Chapter 1

Introduction

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1.1 Background

As the title suggests, this Study explores how various risks encountered by the EPC Project organizations working in Indian thermal power sector can be managed to ensure sustained business success for them. EPC stands for Engineering, Procurement and Construction and EPC business, in simpler term, it means turn-key execution of projects. When an organization achieves business success each year and year after year, it is deemed to have achieved sustained business success. This section provides the context of selection of the topic for the Study.

1.2 Context and Rationale for Selection of the Topic of the Study

Researcher was keen to study an important issue related to a core sector industry that plays an important role in developing India's economy. Although, India has largely been an agrarian economy for many years, contribution of service sector has been increasing significantly over the years. Services sector has contributed around 53.9% to Gross Value Added (GVA) in 2017-18 while the contributions of industry and agriculture have been at around 29.1% and 17.1% respectively (ref. Press Information Bureau, Govt of India, Ministry of Finance Note dated 14-12-2018, Provisional Estimate for the FY 2017-18). Gross Value Added (GVA) is defined as the value of output or contribution of a particular sector (Kenton, 2021).

Eight (8) industrial sectors constitute India's core sector. These are - coal, crude oil, natural gas, refinery products, fertilizers, steel, cement and electricity. Each of these industries has been assigned weightages which is known as Index of Core Industry (ref, Press Release by Department for Promotion of Industry and Internal Trade, Office of the Economic Advisor dated 29-10-2021). Index of Core Industries (ICI) measures collective and individual performance of production of these eight core industries. The weightages of these industries are – coal: 10.33%, natural gas: 6.88%, crude oil: 8.98%, refinery products: 28.04%, fertilizers: 2.63%, steel: 17.92%, cement: 5.37% and electricity: 19.85%. Thus, weightage-wise electricity or power sector (19.85%) ranks second after refinery products (28.03%). While each of the sectors are extremely important, the need and dependence on electricity sector is more fundamental and

critical in nature. This is due to the fact that for any sector to perform, it is heavily dependent on the availability of quality power on 24x7 basis. Hence, electricity or power sector holds a unique position.

Another aspect, the per capita electricity consumption is considered as one of the most important indices for measuring development of a country. India with a per capita electricity consumption of 1149 KWhr (during 2016-17) stands way behind Canada (14,273 KWhr), USA (12,573 KWhr), China (4,546 KWhr) and many other developed countries ((Source: CEA, Ministry of Power Report October 2020: Growth of Electricity Sector in India from 1947- 2020, Chart 5, Page 7). For development of India, per capita electricity consumption needs to be stepped up significantly. Power is also required for creation and operation of new industry, agriculture, infrastructure, healthcare, education as well as for job creation. Power access is linked to improvement in people's quality of life, health, education. In view of its importance, electricity or power sector has been selected for the Study.

Having selected the sector, next step was to decide on the topic for the Study. Post-independence, thermal power (fossil fuel e. g. coal/lignite, gas and oil-based power plants) has been the main stay in India's power sector and even now, it accounts for around 55-60% of country's power need. Indian power sector opened up for very large capacity super critical/ultra-super critical technology-based power plants in 2007-08. Many companies entered the sector, formed Joint Ventures with foreign manufacturers/ collaborators, set up manufacturing plants for boilers, steam turbines, generators and other ancillaries by investing huge money. While the beginning was good, in last 6 -7 years, the sector has been experiencing enormous challenges like continuously declining capacity additions, government thrust on renewable power (ref. details given in Chapter 2), and last but not the least, fierce competition due to limited opportunities. Renewables are slowly but steadily taking a significant role in Indian power sector. There is a rationale behind it. Power sector or rather, the energy sector as a whole, uses fossil fuels that are the big polluters of the environment. For a sustainable development and to tackle the global warming phenomenon, governments across the world are moving towards renewable or green energy. It is in line with the commitment made by the countries to limit global temperature rise (ref. The Paris Agreement, 2016). As a party to the Paris Protocol, Indian government is also giving a huge thrust on renewable

power and set an ambitious target of having 175 GW renewable power by 2022. This is significantly impacting the thermal power sector resulting in a decline of demand for it in the last 6-7 years. Consequently, all organizations like manufacturers, suppliers, designers, EPC organizations/ contractors and others working in this sector are facing huge challenges and it is becoming increasingly difficult for them to meet their fundamental objective of ensuring sustained business success. Amongst these organizations, EPC organizations in particular, face the highest risks and uncertainties since the projects are built in remote and not easily accessible locations where many things are beyond the control of the EPC organizations and also because of very stringent contract conditions. Detailed financial performances of EPC organizations working in Indian thermal power sector for 6 years (FY 2013-14 to 2018-19) have been presented in **Appendix 1** that depicts a very tough situation for them. The organizations are either managing on a very thin profit margin or incurring financial losses. Future also does not look any different. However, considering the huge coal reserves that India has and the large fleet of coal-based power plants built over decades 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, of course at a lower scale. When a matured cost-effective energy storage technology comes up making solar/ wind power generation cost (including the cost of energy storage) equal to or less than thermal power, there will be a hard stop for thermal power. Within this limited time window of 15-20 years, each EPC organization has to be extremely alert and efficient in managing risks to protect their profit margins and have business growth.

EPC business in thermal power sector is having a multitude of challenges and risks that are detailed in subsequent chapters. Some of the major ones include – continuously declining market demand, government focus on renewable power, fierce competition, fixed-price contracts without price variation, stringent terms of payment as well as delay in customer payments, time and cost overruns, variations in sub-soil characteristics, stiff contract conditions favouring the Customers, delay in Customer inputs including various approvals etc. EPC organisations are for the past many years are either making wafer thin profit margins or making financial losses.

Considering the huge challenges involved, Researcher decided to take up the Study to dive deep into the problem and understand the risks involved in EPC business that

adversely impact business success and also to develop strategies to manage the risks and ensure sustained business success for the EPC organizations working in Indian thermal power sector.

1.3 Financial Performance of EPC Organizations in Indian Thermal Power Sector

Thermal power plants are mostly owned by the State Electricity Boards (SEBs) and the Central PSUs like NTPC. Ordering of projects is done through public tendering of Plant packages comprising EPC (Boiler + Steam Turbine Generator+ Balance of Plant) or split packages of BTG (Boiler + Steam Turbine Generator) and Balance of Plant (BOP). Quite a few companies were active in 2007-2008 when the market for large Super-Critical/Ultra-Super- Critical units opened. In the last 10-12 years, the Indian market has stabilised around a very few players. In the Complete EPC/BTG space. The main players are BHEL, L&T and GE Power India. Doosan, Toshiba, Alstom (prior to take over by GE), BGR and Lanco initially participated in a few select EPC projects; however, they have practically withdrawn from this space in Indian market following severe financial stress. Tata Projects and BGR are still the main players for the BOP packages.

Financial performances of BHEL, GE Power (India), Larsen & Toubro (L&T), Tata Projects Limited (TPL) and BGR from FY 2013-14 to 2018-19 have been prepared in the form of tables and graphs based on the data obtained from the Annual Reports of these EPC organizations and the same are given in **Appendix 1** enclosed. For ease of reference, only the performance tables are presented below:

1.3.1 BHEL Limited

Table 1.3.1.1

FY	Sales (Rs. Cr)	EBITDA (Rs. Cr)	PAT (Rs. Cr)	PAT/Sales (%)	ROCE (%)	NWC/Sales (%)
2013-14	39569	4579	3502	8.9%	7.3%	74.1%
2014-15	30848	2141	1450	4.7%	2.2%	99.3%
2015-16	26679	-1357	-706	-2.6%	-5.1%	104.0%
2016-17	29732	1057	455	1.5%	0.5%	79.5%
2017-18	28827	1969	438	1.5%	2.8%	70.3%
2018-19	30368	2134	1009	3.3%	4.1%	50.3%

It is may be seen, all performance parameters like Sales, Earnings before Income Tax, Depreciation and Amortization (EBITDA), Profit After Tax (PAT) and Return on Capital Employed (ROCE) have declined over the period reported. BHEL made a loss in the FY 2014-15.

1.3.2 GE Power (India)

Table 1.3.2.1

FY	Sales (Rs. Cr)	EBITDA (Rs. Cr)	PAT (Rs. Cr)	PAT/Sales (%)	ROCE (%)	NWC/Sales (%)
2013-14	2605	177	230	8.8%	11.6%	17.2%
2014-15	2124	167	177	8.3%	9.0%	23.5%
2015-16	1758	-185	-58	-3.3%	-28.0%	15.0%
2016-17	2041	42	-2	-0.1%	-1.9%	9.5%
2017-18	1343	125	27	2.0%	8.0%	27.5%
2018-19	1903	179	75	3.9%	15.2%	26.6%

GE Power (India) Sales have reduced over the years. While EBITDA remained more or less at the same level, PAT has reduced significantly. GE Power (India) made losses in FY 2015-16 and FY 2016-17.

1.3.3 Larsen & Toubro Limited (L&T)

Table 1.3.3.1

FY	Sales (Rs. Cr)	EBITDA (Rs. Cr)	PAT (Rs. Cr)	PAT/Sales (%)	ROCE (%)	NWC/Sales (%)
2013-14	85128	10730	4900	5.8%	9.2%	20.4%
2014-15	92005	11258	4762	5.2%	7.4%	18.2%
2015-16	101975	10463	4545	4.5%	7.9%	22.0%
2016-17	110011	11130	6486	5.9%	7.1%	29.4%
2017-18	119862	13641	8004	6.7%	8.7%	27.0%
2018-19	141007	16324	10216	7.2%	9.9%	23.0%

L&T has seen increasing trend in its Sales for the years reported and has PAT of around 4.5-7%. It is, however, important to note that L&T's standalone performance for Power segment is not available in the Annual Report. However, since about 70% of L&T's business comes from EPC (that includes Power), it may be appropriate to assume that L&T too would have got impacted by the sector wide down-turn in thermal power. L&T's PAT of 5-7% looks comparatively better which might be due to higher positive contributions of its Engineering, IT and other service businesses.

1.3.4 Tata Projects Limited (TPL)

Table 1.3.4.1

FY	Sales (Rs. Cr)	EBITA (Rs. Cr)	PAT (Rs. Cr)	PAT/Sales (%)	ROCE (%)	NWC/Sales (%)
2013-14	3598	184	98	2.7%	17.1%	11.3%
2014-15	3342	232	94	2.8%	17.6%	14.4%
2015-16	4408	258	64	1.5%	19.0%	9.3%
2016-17	6058	379	135	2.2%	34.0%	5.2%
2017-18	9223	554	187	2.0%	33.7%	3.0%
2018-19	13418	791	249	1.9%	34.1%	3.2%

While Sales have increased over the years, TPL has been operating with about 2-3% PAT in all the years reported here.

1.3.5 BGR

Table 1.3.5.1

FY	Sales (Rs. in Crs)	EBITDA (Rs. in Crs)	PAT (Rs. in Crs)	PAT/ Sales (%)	ROCE (%)	NWC/Sales (%)
2013-14	3301	370	96	2.9%	11.4%	46.9%
2014-15	3366	134	-80	-2.4%	4.3%	41.4%
2015-16	3253	356	13	0.4%	12.2%	35.2%
2016-17	3451	387	85	2.5%	16.2%	20.2%
2017-18	3299	347	1.15	0.0%	16.0%	6.3%
2018-19	3273	323	15	0.5%	16.7%	-1.4%

BGR Sales has been largely stagnant with very low PAT (0 - 2%) in most years. They made loss in FY 2014-15.

On the whole, it is seen, all EPC organizations in power sector are highly stressed.

1.4 Key Features of EPC Projects/ Contracts

As mentioned earlier, EPC means Engineering, Procurement & Construction of projects and EPC execution of projects means turnkey execution of projects that includes engineering, procurement, construction, commissioning and handing over of the projects. A typical project contract of the Indian Public Sector Undertaking, NTPC Limited, the owner of largest fleet of thermal power plants in India, gives the following key features of an EPC Project/ Contract:

- 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 more 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 no Price Variation Clause (PVC) with a fixed completion time.
- Liquidated Damages for delay in project completion date and shortfall in Performance Guarantees (PG) of equipment/system.
- Securities from the EPC contractor and its parents in the form of Bank Guarantees (BG) for advance payment, contract performance, warranty (defect liability), Deed of Joint Undertaking (with the foreign collaborator/parent), cash retention, latent defect liability etc. etc.
- 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.
- Training of Customer's Operation & Maintenance personnel.
- Sometimes, scope of work includes Operation & Maintenance of the power plant for a specified number of years post completion of the project.

1.5 Financing of Power Projects

Financing of infrastructure projects like power projects is generally done through project financing route which is purely based on the merit of the project and the consideration that potential future revenue stream as envisaged to be generated by the project assets would be adequate to repay the loan. Project financing without recourse is called a pure project financing. As per Cheng (2016), in this type of financing, repayment of principal and interest of the loan solely depends on the successful operation of the assets. Lenders base their credit appraisals on the projected revenue stream from the operation of the facility, rather than the general assets or the credit of the sponsor of the facility. The lender acquires the property right of the assets as collateral against the loan. But they do not have any recourse to the sponsor if the project does not get completed or suffer operational losses or if its assets are inadequate to repay the loan. Hayes (2021) said that project financing relies primarily on the project cash flows for repayment, with the operation of project assets.

1.6 Evolution of Power Sector and Future of Thermal Power Sector in India

Pre-independence, the Indian Electricity Act, 1910 regulated the sector and offered framework for electricity supply. Post-independence, The Electricity (Supply) Act, 1948 was enacted. The major change was initiation of the State Electricity Boards (SEBs) which allowed the states to add generation, transmission & distribution capacities in their respective states. It also allowed them to expand their network beyond the city limits. This act offered freedom to SEBs to optimize usage of resources available in the state. Central Electricity Authority (CEA) was constituted under section 3(1) of Electricity Supply Act 1948, which was subsequently superseded by section 70(1) of the Electricity Act 2003. CEA advises the government on policy matters and formulates plans for the development of electricity systems in the country. SEBs also significantly contributed in power sector development. The major changes also included unbundling of generation, transmission and distribution as well as privatization of transmission & distribution.

From 1950, five-year plan was initiated for economic development. This allowed organized growth of power sector in India with specific targets for capacity additions. Installed capacity was 1.7 GW in December 1950 which rose to 326.8 GW at the end of 12th plan (March 2017).

As on 31.03.2020, India's total installed capacity stands at 3,70,106 MW comprising thermal: 2,30,600 MW, hydro: 45,699 MW, Nuclear: 6,780 Mw and Renewables: 87,028 MW. So, thermal power is around 62.31%, hydro is 14.88%, nuclear is 1.83% and renewable is 23.51%. Again, of the total thermal power of 2,30,600 MW, (coal + lignite) contributes 2,05,135 MW i.e. about 89%. Diesel is having a negligible presence (510 MW) amounting to 0.22% and due to gas unavailability, gas-based power plant stands almost static at around 25,000 MW (around 10.8%) since 2017. Lignite capacity is 28,277 MW out of 2,30,600 MW of (coal + lignite) capacity. Thus, for all practical purposes, thermal power plants refer to coal-based power plants.

Progress in Last Decade

Significant growth of electricity is a prerequisite for any growing economy like India. To cater to increasing demand of electricity, post-independence, major focus was given to power sector in India. Currently, Indian power sector is the fifth largest in terms of installed capacity of power generation and third largest in terms of generation & consumption of power. As per CEA report (2020), "Growth of Electricity Sector in India from 1947-2020", during 11th (2007-2012) and 12th (2012-2017) plan, capacity addition in India has been 67.6 GW and 127GW respectively. In this capacity addition, coal-based power plant addition has been maximum i.e. 40.9 GW and 80.1 GW respectively. During the same period, per capita power consumption has increased from 884 KWh (year 2007) to 1122 KWh (year 2017) and this success can be attributed to government focus on power sector. In the same period, private power plants share got doubled from 21.9% (year 2007) to 43.6% (year 2017) in total installed power capacity and even power deficit reduced drastically from 9.5% to 0.7%. Above data indicates enormous growth and improvement in Indian power sector due to demand and various measures/initiatives taken by the Government. Despite above data, India lags in area of Transmission & Distribution (T&D) loss as compared to other countries in the world. From 2007 to 2011, India could reduce T&D loss from 28.6 % to 21.04% only as compared to world average of below 9%.

Future of Indian Thermal Power Sector

The power sector has passed through many challenges since independence involving political environment, technology access, economic scenario, emission norms, fuel availability & supply etc. As per NITI Aayog, India is targeting to reach per capita

electricity consumption of 3000 KWh by 2040. To cater to this increased demand with population growth, power plant capacity needs to be increased. Due to unavailability of natural gas for power generation, India relied mainly on coal based thermal power plants. At the same time, government has taken strong measures to curb pollution through replacing existing sub-critical thermal power plants with more efficient super-critical/ultra-super critical thermal power plants as well as mandating use of flue gas desulphurization (FGD) and selective catalytic reduction (SCR) plants to meet stringent environmental emission rules for sulphur di-oxide and nitrogen oxides respectively. In parallel, government has given a huge push to renewable power to meet its commitment made in the Paris Agreement 2016 to combat climate change. Indian power sector is now at a crossroad where thermal (coal, gas and oil) power and renewable power are staring at each other. However, it is quite evident that thermal power will surely and steadily concede to renewables and the domination of thermal power in India will sharply decline. This trend has already set in. Since India has a large fleet of coal plants and it also has huge coal reserves, it may continue another 15-20 years and may be even beyond. But it is quite clear that coal power has seen its peak and its contribution to India's energy mix will reduce significantly in coming years.

1.7 Major Constructs of the Study

Central theme of the Study is how to ensure sustained business success for the EPC organisations working in Indian Thermal Power sector by managing risks. There are three constructs intertwined in it – risks, business success and risk management.

EPC Project organizations handles multiple projects simultaneously. Each project encounters a large number of risks and at the same time the organizations experience a whole lot of risks at the enterprise level. Some of the risks at enterprise level are not experienced by any project. Thus, risks encountered at the enterprise level is more than the sum total of risks encountered by each individual project. For realising overall business success for the EPC organizations, it is essential to ensure project success of all individual projects. Therefore, all project risks as well as enterprise risks are to be addressed and managed to ensure business success.

Enterprise level risk portfolio includes the project risks also. Similarly, overall business success includes project success too.

At the basic level, the relationships amongst the three constructs are known at the start of this Study. It is intuitively known that risks adversely impact business success while Risk management positively impact the business success of the EPC Project organizations.

Table 1.7.1 provides insights of these three research constructs as given in various literature. While there are three main constructs, each has a few sub-parts to it.

Table 1.7.1: Research Constructs

Sl. No.	Construct	References	Inputs	Relevance to Research Topic
1.	**Risk**			
1a.	Project Risk	Project Management Book of Knowledge 6th edition (2017)	Risk is an uncertain event or condition, that if it occurs, has a positive or negative effect on a project's objective/s. indicated the following risk categories – technical, management, commercial and external	Each EPC organization executes multiple projects simultaneously. Each project team needs to manage these risks. Literature speaks about both risks and uncertainties Knowledge about risks, uncertainties, categories of risks have facilitated in conducting the Study.
		Hasani (2018)	Discussed different aspects of risks and uncertainties and the views of various experts.	
		Rutherford (2002)	Uncertainty concerns the unknown.	
		Rutherford (1995)	Risk is concerned with objective probability and uncertainty is associated with subjective probability	
		Knight (1921)	There are two types of uncertainty. The first has measurable probability which is called 'risk' and the second is unquantifiable or 'uncertainty'	
		Saunders (2016)	The compiled the definition of risk as below:	
		Larson et al. (2011)	A risk has a cause, and if it occurs, a consequence	
		Chapman et al. (2011)	Risk means possible unfavourable outcomes	
		Association for Project Management, 1997	An uncertain event or set of circumstances which, should it occur, will have an effect on achievement of the project's objectives	

Sl. No.	Construct	References	Inputs	Relevance to Research Topic
		Tan (2007)	It is difficult to demarcate clearly between a knowable and an unknowable	
1b.	Enterprise Risk	The Committee of Sponsoring Organizations (COSO, 2012)	Provides some of the categories of enterprise risks like strategic, financial, operational and compliance.	Besides project risks, every EPC organization also encounter risk at the enterprise level. Thus, total risks experienced by an enterprise is more than the aggregate of risks faced by individual projects. Data collection ensured collection of both project as well as enterprise risks so that risk mitigation strategies is developed to address all types of risks.
		Dickinson (2001)	External risks may arise from change in economy, political, legal, technological, demographic etc. A majority part of the internal risks are operational risks.	
2.	**Business Success**			
2a.	Project Success	Chan (2001)	Provided a framework for measuring success of construction projects through objective and subjective Key Performance Indicators (KPI). While objective measures include construction speed & time, variation intime & cost, subjective measures include quality, satisfaction of customers etc.	Project success is doing the projects within the time, cost, quality standards agreed upon by the stakeholders.
		Huges et al. (2004)	Success parameters are mainly cost, time and quality.	

Sl. No.	Construct	References	Inputs	Relevance to Research Topic
		Al-Hajj et al. (2018)	Major project success criteria is time, budget, quality and user satisfaction.	
2b.	Business Success	Gadekar et al. (2013, 2014)	Business success is the extent to which goals and expectations are met.	Business success requires meeting stakeholders' expectations.
		Van Fredericksluist (1978)	Failure is the inability of a firm to pay its obligations when they are due.	
2c.	Business Success Indicators (BSI)	Ofori-Kuragu (2016)	Top Key Performance Indicators (KPI) are quality, client satisfaction, cost, time and business performance.	Business success is manifested through both financial and non-financial business success metrics or KPIs. In this Study, the expression, Business Success Indicators (BSI) has been used to express business success. Financial BSIs include Revenue, profit, ROCE etc. while non-financial metrics like customer, internal process, organizational learning etc. have been considered. This knowledge helped in developing the Business Success Indicators (BSI) later in the Study.
		Mbugua et al. (1999)	Consolidated business performance measurement frameworks and various financial as well as non-financial success indicators as below:	
		Brown et al. (1994)	Financial success indicators proposed are Return on Capital Employed (ROCE), profit, profitability and earning per share (EPS).	
		Kay (1993)	Return on investment (ROI), shareholder return.	
		Kaplan (1992, 1994)	Balance Scorecard 4 Perspective framework covering financial, customer, internal process and organisational learning perspectives.	

Sl. No.	Construct	References	Inputs	Relevance to Research Topic
2d.	Sustained Business Success	Courtenell (2019)	Sustained business success is the preservation of a business growth and profitability over a long period.	This concept has helped to understand the phenomenon of sustained business success. It is the success over a long period of time i. e. it is not for any one year here and there, it is for year after year. 30 Experts were advised to come out with Risk Mitigation Strategies (RMS) considering this aspect of sustained business success since this is the goal of the EPC organizations.
		Llopis (2015)	Suggested 6 pre-requisites for this to happen – right talent, operational efficiency, right customers, sound decision making. Leadership and managing risks.	
3.	Risk Management			
3a.	Project Risk Management (PRM)	Project Management Book of Knowledge 6th edition (2017)	PRM includes risk management planning, identification, analysis, response planning, implementation, and monitoring risk on a project. 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.	This construct provides the wherewithal to address and mitigate risks. Main risk responses include risk avoidance, transfer, accept and mitigate.
		Rastogi (2016)	Suggested strategies like allocating risk to the party that is in the best position to control	

Sl. No.	Construct	References	Inputs	Relevance to Research Topic
			risk, mitigate through indemnity provision and insurance.	
		Zhao (2017)	(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.	
3b.	Enterprise Risk Management (ERM)	The Committee of Sponsoring Organizations of the Treadway Commission (COSO 2004)	ERM is a process, applicable to all across the enterprise, to identify potential risks that may affect the organization and also to manage these risks to achieve the organization's objectives.	Benefits of effective ERM include identification and management of organization-wide risks, positive outcomes, optimum resource deployment and enterprise resilience. In the Study, Risk Management Strategies emerged are with respect to the risks identified that includes project as well as enterprise risks.
		Bromily et al. (2015)	Observed that while many ERM articles have been published, academic research in this is in its infancy and they were published largely in accounting and finance journals and rarely in management journals.	

Sl. No.	Construct	References	Inputs	Relevance to Research Topic
		Fraser et al. (2010)	Observed that there was a distinct lack of information on how to bring all the silos together. They have also opined that the opportunities to study ERM and assist in moving this new methodology forward are limitless and likely to continue.	It came out that it is still a challenge to implement ERM in an organization since it is still in its infancy.
		Lundqvist (2015)	Suggested that ERM is a combination of traditional risk management and risk governance.	

1.8 Motivation for the Study

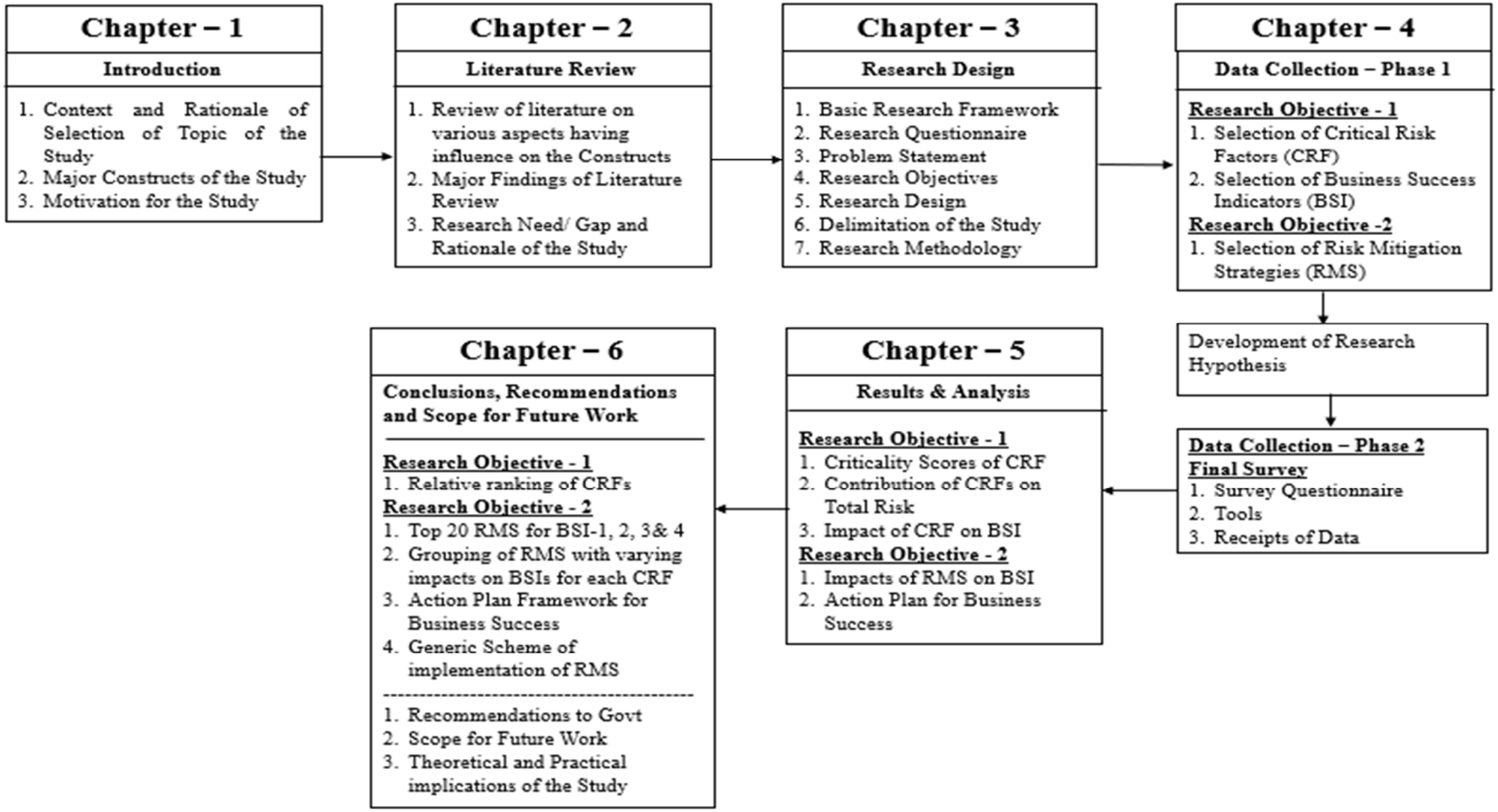
It is evident from the preceding sections that market for thermal power is continuously declining for the last 6-7 years. Shah (2021) has noted very slow growth of the sector. In the last 4 years up to 2020-21additions of coal-based power plants have been 5 GW, 3.4 GW, 4.3 GW and 4.1 GW. PwC – ASSOCHAM Report (2019) speaks about the emergence of the renewable power as a significant player in recent years driven by an ambitious clean energy policies and rapidly declining prices for renewables. The National Electricity Plan (2018) targets 275 GW of RE capacity by 2027, without requiring any new coal plants beyond those already under construction. Woods et al. (2019) pointed out that India's coal-fired generation sector is already facing serious problems and this is just the beginning of the ongoing problems facing India's coal-fired generators. There are three major risks confronting the sector - The over-capacity of coal-plant capacity, about 20% higher than the country's peak demand, increasing competition from low-cost renewable and hydro, particularly during the monsoon and water shortage for power plants. Penetration of low-cost renewables is increasingly impacting coal power sector adversely. EPC project organizations working in the sector has been struggling to ensure survival and growth. Few of them already exited the sector and only a few players are still active in this sector.

Researcher of this Research Study worked in thermal power sector for about 42 years and has been one of the founder members of EPC thermal power business in an Indian premier organization. It was indeed very painful to see such a down-turn of the sector that has been severely affecting the EPC organizations. This agony motivated the Researcher to undertake this Study to dive deep into the subject to understand and identify various risks and how that are impacting business success and also to develop a set of Risk Mitigation Strategies (RMS) and recommendations/ frameworks to help these EPC organizations in ensuring sustained business success. These frameworks will be very useful to the Project Managers, project team, sponsors, proposal & marketing, contract management teams to ensure sustained business success till the thermal power business exists.

1.9 Organization of the Thesis

This thesis contains 6 Chapters and a set of Appendices. The Figure 1.9.1 given below gives the contributions of each Chapters in the form of a flow diagram.

Figure 1.9.1: Organization of the Thesis



1.10 Explanation of Terms

Appendix 2 gives the Explanation of Terms.

1.11 Summary

This section is the curtain raiser of the research Study and provided the context of selection of the research topic. It started off with a brief overview of the evolution of Indian power sector, especially, thermal power, its importance and described the unique characteristics of Engineering, Procurement and Construction (EPC) business, project financing and the multitudes of risks it encounters. It dwelt at length on the three major research constructs – risks, business success and risk management. Finally, it gave a glimpse of the motivation of the Researcher for carrying out the Study.