

## CHAPTER 2

### 2. REVIEW OF LITERATURE

The Review of Literature has been done in two steps. The first step was to understand the theoretical significance of the current award culture in Indian Oil and Gas Sector and need for change in current award framework. The second step was to study various practices and researches worldwide on the Contract Award Framework and Project Performance Measures, parameters to be considered during contract award framework and parameters responsible for success of a project.

#### **Basic terms defined are:**

**Procurement:** The act of obtaining or buying goods and services. The process includes preparation and processing of a demand as well as the end receipt and approval of payment.

**Contract:** A voluntary, deliberate and legally binding agreement between two or more competent parties. Contracts are usually written but may be spoken or implied, and generally have to do with employment, sale or lease or tenancy.

**Contract Award:** Contract Award is the method used during a procurement in order to evaluate the proposals (tender offers) taking part and award the relevant contract.

**Performance:** The meaning of “performance” is more to do with results/outputs/ outcomes or behaviours/processes. Consequently, the literature is divided on whether the formulation and subsequent assessment of performance management objectives should be concerned primarily with the measurement of results/outputs/outcomes, behaviours/processes, either or both. (Armstrong, 1994). (Neely, 2002) however, claims that “objectives” and “goals” are interchangeable terms and can be either “targets” or “tasks” (or “projects”), with targets being quantifiable results to be attained and tasks or projects being units of work to be completed by specified dates in order to achieve the desired results.

**Project Performance:** The overall quality of a project in terms of its impact, value to beneficiaries, implementation effectiveness, and efficiency and sustainability.

**Holistic Approach:** Characterized by the belief that the parts of something are intimately interconnected and explicable only by reference to the whole.

**Framework:** A basic structure underlying a system, concept, or text.

**Quantitative:** Relating to, measuring, or measured by the quantity of something rather than its quality.

## **2.1 THEORETICAL FRAMEWORK**

Initial study made to understand current Public Procurement Guidelines and Regulatory Framework in India.

### ***Procurement Guidelines***

One of the objectives of the various procurement policies under the framework of the general principles contained in the GFR is to ensure responsibility, accountability, efficiency and economy. The policies also ensure transparent, fair and equitable treatment of suppliers and the promotion of competition in public procurement. The cardinal principle in any public buying is to procure the materials and/or services of the specified quality, at the most competitive prices in a fair, just and transparent manner, as outlined in the Manual on Policies and Procedures for purchase of Goods, issued on August 31, 2006.

## Regulatory framework of public procurement in India

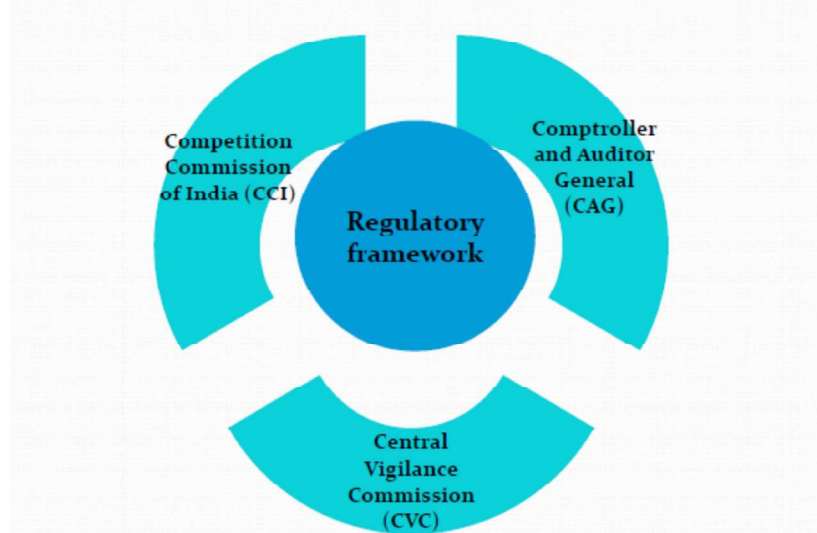


Fig 2.1 (Source:General financial rules-Amitabh Datta)

**CVC:** Central Vigilance Commission (CVC) is an apex Indian Governmental Body created in 1964 to address governmental corruption. It has the status of an autonomous body, free of control from any executive authority, charged with monitoring all vigilance activity under the Central Government of India, advising various authorities in Central Government Organizations in planning, executing, reviewing and reforming their vigilance work. The Annual Report of the CVC not only gives the details of the work done by it but also brings out the system failures which lead to corruption in various departments and organizations, system improvements; various preventive measures and cases in which the Commission's advices were ignored.

**CCI:** To promote and sustain an enabling competition culture through engagement and enforcement that would inspire businesses to be fair, competitive and innovative; enhance consumer welfare; and support economic growth. It is the duty of the Commission to eliminate practices having adverse effect on competition. In addition, also promote and sustain competition, protect the interests of consumers and ensure freedom of trade in the markets of India.

**CAG:** The Comptroller and Auditor General (CAG) of India is an authority, established by the Constitution under Constitution of India/Part V – Chapter V/Sub-part 7B/Article 148, who audits all receipts and expenditure of the Government of India and the State Governments, including those of bodies and authorities substantially financed by the government. The CAG is also the external auditor of Government-owned Corporations and conducts supplementary audit of government companies, i.e., any non-banking or non-insurance company in which Union Government has an equity share of at least 51 per cent or subsidiary companies of existing government companies. The reports of the CAG are taken into consideration by the Public Accounts Committees (PACs) and Committees on Public Undertakings (COPUs), which are special committees in the Parliament of India and the State Legislatures.

Public Procurement Bill 2012, under Chapter II ‘PRINCIPLES AND METHODS OF PROCUREMENT,’ has mentioned principles and method for tendering which is of interest for this research work. Hence principles listed under Chapter II are mentioned below which are:

#### CHAPTER II - PRINCIPLES AND METHODS OF PROCUREMENT

##### A.—GENERAL PRINCIPLES OF PROCUREMENT

GENERAL PRINCIPLES OF PROCUREMENT describes basic norms of public procurement that the procuring entity shall, in relation to a public procurement, have the responsibility and accountability to, —

- (a) Ensure efficiency, economy and transparency;
- (b) Provide fair and equitable treatment to bidders;
- (c) Promote competition;
- (d) Ensure that the price of the successful bid is reasonable and consistent with the quality required;
- (e) Evolve mechanisms to prevent corrupt practices.

Apart from this General Principle, other Principles under this Chapter II are:

- 5. Basic norms of public procurement.
- 6. Code of Integrity for procuring entity and bidders.
- 7. Determination of need for procurement.
- 8. Obligations related to value of procurement.

9. Description of subject matter of procurement.
10. Time limit for processing of procurement.
11. Participation of bidders.
- 12. Qualifications of bidders.**
- 13. Pre-qualification of bidders.**
14. Registration of bidders.
15. Contents of bidding document.
16. Single envelope and two envelope bids.
17. Time limit for submission of bids.
18. Pre-bid clarifications.
19. Modification to bidding document.
20. Procedure relating to submission, opening and evaluation of bids.
- 21. Criteria for evaluation.**
22. Exclusion of bids.
23. Price negotiations.
24. Cancellation of procurement process.
- 25. Award of contract.**
26. Terms and conditions of procurement contract.
27. Offsets. (**Bill No. 58 of 2012**)

Among these Principles which fall into study's scope where multi-parameter approach is suggested are:

No. 13. Pre-qualification of bidders.

(1) A procuring entity may engage in a pre-qualification process, prior to inviting bids, for the purpose of identifying the bidders that are qualified.

(2) The pre-qualification shall be valid for such period as may be specified by the procuring entity in the pre-qualification document.

(3) The procuring entity shall invite bids from pre-qualified bidders during the period referred to in sub-section

No. 21. Criteria for evaluation.

(1) Save as otherwise provided in this Act or the rules made thereunder or in any other law for the time being in force, the evaluation criteria shall relate to the subject matter of procurement and may, as applicable, include—

(a) The price;

(b) The cost of operating, maintaining and repairing goods or works;

(c) The time for delivery of goods, completion of works or provision of services;

(d) The characteristics of the subject matter of procurement, such as the functional characteristics of goods or works or the environmental characteristics of the subject matter;

(e) The terms of payment and of guarantees in respect of the subject matter of procurement;

(f) Where relevant, quality based criteria such as the experience, reliability and professional and technical competence of the bidder and of the personnel to be involved in providing the subject matter of procurement.

(2) Where considered necessary, the procuring entity may also specify trials, sample testing and other additional methods of technical evaluation of a bid: Provided that the requirement of such trials, sample testing or additional methods of evaluation shall be indicated in the bidding document and a record of such trials and testing shall be maintained in such manner as may be prescribed.

**(3) As far as practicable, all non-price evaluation criteria shall be objective and quantifiable.**

(4) The criteria for evaluation of bids, including whether the requirements specified in sub-section (2) of section 11 are applicable, shall be contained in the bidding documents.

**(5) Where applicable, the relative weights to be attached to each criterion shall be specified in the bidding documents;**

(6) No criteria or procedure, other than those mentioned in the bidding document, shall be used by the procuring entity in evaluating bids.

No. 25. Award of contract.

(I) Subject to the provisions of section 22 and sub-section (2) of section 11 and any rules that may be made in this behalf, the procuring entity shall

(a) Where price is the only award criterion, the bid with the lowest bid price which is otherwise acceptable in terms of the criteria and procedures for evaluating bids as specified in the bidding document;

**(b) Where there are price and other award criteria, the most advantageous bid ascertained on the basis of the criteria and procedures for evaluating bids as specified in the bidding document;**

**(c) Where there are no financial criteria, the most advantageous bid ascertained on the basis of selected non-financial criteria or other parameters for evaluating bids as specified in the bidding document.**

These Principles (Pre-qualification, Qualification, Evaluation of Tenders and Award of Contract) are considered for scope of my study where non-price criteria are not quantifiable and relative weight to criteria is not defined. Also no uniform method is mentioned to provide relative weight to these criteria. These lacunas directed in framing study objectives.

### **Theoretical Framework of Contract and tendering:**

The study takes support from two theories; 'A competitive Bidding Strategy', a theory of price and 'A Contract Theory'- theory explaining 'multi-tasking', 'classic moral hazard in team problems' and 'highly incomplete contract'.

'A Competitive Bidding Strategy' of 'A Tendering Theory' is a theory of price determination. It is a method that determines optimum bids in a competitive-bidding situation where each competitor submits one closed bid. The number of bidders may be large or may be unknown. This method makes use of the previous "bidding patterns" of all possible opposition bidders and in the case where the bidding is on contracts, the estimated probability distribution of the cost of fulfilling the contract.

As a theory of pricing, 'Competitive Bidding' has simple and clear message: to maximise the expected profit from a single tender where each competitor simultaneously submits one closed bid (tender). The bidder (tenderer) should select the mark-up on cost that maximises expected value of the profit which is the product of the mark-up and the probability of winning the contract.

'A modern Contract Theory' identifies a variety of obstacles to cooperation and suggests which contracts are best suited to overcome them. The theory is both positive and normative: it offers coherent explanations for the contracts that are commonly written, as well as a method for finding appropriate contractual solutions to new problems. This theory, as briefed by (Hart, 2016) has three models: 'Multi-tasking model' where actions and outcomes are multi-dimensional. The multi-tasking model predicts that when some important task is hard to evaluate, then incentives should be weak for all tasks. 'Incentives in Teams' explain many production processes requiring the cooperation of many agents. If it is only possible to measure aggregate output, it may be difficult to contractually provide optimal incentives for each agent, since there is an incentive to free-ride on the effort of others. The problem is that an individual agent who cheats by providing lower effort cannot be identified if joint output is the only indicator of effort. This is termed as the 'moral hazard in teams problem' and to preserve incentives, a third party - a budget breaker - needs to be involved who can create incentives by removing output from the team in case of inferior performance. This is the classic moral-



hazard model, where contracting parties write performance-based contracts ex ante and enforce appropriate rewards ex post. However it may be difficult to write a sufficiently detailed contract ex ante, specifying exactly what aspect of performance will be rewarded leading to many of the contracts ‘Highly Incomplete’. (Hart, 2016)

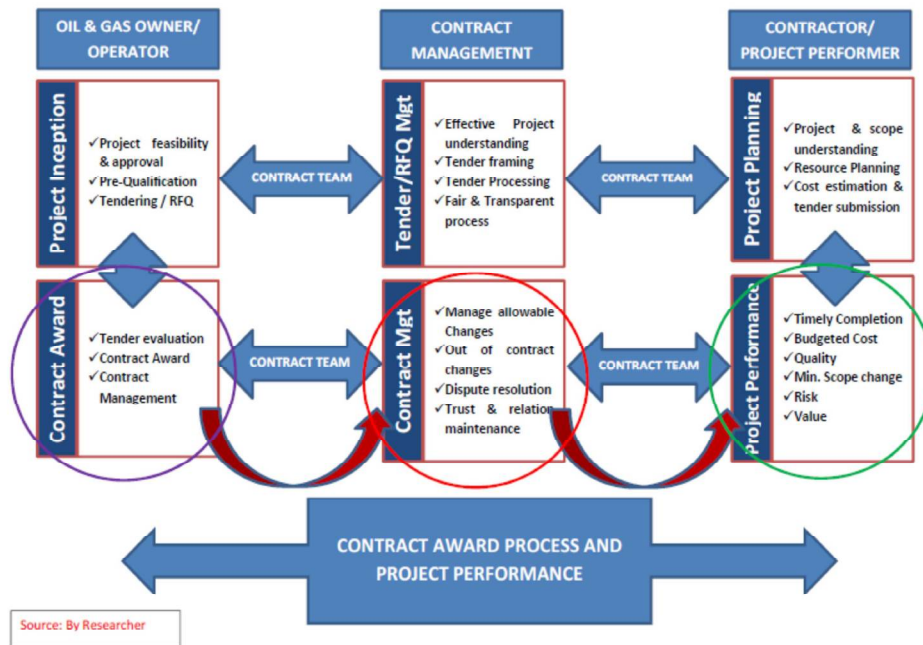


Fig 2.2 Contract Award and Project Performance Process

**Current practice of contract award and project performance in oil and gas industry in India:**

To explain current practice in oil and gas industry in India, Fig 2.2 briefs diagrammatically. Project cycle begins with owner company and prospective contractor bidders start interaction prior to Tender notification. At this point, owner company’s ‘Purpose of the project’ is decided and the company starts interaction externally in the contractor world to understand availability, suitability, new approaches, for the purpose with estimation of budget. Contractor organizations too start gathering resources to align and grab these project opportunities. The more transparent these pre-tender and tender communication linkages are, effective are contract award and project execution process. Closer these linkages are during tendering phase; stronger

is the association of Contractor-Company for making project execution successful. In a nutshell, to improve project performance, study of contract framework is needed. Hence, referring to 'Classic Moral Hazard Contract Theory', performance based contracts study for oil and gas projects is selected for the research.

## References:

1. Armstrong, M. (1994). Armstrong's handbook of performance management, Kogan pages, London.
2. Dutta, A (2015) General Financial Rules Procurement of Goods and Services. NJA BPL Presentations. Available at [http://www.nja.nic.in/Concluded\\_Programes\\_2015-16/P-939\\_PPTs/1](http://www.nja.nic.in/Concluded_Programes_2015-16/P-939_PPTs/1) (Accessed: 14 December 2016).
3. Neely, A. (2002). Business Performance Measurement-theory and practice. Cambridge University Press, Cambridge, pp. 33-35.  
Available at:  
[https://books.google.co.in/books?hl=en&lr=&id=1KIEoQYx5ewC&oi=fnd&pg=PR9&ots=fD9RYdU5ot&sig=xI09rm\\_kNw0hOyQcu-g1AId\\_r1c&redir\\_esc=y#v=onepage&q&f=false](https://books.google.co.in/books?hl=en&lr=&id=1KIEoQYx5ewC&oi=fnd&pg=PR9&ots=fD9RYdU5ot&sig=xI09rm_kNw0hOyQcu-g1AId_r1c&redir_esc=y#v=onepage&q&f=false)
4. Principles of public procurement part II. (2012). Principles and methods of procurement Chapter II, Procurement Policy division, The public procurement bill available at: [www.finmin.nic.in](http://www.finmin.nic.in) (Accessed on: March 28th, 2017).

## **2.2 LITERATURE REVIEW TO UNDERSTAND NEED FOR ALTERNATE FRAMEWORK FOR CONTRACT AWARD AND PROJECT PERFORMANCE MEASUREMENT:**

Many research literatures, high level reports, published articles, conference proceedings are consistently indicating reformations in India's Public Procurement Contract Framework.

Talking about competitive bidding approach, here are some of the studies which indicate troubles and issues in competitive bidding or bidding based on 'lowest price'. "Financial people like to have several vendors pit against each other to drive down price. This practice with no regard to quality and service can actually drive good vendors and good service out of business. How does one measure such a loss to society?" (Walton, 1986).

In the words of Dr. Deming, 'Father of Quality', "The idea of several suppliers for any one item, competing with each other for lower prices (as advocated by some authors), makes good talk, but as a practical matter it is only talk, even under long term contracts. It destroys any possibility of a good relationship between customer and supplier. There is a bear-trap in the purchase on the basis of price tag, Safety Short cut, slow process, insufficient profit margin to not allow investment for research and development, new technology, equipment. In government organizations, procurement methods are influenced by politicians. When the results of competitive tendering are bad for the purchaser, a scapegoat is often found. (Deming, 1994).

The prequalification (PQ) criteria are a yardstick to allow or disallow the firms to participate in the bids. A vaguely defined PQ criteria results in stalling the process of finalizing the contract or award of the contract in a non-transparent manner. It has been noticed that organizations, at times pick up the PQ criteria from some similar work executed in the past, without appropriately amending the different parameters according to the requirements of the present work. Very often it is seen that only contractors known to the officials of the organization and to the Architects are placed on the select list. This system gives considerable scope for malpractices, favoritism and corruption. (Juneja, 2002)

Chief Technical Examiner's Organization (CTOS), under Central Vigilance Commission Government of India Report indicated "Common Irregularities/Lapses in Award," and one area which not only affects the bottom line of the organization considerably, prone to corruption, is the area of contract management. Any mismanagement in the award and execution of contracts may result in heavy leakages of revenue and adversely affect the image and profitability of the organization. (Shanker, 2002).

The low-bid method fails to serve the public interest because the lowest offer may not result in the lowest overall cost to the public mentioned in FAR 2005. And a reduction in cost growth from 5.7 to 2.5% and a reduction in claims and litigation by 86% as per NAVFAC 1996. (Abdelrahman, Zayed & Elyamany, 2008)

A Comptroller Audit General (CAG) Report on "Issue of Licenses and Allocation of 2G Spectrum" indicated the loss at ₹310 billion. In coal mine allocation, CAG estimated that the "Windfall gain" to the allocates was ₹ 10,673 billion.

Chemtech Foundation in Industry Insight in India (2010) Report has indicated that significant challenges still exist in successfully bidding work from the Indian Public Sector. Some examples of these challenges are; a poor bidding and award process in the public sector which results in significant problems during project execution and the tax and the duty regimes in India which adversely affect how contractors bid and execute projects in both the public and private sector.

Tender Info Oil and Gas Overview in India (2010), has analyzed the process and the character of contracting and awarding based on the lowest bidding entity for the future course and consequently the success of the project. A need is shown for efficient contract award process.

"The Public Procurement Bill 2011" announced by Prime Minister has prepared a report under Shri Vinod Dhall and presented to Government of India which reports, "Procurements by Government in India have always been controversial with allegations of favouritism, inefficiency, quantitative and qualitative compromises and above all, corruption and kickbacks. There is no

uniformity in the procurement manuals of various government departments and the whole exercise is “handled in an amateurish manner”. The practice of holding negotiations with the lowest bidder for public contracts is the “seed for most corrupt practices”\_that makes a mockery of the bidding process.”

OECD guidelines for Fighting Bid Rigging (2012), mentioned public and private organizations often rely upon a competitive bidding process to achieve better value for money. Bid rigging occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods or services for purchasers who wish to acquire products or services through a competitive bidding process.

Competitive tendering (bidding) is a widely used procurement method within government agencies and in some private organizations. “The idea behind competitive tendering is that it forces suppliers to compete and (so the theory goes) consequently the purchaser and taxpayer will gain better ‘value for money’. In reality this rarely occurs” (Murray Stanley, 2011).

Richard J. Long (2011), from Long International Inc has reported “Typical problems leading to Delays, Cost overrun, claims on process plant and Offshore Oil and Gas projects”, indicated some of the problem areas as inadequate cost estimate by contractor and award based on it, ambiguity in Contract documents and multiple change orders.

A key recommendation of OECD Report (2012) on “Better Policies on Improving Regulation, Public Governance and Transparency” is “Mitigate risks of waste and corruption in the whole procurement cycle from project design through the tendering process and to the contract management.

United Nations Procurement Manual (2013) specifies Best value of money (BVM) as one of the general principles when exercising the procurement functions of the United Nations. BVM is defined as the “Optimization of whole –life costs and quality needed to meet the user’s requirements, while taking into consideration potential risk factors and resources available” Factors to determine Best Value for Money are Cost for entire life cycle and Quality.

Evaluation of the received tenders is one of the most significant areas of purchase management. The entire process of evaluation and contract awarding must be transparent. The Purchase Officer is required to prepare a comparative statement of quotations received, in the order in which the tenders were received. All tenders must be evaluated solely on the terms and conditions incorporated in the invitation for tenders. No new conditions may be added at the tender evaluation stage; no bidder may have an unfair advantage. (Nehra, 2017)

All these and many other literatures, reports pointing at reformation and change needed in present tendering and contract award framework in public procurement in India.

## References:

1. Abdelrahman, M., Zayed, T. & Elyamany, A. (2008). Best-Value Model Based on Project Specific Characteristics. *Journal of Construction Engineering and Management*, March 2008, pp.179-189.
2. CAG, I. (n.d.). Comptroller And Audit General Of India : Prominent Audit Report. GOI.
3. Chemtech Foundation, (2010). Report on Industry Insight in India, Retrieved from <http://www.chemtech-online.com/events/chemtech/industry-insights/> posted on 11 Feb 2010.
4. Deming, W. (1994). *The New Economics for Industry*. Cambridge: M.I.T. Center For Advanced Engineering Study.
5. Dhall, V. (2011). Public Procurement Problems & Prospects. Dhall Report, pp 5-7. Retrieved from <http://nadfm.nic.in/learning/Research%20Cell/Public%20Procurement%20-%20problems%20and%20prospects.pdf>
6. Juneja, M. (2002,). Office memorandum prequalification criteria. Retrieved March 6, 2017, from Government of India Central Vigilance Commission: <http://cvc.nic.in/six.pdf>
7. Long, R. (2011). Report on 'Typical problems leading to Delays, Cost overrun, claims on process plant and Offshore Oil and Gas projects.' Long International Inc. Retrieved from [http://www.long-intl.com/articles/Long\\_Intl\\_Typ\\_Prob\\_Lead\\_to\\_Delay-Cost\\_Overruns-Claims\\_on\\_Proj\\_Pl-OffShore\\_OG\\_Proj.pdf](http://www.long-intl.com/articles/Long_Intl_Typ_Prob_Lead_to_Delay-Cost_Overruns-Claims_on_Proj_Pl-OffShore_OG_Proj.pdf)
8. Nehra, k. (2017). Government Procurment Law and Policy: India. Retrieved March 2017, from Library of Congress: <https://www.loc.gov/law/help/govt-procurement-law/india.php>
9. OECD Report. (2012). *Better Policies On Improving Regulation, Public Governance & Transparency*. OECD.
10. OECD, R. (2012). Report on OECD Guidelines For Fighting Bid Rigging.



11. Shanker, P. (2002). Report on Common Irregularities/Lapses Observed In Award & Execution Of Contracts In Electrical, Mechanical & Other Contracts. Central Vigilance Commission Government Of India.
12. Stanley, M. (2011). Article Seven Reasons Competitive Bidding Fails. Retrieved from <http://www.processexcellencenetwork.com/innovation/columns/seven-reasons-competitive-tendering-fails-and-what/> posted on 28 Nov 2011.
13. Tenders Info. (2010). Oil & Gas Sector-Overview. Retrieved from <http://www.tendersinfo.com/oil-and-gas-projects.php>
14. United Nations Procurement Manual. (2013). Department Of Management Office Of Central Support Services Procurement Services.
15. Walton, M. (1986). The Deming Management Method. New York, NY Perigree.

### **2.3 LITERATURE REVIEW FOR VARIOUS APPROACHES FOR CONTRACT AWARD FRAMEWORKS:**

To propose solution for contract award framework which is a quantifiable and holistic in nature, the undermentioned research literatures are studied to understand other approaches worldwide vis-à-vis approach based on Competitive bidding theory in India. Various literatures also studied to list down parameters to be considered in oil and gas sector contract award framework.

“A Competitive bidding theory” presented a method that determines optimum bids in a competitive-bidding situation where each competitor submits one closed bid. This method makes use of the previous “bidding patterns” of all possible opposition bidders and in the case where the bidding is on contracts, the estimated probability distribution of the cost of fulfilling the contract.

Tender evaluation by Fuzzy sets explained the process of evaluating tenders to be largely dependent on subjective judgment when cost is not the only criterion used. A systematic procedure based on fuzzy set theory and multi criteria modeling is proposed for the selection of bid contracts cases giving criteria as cost, present bid information, and past experience of tenderers. Comprehensive criteria especially hydrocarbon like industry sector is not

(Drew, 1990) analyzes the relationship between the competitiveness of contract bids entered by individual contractors and the size and type of the contracts involved. He developed competitive index and used criteria as previous experience, number of attempts, and success of bidding, contract types, contract size etc. in construction industry in Hong Kong. But study has not provided any yardstick to measure success of performance and to measure competitiveness of a bidder, previous data records are needed. How useful will this be if bidder is a new participants or bidder has added resources to bid for higher size or different type of project?

Multi parameter bidding system for construction projects in USA attempts the major attributes selected by the owner on multi-parameter where selection of

the contractor will be on more parameters than just cost. (Herbsman, Ellis, 1992). However the method for determining total bid score for each bidder violates the independent principles between all the attributes in the multiple attribute decision. Also proposed system requires owners to determine three multipliers- time, quality and Safety. There are large parameters apart from these three which affect performance of a project.

‘Average Bid Method—a Competitive Bidding Strategy’ has framed bid close to the average bid cost which is formulated in nomographs and bidding process is analyzed mathematically and using Monte Carlo simulation. (Photios, 1993). This is to overcome troubles with Friedman’s ‘lowest bid’ award. ‘Lowest bid’ by Friedman has troubles of disputes; cost & time over run due to unrealistic bid cost of contractors accidentally or detrimentally. But this method is also based on only ‘Price of the bid’ and hence same drawbacks of contractor selection based on only ‘price of the bid’ are observed. Also the method is not suitable when there are only two bidders.

A prototype decision support/expert system for contractor prequalification is described by CP-DSS in Construction Industry in Hong Kong. The system firstly evaluates contractors’ capabilities according to project specific criteria. It then identifies any risks that may be caused by contractors. Finally, contractors are appraised according to their likely performance, management capability, reputation, resources, progress, competitiveness and activeness and ranked in order of selection priority. But project specific criteria are not proposed holistically and are specific to construction industry in Hong Kong. (Ng, Skitmore, 1993).

Bid is evaluated on P2 criteria for information collected and P3 criteria for Price and 60% of P2 and 40% of P3 is calculated to arrive at decision. (Holt, 1996)

In contractor selection using “Multi criteria Utility Theory an Addictive Model,” considers score of each bidder against 5 main criteria and 20 sub criteria and Utility is calculated between 0-1 to arrive at Final score by Additive Model in Construction Industry in Australia. (Hatush, Skitmore, 1998).

“Performance-Based Contracting for Services: A Case Study”. NASA describes QAP, Performance Standards, Job analysis, organization analysis, work analysis, Performance analysis, Directive analysis, and data gathering, Cost analysis, contract type, Contract Administration, Conflict resolution etc. for contract award. This report mentions ‘Partnering’ is a technique for preventing disputes from occurring. Under this concept, the agency and contractor, perhaps along with a facilitator, meet after contract award to discuss their mutual expectations, alternative dispute resolution etc. (Office Of Federal Procurement Policy, 1998).

Ng, Smith & Skitmore proposed Contractor pre-qualification process to improve the reliability and objectiveness of decisions being made. To improve the reliability and objectiveness of decisions being made, prequalification needs were carried out on a more rational basis where a technique in artificial intelligence namely Case-Based Reasoning (CBR) is used for prequalification. This is based on computer based DSS and a prototype EQUAL is developed. This approach uses the previous similar experience in giving solution and accordingly modifying the decision system each time. Over a period of time, system will have enough cases to refer for providing solution but what at the start of the system when records of previous cases are not gathered enough? This a very time consuming approach. (Ng, Smith & Skitmore, 1998).

‘Tendering Theory’ and ‘Competitive Bidding Theory’ does not perform well in terms of accuracy of forecasts and informative content, and that there are inconsistencies in the logic, especially with regards to the assumed profit maximization behavior. As a result it was concluded that bidding strategy, as a prescribed practice is ill founded and this may be one reason why there is little evidence of its adoption in practice or significant development in method. (Runeson, 1999)

Nonlinearity, uncertainty and subjectivity are the three predominant characteristics of contractors prequalification which cause the process more of an art than a scientific evaluation. A fuzzy neural network (FNN) model, amalgamating both the fuzzy set and neural network theories, has been developed aiming to improve the objectiveness of contractor prequalification.

Through the FNN theory, the fuzzy rules as used by the prequalifies can be identified and the corresponding membership functions can be transformed in for prequalifying Hong Kong civil engineering contractors Large Engineering and construction projects between 1995-1999. (Lam, Hu, Ng, Skitmore, Cheung, 2001) Success of FNN depends on more number of training pairs given as input. Also if the training pairs were taken from all failed cases who were selected, then all training cases would be disqualification cases. Any new and innovative criteria will not have inclusion in training pair. Also the data gathered is from old experience cases, considering transformation and evolution of industry as a whole, and oil & gas industry in specific, these training pairs will not be relevant to industry other than Construction.

(Kamal, 2001) used 'Application of the AHP in project management' for pre-qualification of the contractor based on multi-criteria as a decision making tool in project management. But criteria selected has no empirical base and if number of judgements or evaluation criteria are large in number then AHP is cumbersome.

(Ashworth, 2006) introduced benchmarking and Constructing Excellence in the Built Environment for construction industry including health and safety management, partnering the supply chain, sustainability etc. This was further step beyond The Latham Report (1994) and the Egan Report (1998). Similar thinking is a need in Oil & Gas Industry.

Contracting economies of Large Engineering & Construction Projects of oil, gas & petrochemical projects is studied (Berends, 2007) where experienced based theoretical framework of contracting was developed. Under this the project performance analyzed for different contracting strategies resulted in 'Cost Plus Incentive Fee' have been effective in cost level performance and schedule performance, 'Lumpsum/Fixed Price' have been better in cost prediction and 'Cost Plus Percentage Fee' have been worst in schedule & cost performance. This strategy and theoretical framework is based on competitive theory which is solely price based and other non-price parameters are not studied for inclusion in quantitative analysis.

(Zhu,2008) studied rationality of bidding theory and relationship between bidding theory and other decision analyzing tools like Game theory, Operation Research, Action theory etc. for construction contracts. The study mentions construction contracts shifting to realistic models and indicated a deeper understanding and handling of bounded rationality is a need for models to be realistic.

(Abdelrahman, Zayed, and Elyamany, 2008) studies best-value model based on project characteristics. Contractor selection evaluation criteria are selected from past performance and relative weight is calculated using AHP. But each time selection of evaluation criteria will not provide holistic approach and weight calculation using AHP i.e. paired comparison for large number of criteria is cumbersome. Also criteria based on importance of project success is not considered, measure of project performance is not suggested.

(Plebankiewicz, 2010) has developed contractor pre-qualification model using fuzzy sets. The construction owner has possibility to express his evaluation concerning the criteria weight, objectives and also satisfying the criteria by the contractors, using linguistic variables. Owing to the application of fuzzy sets theory, these variables are converted into a fuzzy numbers. But a complicated mathematical apparatus causes some difficulties in applying the model in practice.

Contracts are frequently complex, may involve multiple actors, may last a long time and may consume many resources. It is therefore vital that they are properly managed. Contract management activities can be broadly grouped into three areas: delivery management, relationship management, and contract administration. (SIGMA, 2011).

A ‘Multi-Criteria Decision Making- MCDC’ represents quantitative & qualitative criteria for contractor pre-qualification using AHP methodology in Ghana. But AHP is mostly subjective in nature or initial qualitative and later on quantitative assessment. And these pre-qualification criteria are used from purchase and procurement department of Ministry of Ghana and are not derived from empirical method suitable for oil and gas industry. (Enyinda, 2011).

The World Bank's new 'Procurement Framework' maximizes the strategic role of procurement in achieving development effectiveness goals by:

1. Recognizing that countries are looking to be more efficient in their public spending so that they can invest more in basic public services such as education, health and infrastructure to enrich development outcomes.
2. Modernizing procurement to emphasize flexibility (i.e., fit-for-purpose), quality, and greater value for public spending, while enabling adaptation to country contexts.
3. Promoting strengthened national procurement systems that are empowered to support sustainable development objectives.
4. Increasing transparency in public spending by taking advantage of ICT tools in public procurement.

( World Bank's New procurement framework, 2016)The core procurement principals by which the policy is governed by are:

1. Value for money
2. Economy
3. Integrity
4. Fit for purpose
5. Efficiency
6. Transparency
7. Fairness

## References:

1. A. Kurkova. (2012). Evaluation Of HSE Practices At Construction Sites In Developing Countries. Thesis For Degree Masters Of Science Norwegian University Of Science And Technology.
2. Abdelrahman, M., Zayed, T. and Elyamany, A. (2008). Best-Value Model Based on Project Specific Characteristics. Journal of Construction Engineering and Management, March 2008, pp.179-189.
3. Ashworth, A. (2006). Contractual procedures in construction industry. Pearson Education Limited Fifth edition, 2006, London.
4. Berends K. (2007). Engineering And Construction Projects For Oil And Gas Processing Facilities: Contracting, Uncertainty And The Economics Of Information. Elsevier-Energy Policy, Volume 35, Issue 8, pp. 4260–4270.
5. Drew, D.S. and Skitmore, martin R. (1990) Analysing Bidding Performance; Measuring The Influence of Contract Size and Type.Proceedings The International Council for Building Research Studies and Documentation, CIB W-55/65, pp. 129-139, Sydney, Australia. Accessed from: <http://eprints.qut.edu.au/archive/00004512>
6. Dutta, A (2015) General Financial Rules Procurement of Goods and Services. NJA BPL Presentations. Available at [http://www.nja.nic.in/Concluded\\_Programes\\_2015-16/P-939\\_PPTs/1](http://www.nja.nic.in/Concluded_Programes_2015-16/P-939_PPTs/1) (Accessed: 14 December 2016).
7. Enyinda, C., Ogbuechi, A., Udo, G. (2011). A Decision Support Model For Contractor Selection In A Government Procurement Supply Chain: Evidence From An Emerging Market. Journal of Management Policy and Practice vol. 12(7) 2011.
8. Friedman, L. (1956). A Competitive Bidding Strategy. Operations Research 4(1), 104-112.
9. <https://www.nobelprize.org>. Retrieved August 31, 2017, from THE ROYAL SWEDISH ACADEMY OF SCIENCES.



10. Hatush, Z., Skitmore, M. (1998). Contractor Selection Using Multi-Criteria Utility Theory An Addictive Model. *Building And Environment* 33(2 - 3), 105-115.
11. Herbsman, Z., Ellis, R. (1992). Multi Parameter Bidding System-Innovation incContract administration . *Journal of Construction Engineering and Management* Vol. 118, Issue 1 (March 1992). Available at: [https://doi.org/10.1061/\(ASCE\)0733-9364\(1992\)118:1\(142\)](https://doi.org/10.1061/(ASCE)0733-9364(1992)118:1(142)).
12. Holt, G. D. (1996). *Tendering Procedures, Contractual Arrangements And Latham: The Contractors' View*. Engineering, Construction And Architectural Management.
13. Kamal, M. (2001). Application of the AHP in project management. *International Journal of Project Management* 19 (2001) 19-27.
14. Lam KC, Hu TS, Ng ST, Skitmore M and Cheung S (2001), A Fuzzy Neural Network Approach for Contractor Pre-qualification, *Construction Management and Economics*, 19(2): 175-188.
15. Ng, S. Thomas and Smith, Nigel J. and Skitmore, Martin (1998) A case based reasoning model for contractor prequalification. *International Journal of Construction Information Technology*, 6(1):pp. 47-61. Available at <http://eprints.qut.edu.au>. (Accessed:)
16. Ng, S. Thomas and Smith, Nigel J. and Skitmore, Martin (1998) A case based reasoning model for contractor prequalification. *International Journal of Construction Information Technology*, 6(1):pp. 47-61. Available at <http://eprints.qut.edu.au>. (Accessed:)
17. "Ng, T., Skitmore, R. (1993). CP-DSS: decision support system for contractor prequalification. *Journal of civil engineering systems*, Vol 12, Issue 2, Pages 133-159. Available at: <https://doi.org/10.1080/02630259508970164>
18. Nguyen, V. (1985). Tender evaluation by fuzzy sets. *Journal of Construction Engineering and Management* Vol. 111, Issue 3 (September 1985). Available at [https://doi.org/10.1061/\(ASCE\)0733-9364\(1985\)111:3\(231\)](https://doi.org/10.1061/(ASCE)0733-9364(1985)111:3(231)).

19. Photios G., Sou-Sen L. (1991). 'Average Bid Method—A Competitive Bidding Strategy', *Journal of Construction Engineering and Management*, ASCE, Vol. 199, No.1, March 1993, pp. 131-147.
20. Plebankiewicz, E. (2009). Contractor prequalification model using fuzzy sets. *Journal of civil engineering and management*, 15(4): 377–385.
21. Runeson, G. &. (1999). <http://eprints.qut.edu.au/39944>. Retrieved 2015, from *Tendering theory revisited*.
22. SIGMA. (2011). *Public Procurement Training Manual - Support For Improvement In Government And Management*. Retrieved from <http://www.sigmaweb.org>.
23. Sylvester, D., Shima N. (1998). 'Theoretical Framework: Factors For Project Success In Oil And Gas Companies And Contractors', *International Conference on Business and Economics Research*, Vol 1 (2011). IACSIT Press, Kuala Lumpur, Malaysia.
24. Zhu, Chunxue (2008). *Rationality in bidding theory: a construction industry perspective*. *Proceedings 8th International Postgraduate Research Conference 2(1)*, pages pp. 257-264, The Czech Technical University of Prague (CVUT), Czech Republic.

## **2.4 LITERATURE REVIEW FOR VARIOUS APPROACHES FOR PROJECT PERFORMANCE:**

Quantifiable contract award framework is useful only when it is backed up by similar holistic and quantifiable framework which measures project performance. This will complete one cycle initiated for project purpose by way of various contracts to execute and complete the project to achieve its desired objective. Project is successful only when it can meet set objectives within set time duration, within set budget without compromising stakeholder's satisfaction and quality. Projects in India's public sector undertaking do not have holistic and quantifiable measure to declare how successful the project completion is. Hence literature review involved current project measures in various sectors in India and worldwide and also literature review done to find parameters responsible for success of a project in oil and gas sector in India.

The Infrastructure and project monitoring division (IPMD) under Ministry of Statistics and Implementation provides services to government of India for efficient and effective management of projects costing more than INR 20 Crore by Public sector Undertaking and infrastructure projects of private and joint sector. Some of the project performance measurement approaches used by IPMD are:

- Performance reviews to assess and/or progress towards meeting objectives
- Trend analysis to examine project results over time
- Earned Value Management (EVM)

From which EVM is suggested as most efficient tool which provides management and control of time, cost, resources and quality collectively thus leading to successful completion of projects on time and within the stipulated budget. (Kalady, 2009)

The role of multiattribute utility theory is first placed in the overall context of decision analysis. Many complex decision problems have the characteristic of being multiple objective in nature. Inevitably, these multiple objectives are conflicting in the sense that, once dominated alternatives have been eliminated, further achievement in terms of one objective can occur at the expense of some achievement of another objective. Thus, in evaluating alternatives, decision maker must consider his preference tradeoffs between various degrees of achievement of one objective and degrees of achievement of others. (Keeney, 1977)

Decision theory proposes 'Encompassing a wide variety of analytical techniques for handling management problems'. The purpose of decision theory is to solve

management problems of the type that traditionally could be attacked only through intuitive judgment. [43].

Utility is one of the basic components of decision-making. Computation of the utility is an alternative approach to the commonly used subjective elicitation of the utilities.

Scope definition for bidding project control services is scope of work weighs the time and costing as to not exceed the intended profit by the contractors. (Turner E. K., 1988)

Quality is the end product of the Project Management Triangle. The dimension of scope, time and cost equals quality product. (Bubsh .

Triple Constraint explained the Project Management Triangle concept applied in the execution of projects tendered by the Oil and Gas Companies and Contractors which fall in either its cost and time, or quality and ti .

Effect of Six Sigma projects on innovation and firm performance explained the scope of work is more important to the contractors rather .

KPI for performance evaluation: Client Satisfaction, Environmental, Finance, Personnel, Process. (University of Oxford Report, KPI process).

Various Performance evaluation approaches and angles studied are Earned Value Management (EVM), leadership behaviours of project managers, develop and maintain good relationship and effective communication with key stake holders and project sponsors, fuzzy multiple attribute-based group decision system etc.

Implementing a pmValue Measurement System to measure project management performance and value will help organizations achieve one or more of the organization goals. These goals are based on determining the value of implementing project management improvement initiatives in the organization. Choosing those measures is key to the success of the pmValue Measurement System (Centre For Business Practices. Measures Of Project Management Performance And Value., .

Performance evaluation model of engineering project management is based on improved wavelet neural network. (Zhang Qinghua & Fu Qiang, 2009)

Enhancing construction project supply chains and performance evaluation methods is published for a case study of a bridge construction project applying the SCOR model to develop a dynamic cSCM model using computer simulation. (Pan, Lin, & Pan, 2010)

Further a shift in the focus of measurement for project management from the exclusive process driven criteria from the Iron Triangle to the Square Route. It is further suggested that shift could be significantly helpful if a definition for project management was produced which did not include limited success criteria. (Atkinson, 1989)

Competitive tendering forces contractors to depend even more on its suppliers. Literature and practice showed that to win a tender in Oil and Gas contracting, the supply or procurement part should convince the client that the contractor has access to the right goods and services at the right price. Other parameters clearly communicate the intention to enter the new market, strive for highest possible quality in RFQs, involve senior management in interactions with the suppliers etc. (Horst, 2013)

## References:

1. Atkinson, R. (1989). Project Management: Cost, Time And Quality, Two Best Guesses And A Phenomenon, It'S Time To Accept Other Success Criteria. *International Journal of Project Management* Vol. 17, No. 6, 337-342.
2. Browser, F. (2008). The Triple Constraint 1 of 5. International conference on Business and Economic Research. Kuala Lumpur, Malaysia: Lacsit Press.
3. Bubshait, A. A. (1994). Owner Involvement In Project Quality. *International Journal Of Project Management* 12 (2), 115-117.
4. Centre For Business Practices. Measures Of Project Management Performance And Value. (2000). Retrieved from [Http://Www.Cbponline.Com/](http://www.cbponline.com/).
5. Horst, T. v. (2013). Project procurement in oil and gas Industry. Delft University of Technology.
6. Keeney, R. (1977). The Art Of Assessing Multi Attribute Utility Functions, *Organization Behavior And Human Perform.*
7. Pan, N. -H., Lin, Y.-Y., & Pan, N.-F. (2010). Enhancing Construction Project Supply Chains And Performance Evaluation Methods: A Case Study Of A Bridge Construction Project.
8. Parast, M. M. (2010). The Effect Of Six Sigma Projects On Innovation And Firm Performance. *International Journal Of Project Management*.
9. Turner E. K. (1988). Scope Definition For Bidding Project Control Services. *International Journal Of Project Management* 6 (1), 39 - 44.
10. University of Oxford Report, The Key Performance Indicator Evaluation Process, KPI Process, available at : [https://www.admin.ox.ac.uk/media/global/wwwadminoxacuk/localsites/estatesservices/documents/capitalprojects/KPI\\_Process\\_Guidance\\_Note.pdf](https://www.admin.ox.ac.uk/media/global/wwwadminoxacuk/localsites/estatesservices/documents/capitalprojects/KPI_Process_Guidance_Note.pdf), Accessed on

11. Zhang Qinghua & Fu Qiang. (2009). Performance Evaluation Model Of Engineering Project Management Based On Improved Wavelet Neural Network.

Many such literatures provided criteria in bits and pieces and multiple ways, in fact each different way by each owner, to decide project is performed successfully or not. But most of these approaches are subjective, do not quantitative measure and measure has not included broad parameters covering 360 degree performance measure to decide project is performed successfully or not. All these literature study compiled in a tabular form based on its theme and research gap found in each theme to arrive at problem areas and hence deciding objective of the research.

## 2.5 SUMMARY OF LITERATURE REVIEW THEME AND RESEARCH GAPS:

More than 180 literatures studied during literature review are summarised based on five themes to identify research Gap for study.

Author and Paper	Research theme	Context	Research Gap
(Friedman 1956), (Nguyen 1985), (Enyinda 2011), (Photios and Leu 1993), (Kees Berends 2007), (Hegazy and Moselhi 1994), (Ashworth 1985)	Contract Award Framework-based only on Price	Global	These Contract Award frameworks are based on "Price" (Lowest price/ Average price or most reasonable price) but other technical, quality, commercial parameter weightage not considered.
(Ng, Thomas and Smith 1998), (Skitmore ,Martin 1990), (Crease 1971), (Burgess 1971), (Zhu, Chunxue 2008), (SIGMA OECD, 2011), (Richardson 1995)	Contract Award Framework-on few factors without weightage	Global	Very limited factors apart from Price are mentioned but comprehensive parameters and their weight for inclusion in contract framework not studied
(Ng, Thomas, Skitmore and Martin 1994), (Zedan , March 1998), (Herbman and Ellis, 1990), (Performance-Based Service Contracting (PBSC)	Contract Award Framework-applicable for industry other than Oil and Gas and for	Global	This Contract evaluation Framework mentions few parameters specifically applicable for Infrastructure Projects,



NASA	countries other than India		Aviation sector and space research. Specific to Oil and Gas sector such study is not made.
(Keeney 1977), (Turner 1988), (Bubshait 1994), (Browser 2008), (University of Oxford), (Chen , Lee 2007), (Bower, Finegan 2009), (Lewis and Bajari, ), (Sylvester, Nazatul 2010), (Parast 2010), (Turner 1988), (Nguyen, Huyen and My 2013) , (Ramezani, Lu 2014), ( Long 2014),	Factors for successful Project Performance	Global	Study shows various Factors in bits and pieces responsible for success of Project Performance but no study has quantitatively studied large parameters in a compile way for success of project and there is no link to project performance parameters to be considered during Contract award .
(Oil and Gas IQ 2010), (OECD better policies- India Brochure 2012), (Dhall Report (Oil and Gas overview by Tender info 2010), (Chemtech Foundation in Industry Insight 2010), (Central Vigilance Commission Government of India, 2002), (OECD guideline for fighting Bid rigging, 2011),	Need for alternate approach for Contract award for India	India	Recommendations and suggestions provided for need for improvement in Contract award process for Oil and Gas project in India but solution framework is not studied and suggested.
(Long 2014), (Walton 1986), (Stanley 2011), (Deming 1994),	Need for alternative to Competitive bidding	Global	These studies indicated competitive bidding (Lowest price basis contract award) is not recommended for maintaining quality, economy and

			sustainability in Oil and Gas projects. But no study is made to provide solution for alternate Contract Award framework.
--	--	--	--

Table 2.1

In a nutshell, many of the above approaches are based on lowest bid/most viable bid in terms of price. Few are based on quantitative technique used for pre-qualification of contractors. Even pre-qualification study made is for construction industry, aviation industry, space research, medical science etc but not for oil and gas industry. Researches were carried out specific to country like USA, Hong Kong, Malaysia, Australia, UK etc. But no Research on Contract Award based on quantitative score with multiple factors responsible for enhancing performance of oil and Gas projects is studied.

## **2.6 PROBLEM STATEMENT:**

Large oil and gas project majorly comprises oil and gas owner or operator companies of public sector undertaking or upstream private companies with production sharing contract with government of India following tendering framework where tender evaluation and award is based on 'lowest price bid.' Large oil and gas projects with value ranging from 100 crore to 10,000 crore reported to have procurement component of 40-50% of project value. These involve various contract awards to PMCs, EPCs, critical equipment Contractors, technical and quality Service providers, oilfield service providers based on lowest price. This is largely impacting quality in projects, inefficient management of public money and keeping good players away because lowest price do not justify value addition in terms of added quality, global experience brought in, providing innovative solutions and undertaking risk in new venture projects. Technical evaluation of tenders are done on the basis of documents like proof of completion signed by end client, acceptance of purchase order copy having mention of only those words as required in tender and client completion letter acceptance only if required value is mentioned in the letter etc. which is merely compilation of documents and neither indicate technical-quality-reliable capability nor guarantee timely completion. In addition to this, projects performed do not have any yardstick which can measure completion of objectives to reward great performances or penalize underperformed work. Summarizing , projects carried with public money has no monitoring and checks to control wastage of public money and lack of quality, time and cost overrun is causing huge money loss in Indian oil and gas projects.

## **2.7 BUSINESS PROBLEM:**

Many large investment projects in Indian Oil and Gas Sector have performance below expectation due to lack of contract award and project performance framework.

## **2.8 RESEARCH PROBLEM**

A holistic contract award and project performance framework is not developed for Oil and Gas projects in India and their relationship is not analyzed.

## **2.9 RESEARCH QUESTIONS:**

Q1: What are significant factors during Contract Awards in Oil and Gas industry in India?

Q2: What are significant factors for Project Performance in Oil and Gas Industry in India?

Q3: What is the framework of Contract Award Index (CAI) and Project Performance Index (PPI)?

## **2.10 RESEARCH OBJECTIVE:**

1. To identify the significant factors during Contract Award for Oil and Gas projects in India.
2. To identify significant factors during Project Performance of Oil and Gas project in India.
3. To suggest the holistic Contract Award Framework in terms of Contract Award Index (CIA) and Project Performance Index (PPI) for Oil and Gas Projects in India.

**2.11 INITIAL PARAMETERS WHICH ARE RESPONSIBLE FOR SUCCESS OF A PROJECT COMPILED AND LISTED FROM LITERATURE REVIEW TO STUDY ITS RELEVANCE TO O & G IN INDIA ARE:**

- Integration of Project
  - Integrated project charter
  - Project schedule/plan
  - Clear scope statement
  - Defined project management plan
  - Top management support process review planning
  - Client satisfaction
  - Arrangement of change control
- Scope Management
  - Focused scope statement
  - Cost/Benefit analysis
  - Project constraints
  - Work breakdown structure
  - Responsibility breakdown structure
  - Scope change control
- Time Management
  - PERT and GANTT chart
  - Critical path method
  - Network model
  - Resource loading
  - Reporting

- Cost Management
  - Financial analysis
  - Cost estimating
  - Forecasting
  - Cost control
  - Cost reporting
- Quality Management
  - Quality assurance
  - Quality control
  - Cost of quality
  - Quality conformance
- Human Resource Management
  - Leadership skill development
  - Team building
  - Motivation
  - Conflict management
  - Compensation
  - Organisation structure
- Communication between Owner and Contractor
  - Communication matrix
  - Communicating vehicles
  - Listening and presenting skill
  - Facilities to remove barrier
- Risk Management
  - Risk identification
  - Risk analysis
  - Risk mitigation
  - Contingency planning against external risks
- Procurement and subcontracting efficiency

- Material selection
- Vendor pre-qualification
- Contract types
- Contract risk assessment
- Contract negotiation
- Contract change address
- Benefits to Stakeholders
  - Stakeholder satisfaction
  - Stakeholder profitability
  - Stakeholder retention
  - Market share
  - Shareholder use
- Benefits to Performing Organisation
  - Employee satisfaction
  - Employee motivation
  - Employee empowerment
  - Employee productivity
  - Organisation growth
  - IT development
- Lessons Learnt from past experience

(Atkinson, 1989) (United Nations Procurement Manual, 2013) (Von Branconi Christof, 2004) (Jeffrey K, 1987) (Merrow E. W., 2011) (PMBOK, 2000) (James, 2005) (Hilger, 2009) (Kashiwagi, 2010) (LALL, 1992)

## **2.12 INITIAL PARAMETERS CONSIDERED FROM LITERATURE REVIEW FOR CONTRACT EVALUATION AND AWARD ARE:**

- Technical capability
  - Use of Technology and Science
  - Engineering capability
  - Emphasis on research and innovations
  - Accreditations with various bodies
  - Development of strategy
- Financial Capability
  - Return on investment
  - Return on capital employed
  - Working capital
  - Financial Risk
  - Cost saving
  - P/E ratio
  - Earning per share
  - Financial stability
- HSE competency
  - Employee health care
  - Safety policy
  - Environmental Policy
  - Social responsibility
  - Ethical Value
- Risk Management Capability
  - Capability to address Economic risk
  - Capability to address Political risk
  - Capability to address statutory requirement
  - Capability to address regulatory changes
  - Capability to handle any foreseen risk



- Human Resource Competency
  - Number of manpower
  - Quality of manpower
  - Training and development of manpower
  - Empowerment of manpower
  - Attrition rate
- Communication competency
  - Communication with owner company
  - Communication within bidder's organisation
  - Top management support and involvement of bidder's organisation
  - Cross functional communication within bidder's organisation
  - Update on regulatory and statutory system
  - Update with National and International approval bodies
- Management Competency
  - Past performance and quality
  - Quality control policy
  - Quality management system
  - Project management system
  - Experience of technical personnel
  - Management knowledge
- Company Reputation
  - Past failures in completed projects
  - Number of years in construction
  - Past client relationships
  - Cooperation with contactors
  - Past failures in completed projects

(CIPS 2013) (Lindbom 2007)

## References:

1. Atkinson, R. (1989). Project Management: Cost, Time And Quality, Two Best Guesses And A Phenomenon, It'S Time To Accept Other Success Criteria. *International Journal of Project Management* Vol. 17, No. 6, 337-342.
2. CIPS Contract Management Guide , (2013). The Chartered Institute of Purchase & Supply. Retrieved from [https://www.cips.org/documents/CIPS\\_KI\\_Contract%20Management%20Guidev2.pdf](https://www.cips.org/documents/CIPS_KI_Contract%20Management%20Guidev2.pdf)
3. Hilger, A. P. (2009). Best Value procurement - Lesson learnt. University of Minnesota., Sept 17, 2009.
4. James, P. (2005). Center for Business Practices.
5. Jeffrey K, P. D. (1987). Critical Success Factors In Effective Project Implementation. *Sloan Management Review*, pp. 33-41.
6. Kashiwagi, D. (2010). Best Value Procurement/Performance Information Procurement System Development. Arizona State University: Performance Based Studies Research Group, School of Sustainable Engineering and the Built Environment. Retrieved from [https://aiahouston.org/media/uploads/resource-docs/case\\_study\\_best\\_value\\_procurem.pdf](https://aiahouston.org/media/uploads/resource-docs/case_study_best_value_procurem.pdf).
7. Lindbom, R. B. (2007). Competitive Advantage of Environmental Sustainability. Hogskolan i Halmstad sektionen for Ekonomi Och Teknik.
8. Merrow E. W. (2011). *Industrial Megaprojects: Concepts, Strategies*. New Jersey, USA: John Wiley & Sons, 7,8,10,25,139.
9. PMBOK. (2000). *A Guide to Project Management body of knowledge*. Project Management Institute Inc.
10. United Nations Procurement Manual. (2013). Department Of Management Office Of Central Support Services Procurement Services.

11. Von Branconi , C. H. (2004). Contracting For Major Projects: Eight Business Levers For Top Management. International Journal Of Project Management 22.2, 119-130.

### **2.13 LITERATURE REVIEW FOR INDEX FRAMING:**

Indexes are ordinal measures of variables. It can rank order the units of analysis. Index is a measurement based on more than one data item and hence is a composite measure of variables. Globally accepted Indexing approach is studied from UNDP 1990 , UNDP 2010.

“The Human Development Index (HDI) measures achievements in three aspects of human development: health, education and living standards. The global HDI, first presented in the 1990 Human Development Report (HDR), measures a country's success in the following human development achievements for its citizens: a long and healthy life (using health data), access to knowledge (using education data) and a decent standard of living (using income per capita). The HDI was introduced as an alternative to conventional measures of economic development such as income per capita and the rate of economic growth. HDI offers a powerful alternative to conventional measures for measuring well-being and socio-economic progress.

In structure, the HDI is a summary composite index. The breakthrough for the HDI was the creation of a single statistic which was to serve as a frame of reference for both social and economic development. The HDI sets a minimum and a maximum value for each dimension and then shows where each country stands in relation to these values, expressed as a number between 0 and 1. 1 The higher a country's HDI score, the higher its level of human development (and vice versa). The HDI indicators and functional form have evolved over time, most recently in 2010.

Since 1990 the HDI has had three dimensions: a long and healthy life, knowledge, and a decent standard of living.

Step 1: The first step of calculating the HDI is to create three separate indices for each of the three dimensions. These dimension indices (one for long and healthy life, one for knowledge and one for decent standard of living) are then used to calculate the global HDI. In each of the three dimension indices, a country's achievements are normalized to a score between 0 and 1 using the minimum and maximum values outlined below.

Step 2: These three indices are then aggregated to create the global HDI. To do this, the three dimension indices are multiplied together and their cube root is taken. This produces the geometric mean of dimension indices.” (UNDP, Human Development Report, 1990) (UNDP, Human Development Report, 2010)

Arithmetic mean is based on each and every item of the series, extreme or abnormal (very small and very large) items of the series unduly affect its value. But Geometric mean is based on all items of a series and has sampling stability. (Kar, DDCE Utkal university paper ‘Sociology-7’).

A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. Geometric mean is really a log-transformation of data to enable meaningful statistical evaluations. (Costa, Buzzards Bay National Estuary Program).

### **References:**

1. Costa, J. Calculating Geomtric Means, Buzzards Bay National Estuary Program. Retrieved from <http://www.buzzardsbay.org/geomean.htm>
2. Kar, P. Paper 'Sociology-7, Research Methodology, pp 21,25'. Retrieved from [http://ddceutkal.ac.in/Syllabus/MA\\_SOCIOLOGY/Paper-7.pdf](http://ddceutkal.ac.in/Syllabus/MA_SOCIOLOGY/Paper-7.pdf)
3. UNDP. (1990). Human Development Report. Oxford University Press.

4. UNDP. (2010). Human Development Report. Oxford University Press.