# CHAPTER-2

# LITERATURE REVIEW

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## 2.1 OVERVIEW:-

The chapter covers the literature review. Brief description about the material referred, citations, research gaps and research questions are listed. The review of Indian nuclear sector is also described in the chapter. Outcome of literature review is also summarised here.

## 2.2 LITERATURE REVIEW:-

Researchers have adopted Questionnaire survey method/approach for data collection. Mathematical tools and statistical techniques are employed for analysis and conclusions. Each researchers has own performance criteria for measuring success. The criteria , schedule, cost, quality, perceived performance, client satisfaction, etc. are used for analyses. Delay factor is considered as prominent performance factor in infrastructure & power sector.

The construction sector may be divided into two parts ie. Infrastructure sector and power sector for literature review point of view. The power sector further can be divided into conventional sector and nuclear sector. Information about the project execution is available in infrastructure and conventional power sectors. Limited published information on nuclear projects is available internationally.

In Indian nuclear sector, limited literature is available for the attributes related to delay in project schedule and strategic factors.

The information in the following areas/ sectors is searched;

**i.** Construction sector (infrastructure& power) projects.
**ii.** International nuclear sector projects.
**iii.** Indian nuclear sector projects.
**iv.** Project management system.
**v.** Management information system.

Extensive review of literature is carried in above areas. Research papers published in international journal like “International Journal in Project management, Journal of Engineering & Technology

Management, Automation in construction etc." are referred. The research gaps and research questions are listed.

Information from articles/reports & books on international and Indian nuclear sector, project management, contract management tools-technique, management information system, organisational system etc. are collected.

Articles and books for research methods and quantitative tools are also referred.

The official web sites of GOI and its institutions and international nuclear institutions etc. are referred to collect the updated information.

The important literature review having research gap are listed below;

**1.** Berends, T. C. & Dhillon, J. S.(2004) describes two contracting approaches, Lump Sum/Fixed priced (EPC) and Cost Plus Fee (EPCM) are being adopted in Oil & power sector. In addition to LSFP & CPF contract, a number of hybrids versions were used and are being used in cut & pieces, but not modelled. The interests of financiers related to repayment are not considered on the realization of project.

**2.** Sang Hyuen Lee, Feniosky & Moonseo Park (2006) says in his paper that the constructions of projects are inherently very complex & dynamic. Project execution has nonlinear relationship and multiple feedback process. Problems encountered during execution of project are fundamentally dynamic but in general, they have been treated statically. CPM, PERT and EVM tools fundamentally utilize a static approach that may give unrealistic estimates to users.

**3.** Phil Loots & Nick Henchie (2006) describes the EPC& EPCM procurement routs available for international infrastructure and

major construction works. Both models have positive and negative points. These models generate multiple disputes during the project execution. Risk sharing pattern among owner and contractor/s are not defined well.

**4.** Berends T. C. (2000) describes EPC contract as LSFP contract and EPCM as CPFF contract. A hybrid contract strategy is derived from LSFP and CPFF and Cost plus incentive fee contract (CPIF) name is given. Only mathematical equations for costing model for under-run project are provided. Mathematical modelling for overrun project is missing.

**5.** Akintola S. A. & Malcolm J. (1997) shares the experience on risk management in construction. Risk in construction is main concerned because of time and cost overrun associated with construction projects. Risk analysis mainly depends on intuition, judgment and experiences. The parties show more tendency to transfer the risk.

**6.** Caron F., Gmarchet & Perego A. (1998) presents the stochastic model to plan project logistics in integration with the procurement & construction. The project scheduling process is based on backward approach. It shall be planned in forward way.

**7.** Almohawis S. & Salem A.A.A. (2011) describes the contracting strategies in mega projects and the differences in between EPC & EPCM. None of method gives the satisfaction to project owner to execute the project. They suggest that to reduce both cost and time of the project Management Information System (MIS) shall be adopted. The MIS shall be an integrated part of contract strategy.

Yeo K. T. & Ning J. H. (2002) explains the nature & characteristics of EPC projects and presented this with special interest in project management. The project performance, measured in term of schedule, cost, quality, technical parameters, safety and project objectives has gaps for substantial improvement. Phase changes of engg./design, procurement and construction increase the risk of project overrun.

**8.** Xianhai Meng (2012) has summarized the old to latest causes for delay and overrun in project execution. External factors are not considered for evaluation of project performance.

**9.** Ward S.C. & Chapman C.B. (1995) develops the mathematical model for fixed price contracts. Only linear equations are used for mathematical modelling. No validation is carried out with the practical data.

**10.** Kamal M. Al Subhi Al Harbi (1998) describes the risk sharing approach between the owner and contractors. It is difficult for the any government/ project authority to distinguish between high and low cost or inefficient and efficient firm on the basis of bid or target.

**11.** Lam K. C., Wang D., Patricia, Lee & Tsang. (2007) draw a model on the risk allocation decisions in contracts for project construction. Important decision leading to project success is the allocation & sharing of risks among the parties in a construction contract. There is substantial room for up-gradation.

**12.** Ballesteros P., Gonzalez-Cruz M. C. & Pastor-Ferrando J. P. (2010) analyses the expectation and relationship of the key stakeholder involved in the execution of project. There is no feedback during project in its life cycle.

**13.** Wen-Lin Tzeng, John Chin-Chung Li & Chang T. Y. (2006) presents the Lowest Bidding Tender method and Moat Advantageous Tender in Tiwan. The second suffers shortcomings of consumption of time and manpower and complicated tendering process.

**14.** Ward S.C. (1999) examines the shortcomings of the technique used in analysis and management of risk. A common problem is needed to be identified in project risk management processes and needed to be determined the relative significance of different sources of risk. It also guides the subsequent risk management effort and ensures cost effectiveness.

**15.** Karlos Artto & Kujala J. ( 2008) said about the strategies being adopted in construction projects. Due to inherent complexity of multi stake holder projects, project must consider the multiple stake holders interests during goal setting. Interest of all stake holders shall be accounted.

**16.** Hemanta Doloi, Anil Sawhney, K.C. Iyer & Sameer Rentala. (2012) presented the analysing factors affecting delays in Indian construction projects. The critical factors responsible for delays in construction are identified as i. lack of commitment, ii. inefficient site management, iii. poor site coordination, iv. improper planning, v. lack of clarity in project scope, vi. lack of communication and substandard contract. These factors are known but no combined solution is suggested.

**17.** Hemanta Doloi, Iyer K. C. & Anil Sawhney. (2011) try to find out the attributes related to contractor's prequalification which contributes in project success. A clear consensus on the contractor selection criteria and their links are main concerned. The quantitative impacts on the successful time, cost and quality outcomes in projects cannot be drawn decisively.

**18.** Jha K.N. &. Iyer K. C. (2006) describes the critical determination of project coordination. Coordination is considered as one of the seven critical attributes of management. Advanced communicating tools like ERP (similar to MIS) system are not considered during analyses.

**19.** Iyer K. C. & Jha K.N. (2005) describes the critical attributes/factors affecting the cost performance of project. More concentrated on project manager (PM) performance. Accountability other than PM shall also be considered.

**20.** Sadi A. Assaf & Hejji S. A. (2005) presented a survey in Saudi Abria conducted in construction to find out the causes of delays and their importance in project.

**21.** Jai G. & Chen Y. (2011) says that the program management can improve the capability of project execution. The integrated model can improve the Project management system in construction sector. Program management is not matured in China construction sector. MIS shall be made as an integral part of model.

**22.** Qian Shi (2011) describess the implementation of project management techniques. He presented a Value Adding Path Map (AVPM) approach. Implementation of project

management in organization can be done by using VADPM method.

**23.** Hsueh S. L. & Perng Y. H. (2007) describes the line assessment of project and their risks. Integration in the model with the computer system and implementation scheme is missing.

**24.** Ling F. Y. Y. & Hoi L. (2006) presents the investigation on the risk response techniques in India. Risks are described but no quantification is done.

## 2.3 REVIEW OF INDIAN NUCLEAR SECTOR:-

"Nuclear India", a periodic magazine published Department of Atomic Energy(DAE) , GOI, "Nu Power" a periodic magazine published by Nuclear Power Corporation India Ltd. (NPCIL), "Monthly News Letter" released by Bhabha Atomic Research Centre (BARC), magazine and report published International Atomic Energy Agency (IAEA), World Nuclear Association and various internal reports of DAE are referred.

Official web sites of the GOI and its institutions and international institutions are sourced to get the latest information in nuclear field.

On review of the Indian nuclear sector, it is found that there are some specific constraints & limitations. The facts in Indian nuclear sectors are summarized as

**i.** Government of Indian is only project executing & operating authority. This sector is not yet opened fully to private firms. Private firm's participation is limited in nuclear sector.

**ii.** No Indian firm has full capability to execute project on turnkey basis.

**iii.** India has import restrictions and Embargo problems after II Pokhran Nuclear test (1998).

iv. India has not signed Non Proliferation Treaty (NPT).

v. Restricted availability of advanced engineering analysis software to Indian Nuclear sector.

vi. Purchase & procurement of items are as per strict GOI procedures.

vii. Strict safety audits carried by AERB and/ or IAEA.

## 2.4 SUMMARY OF LITERATURE REVIEW:-

Limited published information on nuclear projects is available nationally & internationally. The literature review in conventional construction sector and available information in nuclear sector is done. Relevant & common gaps are identified.

Literature review can be summarised as:

EPC and EPCM models are in practice construction sector globally. Project Management Information System (MIS) is not well considered in models. The identified critical factors of construction delay are known but no mechanism is developed to address these factors. No project execution model is available in Indian nuclear sector.

The collective approach is required to address the critical factors and constraints & limitations in Indian nuclear sector.