.
Maintenance practice has two orientation one is managerial which is concerned with the cost of maintenance and cost of loss in production caused by poorly or ill maintained machines.

Preventive maintenance is a cheap insurance for breakdown maintenance as well as time and cost saving method for corrective maintenance also.

Proper lubrication of mechanical equipment is a must to avoid wear and tear of the parts. This is the duty of maintenance group to provide information to operators, on specification and the doses of lubricants and explain them procedures and practices of lubrication and the inspection.

Fixation of size of maintenance crew is also a matter of concern. To have a realistic estimate, amount for maintenance should be taken as a certain percentage of investment in machinery. The annual cost of maintenance may range between 3 to 5 percent of investment in tools, plants and machinery. However, maintenance cost of building may run between 3 to 8 percent depending on type, size and use of the building. The labour cost may alone constitute 30 to 50 percent of total maintenance cost.

Quite often in smaller project a few maintenance men who are jack-of-all-trades can be appointed without any problem. While in larger project separate shops may be set up for each craft.

Supervision is also an important part of the maintenance programme. It is obligatory upon the supervisors to train the craftsmen to save time for future planning and to improve the efficiency of the maintenance shop.

Competence of foreman and craftsmen plays an important role in achieving the objective of low cost and high productivity at all levels of maintenance.

Diversified experience and competence should be the main criteria for the selection of foreman and craftsmen. In scholar's opinion the foremost quality to be judged in any candidate 'the desire to learn and has an attitude towards cost consciousness.

Effectiveness of preventive maintenance can be judged by counting the number of breakdowns. Preventive maintenance gives many returns if programme is run properly. To make preventive maintenance programme a success: it is
necessary to inculcate the value “preventive maintenance is the duty of everybody”.

Maintenance inspectors should be thoroughly trained about the parts, which are to be inspected during inspection. What to inspect and when to inspect and how to inspect. Sometimes craftsmen who regularly maintain the equipment is many a times better inspectors than the manufacturers. Service manuals received from the manufacturers must always be referred to, critical parts must be noted down.

A checklist should be prepared. Preventive maintenance manager must make sure that no item needing inspection is omitted. But at the same time he must be careful that inspection costs do not get inflated through needless checks and tests. Checklist should be revised on the basis of experience gained.

The frequency of inspection depends on amount of costs and saving from a preventive maintenance programme. Over inspection is expensive and under inspection leads to more breakdowns and quicker replacement. In this situation only experience can give an optimal solution.

Too much unscheduled work means, lack of preventive maintenance.

In spite of all complexities preventive maintenance remains an affective tool of management. Experience and development of new procedures make preventive maintenance administration easier. The executive, administering preventive maintenance must be technically skilled to highest level and should be a good manager as well.

The optimised model of Construction Company is shown in Fig.10.2
10.11 DIRECTION FOR FURTHER RESEARCH

Like other research work present work also has its limitation and has scope for further research and advancement of studies. Few possibilities are as under:

1. A management information system specific to construction industries in Indian context can be developed.
2. A document can be prepared on dealings with government agencies in construction contract in India.
3. SCBA packages for specific project in Indian context can be made.
4. There is a dire need of preparation of simple optimisation packages for cost optimisation in construction project.
(5) A comparative study of schedule of rate and analysis of rate of various states and departments can be done to ascertain degree of accuracy with actual field data.

(6) A document giving recommendation on optimal design of individual structural member and structural system can be prepared.

(7) A detailed CPM network based on realistic field data specific to particular construction project like housing, bridges for India can be prepared.

(8) A study on financial management in major construction companies in India can be done.

(9) A document dealing in real estate management in India can be prepared covering all the aspects of real estates.

(10) A document/software giving optimal plans for various types of building can be prepared.

(11) A manual dealing with finance, selection, purchase, rental quandary, and maintenance of construction equipment based on life cycle costing can be prepared for heavy construction equipment.

(12) A handbook covering all aspects of materials management of construction material in India can be written.

(13) A study on labour economics of construction worker in India can be done.

(14) A study on the productivity of construction workers in India can be done.

(15) A study of strategic human resource management in construction companies of India can be undertaken.

(16) Safety measures during execution of project always increase construction cost. This opens a new portal for optimisation of safety practices in construction projects. A manual can be prepared.

REFERENCES