Chapter 2

Literature Review

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2.1 Background

This research Study is about how to ensure sustained business success of EPC Project organizations working in Indian thermal power sector, by managing risks encountered by them. Chapter 1, gave the three major constructs of the research Study – risks, business success and risk management in the context of EPC organizations working in Indian thermal power sector.

Literature review was intended to address all the aspects that are connected or have influence on these three constructs. Review was conducted under the following major heads (Ref Table 2.1.1 below):

Table 2.1.1: Major Heads for Literature Review

1. Overview of Indian Thermal Power Sector	8. Financial Management
2. Key Features & Characteristics of EPC Projects/Contracts	9. Business Continuity
3. Project Financing	10. Stakeholder Satisfaction
4. Risks - Project Risks, Enterprise Risks	11. Entrepreneurial Leadership
5. Project Success, Business Success	12. Sustainability
6. Risk Management - Project Risk Management, Enterprise Risk Management	13. Communication
7. Project Management	

During planning, designing and conducting the Study, the overarching influence of risks on the business success was recognised and accordingly, the Study has been carried out through the lens of risk management.

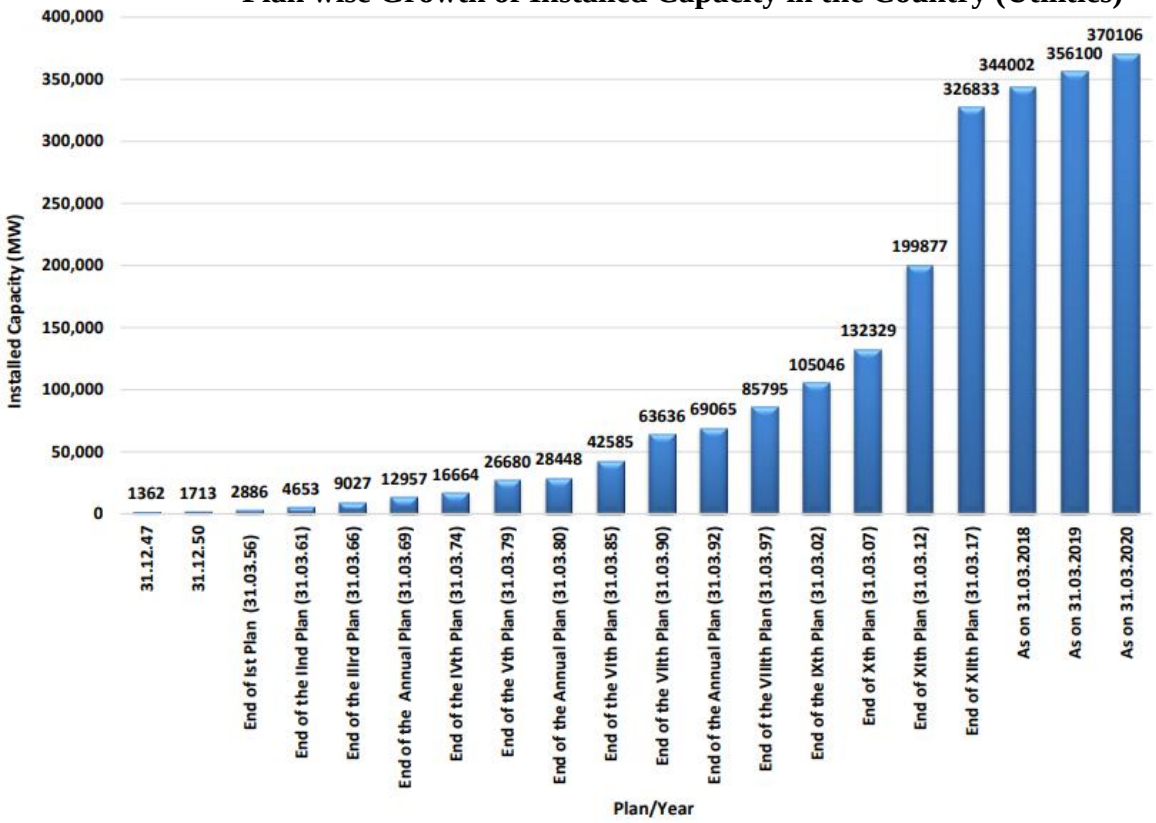
2.2 Literature Review

2.2.1 Overview of Indian Thermal Power Sector

Review of Ministry of Power, Government of India Reports:

Installed capacity of the power plants since 1947 to 2020 is in Graph 2.2.1.1 given below:

Graph 2.2.1.1
Plan wise Growth of Installed Capacity in the Country (Utilities)



(Source: CEA, Ministry of Power Report October 2020: Growth of Electricity Sector in India from 1947- 2020 on - Chart 1, Page 2)

Looking at the data in Graph 2.2.2.1 above, period between 1947 and 2020 can broadly be divided into four (4) parts – (1) in 27 years (1947-1974), installed capacity grew from 1,362 MW to 16,664 MW (CAGR: 9.72 %), (2) in next 28 years (1974 – 2002) capacity grew from 16,664 MW to 1,05,046 MW (CAGR: 6.79 %), (3) in next 15 years (2002 – 2017), installed capacity grew from 1,05,046 MW to 3,26,833 MW) (CAGR: 7.86 %) and (4) in the last 3 years (2017 – 2020) the capacity grew from 3,26,833 MW to 3,70,106 MW (CAGR: 4.22 %). Being the lowest.

Following Table 2.2.1.1 gives Plan wise growth of Installed Capacity in India – Mode wise contribution of various sources of energy in the installed capacity of 3,70,106 MW:

Table 2.2.1.1

Plan wise Growth of Installed Capacity in India - Mode wise

(Utilities)

(MW)

Sl. No.	As on	Thermal				Hydro	Nuclear	RES	Total
		Coal/Lignite	Gas	Diesel	Total				
1	31.12.47	756	0	98	854	508	0	0	1362
2	31.12.50	1004	0	149	1153	560	0	0	1713
3	31.03.56 (End of 1st Plan)	1597	0	228	1825	1061	0	0	2886
4	31.03.61 (End of 2nd Plan)	2436	0	300	2736	1917	0	0	4653
5	31.03.66 (End of 3rd Plan)	4417	134	352	4903	4124	0	0	9027
6	31.03.69 (End of 3 Annual Plans)	6640	134	276	7050	5907	0	0	12957
7	31.03.74 (End of 4th Plan)	8652	165	241	9058	6966	640	0	16664
8	31.03.79 (End of 5th Plan)	14875	168	164	15207	10833	640	0	26680
9	31.03.80 (End of Annual Plan)	15991	268	165	16424	11384	640	0	28448
10	31.03.85 (End of 6th Plan)	26311	542	177	27030	14460	1095	0	42585
11	31.03.90 (End of 7th Plan)	41237	2343	165	43745	18308	1565	18	63636
12	31.03.92 (End of 2 Annual Plans)	44791	3095	168	48054	19194	1785	32	69065
13	31.03.97 (End of 8th Plan)	54154	6562	294	61010	21658	2225	902	85795
14	31.03.02 (End of 9th Plan)	62131	11163	1135	74429	26269	2720	1628	105046
15	31.03.07 (End of 10th Plan)	71121	13692	1202	86015	34654	3900	7760	132329
16	31.03.12 (End of 11th Plan)	112022	18381	1200	131603	38990	4780	24504	199877
17	31.03.17 (End of 12th Plan)	192163	25329	838	218330	44478	6780	57244	326833
18	31.03.2018	197172	24897	838	222907	45293	6780	69022	344002
19	31.03.2019	200705	24937	638	226279	45399	6780	77642	356100
20	31.03.2020	205135	24955	510	230600	45699	6780	87028	370106

RES:-Renewable Energy Sources includes Hydro capacity of 25.00 MW and below as reported by MNRE.

(Source: CEA, Ministry of Power Report October 2020: Growth of Electricity Sector in India from 1947- 2020 on – Table 2, Page 8)

A few important observations from the Table 2.2.2.1 are given below:

- Of the total installed capacity of 1,362 MW in 1947, thermal and hydro power constituted 854 MW (62.70%) and 508 MW (37.30%) respectively. Till

31.03.1969 (end of 3rd Annual Plan), only these two modes of power generation existed.

- During the 4th Plan, nuclear power made foray into Indian power generation scene and as on 31.03.1974 (end of 4th Plan), it stood at 640 MW.
- Renewable power commenced during 7th Plan and as on 31.03.1990 (end of 7th Plan), it stood at a miniscule capacity of 18 MW.
- From 1974, thermal and hydro power addition picked up. While thermal went up from 9,058 MW as on 31.03.1974 to 2,30,600 MW as on 31.03.2020, hydro went up from 6,966 MW to 45,699 MW during the same period.
- Nuclear and renewables stand at 6,780 MW and 87,028 MW respectively (as on 31.03.2020).
- It may be seen that renewables have already become a force to reckon with its growth post 2012, has been spectacular.

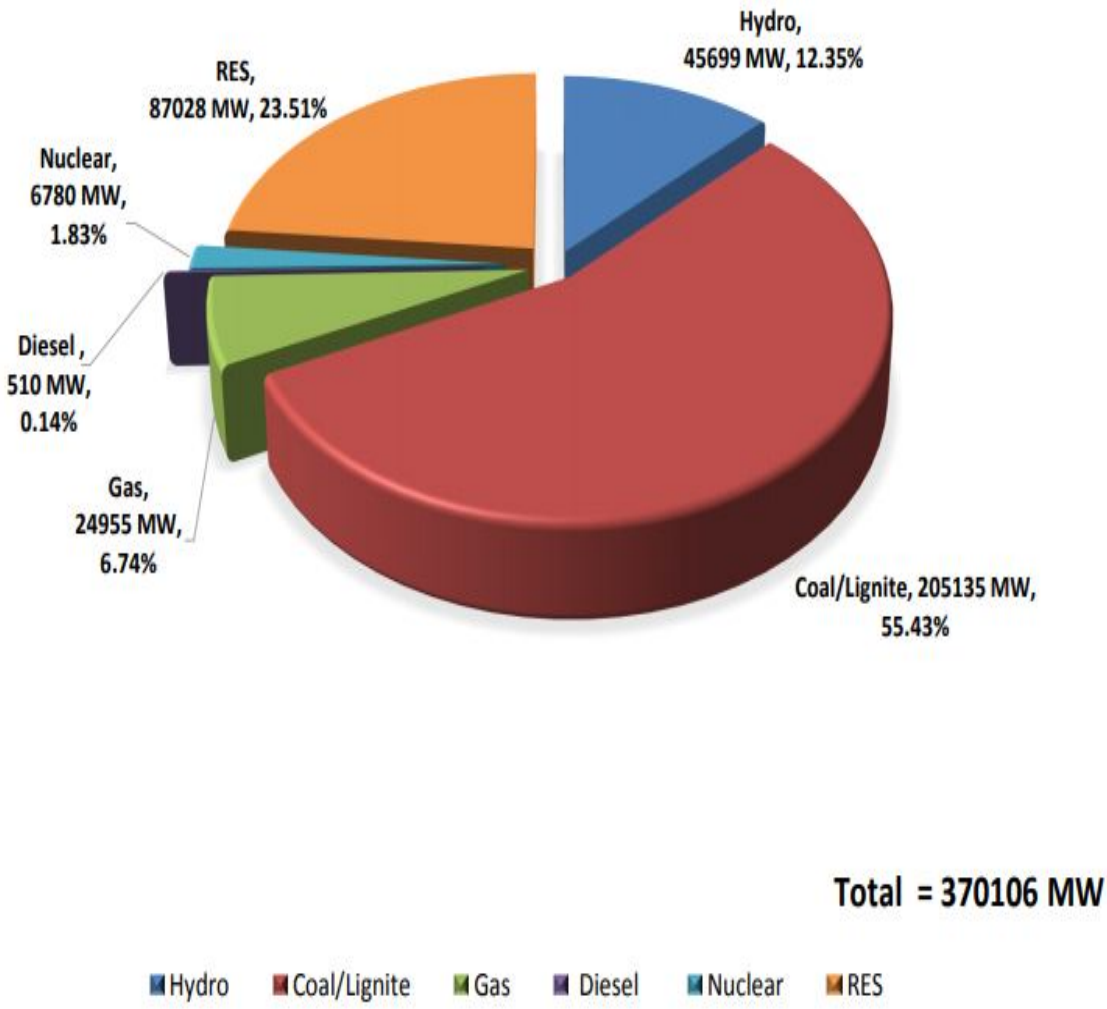
From the above, it is seen that during the period 2017-18 to 2019-20, thermal power has increased from 2,18,330 MW to 2.30,600 MW while the total installed capacity has increased from 3,26,883 MW to 3,70,106 MW. In percentage term, share of thermal power has reduced from 66.80% to 62.31%. During the same period, renewable power has increased from 57,244 MW to 87, 028 MW. In percentage term, renewable power's share has increased from 17.51% to 23.51%. Contributions from hydro and nuclear have reduced from 13.61% to 12.35% and 2.1% to 1.83% respectively. Thus, it is seen that renewables are slowly replacing thermal power.

Thermal power contribution to total installed capacity as on 31.03.2020 is 62.31%. Within thermal power segment, diesel is having a negligible presence (510 MW). Due to gas unavailability, gas-based power plant stands almost static at around 25,000 MW since 2017. Coal/lignite contribution (2.05.135 MW) to total thermal power (2,30,600 MW) is around 89%. Thus, thermal power practically refers to coal-based power plants.

The following pie-chart (Figure 2.2.1.1) depicts the contribution of all modes of power generation towards total installed capacity:

Figure 2.2.1.1

Contribution of all modes of Power Generation towards Total All India Installed Capacity (Utilities) As on 31.03.2020



(Source: CEA, Ministry of Power Report October 2020: Growth of Electricity Sector in India from 1947- 2020 on – Pie Chart 9, Page 18)

After having discussed the installed capacity of all the modes of generation, now, let us have a look into the total power generation scenario over the years and how the different modes of generation have contributed to it (ref. Table 2.2.1.2) below:

Table 2.2.1.2

Plan wise Growth of Gross Electricity Generation in India- Mode wise (Utilities)

(GWh)

SL. No	During financial year ending with	Thermal				Hydro	Nuclear	RES	Total
		Coal/ Lignite	Gas	Diesel	Total				
1	1947	1733	0	144	1877	2195	0	0	4073
2	1950	2587	0	200	2787	2519	0	0	5106
3	1955-56 (End of the 1st Plan)	5367	0	233	5600	4295	0	0	9662
4	1960-61 (End of the 2nd Plan)	9100	0	368	9468	7837	0	0	16937
5	1965-66(End of the 3rd Plan)	17765	69	324	18158	15225	0	0	32990
6	1968-69(End of the 3 Annual Plans)	26711	124	194	27029	20723	0	0	47434
7	1973-74(End of the 4th Plan)	34853	343	125	35321	28972	2396	0	66689
8	1978-79(End of the 5th Plan)	52024	515	55	52594	47159	2770	0	102523
9	1979-80(End of the Annual Plan)	55720	500	53	56273	45478	2876	0	104627
10	1984-85 (End of the 6th Plan)	96957	1834	45	98836	53948	4075	0	156859
11	1989-90 (End of the 7th Plan)	172643	5962	85	178690	62116	4625	6	245438
12	1991-92(End of the 2 Annual Plans)	197163	11450	95	208708	72757	5525	38	287029
13	1996-97(End of the 8th Plan)	289378	26985	679	317042	68901	9071	876	395889
14	2001-02(End of the 9th Plan)	370884	47099	4317	422300	73579	19475	2085	517439
15	2006-07(End of the 10th Plan)	461794	64157	2539	528490	113502	18802	9860	670654
16	2011-12(End of the 11th Plan)	612497	93281	2649	708427	130511	32287	51226	922451
17	2016-17(End of the 12th Plan)	944022	49094	401	993516	122378	37916	81548	1235358
18	2017-18	986591	50208	348	1037146	126123	38346	101839	1303455
19	2018-19	1022265	49834	215	1072314	134894	37813	126759	1371779
20	2019-20	994197	48443	199 *	1042838	155769	46472	138337	1383417

Note: * Provisional

1. RES Generation upto 2013-2014 as per normative generation.
2. RES Generation during 2014-2015 is as per actual generation received from utilities.

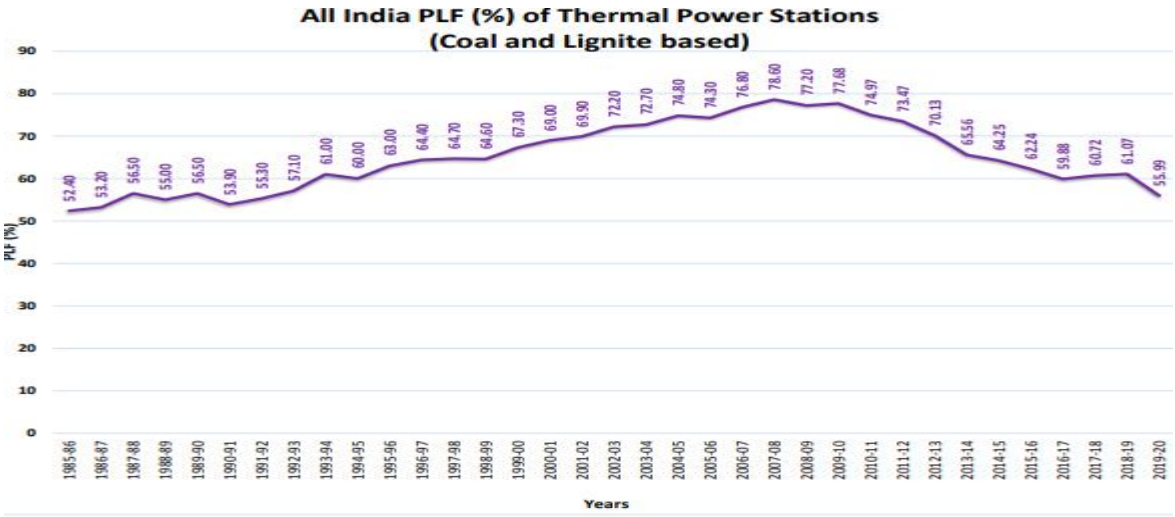
(Source: CEA, Ministry of Power Report October 2020: Growth of Electricity Sector in India from 1947- 2020 on – Table 3, Page 20)

It is observed, during the period 2017-18 to 2019-20, contribution of thermal power in total generation has reduced from 80.4% to 75.4% while contribution of renewables has increased from 5.6% to about 10%. During the same period, contributions from hydro has increased from 9.9% to 11.3% and nuclear has remained around 3%.

Thus, from the points of view of both the total installed capacity (MW) as well as electricity generation (GWh), it is apparent that renewable power is slowly replacing thermal power.

Let us now examine the All-India Plant Load Factors of the Coal/ lignite plants over the years (ref. Figure 2.2.1.2) below:

Figure 2.2.1.2



(Source: CEA, Ministry of Power Report October 2020: Growth of Electricity Sector in India from 1947- 2020 on – Chart 13, Page 26)

The above graph clearly indicates that PLF has been declining quite drastically since 2009-10 and in 2019-20, it stands at 55.99%. It indicates that the use of coal/lignite power is reducing. As per Power Sector at a Glance All India (updated on 15.11.2021) of Ministry of Power, Government of India the following is the power position as on 30.09.2021 (ref. Table 2.2.1.3) below:

Table 2.2.1.3: Fuel wise Power Position As on 30.09.2021

Fuel	MW	% of Total
Total Thermal	2,34,024	60.2%
Coal	2,01,995	51.9%
Lignite	6,620	1.7%
Gas	24,900	6.4%
Diesel	510	0.1%
Hydro (Renewable)	46,512	12.0%
Nuclear	6,780	1.8%
RES* (MNRE)	1,03,055	26.4%
Total	**3,86,888**	100%

* Installed capacity in respect of RES (MNRE) as on 30.09.2021.

The above table shows, % installed capacity of renewable has further gone up from 23.51% (as on 31.03.2020) to 26.4% (as on 30.09.2021). At the same period, thermal power contribution has reduced from 62.31% to 60.2%.

CEA, Ministry of Power Report on Optimal Generation Capacity Mix for 2029-30 projected the following generation mix (ref. Table 2.2.1.4):

Table 2.2.1.4: Projected Optimal Generation Capacity Mix for 2029-30

Fuel	MW	% of Total
Total Thermal		
Coal + Lignite	2,66,911	32.66%
Gas	25,080	3.07%
Nuclear	18,980	2.32%
Solar	2,80,155	34.28%
Wind	1,40,000	17.13%
Biomass	10,000	1.22%
Hydro *	60,987	7.46%
PSP	10,151	1.24%
Small Hydro	5,000	0.61%
Total	**8,17,254**	
Battery Energy Storage #	27,000 MW/108,000 MWh	

* Including hydro imports of 5,856 MW # Active Battery Storage

The above table shows that while there is a plan of total addition of 5,30,366 MW in the power sector in about 9 years, only 56,486 MW is expected in (Coal + Lignite) plants which is around 10% of total addition. On the other hand, solar and wind power will add 4,20,155 MW and will account for more than 51% of the projected installed capacity from 25.2% at present. (Coal + lignite + gas) will account for less than 36% from the present installed capacity of more than 60%.

Therefore, it is evident that thermal power will continue to decline with respect to other modes of power generation. In view of the above, EPC organizations, designers, manufacturers, suppliers, contractors etc. working in this sector will continue to face greater challenges.

Future of Thermal Power in India

The preceding section has given an overall idea of how the influence of thermal power is declining while renewable power is on the rise. Power demand depends on various factors like economic growth, plant load factor (PLF), cost of generation, energy efficiency, residential connectivity, T&D losses, rural electrification, penetration of

renewable power etc. Various studies have been conducted by Central Electricity Authority (CEA) - Ministry of Power (MOP), The Energy and Resource Institute (TERI), NITI Ayog and various Management Consulting groups. Climate Change is one issue that is having far reaching consequences on addition of fossil fuel (coal, gas, oil etc.) fired power plants. In line with India's commitment to The Paris Agreement 2016, Indian government embarked on a very ambitious plan of 175 GW addition of renewable power by 2021-22 from 57 MW (as on 31.03.2017).

A study by TERI, "Transition in Indian Electricity Sector 2017-2030" estimated electricity demand to increase from 1115 BU in 2015-16 to 1692 BU in 2022, 2509 BU in 2027 BU and 3175 BU in 2030. The report considers two cases – (a) high and (b) low-capacity addition of renewables. "High" case considers increase of renewable power to 175 GW in 2021-22, 275 GW in 2025-26 and 853 GW in 2029-30. "Low Renewable scenario" considers 125 GW in 2021-22, 225 GW in 2026-27 and 284 GW in 2029-30. In both the case, Plant Load Factor (PLF)/Capacity Utilization Factor (CFU) of nuclear, hydro and solar plants have been considered as 75%, 35% and 19 % respectively. Generation and installed capacity of Coal in "High" and "Low" renewable scenario are estimated to be 1763 BU/218 GW and 2354 BU/474 GW respectively. As on January 31, 2020, installed capacity of Coal power plant has been 205 GW. So, it may be seen in "High" renewable scenario, there is hardly any need of addition in coal plants. As per NEP 2018, this may be met through around 50 GW of coal capacity currently under different stages of construction. Since the capacity under various stages of construction is much higher than the requirement till 2022, there will be hardly any new demand for thermal power. During the period 2022-2027, CEA anticipates requirement of 46.420 GW of coal-based capacity (NEP 2018) expected to be primarily met by the existing and under construction projects. Thus, addition of new plants seems doubtful. Yadav (2019) of CEA in presentation titled, "Updates and Future of Indian Power Sector" stated that with 56.4 GW of coal-based capacity expected between 2017-22 along with the committed capacity of 38,040 MW from Hydro, Nuclear and Gas, there may not be any further requirement of additional capacity during 2017-22. The Plant Load Factor (PLF) of the coal plants may vary between 50% to 60%. Shah et al. (2019) in their article, "Continued Decline in Indian Thermal Capacity Addition" observed that from the highs of 20 GW of new coal-fired power plants commissioned every year between FY13 to FY16, net capacity additions in FY 17, FY 18 and FY 19

have been 7 GW, 5 GW and 1.2 GW respectively. This decline is the result of a fundamental change in electricity market dynamics driven by competition from cheaper renewable energy sources.

Bandyopadhyay et al. (2017) stated that 175 GW renewable energy targeted by government by 2021-22 amounts to 21% of the total energy required in 2021-22. PLF of thermal power plants, as a result, may further fall to around 48-50%. Capacity addition outpaced the rate of growth of demand in 12th Plan (2012-2017) and there has been excess capacity additions in thermal sector. Around 50 GW is around various stages of construction that will come in by 2022 and capacity may remain under-utilized significantly. New coal capacity addition envisaged during 2017-22 and 2022-27 to be nil. Only silver lining is the replacement of old inefficient plants. Thus, overall, very little fresh ordering in coal power is expected during this time frame.
At present, indigenous manufacturing capacity for super-critical equipment consists of 22.7 GW/year Boiler and 24.5 GW/year Steam Turbine-Generator. This gross over-capacity with respect to demand, has started taking its toll on the manufacturers who had invested very heavily for their facilities. All have reported lack of enough orders. Going forward, the situation is likely to worsen further. Moreover, installation of FGD and SCR system has now been made mandatory by the Central Pollution Control Board for controlling SOx and NOx emissions, is increasing the plant cost by about Rs. 0.5 Crore/MW. Additional space and water are also required for installation and operation of these equipment. Many customers have not installed such equipment because of increase in cost of generation.

India-UK Energy for Growth Partnership, New Delhi (6^{th} – 7^{th} April 2017)– Utilities of the Future: Background Paper (CII, 2017) also speaks about high induction of Renewables leading to lower generation through fossil fuel. NITI Aayog Government of India (2015) Report on India's Renewable Electricity Roadmap 2030: Towards Accelerated Renewable Electricity Deployment recommends that Renewables shall be treated as a resource of national and strategic importance and it shall be mandated as a significant component of the power sector. According to BP Energy Outlook 2019, contribution of coal will reduce from 56 % (in 2017) to 48 % (in 2040). CEA reports that the country has an existing large fleet of coal plants and there is a mismatch between peak demand and output from renewables. This leaves a good role for the coal

plants. Power supply from renewable energy cannot be switched on and off like a fossil-fuel power plant. Then again, the sun only shines during the day time, that too on cloudless days, and the wind doesn't always blow. Thus, renewables cannot supply uninterrupted reliable power on 24x7 basis, especially during times of peak demand.

Jain (2018) in his Article in Bloomberg NEF on 11th December 2018, observed that the coal fleet utilization reduced from 77.5% in fiscal 2010 to 60.6% in 2018, due to faster capacity build up against slower-than-expected growth in power demand. Solar and wind power are already the cheapest form of new power generation sources in India. The long-term outlook for coal power generation looks weak as the challenges facing the coal sector will persist and will intensify, in future. While capacity additions will ease off, the retirements of coal fleet will accelerate. The National Electricity Plan 2018, Central Electricity Authority expects 48 GW of coal-based generation capacity to retire by March 2027. Due to the air pollution concerns, coal projects are not expected to go for life extensions through renovation and modernization. Based on the long-term economic forecasts of India's power system, renewable energy sources (including hydro) can supply 75% of India's total electricity needs by 2050. Solar and wind are expected to supply a third each of the total power demand. The share of coal may likely drop to just 14% in 2050.

Outcome of the Literature Review and Researcher's Observations:

The foregoing discussion paints a very dismal picture of the present as well as the future of Indian thermal power sector and the huge stress on the organizations working in the sector. All organizations – designers, manufacturers, suppliers, EPC contractors are struggling. EPC business, by nature, is intrinsically risky and now it has now become riskier due to the prevailing situation.

It is quite clear that the golden days of coal power is certainly over and renewable power is coming in a big way. In the next 15-20 years, the contribution of renewable power will become more than 50% while coal & lignite will be reduced to around 30-35%.

However, considering that India has huge coal reserves and a large fleet of coal-based plants that cannot be shut down or retired overnight, thermal power sector is expected to exist at least for the next 15-20 years and may be beyond, but obviously at a lower scale. One plus point for Coal power - it is required for grid stabilization. Another important point against renewables – though it is clean, it is intermittent, has a low-capacity utilisation factor (less than 20%) and is not of consisting quality. None of the

core sector industries can run on this since they require quality power continuously on 24x7 basis. Renewable power has to find a matured and economic energy storage technology like battery storage system. Extensive work is going on full swing across the world on this. When the cost of generation of solar power (including energy storage cost) matches or become lower than the coal power, it will compel coal power to stop. Coal will decline very fast after that. Till such time, coal will continue and renewables will take care of intermittent, residential and local needs (off-grid applications). Due to the prevalent conditions, all organizations e. g. manufacturers, suppliers, designers and EPC contractors working in Indian thermal power sector will continue to face enormous challenges. This Study examines the case of Indian EPC organizations working in thermal power sector since the risks are very high in this business compared to others. Financial performance of these EPC organizations for last 6 years (as presented in Chapter 1) indicate a very difficult situation for them.

All the EPC organizations must be going all out to find ways and means to manage the huge challenges for their own survival and growth. Obviously, their analysis or strategies to deal with this situation are not available in the public domain. Thus, there is an urgent **Need** that warrants a research study be undertaken to come out with major strategies on how to manage risks to ensure sustained business success of the EPC organizations working in Indian thermal power sector.

2.2.2 Key Features and Characteristics of EPC Projects/ Contracts

Customers place project orders on the EPC organizations through project contracts. All technical, commercial, financial, statutory terms and conditions are made part of these contracts. Such contracts provide an overview of the key features and characteristics of the EPC projects. A typical EPC contract of NTPC, the premier public Sector Undertaking that owns more than 60,000 MW thermal power plants contains the following major features/ characteristics and contract conditions of EPC projects:

- Very large size and value: Single or multiple units of 660 MW/800 MW/1000 MW comprising full EPC scope or split scope of BTG (Boiler Turbo-Generator) and BOP (Balance of Plant) packages or it could be three separate packages-Boiler, Steam Turbine Generator and BOP. Order values range between Rs. 2-3 K Cr to Rs. 12 K Cr and above depending on the scope of work.
- Long Gestation Period of 4 to 6 years and beyond.
- Single Point responsibility and accountability for end-to-end project execution.

- Mostly, Fixed Price Contract with a fixed completion time.
- Liquidated Damages for delay in project completion date and shortfall in Performance Guarantees (PG) of equipment/system.
- Security from the contractor and its parent in the form of Bank Guarantees (BG) for advance payment, contract performance, warranty (defect liability) period, Deed of Joint Undertaking (confirming the commitment of the foreign collaborator/parent), cash retention, latent defect liability period etc. etc.
- Customers generally take no/limited technological risks.
- Comprehensive and multiple regulatory compliances and approvals.
- Very stringent contractual conditions with practically no recourse for the contractor to claim extra time and/or extra money.
- Management of multiple stakeholders with different expectations.
- Training of Customer's Operation & Maintenance personnel.
- At times, Operation & Maintenance of the power plant for a specified number of years post completion of the project is included in the scope of work.

A closer look into the above contract conditions reveals the enormous risks involved in an EPC Contract. In other words, EPC projects as well as the EPC organizations need to manage themselves in an environment of risks.

Solabannavar et al (2017 discussed various models of contracting. One of the earlier modes of execution was Item Rate Contract where the Bill of Quantity (BOQ) used to be provided by the customer. It works well where the work is standard and repetitive. With the increase in project complexities, design and development of accurate BOQ becomes difficult. Consequently, rate contracts run into time and cost overruns and disputes. There are some other contracting models available like Build, Operate and Transfer (BOT), Build, Own, Operate and Transfer (BOOT), Build, Own, Lease, and Transfer (BOLT) etc. However, in these models, customers have a number of obligations. In order to avoid these, customers have adopted EPC model as an optimum method of contracting and it has been adopted by both the government and private customers. This is, in fact, a risk mitigation strategy of the customers to transfer a huge lot of risks to the EPC contractors. EPC contractors carry out design, procure equipment and materials as per the contract specifications and commission the project within the specified time, cost and quality ensuring the fulfilment of the guarantee parameters. Failure to comply with any of the specified contract requirement attracts huge liability

on the contractor. This model has gained popularity amongst customers since it places a single point responsibility and accountability for the entire work on the contractor. Stringent contractual conditions including fixed time, fixed cost and performance guarantees minimize customer's risks. Sudirman et al. (2018), said that EPC Contract is a form of direct contract between the Employer and the EPC contractor, fully responsible for design, procurement, construction, commissioning, asset transfer on a single point responsibility basis while the responsibility of customers is mainly limited to design review, approval and providing inputs like land, construction power, water, statutory approvals and timely payments.

Outcome of the Literature Review and Researcher's Observations:

The foregoing section provides an overview of the extent of the major contractual risks – financial, technical, commercial, etc. involved in an EPC project. It provided useful inputs to the Researcher.

2.2.3 Project Financing

DLA Piper (Global Law Firm), 2011 Report observes that Engineering, Procurement and Construction (EPC) contracts undertake large scale and complex infrastructure projects. The EPC Contractor is contracted to deliver a complete facility to a developer or the Project Company who need to only turn the key to start operating the facility.

Figure 2.2.3.1 below gives the Typical Structure of a Project Financed Power Projects using EPC Contract is as below:

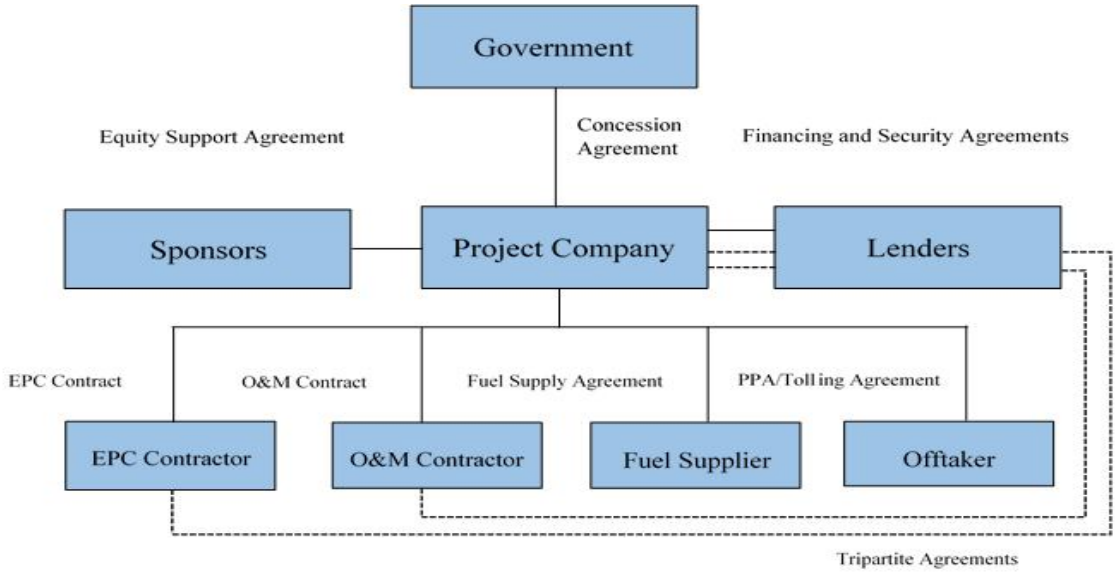


Figure 2.2.3.1: Typical Structure of a Project Financed Power Project

(Source: DLA Piper (Global Law Firm), 2011 Report)

Generally, finance is arranged by the customer. Yet, it is essential for the EPC contractors to understand how a whole lot of risks are passed on to him by the customer based on the lender's requirement. Lenders want that their risks to remain within manageable limit and they will always like to be protected from any threat of default or actual default by the customer in repayment of loan with interest.

The most common form of financing of infrastructure projects is project financing. It means that the financing is based on the strength of the project assets such that the future revenue stream as scheduled to be generated by the project assets would be enough to pay back the debt. Lenders ensures that the contractor has no scope to claim extra time and cost and accordingly EPC contract is framed by the customer. Lenders prefer a fixed price fixed completion date, no technology risk, guaranteed output, efficiency and other performance parameters, liquidated damages for both delay and performance shortfalls, warranty/defect liability period, latent defect period, security from the contractor in the form of bank guarantee, cash retentions, etc. etc.

As depicted in the Figure 2.2.4.1, key players to a project financing are – the sponsors, project company, lenders, EPC contractor, O&M contractor, Fuel suppliers, off-takers and government as the regulator. Vance (2006) pointed out that for project finance, allocation of risk is a fundamental issue for lenders and EPC contract itself is a tool to allocate project risks between sponsors/owners and contractors that include risks related to construction, operation, financial, legal, political etc. Picha (2015) said that excellent contract management with good knowledge of legal aspects are must to become successful in executing EPC projects since huge risks are involved.

Nadar et al. (2013) suggested that the quality of contractor, subcontractors, construction management and consultants are the success factors while qualities of project team, project monitoring methods, etc. are project success enhancing factors. Further, vendor/supplier selection, training of project manager and project team are some of the other enablers for success.

Outcome of Literature Review and Researcher's Observations:

This section explains as how the risks perceived by the lenders in project financing are transferred from the lenders to the customer to the EPC contractor.to the EPC contractor

through the EPC contract. If the lenders are not convinced of the soundness of the proposal, financial closure gets delayed or does not take place. In case, project does not get financially closed after the project has progressed, lenders stop money to the project company. This will lead to stoppage of payment to the EPC contractor leading to litigations hugely affecting the EPC contractor. Thus, EPC contractor must understand the underlying principles of project financing and magnitude of the potential risks. Accordingly, they must have a risk management system and risk mitigation strategies in place to address such risks.

2.2.4 Risks – Project Risks and Enterprise Risks

Project Risks

Project Management Book of Knowledge, 6th edition (2017), defines risk as, an uncertain event or condition, that if it occurs, has a positive or negative effect on a project's objective. In project management, risk refers to the measurement of both the probability and impact of risk. Few experts made distinction between the words risk and uncertainty. According to Rutherford (2002, p.182), uncertainty concerns the unknown. According to Knight (1921), there are two different types of uncertainty. The first has measurable probability which is labelled as "risk." The second is unquantifiable or uncertainty. Thus, while risk can be assigned a probability value, the same is not possible for uncertainty. Saunders (2016), presented the definition of risk as provided in different literature, as below:

- "A risk has a cause, and if it occurs, a consequence" (Larson & Gray, 2011, p.211).
- "Risk means possible unfavourable outcomes" (Chapman & Ward, 2011, p.3)
- "Project risk is often defined as the product of the probability of an event's occurrence and the extent of its impact" (Loch, DeMeyer, & Pich, 2006, p.2)
- "An uncertain event or set of circumstances which, should it occur, will have an effect on achievement of the project's objectives." (Association for Project Management, 1997).

PMBOK, 6th edition (2017) has specified the following risk categories – technical, management, commercial and external. Other project risk categories could be cost, schedule, performance, financial, legal etc.

Some scholars emphasized the negative impact or risk and considered risk as threat (Baloi et al, 2003, Rescher 1983, Rowe, 1977) while some others felt that risks encompass both threat and opportunity (Loosemore 2006; Segal 2011; Ward et al 2003). Some researchers used the terms, risk and uncertainty interchangeably (Del Cano et al 2002; Diekmann et. al. 1988) as it is difficult to demarcate clearly between a knowable and an unknowable belief (Tan 2007). As risk arises from uncertainty (Hillson et al 2007), some of the definitions of risk are linked to uncertainty. Knight (1921) argued that while risk can be approximately calculated, uncertainty cannot be.

Project Risks as per Various Researchers

Project risks as proposed by 24 researchers, mainly from the point of view of the EPC contractors have been collated and the same has been presented in **Appendix 5**. Nurdiana et al. (2020) assessed EPC project risks from the perspectives of the owner. Major risks identified are lack of quality contractor, design delay, land and environmental issues, less competent vendors, inaccurate quantity estimation, cost escalation, contract change order. It is important to note that risks identified from the perspectives of both the contractor as well as the customer are to a large extent the same.

Enterprise Risk

As the name suggests, risks that impacts an organization at its enterprise level, are called Enterprise Risks. Project organizations handle multiple projects simultaneously. Thus, enterprise risks for these organizations are the aggregate of project level risks of all the projects plus other risks that are encountered at the enterprise level or business level. It could be both internal or external, that threaten the financial health of an organization. Dickinson (2001) said that external risks may arise from change in economy, political, legal, technological, demographic and other environments. These are beyond the control of the management. Some other external risk factors could be take-over, pandemic, natural calamities, war etc. Internal risks include compliance issues, debt, lack of trained manpower, low managerial band-width, persistent labour disputes, etc. According to Dickinson (2001), a majority part of the internal risks are operational risks. Risk categories of enterprise risks and project risks are similar. COSO (2012) provides some of the categories like strategic, financial, operational and compliance. Similarly, other risk categories like market, environment, governance

etc. could also be present. Sadeghi et al. (2016) brought a category of "recurring risks" that are inherent in EPC projects.

Overview of the Literature Review and Researcher's Observations:

It is noted that business risks mainly emanate from external issues whereas project risks come from both internal and external issues. However, ultimately, all risks come under the enterprise risk portfolio. While conducting the Study, in order to find out the total risks that a project organisation faces, all project level risks and enterprise level risks have been aggregated to carry out the Study.

2.2.5 Business Success – Project Success and Business/ Enterprise Success

As explained earlier, for a project organization, project success is a part of overall business success or enterprise success and the same is elaborated below:

Project Success:

Project success is determined by realising the project objectives involving the triple constraints of time, cost, and quality. Chan (2001) gave a framework for measuring success of construction projects through objective and subjective Key Performance Indicators. While objective measures include construction speed & time, variation of time and cost, subjective measures include quality, satisfaction of customer etc. According to Huges et al., 2004), success parameters are mainly cost, time and quality. Ofori-Kuragu (2016) et al. (2016) found out the top Key Performance Indicators (KPI) as quality, client satisfaction, cost, time and business performances. Al-Hajj et al. (2018) postulated the major project success criteria as time, budget, quality and user satisfaction. Abdullah et al. (2006) have given the project success criteria as appreciation by the stakeholders, quality, budget and time schedule whereas the success factors are team and leadership, project manager, communication, stakeholder management, planning, scheduling, organization, control and monitoring, financial resources and quality management.

Business/ Enterprise Success:

In simple terms, business success of an enterprise implies meeting the expectations of all stakeholders. When business achieves success every year and year after year, it implies that business is moving towards sustained business success. It is expressed in terms of financial and non-financial indicators. Gadekar et al. (2013,2014) defined business success as the extent to which goals and expectations are met. On the other hand, one of the definitions of failure is the inability of a firm to pay its obligations

when they are due (van Frederikslust, 1978). Business success is manifested through various measures of success like key performance indicators (KPI) or simply business success indicators (BSI). In this Study, the term, BSI have been used to express business success. Perez et al. (2009) found that major dimensions used in the literature to measure success of newly created firms as growth, revenue, profit, liquidity, human capital, market share, etc. Mbugua et al. (1999) consolidated business performance measurement frameworks and various financial and non-financial success indicators. Financial success indicators proposed are return on investment (ROI), shareholder return (Kay, 1993), Return on Capital Employed (ROCE), profit, profitability and earning per share (EPS) (Brown et al, 1994). Non-financial measures focus on product/service quality, customer satisfaction and business processes. Ofori - Kuragu et al. (2016) found out the major KPIs for Ghanaian contractors as quality, client satisfaction, cost, time and business performances. These measures provide management the tools for continuous improvement and encourage a proactive management style (Bititci, 1994).

Besides, various business excellence models have been developed to assess the maturity of the organizations, capabilities and the processes. The more popular ones are European Foundation for Quality Management Model for Business Excellence (the EFQM Excellence Model) and the Baldrige Quality Award's Criteria for Performance Excellence Framework (the BQA Criteria Framework). Both of these models grew out of the Total Quality Management (TQM) initiatives of the 1980s. Both propose a similar measurement Framework based upon leadership and strategy, resources and the processes that apply them, and observation of resource-level outcomes leading to overall firm performance and value. Both are highly respected in their respective geographies: Europe for the EFQM Excellence Model, and the United States for the BQA Criteria Framework performance. Spence (2017) said that Business Excellence = (Talent + Culture + Extreme Customer Focus) x Disciplined Execution, that is elf-explanatory. Balanced Scorecard 4 Perspective Framework (Kaplan et al 1992, 1994) is also being adopted in the industry. Another model developed in 1986 for the US Department of Defence for their Software Projects was Capability Maturity Model (CMM). Later in the year 2006, Software Engineering Institute (SEI) and Carnegie Melon University, USA developed a new model named Capability Maturity Model Integration (CMMI) Version V 2.0. This model helps organizations streamline and

improve processes that decrease risks in software, product and service development. CMMI's five Maturity Levels are:

Initial: Here the processes are viewed as unpredictable, reactive and ad-hoc that increases risk and inefficiency. It may lead to schedule and budget overrun.

Managed: At this stage, projects are planned, performed, measured and controlled, but process is not fully set.

Defined: At this stage, a set of standard operating procedures are laid down and followed.

Quantitatively managed: This stage is more measured and controlled. The organization is working off quantitative data to determine predictable processes that align with stakeholder needs. The business is more data-driven and is ahead of risks.

Optimizing: At this stage, an organization's processes are stable and flexible. An organization will be in constant state of improving and responding to changes and opportunities. The organization's stability allows for more agility and innovation.

Once organizations hit Levels 4 and 5, they are considered high maturity, where they are continuously evolving, adapting and growing to meet the needs of stakeholders and customers. However, as mentioned above this model is mainly used in Software sector.

In the year 1994, Confederation of Indian Industry and EXIM Bank of India jointly promoted the EFQM based Business Excellence Model in India with an objective of enhancing the competitiveness of Indian Industry, to world-class level. It is on the premise that excellent organisations achieve and sustain superior levels of performance that meet or exceed the expectations of all their stakeholders. The fundamental concepts of Excellence are achieving balanced results through vison, mission meeting/exceeding the short-term and long-term needs of the stakeholders, adding value for customers, leading with vision, inspiration and integrity, managing by processes, succeeding through people, nurturing creativity and innovation, building partnerships and taking responsibility for a sustainable future. FICCI Quality System Award is also followed by some industries.

After discussion on business success, let us also consider the concept of sustained business success. Llopis (2015) said that while every organization wants continuous growth of their business, few knows how to sustain it. He suggested 6 pre-requisites for this to happen e. g. right talent, operational efficiency, right customers, sound decision

making, leadership and managing risks. Similarly, Courtenell (2019) said that sustained business success is the preservation of a business growth and profitability over a long period. Labotis (2007) recommended strengthening leadership practices including customer-focused strategies and effectively executing the same.

Outcome of Literature Review and Researcher's Observations:

This section gave a good idea about project success as well as enterprise or business success. It has also given the financial and non-financial business success indicators (BSI) and the various models of excellence followed in the industry. These inputs helped the Researcher to develop Four (4) Business Success Indicators (BSI) – two (2) Short-Term and two (2) Long-Term, during the course of this Study. These BSIs have been used in the Study. While it is obvious that organization must have business success, they cannot afford to have it for only one year. They need to ensure business success every year and year after year i. e. over a long period of time. Based on this understanding, it is considered that when an organization realises business success each year and year after year, it is deemed to have achieved sustained business success.

2.2.6 Risk Management – Project Risk Management (PRM) and Enterprise Risk Management (ERM)

It is evident now that both project risk management and enterprise risk management would be needed for business success.

Project Risk Management (PRM)

As per PMBOK, 6th edition (2017), Project Risk Management includes risk management planning, identification, analysis, response planning, implementation, and monitoring risk on a project. The objectives of this process are to increase the probability of impact of the positive risks and to decrease the probability of the impact of negative risks, for optimise the chances of project success. Zhao et. al. (2015) mentioned that Project Risk Management (PRM) has been practised for a long time in individual business units separately within a company without considering the risk interdependence at the enterprise level. This resulted in duplication of expenditure. PMBOK, 6th edition (2017) suggested five basic alternative risk responses – Escalate to higher up when it is beyond the jurisdiction of the project manager, Avoid, Transfer, Mitigate and Accept.

Enterprise Risk Management (ERM)

While the Project Risk Management (PRM) is essentially done in individual project silos, Enterprise Risk Management (ERM) addresses all risks comprehensively and not on an individual silo basis. For project organizations, ERM system and risk responses are similar to PRM. ERM treats each risk as a part of an enterprise's overall risk portfolio thereby creating an overall integrated risk management approach. The Committee of Sponsoring Organizations of the Treadway Commission (COSO 2004) defined ERM as a process, applicable to all across the enterprise, to identify the potential risks that may affect the organization and also to manage these risks to achieve an organization's objectives. Benefits of effective ERM includes new opportunities, identification and management of organization-wide risks, positive outcomes, optimum resource deployment and enterprise resilience. Malik et al. (2013) noted that ERM is emerging as an important and relatively a new business trend which uses the principles of the traditional risk management approach. According to KPMG (2001), ERM is more structured and a disciplined approach of aligning strategy, processes, people, technology, risk appetite and knowledge for managing the uncertainties the enterprise faces. Casualty Actuarial Society Enterprise Risk Management Committee (2003) defined ERM as the discipline that assesses, monitors and controls risks from all sources to increase organization's short-term and long-term value to its stakeholders. It helps in making better decisions by aligning a company's risk appetite with its strategy and management of multiple cross-enterprise risks.

Bromily et al. (2015) compiled a list of definition of ERM. One of them is given by Dickinson (2001) that says that ERM is a systematic and integrated approach of the management of the total risks a company faces. Bromily et al. (2015) also observed that while many ERM articles have been published, academic research in this is in its infancy and they appeared largely in accounting and finance journals and rarely in management journals. Fraser et al. (2010) observed that there was a distinct lack of information on how to bring all the silos together. Based on a survey of 145 firms, Lundqvist (2015) suggested that ERM should be seen as a combination of traditional risk management and risk governance. The Enterprise Risk Management Framework of Johnson & Johnson identified the basic risk types as strategic, operational, compliance, financial, environmental, social and cybersecurity. The organization says

that ERM enables them to successfully grow the business in alignment with their objectives.

Difference between ERM and Silo-based Project Risk Management (PRM)

PRM is a silo-based approach where each silo manages its own risks and no single group or person oversees the entire risk exposure of the organization. Since mid-1990s (Cumming et al 2001; Liebenberg et al 2003; Spicer 2014), ERM has been slowly recognized as an integrated and powerful approach to manage an enterprise's entire risk portfolio. ERM treats each risk as a part of a company's entire risk portfolio rather than a discrete single risk that distinguishes ERM from PRM. Each Project Manager deals only with the risks of his/her own projects, but do not address risks at the enterprise level. Focusing solely on PRM leads to lack of coordination between the projects and makes it difficult to achieve the strategic objectives across multiple projects. ERM deals risks at enterprise level, focuses on the strategy, operations, reporting and compliance of an organization while PRM addresses risks at the project level and ensures that project objectives like time, cost, quality and safety are met. PRM aims to increase the probability and impact of positive events and decrease the probability and impact of events that can negatively affect project objectives (PMI 2017). PRM is, in fact, an integral part of ERM since project risks are within the entire risk profile of an organization. Both ERM and PRM deal with risks that an organization encounters, but at different levels (Liu et al 2013, 2014). Hence, ERM and PRM do not contradict, rather complement each other as they have different goals. Renuka et al. (2014) in their "A Review on Critical Risk Factors in the Life Cycle of Construction Projects" have consolidated the Critical Risk Factors as presented in various studies. Rezakhani (2011) in his "Fuzzy Risk Analysis Model for Construction Projects", proposed a computational method of risk analysis. Junior et al. (2011) demonstrated a positive impact of effective risk management on Project Success.

Outcome of the Literature Review and Researcher's Observations:

In day-to-day operations, the EPC Organisations encounter many risks. Risk is embedded in any social as well as any business process and is an intrinsic element that arise during and after making any choice or decision. Risk management has emerged, over time, as a critical part of any business operations. Accordingly, this study has been carried out through the lens of risk management both at the project and at the enterprise levels. Effective risk management, therefore, decides the success or failure of both

projects and enterprise. Risks are to be managed at both project level as well as at the enterprise level as PRM and ERM are complementary in nature. While a large number of research studies are available on Project Risk Management (PRM), comparatively, fewer research studies have been done in the area of Enterprise Risk Management (ERM) perhaps ERM concept got developed much later. This aspect has been taken into consideration while framing the survey questionnaire for the Pilot Study to identify the risks that an organization encounter at the enterprise level in addition to those that are faced at project level.

In this Study, based on the inputs obtained through primary sources like Pilot Study and secondary sources like literature review, risk map and case studies, total list of risk factors as seen by an enterprise have been developed during the Study.

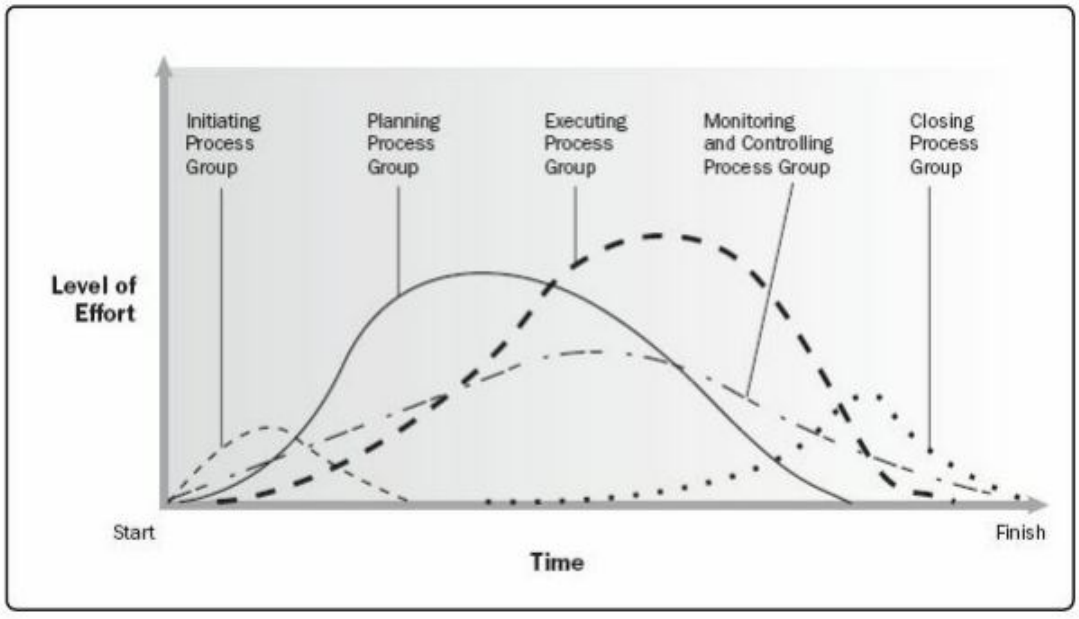
2.2.7 Project Management

As per Project Management Body of Knowledge (PMBOK), 6th edition (2017), a Project is a temporary endeavour undertaken to create a unique product, service, or result. It says that business value in projects refers to the benefits that a specific project provides to its stakeholders like monetary assets, market share, goodwill, brand recognition, public benefit, and reputation. Again, PMBOK, 6th edition (2017) defines Project Management as the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project management enables organizations to execute projects effectively and efficiently. Effective project management helps the organizations to meet business objectives like meeting stakeholder expectations, increase chances of success, carry out risk management, manage constraints (e.g., scope, quality, schedule, costs, resources etc.) and above all, manage changes. Poor and ineffective project management may result in time & cost overruns, poor quality of work/ rework, safety issues, loss of reputation etc. Project management is essentially a set of plans, tools, processes, methodologies and approaches that create value in organizations and help them to manage projects with tighter budgets, shorter timelines, scarcity of resources, and rapidly changing technology. From another viewpoint, it is the umbrella that covers a whole lot of process groups, knowledge areas & expertise that takes care of the project business. While it covers many areas as given below, it is on the whole, both a risk management system and a tool.

Project Life Cycle

As per PMBOK, 6th edition (2017), the series of phases that a project passes through from its start to end is called Project Life Cycle. The phases can be sequential or overlapping. The names, number, and duration of the project phases are determined by the management and the nature of the project. As per Kloppenborg (2015), these phases are selecting & initiating, planning, executing, and closing & realizing. Gray et al. (2005) spoke about four stages - defining, planning, executing and delivering. Phases are time bound, with a start and end or control point (sometimes referred to as a phase review, phase gate, control gate, etc.). PMBOK defined five (5) Project Management Process Groups - initiating, planning, executing, monitoring & controlling and closing. Process groups are not project phases. The figure 2.2.7.1 given below superimposed all the process groups.

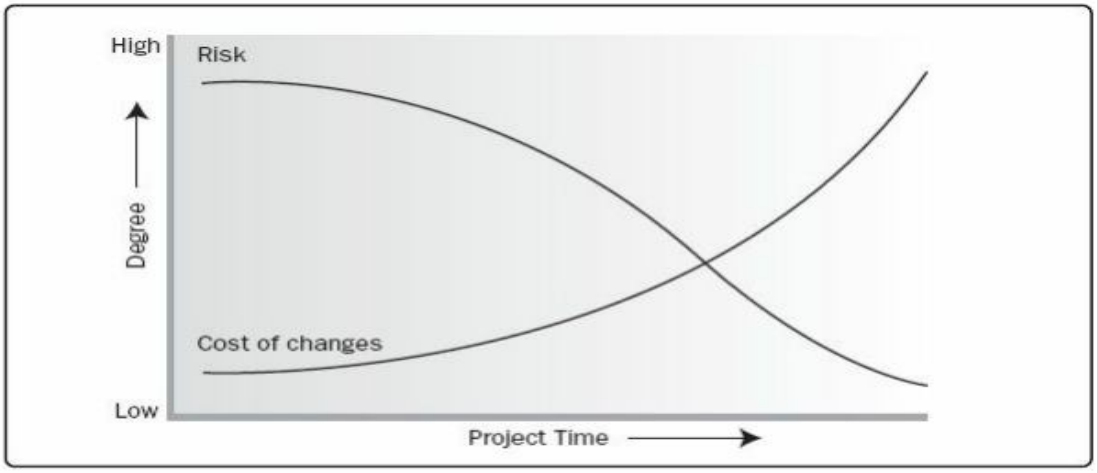
Figure 2.2.7.1: Project Management Process Groups



(Source: Project Management Institute. 2017. A Guide to the Project Management Body of Knowledge (PMBOK® Guide). Newtown Square, PA: Fig 1-5, Page 533)

Figure 2.2.7.2 given below illustrates that the cost of making changes and correcting errors increases as the project approaches completion.

Figure 2.2.7.2: Risks and Cost of Changes with Time



(Source: Project Management Institute. 2017. A Guide to the Project Management Body of Knowledge (PMBOK® Guide). Newtown Square, PA: Fig 1-3, Page 528)

Rilo et. al (2012) enumerated eight levers of project management, the important ones are cost optimization, design, rigorous risk management, procurement excellence, contracting strategy etc. PMI-KPMG Study (2010) based on survey of 100 plus top management personnel over across multiple infrastructure sector organizations found that cost overrun is caused by frequent design changes and increase in materials cost while time overruns occur due to factors such as land acquisition, regulatory approvals, local community, financial arrangements, environmentalists, weak project planning etc. The study recommended entering into fixed price contracts, long term supply agreements, early procurement of critical materials etc. Kerzner et al. (2009) said that global economy and competition are compelling companies to take greater risks. Deloitte's 2020 Engineering and Construction Report said that digital technologies like Internet of Things (IOT), Artificial Intelligence (AI), Virtual Reality (VR) have started impacting Engineering and Construction businesses by bringing in higher efficiency, productivity, safety, speed thereby reducing cost. Stober (2013) observed the emerging trends in Project Management like emphasis on project management soft skills for the Project Managers and their team members and the need for acknowledging social responsibility and planning for sustainability, in projects.

Program Management

Having discussed the concepts related to project management, it is essential to look into another important aspect of project management, known as program management. PMBOK defines it as a group of related projects managed in a coordinated manner to

obtain benefits not available from managing them individually. Program management helps to manage and control strategic, financial and operational risks.

Programs are a collection of similar type of projects that aim to achieve similar objectives. Each of the projects within a program has separate project manager and a project team, but they all aim to achieve same strategic objectives.

In an EPC project organization, multiple projects are executed simultaneously, but all are having similar organizational objectives of achieving success. One critical role of program management is to utilise the interdependence to optimise people, plant and machinery and other resources. It enables the organization to prioritize and fund the program that drive the most value.

While project management is more focused on specific project tasks and schedule, program management is more concerned on strategic planning, continuous improvement and value realization. Program management ensures the projects are better aligned to corporate strategies and resources are optimized across the organization without much conflict that can cause delays or budget issues. In programs, risks are spread across the projects while it is contained in all individual projects. Programs focus on interdependencies between the projects and ensure use of common processes across projects. The close working and interdependence of various teams help in sharing knowledge and best practices. Program management leverages on synergy between the various project teams. One of the program management models followed by an Indian premier EPC organization is by creating a cluster of projects headed by an office of the Cluster Project Director that oversees the execution of the multiple projects and fulfils the strategic objectives of the organization by optimising resources and bringing in better control.

Outcome of the Literature Review and Researcher's Observations:

Project management is an extremely powerful tool to ensure project success as well as business success. It is an umbrella of methods, processes, techniques, skills that help in effective execution of projects. While there are quite a few Project Management Standards developed by various countries including India, Project Management Book of Knowledge (PMBOK) of Project Management Institute, USA is used as a pioneer of project management practices the world over. It is a flexible, dynamic and powerful tool. With 5 process groups, 10 knowledge areas and 47 project processes it covers the entire gamut of Engineering, Procurement and Construction (EPC) aspects of project

management. From another view point, it is also a major risk mitigation tool for the EPC projects.

2.2.8 Financial Management

Financial management includes cost management of EPC projects. In an EPC project organization, multiple projects are executed simultaneously. In view of this, financial aspects are managed at both individual project level and at the enterprise level.

Bausman (2008) developed a list of key financial indicators like profitability (Return on Equity, gross profit and net profit), cash flows, current ratio etc. Purnus et al. (2015) observed that construction sector is vulnerable to economic changes due to the high capital investment, lack of funds, fluctuation of forex rate, political instability and fierce competition. They proposed a cash flow analysis model that involves project planning, project risk, controls and governance, project performance etc. Cash flow analysis model is proposed at project and project portfolio levels. At project level, each project is analysed with respect to its scope, time, resources, cost, contract payments term and risk management plan. At the enterprise level, the aggregation of all projects is done and the portfolio cash-flow is developed with an aim to get a project portfolio cash-flow always positive.

Shelton (2002) said that working capital and current ratio analysis are the measures of liquidity. Kandpal (2015) studied the working capital management policies on profitability, correlation between liquidity, profitability and profit before tax of 10 Indian infrastructure companies (Gammon, GMR, HCC, IVRCL, Jaiprakash Associates, Lanco Infratech, L&T, NCC, Punj Lloyd and Simplex Infrastructure) between 2007 and 2012. He found that efficient working capital management increases firms' free cash flow and growth opportunities.

Outcome of the Literature Review and Researcher's Observations:

While financial management deals with the financial performance of the project as well business or enterprise, it is also a risk mitigation tool used in projects.

At the beginning of execution of any project, all data like total order value with break-ups, planned month-wise project progress, invoicing, project direct costs (materials, salaries, services etc.), indirect costs (rent/leases, other overheads, allocations etc.),

cash inflows/ outflows, requirement of resources (manpower, plant & machinery etc.) requirement over the entire duration of the project are uploaded by the individual project teams on the centralised ERP system (like SAP version 7.6). Corporate allocations are provided by the corporate (enterprise) finance department. Data are updated on a real time basis by the project teams. The data is aggregated and various reports/financial statements are taken out from the system., All actual data are monitored and compared against the planned data. Deviations are analysed to understand the underlying reasons and action plans are prepared and implemented to bring the project back on track. Outstanding payment (both from customers and also to the vendors/suppliers) with ageing, working capital position, requirement of borrowing, forward cover, investments, insurance etc. are decided at the enterprise level. It is apparent that financial management apart from doing financial management, works as a risk mitigation tool as well.

2.2.9 Business Continuity

Business continuity relates to the advance planning and preparation to enable an organization to operate its critical business functions even during emergency events e.g. natural disasters, business crisis, pandemic (COVID 19) etc. that results in disruption of the business operation.

ISO 22301:2019 is an international standard for Business Continuity Management Systems (BCMS). In a world where cyberattacks, data breaches and natural disasters can interrupt business continuity and damage reputation, organisations need to plan, implement, maintain and keep refining their business continuity management system. ISO 22301:2019 helps organisations identify and prioritise threats, implement the business continuity management system to make them ready to respond to and recover from incidents with the least disruption to business. A proactive, adaptive, robust and resilient organisation knows where lie its vulnerabilities and have plans in place to mitigate risk and bounce back from its disruptions. It aims to protect, reduce the likelihood of occurrence, prepare, respond and recover from disruptive incidents as and when they arise. Some of the major business continuity risks include – cyberattacks, communication outages, interruptions to utility supply, pandemics and epidemics, natural disasters, terrorism, security incidents, destruction of physical property or material loss. Goh (2015) defined Business Continuity Management as a holistic

management process that identifies potential threats to an organization and the potential impacts to business operations, and provides a framework for building organizational resilience with an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities. According to him, phases of BCM implementation are - project management, risk analysis and review, business impact analysis, business continuity strategy, plan development, testing and exercising and program management. Punla et al. (2017) defined business continuity as the process of creating systems of prevention and recovery to deal with potential threats to a company. Business continuity plan helps organizations to withstand difficult times with minimum impact to their operations without incurring too much loss. Kliem et al. (2016) said that a company should have the ability to respond and bounce back from the impact of events quickly. Business continuity helps organizations to become resilient. According to Long (2017), business continuity includes - how and what to communicate with the customers, vendors and others, how to ensure services or products can still be provided to the customers, how much time will be required to restore business processes, how to support employees during such events etc. According to IBM Services (2019), it is important to have a business continuity plan in place to identify and address resiliency amongst business processes, applications and IT infrastructure.

Outcome of the Literature Review and Researcher's Observations:

In the context of COVID 19 pandemic and other mega natural disasters, it has become extremely crucial for the organizations to implement business continuity management system to become resilient and take appropriate measures to bounce back with minimum disruptions to the business. Business continuity or business resilience has become a dimension of business sustainability concept. Thus, organizations while developing their strategies must keep this critical requirement in view. As given above, it involves a great deal of risk analysis, review and strategy development for business continuity.

2.2.10 Stakeholders' Satisfaction

As per PMBOK (6th edition 2017), Project Stakeholder Management processes identify the people, groups, or organizations that could impact or be impacted by the project, to analyse stakeholder expectations and effectively engaging them in project decisions and execution. Stakeholder management also focuses on continuous communication with them to understand their needs and expectations, managing conflicting interests.

Stakeholder satisfaction is a key project objective. Carson (2002) found that organizations with high customer satisfaction, in terms of American Customer Satisfaction Index (ACSI), consistently outperform the S&P 500. Satisfied customers are more likely to remain loyal and make future purchases. Naseem et. al. (2011) observed that employee satisfaction plays a significant role in defining organizational success. Satisfied employees generate customer satisfaction through excellence in performance. It leads to organizational success resulting in improved financial success. It is not feasible to sustain customer loyalty without employee loyalty. Moreover, sustaining the satisfaction level of customers is a continuous process whose basics are intrinsically linked with the employee satisfaction.

Fonseca et. al. (2016) studied the relationship between stakeholder satisfaction and organizational sustainable growth and success. Stakeholder theory (Freeman 1984) supports the business case for the satisfaction of the organization. This study found that Shareholders' satisfaction, employee satisfaction and quality of suppliers and partners relationships have highest correlations with revenue increase and profitability. Quality of suppliers and partners, employees and customer satisfaction are also relevant. New customers seem to be best attracted by satisfied employees, shareholders and best run suppliers and partners. Overall, the importance of shareholders, partners, suppliers, employees and customers' satisfaction are important for organisational sustainable success.

Outcome of Literature Review and Researcher's Observations:

This section made it clear that meeting the expectations of all stakeholders is one of the most fundamental objectives of any organization for its business success. Again, in a way, this is risk management.

2.2.11 Entrepreneurial Leadership

Esmer et al (2016) said that entrepreneurial leadership is a combination of leadership and entrepreneurship. Entrepreneurial leader is a leader who has the ability of taking risks, is innovative, productive and strategic. In today's dynamic competitive business environment, entrepreneurial leadership is essential for survival and growth of any company. Abd-Hamid et. al. (2015) explored the factors that are required for construction entrepreneurs to succeed and survive. Entrepreneurship has been considered as an important factor in realizing business success (Kraus, 2013). Zain et al. (2007) conducted an empirical survey to examine the relationship between corporate

entrepreneurship and company performance of 55 Malaysian construction enterprises. Regression model revealed significant influence of corporate entrepreneurship on company survival and growth. Fatoki (2018) investigated the relationship between entrepreneurial resilience and the success of the SMEs in South Africa through survey of data from 170 small business owners. Statistical analysis shown that there is a significant positive relationship between entrepreneurial resilience and organizational success. Karmakar et al (2014) said that unlike the conventional belief that entrepreneurs are born, the entrepreneurial qualities can be acquired from friends, families, society, education and experience. An entrepreneurial leader significantly contributes to the growth of the organization through his leadership, innovation, management, competitiveness, job creation, productivity and creation of new industry. Sandybayev (2019) conducted a study to understand the effect of entrepreneurial leadership on organizational performance in the United Arab Emirates by examining 87 small and medium enterprises. The study established that there was a significant positive relationship between entrepreneurial leadership and organizational performance. Rahim et al. (2015) examined the relationship of entrepreneurial leadership and organizational performance with 391 respondents participated in the study. The result showed that entrepreneurial leadership has positive effect towards organizational performance.

Outcome of the Literature Review and Researcher's Observations:

This section shows that there is a positive correlation between entrepreneurial leadership and growth of an organization. Entrepreneurial leaders are innovative, has appetite to take calculated risk and can make foray into uncharted territory. More often than not, they succeed. Even in the event of any failure, they have the resilience to bounce back. Entrepreneurial leadership is, thus, also a Risk Management Strategy that works towards business success.

2.2.12 Sustainability

Fauzi et. al. (2010) stated that corporate performance is normally expressed through financial parameters such as profit, Return on Asset (ROA) and Economic Value Added (EVA), referred to as "bottom line". Venkatraman et al. (1986) divided corporate performance into operational and financial performances. Operational performance includes market share, product quality, and marketing effectiveness. Financial performance is further divided into two subcategories - market-based performance

(e.g., stock price, dividend pay-out and earnings per share) and accounting-based performance (e.g., Return on Asset, Return on Equity). Kaplan et al. (1992) presented a new concept, Balance Scorecard to measure the extended corporate performance where the core idea is to balance the financial and non-financial aspects in corporate performance. Extended Corporate performance is labelled as Triple Bottom Line which includes three 3 P's – Profit (financial), People (social) and Planet (environment). Since the time concept of "Triple Bottom Line" was coined by Elkington (1994), the trends of companies focusing on the interest of different stakeholders have been increasing. Grieg-Gran (2002) discussed whether good environmental and social performance can positively impact company's financial performance. He said, since the companies with good environmental and social performance are perceived to be less risky by financial markets, the cost of capital may get reduced. As the company earns market reputation, financial markets also recognize and reward sustainability in performance. The companies also get socially more respected. Silvius et al. (2016) developed ten (10) dimensions of sustainability and six (6) project success criteria. A conceptual mapping of the direct relationships between these two was done. It showed that the most positive relationships are expected for the relationship between sustainability and the success criteria (a) stakeholders of the project are satisfied, (b) project is preparing the organization for the future and (c) project has been executed in a controlled manner. Positive relationships are also expected between sustainability and the success criteria (d) project deliverables are 'fit for purpose' and (e) business objectives or goals of the project are realized. The expected relationship between sustainability and (f) completing the project on schedule and within budget is uncertain which needs further investigation.

Outcome of Literature Review and Researcher's Observations:

Literature survey has recommended that all organizations shall ensure successful accomplishments of Triple Bottom Line, for its sustainability. This Input has been considered as a Business Success Indicator (BSI) in the Study. During the discussion of Project management Success and Project Success, it was explained that for project to be become truly successful, there has to be a mechanism to integrate sustainability or long-term thinking, especially from the point of view of long-term customer satisfaction, benefit realization into project management of every project.

2.2.13 Communication

Project communication is a fundamental requirement for a project. Project Managers spend most of their time communicating with team members and other project stakeholders – both internal and external to the organization. Different stakeholders have different needs and accordingly they will require different information about the project.

As per PMBOK (6th edition, 2017), Project Communications Management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, management, control and the disposition of project information. Effective communication creates a bridge between diverse stakeholders who may have different cultural and organizational backgrounds, different expertise, perspectives and interests in the project which have influence on the project execution. Pal et al (2011) said that in order to have effective communication, it should have clarity, completeness, conciseness, correctness and courtesy. It should also avoid gender bias and emphasise positive pleasant facts. The phenomenal growth of email has made itself an important vehicle of business communication. Luthra et al. (2015) found that to become an effective leader, he/she must be an excellent communicator and should be able to motivate the team members. It will help to build trust, a healthy, positive congenial environment and in turn, the productivity of the team will increase. Project Management Institute (PMI), USA in their White Paper (2013), concluded that the organizations who are highly effective communicators, 80 percent of their projects meet original goals, versus only 52 percent by their minimally effective counterparts. Highly effective communicators are also more likely to deliver projects on time (71 percent versus 37 percent) and within budget (76 percent versus 48 percent). Bucata et al. (2017) observed Communication as a management tool that helps relationship amongst people to create the environment for development of an organization. Kelvin-Iloafu (2016) conducted a research study on communication in the organization and one of the objectives was to evaluate the impact of communication in achieving the organizational strategic goal. The study found that effective communication is a foundation upon which every organization irrespective of size and structure must be built. It also indicated a unanimous acceptance of the importance of communication in attaining corporate goals. Effective communication is an essential tool for the strategic management of organizations. Low productivity, loss of customers, low turnover,

conflict, and absenteeism are caused by poor and ineffective communication. This is to say that effective communication is the life wire of any organization.

Outcome of the Literature Review and Researcher's Observations:

The above section establishes that communication is a fundamental requirement for success of an organization both at the project and enterprise levels. If it is done effectively, many of the risks may be averted.

2.3 Findings of the Literature Review

The foregoing literature survey brings out the following major points:

- Indian Thermal Power sector, the main contributor to India's power mix for many decades, is steadily going down the hills and making way for the renewables. Riding on Climate change issue and government thrust, renewable power is penetrating into thermal power space and has already become a force to reckon with. Going forward, this scenario will be more acute for thermal power.
- However, looking at the huge Indian coal reserves, a large fleet of coal-based power plants, and considering the intermittent nature of renewable power (in other words, non-availability on 24x7 basis), coal power is expected to exist for at least 15-20 years and may be even beyond. Under this situation all organizations - manufacturers, designers, suppliers and the EPC Organizations working in the sector are languishing. Organizations are surviving with very thin margin or incurring financial losses. Many EPC organizations have exited the sector.
- All existing EPC players must be working very hard in finding ways and means to address these issues to become successful. Since thermal business is expected to be in the market for the next 15-20 years, it is all the more challenging to ensure sustained business with a much lower business volume. However, there are no specific analysis or strategies are available in the public domain to deal with the subject. In view of this, a study is essential to be undertaken on how to navigate and manage risks to ensure sustained business success of these EPC organizations working in Indian thermal power sector.

- Thermal power project is generally financed through project financing mode. Such financial framework involves a lot of contractual risks in the lending agreement between the customers and the lenders. Customers transfers almost all risks to EPC contractors through the EPC contracts as their risk mitigation strategies. It is now

the turn of the EPC contractors to devise appropriate risk responses and risk mitigation strategies for their survival and growth.

- Risks are present both at the project as well as the enterprise levels. Accordingly, both Project Risk Management (PRM) and Enterprise Risk Management (ERM) are to be carried out simultaneously. PRM and ERM are complementary in nature and both are required for organisational success. Project Risks are a sub-set of Enterprise Risks. Literature recognises that while a lot of work has been done on PRM, comparatively, lesser number of studies have been conducted in ERM space since the concept came much later. This aspect of the criticality of enterprise risks has been considered in the Study.
- Project success indicators have been discussed in the literature. Major objective Key Performance Indicators (KPI) to measure project success are given as construction speed & time, variation of time and cost, while subjective KPIs include quality, satisfaction of customer etc. Business success for an organization are indicated by the financial metrics like revenue, profit, profitability, growth, financial liquidity, market share, ROI, ROCE, EPS, etc. and non-financial measures include product/service quality, customer satisfaction and business processes. Project success metrics as well as business success measures have been considered in defining Business Success Indicators (BSI) in the Study.
- Efficient working capital management is key to increase firms' free cash flow and growth opportunities.
- Project management is an all-encompassing umbrella tool comprising methods, process, knowledge areas and tool that helps in effective implementation in the project. It ensures success of projects.
- Financial management deals with the financial performance of the project as well the enterprise. It is also a risk mitigation tool used in projects.
- Sustainability, communication, business continuity, stakeholders' satisfaction has emerged as very crucial for the business success.
- There is a positive correlation between entrepreneurial leadership and growth of an organization.

Each of the aspects discussed under literature review is, in fact, a method of risk management that needs to be addressed for sustained business success.

2.4 Rationale of the Study

Power sector is a critical sector since reliable and quality power is required on 24x7 basis continuously by all the other sectors including agriculture, services, manufacturing etc. for their performance and growth. Besides, it is a fundamental need for the citizens, society and the country for ensuring continuous development and improvement in the quality of life. Thermal power has been the backbone of Indian power sector for many decades. However, they are encountering strong head-winds only a very few have been able to manage till now. These organisations must be strategizing as how to cope with this prevailing situation. But, no such strategies, nor any research studies are available on the subject, in the public domain.

Thus, there is both a critical **Need** as well as **Gap** exists that requires a study to be undertaken on how to manage risks to ensure sustained business success of EPC organizations in Indian thermal power sector. The outcomes of the literature review have been considered as inputs to the research Study.

2.5 Summary

Literature review has clearly thrown up the need to conduct an important Study to dive deep into the problem of understanding various risks and their impact on business success. At the same time, it warrants a set of recommendation framework to be developed through the Study that can be implemented by the EPC organizations to not only to survive, but ensure sustained growth. It is also seen that project management, financial management, ERM, PRM, ensuring stakeholders' satisfaction, entrepreneurial leadership, business continuity, sustainability are various methods of risk management.