Appendix 1

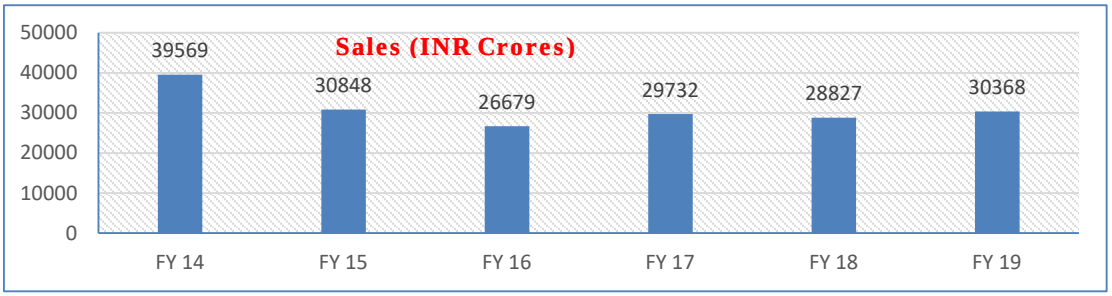
Financial Performance of EPC Organizations in Indian Thermal Power Sector
(for FY 2013-14 to 2018-19 based on the Annual Reports of the organization)

1. BHEL: FY 2013-14 to FY 2018-19 (Ref. BHEL Annual Reports)

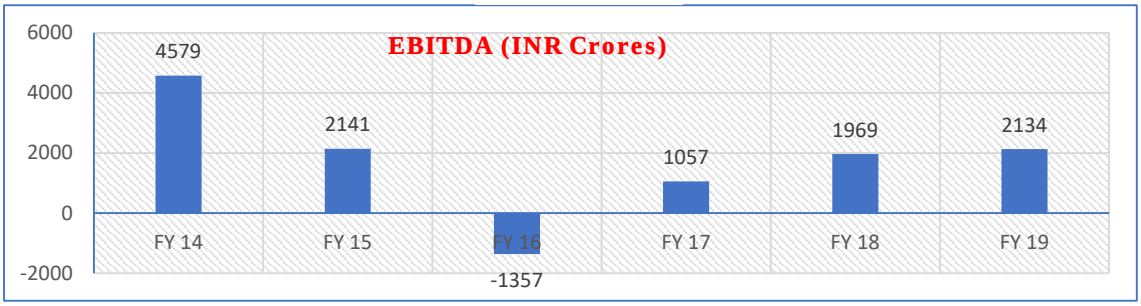
Table 1.1

FY	Sales (Rs. in Crs)	EBITA (Rs. in Crs)	PAT (Rs. in Crs)	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%

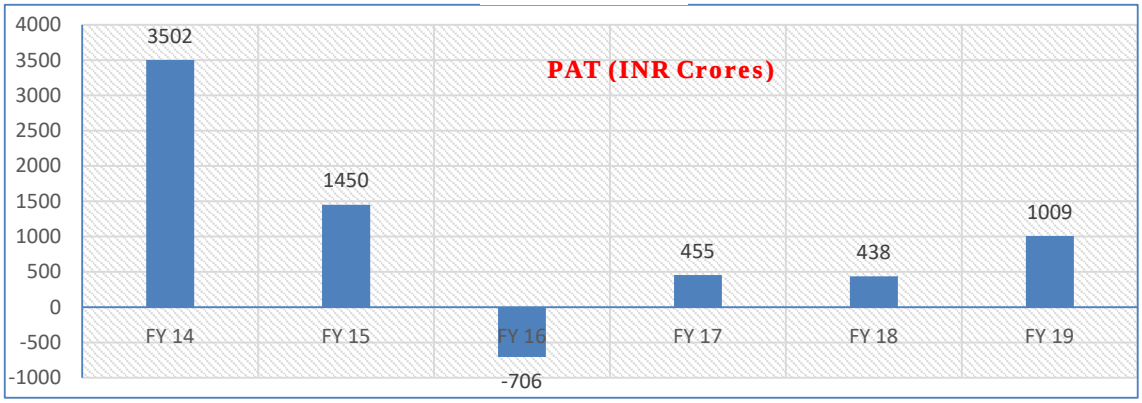
Graph 1.1



Graph 1.2



Graph 1.3



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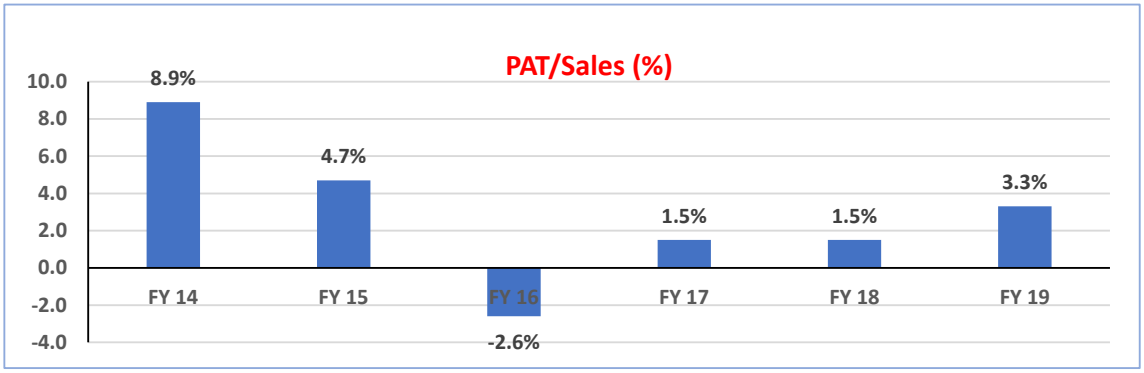
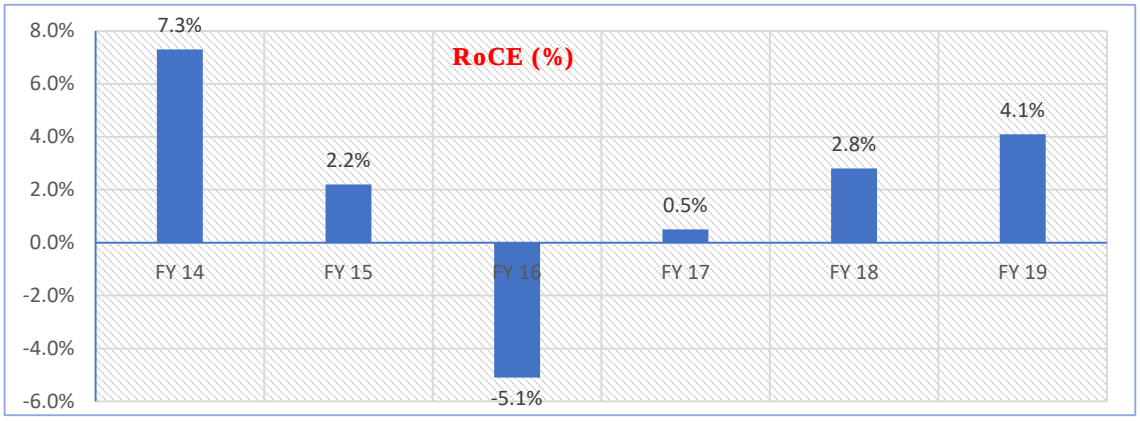
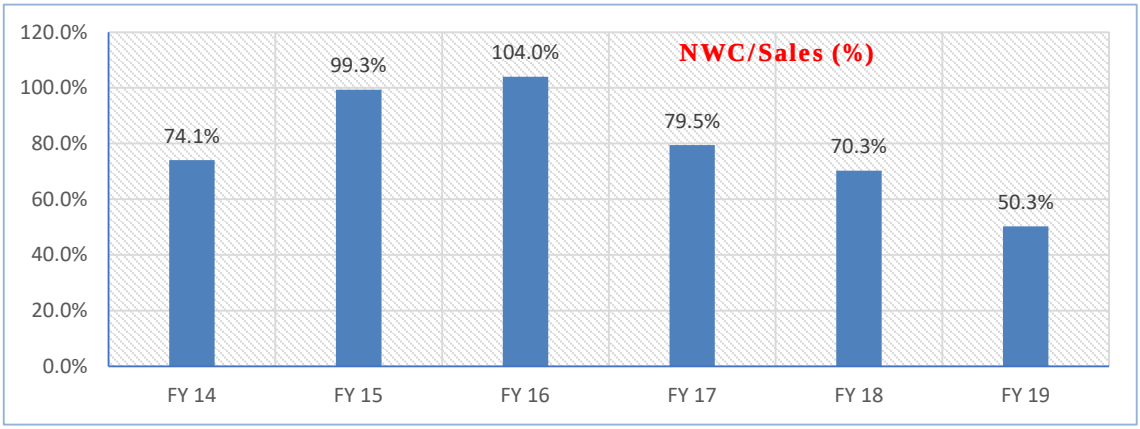


Graph 1.5



Graph 1.6

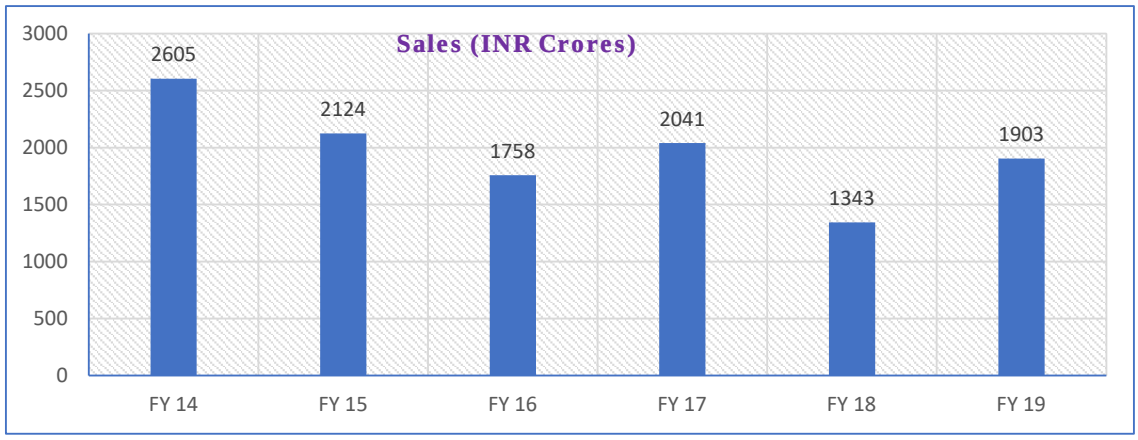


2. GE Power (India): FY 2013-14 to 2018-19 (GE Power India Annual Reports)

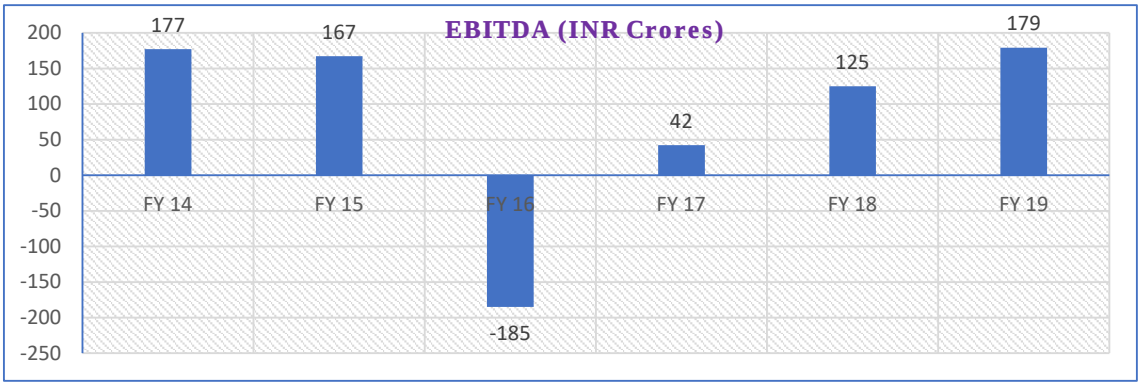
Table 2.1

FY	Sales (Rs. in Crs)	EBITDA (Rs. in Crs)	PAT (Rs. in Crs)	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%

Graph 2.1



Graph 2.2



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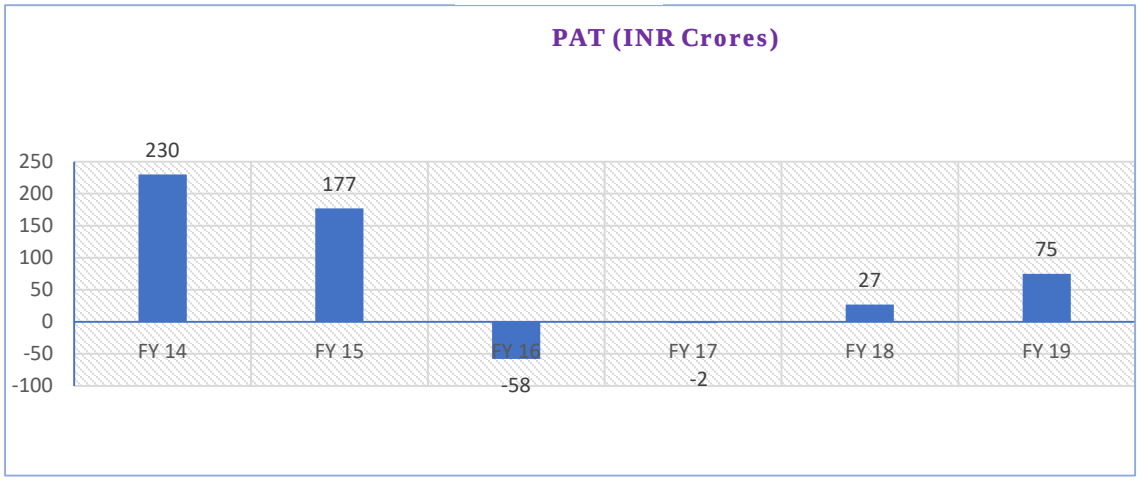

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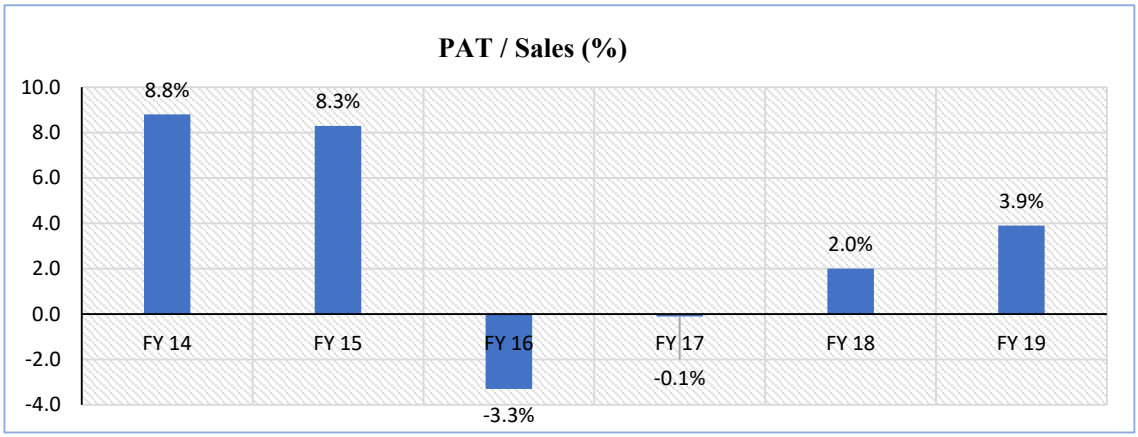
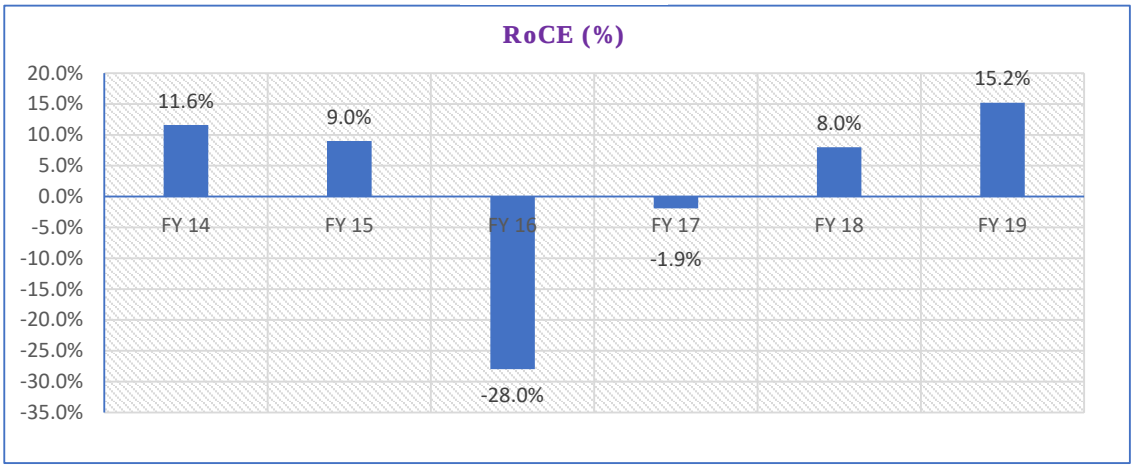
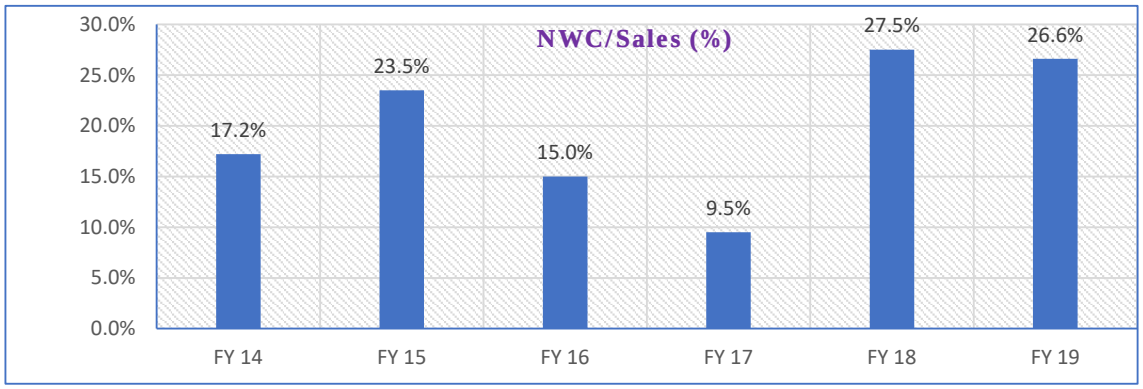


Graph 2.5



Graph 2.6

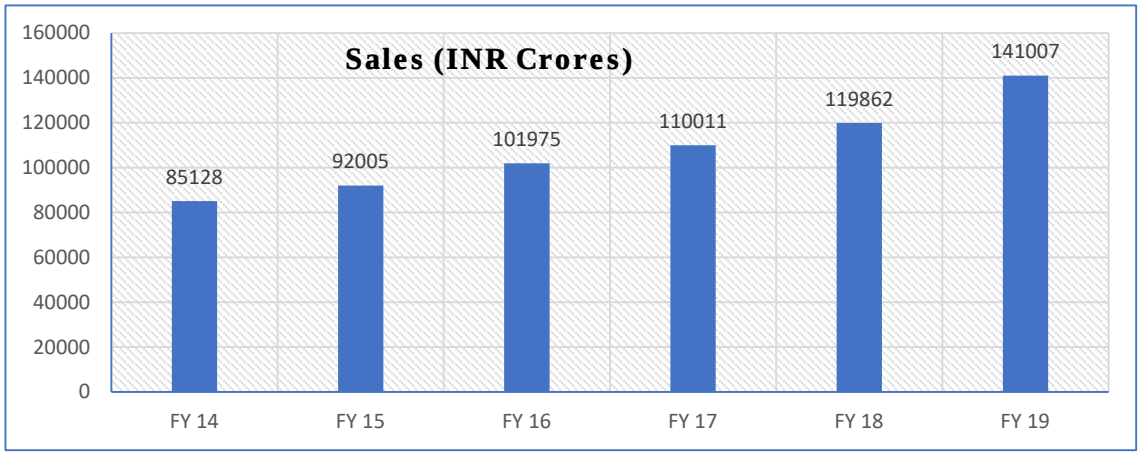


3. L & T: 2013-14 to 2018-19 (Ref. L&T Annual Reports)

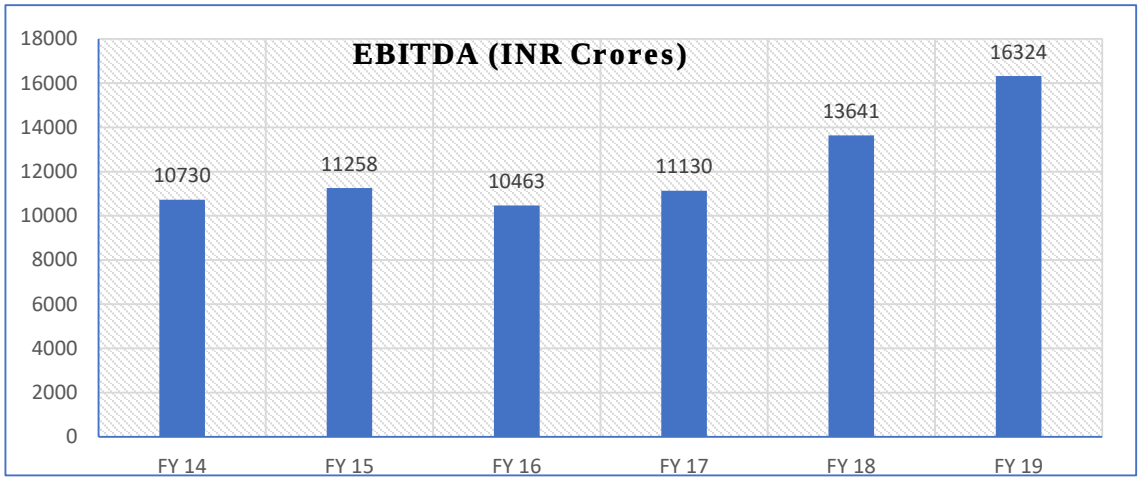
Table 3.1

FY	Sales (Rs. in Crs)	EBITDA (Rs. in Crs)	PAT (Rs. in Crs)	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%

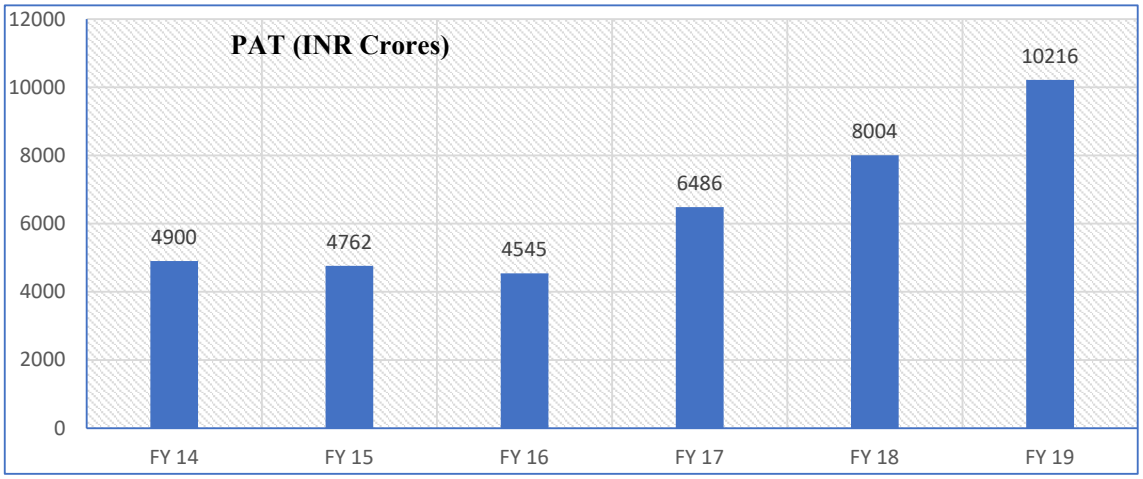
Graph 3.1



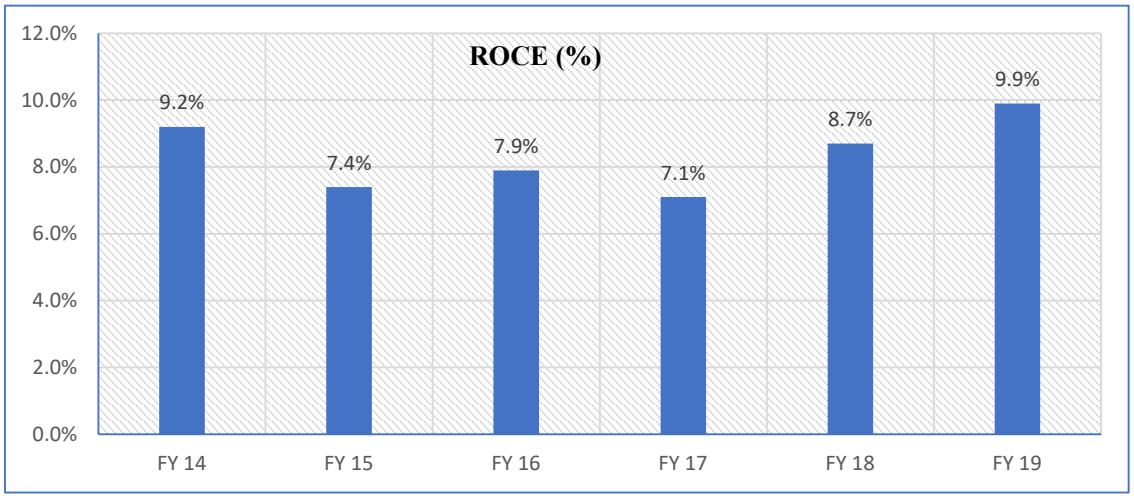
Graph 3.2



Graph 3.3



Graph 3.4



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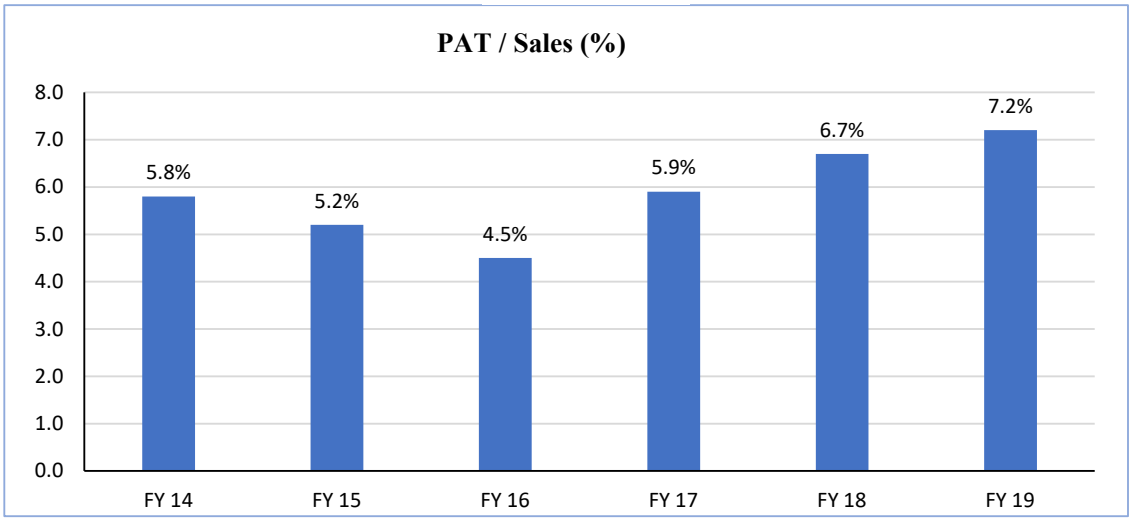
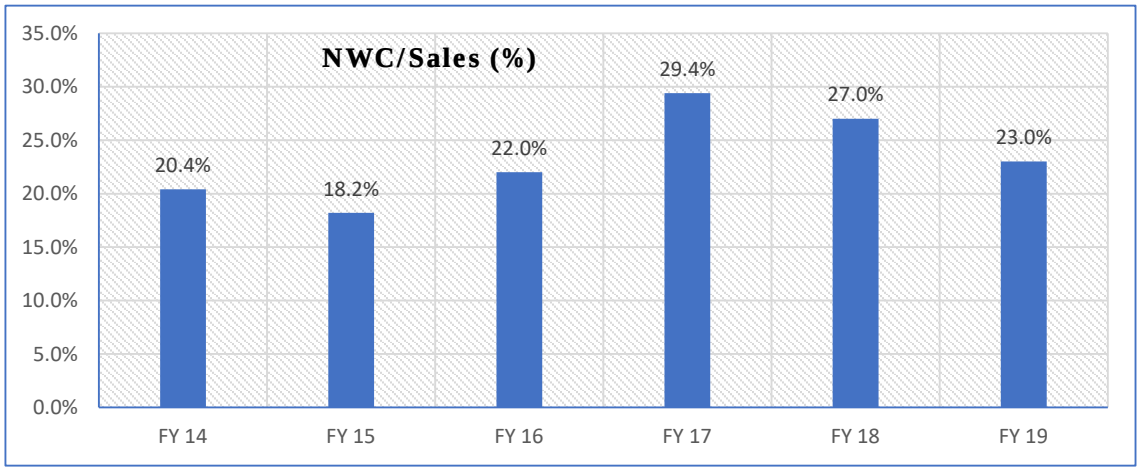


Graph 3.6

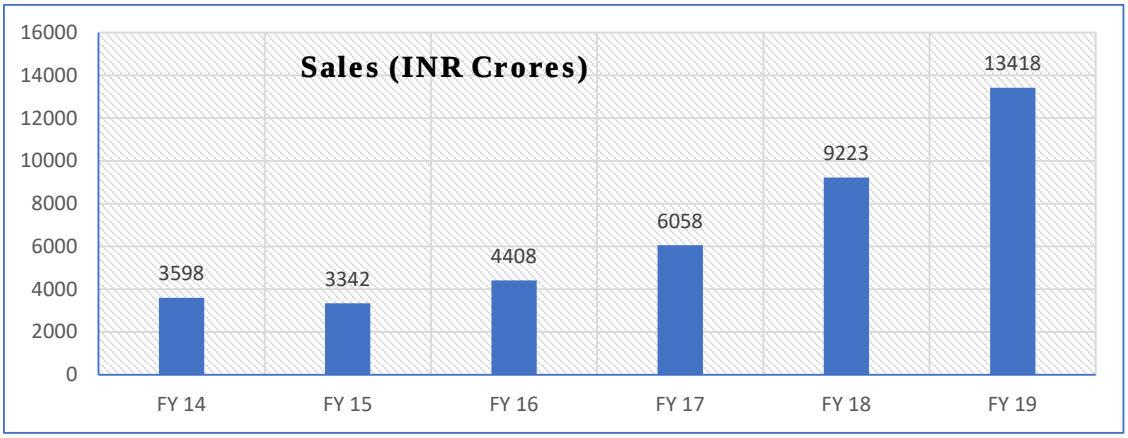


4. Tata Projects Ltd: FY 2013-14 to FY 2018-19 (Ref. Tata Projects Annual Reports)

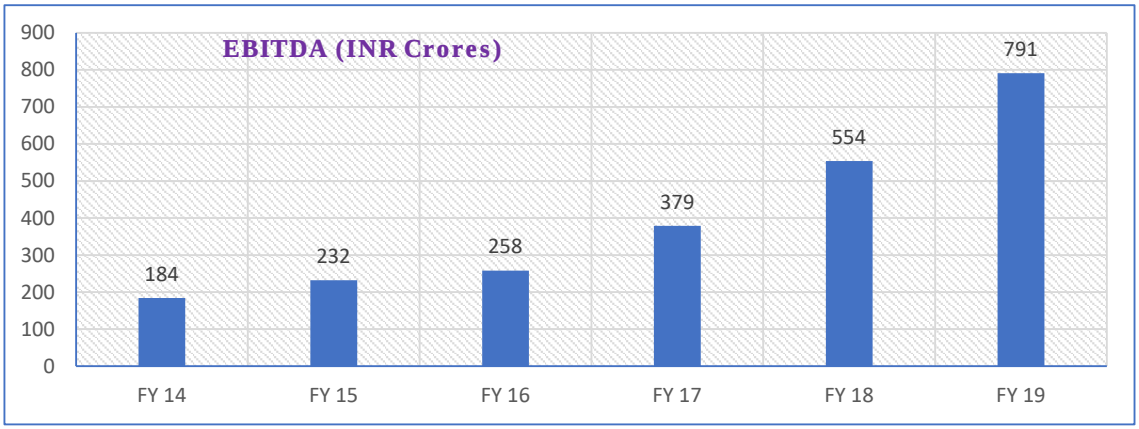
Table 4.1

FY	Sales (Rs. in Crs)	EBITA (Rs. in Crs)	PAT (Rs. in Crs)	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%

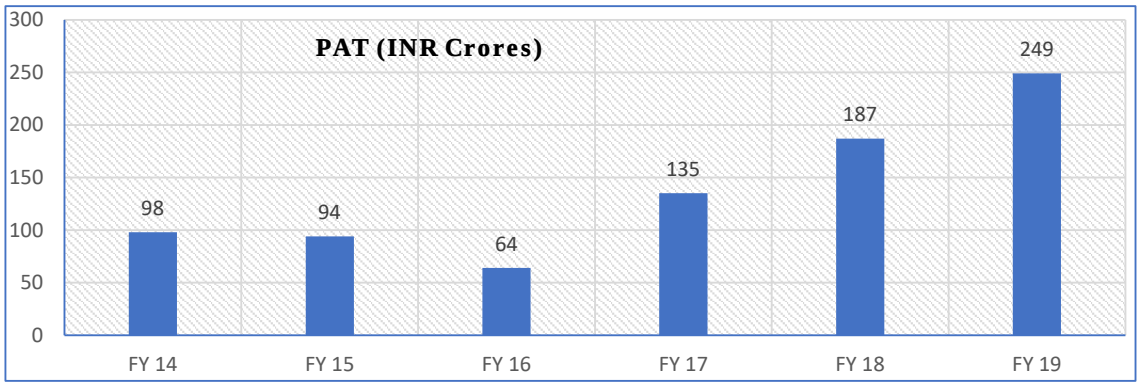
Graph 4.1



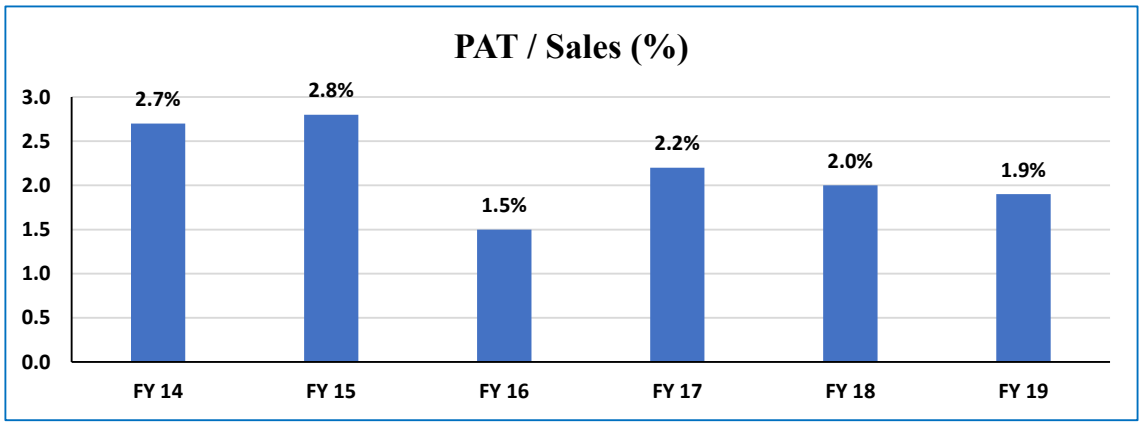
Graph 4.2



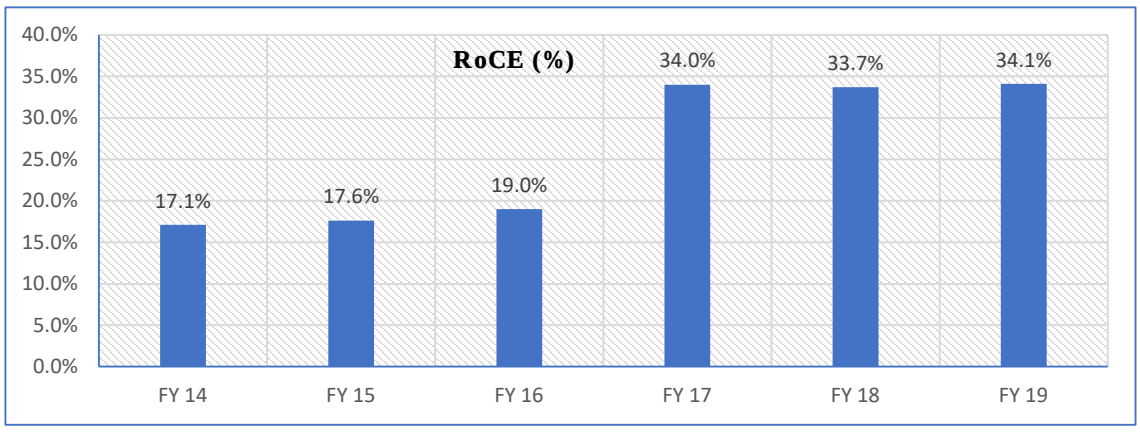
Graph 4.3



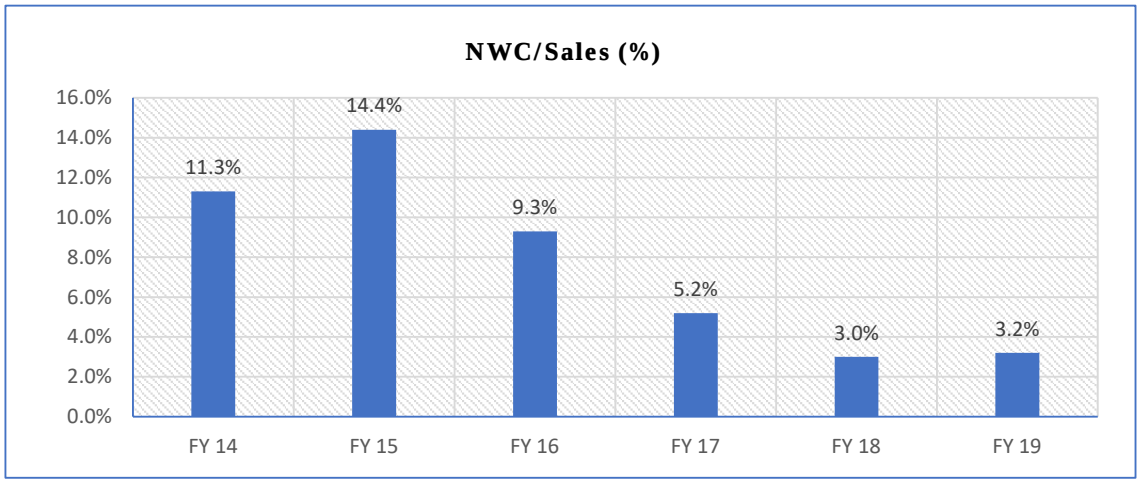
Graph 4.4



Graph 4.5



Graph 4.6

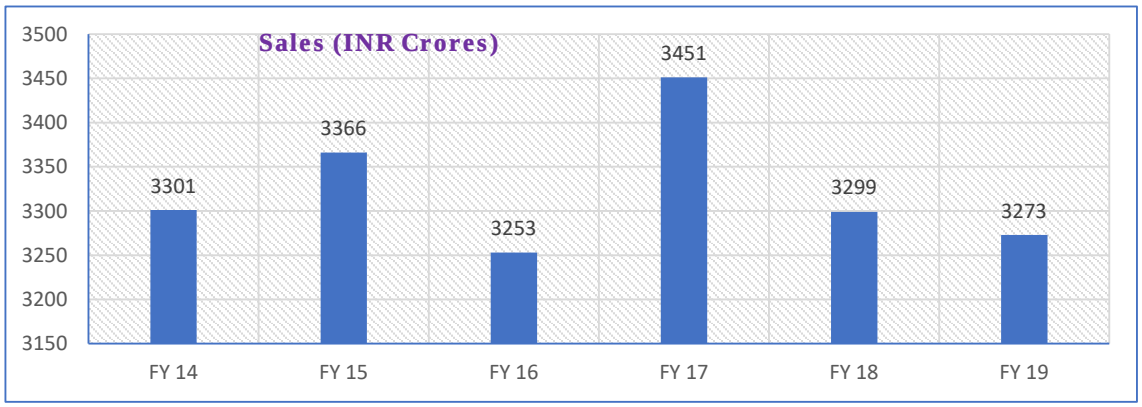


5. BGR: FY 2013-14 to FY 2018-19 (Ref. BGR Annual Reports)

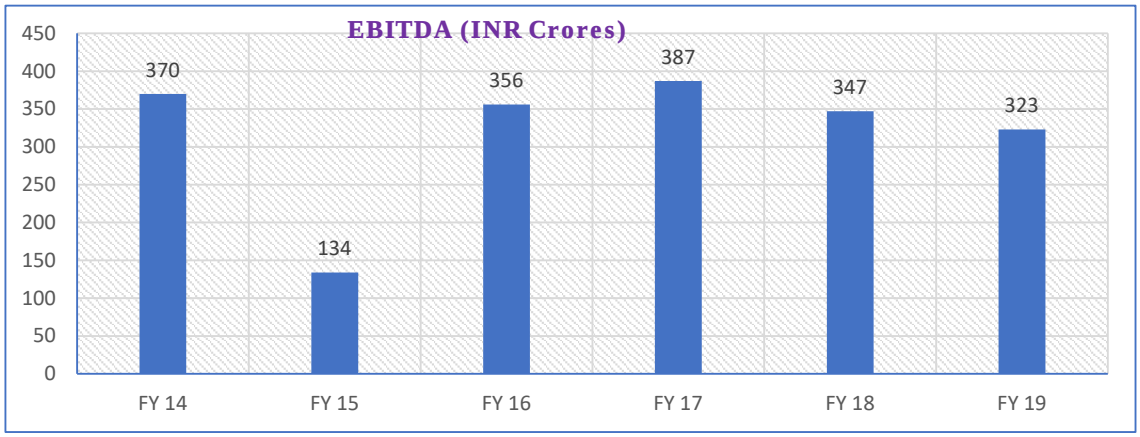
Table 5.1

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%

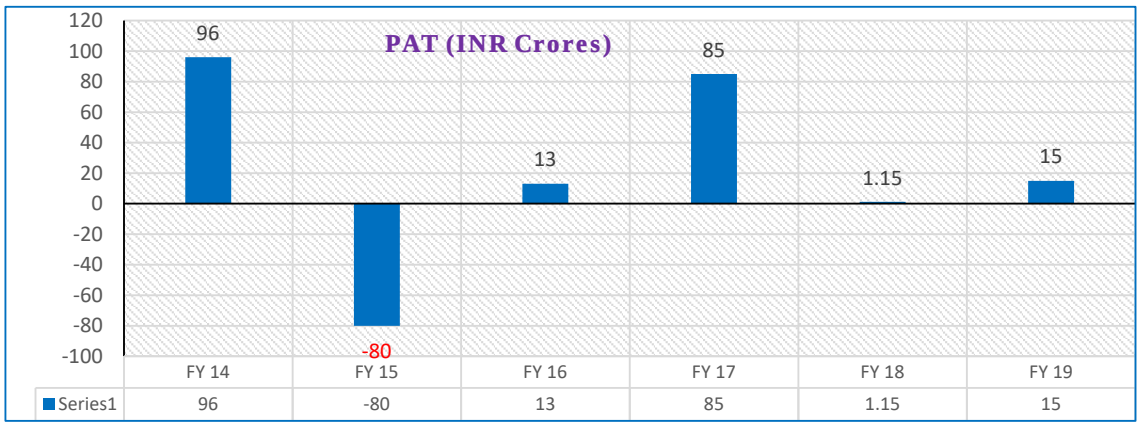
Graph 5.1



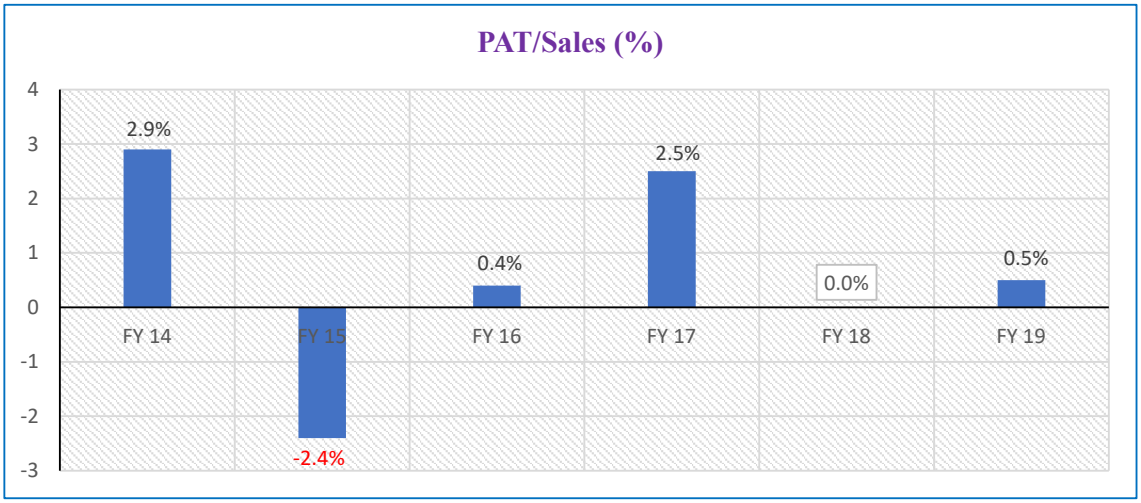
Graph 5.2



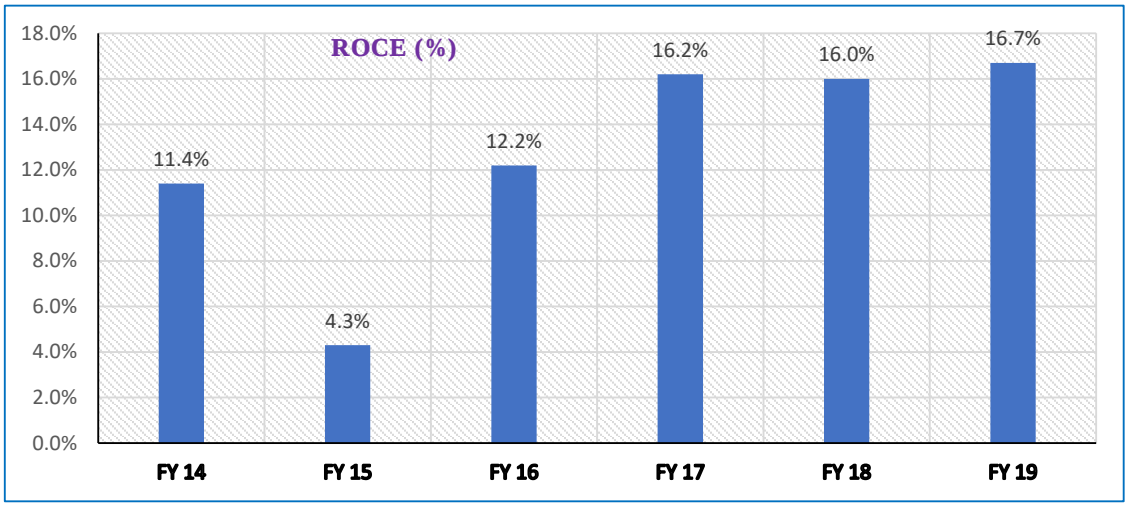
Graph 5.3



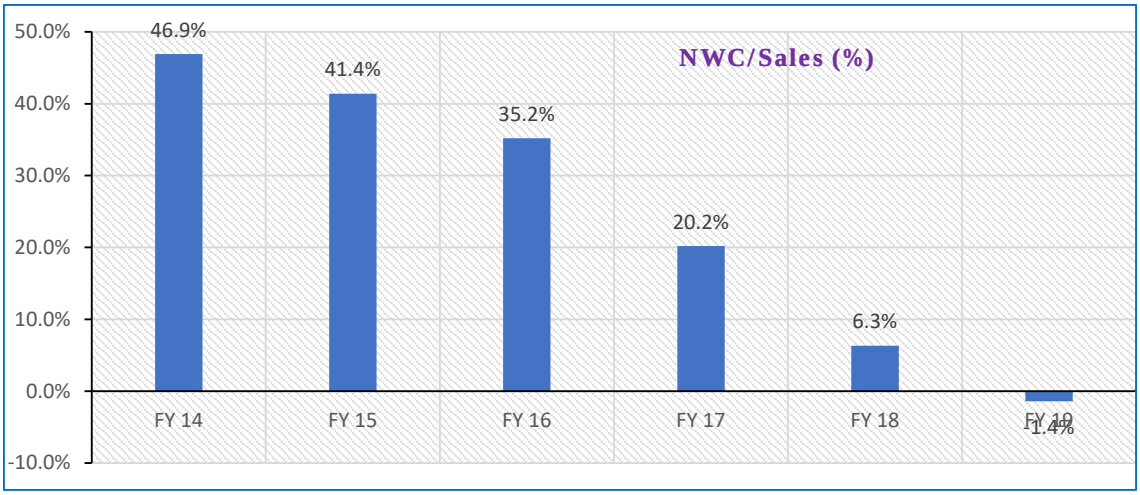
Graph 5.4



Graph 5.5



Graph 5.6



Appendix 2

Explanation of Terms

- **Business Success:** It is the business success of a commercial enterprise that meets the expectations of all the stakeholders e.g. shareholders, employees, management, customers, OEMs/vendors/partners, government, statutory authorities, society, environment. For project organizations, it is important to ensure individual project success to realise business success or enterprise success.
- **Business Success Indicators (BSI):** Business Success is expressed through Key Performance Indicators (KPI) or Business Success Indicators (BSI). In this Study, the term, BSI has been used. In the course of this Study, through Literature Review and Pilot Study, four (4) Business Success Indicators emerged – two (2) Short-Term Business Success Indicators, BSI 1 (Financial Performance) & BSI 2 (Project Performance) and two (2) Long-Term Business Success Indicators, BSI 3 (Brand Image) & BSI 4 (Enhancement of Shareholders' Value) were developed. It is explained in Chapter 4 of the thesis.
- **Case Studies:** In order to understand the major risks encountered by any large EPC Thermal Power Project, 9 large projects were reviewed and major risks were identified with the Project Manager/ Project Control Manager. It is discussed in Chapter 4.
- **Critical Risk Factors (CRF):** These are the major risks that adversely affect the Business Success of an organisation. A set of 34 Critical Risk Factors (CRF) have been Identified in this Study through Pilot Study, Literature Review, Risk Map and Case Studies. It is explained in Chapter 4.
- **Enterprise Risks:** The risks that impact an organization at the enterprise level.
- **Enterprise Risk Management:** Enterprise Risk Management (ERM) is the process of planning, organising, leading and controlling the activities of an organization in order to minimize the effects of risk on organization. It is an integrated view of the risks an organization faces at overall or enterprise level, rather than at the individual project silo levels. In this, all the risks form a part of enterprise level risk portfolio.
- **EPC Business and EPC Organization/Contractor:** EPC Business refers to Engineering, Procurement & Construction of projects. Customers give orders to EPC organizations/ contractors on a single point responsibility basis who does design & engineer, procure, supply materials/equipment, carry out construction and commissioning of the plant including reliability run and performance guarantee (PG) tests and hand over the plant to the Customer, as per the specifications/contract provisions.

- **Final Survey:** Based on the data received from Pilot Survey and secondary sources, questionnaire was prepared for Final Survey where data were collected from 266 people for further use in the Study.
- **Pilot Study/Survey:** Primary data were collected through Pilot Study/Survey which was conducted with 30 experts to firm up the concepts, problem formulation and approach to the Final Survey.
- **Project:** Project Management Institute (PMI), Project Management Body of Knowledge (PMBOK), 6th edition, 2017, defined project as a temporary endeavour undertaken to create a unique product that has a definite beginning and end. The end is reached when project's objectives have been achieved or when the project is terminated because its objectives cannot be met. Project has some major objectives or goals – scope, budgeted cost and scheduled completion time while there are two other implicit objectives – to meet the specified quality and safety requirements.
- **Project Phase:** Any project goes through various stages or phases during the project life cycle e.g. initiation, planning, execution, monitoring & control and closure. Again, execution comprises of engineering, procurement, construction, commissioning & start phases.
- **Project Risk:** It is an uncertain event or condition, that if it occurs, has a positive or negative effect on a project's objective/s e.g. scope, schedule, cost, quality, safety etc. It occurs at individual project level.
- **Project Risk Management (PRM):** As per Project Management Institute (PMI) PMBOK, Risk Management is one of the ten knowledge areas of Project Management in which Project Manager and the project team must be competent. PMI defined project risk as an uncertain event or condition, if it occurs, has an effect on at least one of the project objectives. A risk may have one or more causes and if it occurs, it may have one or more impacts. Project Risk Management (PRM) process comprises risk identification, risk quantification, risk response and risk monitoring and control.
- **Project Success:** It refers to execution of a project when its total scope of work is completed within the budgeted cost, agreed time schedule while meeting the desired quality and safety standards/ specifications.
- **Performance Guarantee:** Customer gives project order to EPC Contractor with a defined scope of work and specification, completion schedule and performance guarantees of the equipment/plant/system like output, efficiency, aux. power

consumption, water consumption etc. A huge commercial obligation is associated with this in case the contractor fails to meet the guarantees agreed upon in the contract.

- **Risk Map:** All EPC organizations have, under different names, various risk check lists, risk protocols, risk policies or guidelines for their project teams. Based on these and also on the basis of the work of various researchers, a document called Risk Map of EPC Power Projects was developed that provides risks, category of risks, sources of risks etc. It has been used as a secondary source of data in the Study.
- **Risk Management/ Mitigation Strategies (RMS):** As a part of Project Risk Management (PRM) and Enterprise Risk Management (ERM), 155 Risk Management/ Mitigation Strategies (RMS) were developed during the Pilot Study to be used for mitigation of the Critical Risk Factors (CRF) and positively impact business success of the EPC Organizations. It has been covered in Chapter 4.
- **Sustained Business Success:** It refers to organizations achieving business success every year and year after year on a sustained basis.
- **Thermal Power Sector:** It comprises grid connected power plants that run on fossil fuels like coal/ lignite, gas and oil.

Appendix - 3

List of Experts participated in the Research Study

1. Experts participated in Pilot Study

Sl No.	Name	Area/ Discipline	Years of Experience
1	P. Mehndiratta	Corporate Strategy	20
2	D S N Reddy	Corporate Strategy	10
3	H Dave	Corporate Strategy	15
4	Rajarsi Ray	Engineering & Technology	20
5	Pratik Banerjee	Engineering & Technology	23
6	Arijit Biswas	Engineering & Technology	26
7	A K De	Engineering & Technology	32
8	Rajen Pandya	Engineering & Technology	35
9	Srikant Jainapur	Engineering & Technology	35
10	Somnath Kundu	Engineering Management	37
11	Srinivas Sirupa	Procurement/ SCM	31
12	CK Suresh Doss	Procurement/ SCM	35
13	A K Basu	Project Management	22
14	P Patil	Project Management	24
15	Hemendra Gupta	Project Management	24
16	H Pooniwala	Project Management	27
17	V Suresh Kumar	Project Management	30
18	S Indwar	Project Management	33
19	N R Patki	Project Management	34
20	KM Subramanian	Contract & Risk Management	33
21	K K Dutta	Project Management	35
22	P N Kharche	Project Management	40
23	S D Navare	Project Management	35
24	K Ravindranath	Project Management	42
25	K Sudhakar	Engineering Management	38
26	V P Singh	Construction Management	36
27	Sunil Sevak	IT & Digital	31
28	Aditi Bandyopadhyay	IT & Digital	23
29	V K Bansal	QA & QC	35
30	Jitesh Poptani	Finance & Accounts	20

2. Other Experts Consulted during the Study

Sl. No.	Name	Area/ Discipline	Years of Experience
1	Sandeep Dipankar	Corporate Strategy	15
2	Usashi Banerjee	Corporate Strategy	9
3	Jignesh Chokshi	Engineering & Technology	26
4	K C Rao	Engineering & Technology	35
5	B Bhattacharya	Engineering & Technology	46
6	Randip Ghosh	Engineering & Technology	30
7	B Bagchi	Engineering & Technology	35
8	A K Shringi	Procurement/ SCM	30
9	A Baxi	Procurement/ SCM	10
10	Amit Biswas	Construction Management	30
11	Soumen Sengupta	Construction Management	30
12	S Dasgupta	Commissioning	38
13	P Jena	Project Planning & Control	26
14	H Ahuja	Contract & Risk Management	34
15	Sourav Roy	Contract & Risk Management	32
16	S Bera	Project Management	31
17	A Bhattacharya	Marketing & Proposal	25
18	Chirag Shah	Marketing & Proposal	20
19	Aanal Shah	IT & Digital	14
20	Nishad Mehta	HRD	22
21	Sachin Bordavekar	HRD	22
22	Harshida Pethapuria	HRD	15

Risk Factors per Pilot Study

Appendix - 4

Sr. No.	Risk Factors
1	Liquidated Damages (LD) for delay / time overrun / stringent delivery schedule / Unrealistic Schedule / Risk of not having on-time completion / Schedule Risk / Disputes related to delay / Delay in demonstrating performance test guarantee
2	Uncertain future of coal and gas power businesses due to environmental issues/ government thrust on alternate technologies e.g. renewables / lack of demand for thermal power / changing market conditions / dimiished market size / lack of order booking / sustainability of business / meeting financial and non-financial targets / Industry Weakness / Low market demand / Structural Changes
3	Liquidated Damage for non-performance of Equipment / Plant; not meeting technical guarantee of plant and equipment
4	Lack of competent / skilled personnel / Specific skill / Productive / Efficeint Talent Acquisition; Retention; Employee Engagement; Attrition
5	Labour issues including labour union, labour disturbance, local issues / disputes / local culture / political issues / political stability / law & order issues, strikes, violence, terrorism / job site security & safety / insecurity / crime
6	Unpredictable price variations / increase of bulk Commodities e.g. structural steel, reinforcement steel, cement, equipment leading to cost overrun / erosion of profit margin, etc. / Fluctuation in material cost
7	Lack of competent / credithworthy / financially sound vendors / suppliers and under/non-performance of vendors / delay in supply of material / equipment / lead time changes / equipment by vendors / Availability of materials and equipment / poor quality of supplies / short supplies / defective materials / post-order deviation
8	Forex variation
9	Stringent Payment terms / Invoce processing / Collection of Payments / Payment terms with Customer / Payment terms with vendors / Lack of Cash Flow / Insufficient Working Capital / Management of CF & WC / Insolvency / cash flow imbalance
10	Poor Quality of work / Inadequate QA programme / Sub-standard design, workmanship / rejection of work and HSE risks / issues; Inadequate Quality & HSE Planning / Accidents / Poor quality of work
11	Cost of capital / increase in interest rate / increase in inflation rate / non-availability of financial resources / ability to raise money / rising NPA / funding risks / fund allocation issues / liquidity / Financial & Economical risk / Bank Policy / Insufficient Capital
12	Variation / increase / shortfall / error in Bill of Quantities (BOQ)
13	Changes in government policy, laws and regulations including increased taxation & duties, minimum wages / imposition of new levies / withdrawal of benefits like Deemed Export Benefits
14	Fierce competition (disruptive pricing)/ Pressure on profit margin / sub-contractor turning into competitors / Strong competitors
15	Credit worthiness & solvency / financial soundness of the customer / funding shortage / bankruptcy / payment risk / payment security / financial uncertainty / delay of payment / delay in tie-up of funds / delay in releasing payment
16	Lack of scope clarity and interface issues / unclear boundary of work / risks with Customer and other agencies / contractors / scope creep / scope increase / change in requirements in Project Scope without any time extension / Inadequate scpe control during implementation
17	Lack of competent subcontractors with required finances and resources / workmen / labour / skilled manpower / capital / equipment / sub-contractor acquisition & retention / low productivity / lack of experience of handling multiple small contractors leading to delay / poor performance / breach of contract & dispute
18	Unilateral / unequitable contract clauses favouring the customer/ contractual / commercial risks w.r.t. scope, taxes & duties / improper or unclear contractual assignment of risks / unfamiliarity with contract conditions for claims and litigations / special local requirements / owner's breach of contract & disputes / delay in resolving contractual disputes / resolution of disputes / objectionable clauses like auto-renewal / open-ended Bank Guarantee / restriction on issuing bank / tender condition requiring IDC to be absorbed by the Contractor
19	Design & Specification risks / multiple changes / cumbersome approval process by customer leading to delay / vague sepcifications / unfamiliarity with local codes and standards / lack of knowledge of construction method / inadequate or incomplete sepcification for the scope of work / inadequate or insufficient site information (including soil data)
20	Geo-political risks / Issues and International Geopolitics / new region

Sr. No.	Risk Factors
21	Delay and non-fulfillment of customers' inputs e.g. land, site access, permits, water, construction power, power evacuation, PAC, financial closure, non-finalization of PPA, FSA, CCOE, IBR, EC, Labour Licence, F.O. Storage, Electric Inspection, Factory INspection, Aviation, etc., Approvals and other Statutory Clearances / Government permits / Government Bureaucracy / O&M Staff
22	Natural calamities / Acts of God / other Force Majeure conditions / Ecological Risks / Impact of accidents, fire, theft / Earthquake, Tsunami, Storm, etc.
23	Delay in receipt of engineering inputs from OEMs / Vendors / Customers / Delay in issue of enginering deliverables / delay in finalization of Engineering / late Design decisions and drawings / frequent design changes / design changes by Customer / design change in site topography / constructibility issues / poor design / incomplete design
24	Working in severe weather / climatic conditions / heavy monsoon & flooding / unforeseen ground & site conditions / inclement weather
25	Change of specification / new and emerging technology / Lack of technical know-how / Too high quality standard
26	Socio-economic-political-cultural issues / uprising issues / lack of stability of government / war/problem with neighbour / revolution/riots/ civil disorder/ consistency of government policy / culture / language / religion / social acceptance / laws
27	Technology change / obsolence risk
28	Lack of reliable logistics vendors / logistics risks / issues / In-transit delay
29	Defect Liability Period (DLP) / Latent Defect Period / O&M liability in DLP
30	Delay in securing Retention money & Bank Guarantee / Invocation of BG by Customer
31	Legal risks / Disputes / Arbitration /
32	Variation of soil characteristics; water/fuel analysis & other input data provided by the Customer / Differeing / Unknown site conditions; Actual ground conditions / Geological Conditions
33	Prolonged delay in contract / project closure
34	Underutilization / Sub-optimal use of Assets / wrong allocation of human resources / Inadequate Resource Management and lack of Resources
35	Degradation of brand image / reputation / credit rating / lack of credibility / blacklisting of company / poor or negative feedback on company's performance
36	Steep minimum wage hike not covered in Price Variation Clause (PVC) / Fixed Price Contract without Price Variation clause
37	Poor access/connectivity of site by road, rail, air / poor infrastructure in and around site
38	Lack of leadership / Organisational failure / Inadequate Management Skills/ Lack of requisite competence / No previous experience in the line of work / Improper organization structure
39	Not meeting shareholders expectations / erosion of share price / market cap / shareholders losing interest
40	Delay / idling due to non-finalisation of order / non-readiness / non-availability of fronts/facilities by Customer (interfaces) or by other contractors
41	Country risk
42	Hostile takeover threat
43	Not meeting Customer satisfaction
44	Improper Communication / coordination inadequate consultation with project stakeholders
45	New vendor approval by customer
46	Lack of data / inadequate data at proposal time / inadequate cost estimation / errors in cost estimation at bidding time
47	Extended stay at site and cost overrun (including P&M and overheads) / Cost overrun / Cost increase
48	Contractual gaps (between customer and contractor & contractor and the vendor)
49	Inadequate procurement planning / Delay in ordering / Poor purchase / Other procurement risks
50	Claim management / Change Management with customers / vendors / Claim settlement and dispute resolution
51	Geological risks
52	Insufficient space for office, storage, laydown and construction areas
53	Construction error / rework / lack of proper construction technologies / Unpredicted technical problems in construction
54	Right of Way
55	Consequential Damage
56	Plant Outage Risks
57	Absence of Price Variation clauses (PVC)
58	Delay in taking decisions / slow decision making & approvals

Sr. No.	Risk Factors
59	Material Reconciliation Risk
60	Lack of internal control
61	Erosion of paid up capital
62	Morale / motivation of Employees
63	Monetary Policy / Restrictions
64	Lack of IPPs / Private Sector Participation
65	Design errors / defective design / omissions, misinterpretation of technical document, errors in technical / project doc, drawing errors / using wrong reference specs, codes or standards
66	Poor / Inadequate Resource Planning & allocation / Scheduling/ Micro-planning / Construction Planning / Inadequate post- project review / management of float / delay due to inadequate planing and scheduling
67	Construction pollution and environmental degradation / pollution
68	Change in owner's organisation and personnel change
69	Unethical work practices / bribery / corruption / lobby (legal/illegal)
70	Inadequate housekeeping
71	Delay in construction
72	Increased cost due to fast tracking / crashing of activities for acceleration time schedule
73	Financial / Economic stability, Inflation, Legal stability, unavailability of funds / Rules & Regulations / financial uncertainty
74	Import / Export Restriction
75	Environmental compliance
76	Resolution of disputes and contractual issues / conflict management / unjust arbitration
77	Inadequately defined roles & responsibilities / accountability / Improper coordination amonst teams / coordination failure
78	Unstable relatioships amongst project participants / Disputes amongst entities
79	Proejct Execution Risks
80	Installation Risks of Mechanical and Electrical Works
81	Inadequate sales
82	Insufficient profit
83	Over-expansion
84	Improper use of Project Management techniques
85	Lack of experience in line of work / non-familiarity with the technology / working in new region
86	Lack of early warning measures
87	Lack of Documentation System
88	Heavy Operating Expenses
89	Materials and Plant availability / Equipment availability / Productivity and efficiency of equipment
90	Owner's improper intervention / involvement in construction phases
91	Consequence of ignoring risk / Inadequacy of Risk Management
92	Poor Security
93	Poor Maintenance
94	Monopolistic bidding
95	Inadequate Insurance coverage and difficulties in claiming insurance compensation / Insurance deductibles
96	Faulty job field survey
97	Traffic & work hour restrictions
98	Third party objections / Relation with third party
99	Low working morale
100	Constraints on Employment
101	Criminal Acts
102	Substance abuse
103	Local Protections
104	Unfairness in tendering
105	Effective date / zero date of contract and date of contract signing
106	Increase in CIF Value for imported items
107	Change in material sourcing - indigenous & imported resulting in financial implication and delay in delivery
108	Surrounding property damage, cost escalation for reordering in case of damage, third party liability
109	Mechanism of payments e.g. direct, through L/C, etc.

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
1	Liquidated Damages (LD) for delay / time overrun / stringent delivery schedule / Unrealistic Schedule / Risk of not having on-time completion / Schedule Risk / Disputes related to delay / Delay in demonstrating performance test guarantee	1		1												1		1			1	1			1
2	Uncertain future of coal and gas power businesses due to environmental issues/ government thrust on alternate technologies e.g. renewables / lack of demand for thermal power / changing market conditions / dimiished market size / lack of order booking / sustainability of business / meeting financial and non-financial targets / Industry Weakness / Low market demand / Structural Changes	1	1														1						1	1	

Risk Factors per Literature Review

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3	Liquidated Damage for non-performance of Equipment / Plant; not meeting technical guarantee of plant and equipment			1																	1	1			
4	Lack of competent / skilled personnel / Specific skill / Productive / Efficient Talent Acquisition; Retention; Employee Engagement; Attrition	1		1												1		1					1	1	1
5	Labour issues including labour union, labour disturbance, local issues / disputes / local culture / political issues / political stability / law & order issues, strikes, violence, terrorism / job site security & safety / insecurity / crime	1	1															1			1	1	1	1	1

Risk Factors per Literature Review

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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6	Unpredictable price variations / increase of bulk Commodities e.g. structural steel, reinforcement steel, cement, equipment leading to cost overrun / erosion of profit margin, etc. / Fluctuation in material cost		1													1	1				1	1	1	1	1
7	Lack of competent / creditworthy / financially sound vendors / suppliers and under/non-performance of vendors / delay in supply of material / equipment / lead time changes / equipment by vendors / Availability of materials and equipment / poor quality of supplies / short supplies / defective materials / post-order deviation	1			1										1			1				1		1	1
8	Forex variation	1	1														1				1		1	1	1

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9	Stringent Payment terms / Invoice processing / Collection of Payments / Payment terms with Customer / Payment terms with vendors / Lack of Cash Flow / Insufficient Working Capital / Management of CF & WC / Insolvency / cash flow imbalance															1						1			
10	Poor Quality of work / Inadequate QA programme / Sub-standard design, workmanship / rejection of work and HSE risks / issues; Inadequate Quality & HSE Planning / Accidents / Poor quality of work	1	1							1					1		1		1	1	1	1	1	1	1

Risk Factors per Literature Review

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11	Cost of capital / increase in interest rate / increase in inflation rate / non-availability of financial resources / ability to raise money / rising NPA / funding risks / fund allocation issues / liquidity / Financial & Economical risk / Bank Policy / Insufficient Capital		1												1	1			1				1	1	
12	Variation / increase / shortfall / error in Bill of Quantities (BOQ)																				1				
13	Changes in government policy, laws and regulations including increased taxation & duties, minimum wages / imposition of new levies / withdrawal of benefits like Deemed Export Benefits	1	1													1	1	1			1		1	1	1
14	Fierce competition (disruptive pricing)/ Pressure on profit margin / sub-contractor turning into competitors / Strong competitors																						1		

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15	Credit worthiness & solvency / financial soundness of the customer / funding shortage / bankruptcy / payment risk / payment security / financial uncertainty / delay of payment / delay in tie-up of funds / delay in releasing payment	1																			1		1		1
16	Lack of scope clarity and interface issues / unclear boundary of work / risks with Customer and other agencies / contractors / scope creep / scope increase / change in requirements in Project Scope without any time extension / Inadequate scope control during implementation	1	1		1		1	1	1	1			1	1	1	1	1		1			1		1	1

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17	Lack of competent subcontractors with required finances and resources / workmen / labour / skilled manpower / capital / equipment / sub-contractor acquisition & retention / low productivity / lack of experience of handling multiple small contractors leading to delay / poor performance / breach of contract & dispute	1	1	1													1	1		1	1	1	1	1	1

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18	Unilateral / unequitable contract clauses favouring the customer/ contractual / commercial risks w.r.t. scope, taxes & duties / improper or unclear contractual assignment of risks / unfamiliarity with contract conditions for claims and litigations / special local requirements / owner's breach of contract & disputes / delay in resolving contractual disputes / resolution of disputes / objectionable clauses like auto-renewal / open-ended Bank Guarantee / restriction on issuing bank / tender condition requiring IDC to be absorbed by the Contractor															1						1	1	1	1

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19	Design & Specification risks / multiple changes / cumbersome approval process by customer leading to delay / vague specifications / unfamiliarity with local codes and standards / lack of knowledge of construction method / inadequate or incomplete specification for the scope of work / inadequate or insufficient site information (including soil data)															1		1	1				1	1	
20	Geo-political risks / Issues and International Geopolitics / new region		1														1								

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21	Delay and non-fulfilment of customers' inputs e.g. land, site access, permits, water, construction power, power evacuation, PAC, financial closure, non-finalization of PPA, FSA, CCOE, IBR, EC, Labour Licence, F.O. Storage, Electric Inspection, Factory Inspection, Aviation, etc., Approvals and other Statutory Clearances / Government permits / Government Bureaucracy / O&M Staff		1		1			1	1			1						1	1	1	1		1	1	1
22	Natural calamities / Acts of God / other Force Majeure conditions / Ecological Risks / Impact of accidents, fire, theft / Earthquake, Tsunami, Storm, etc.				1											1	1					1	1		

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23	Delay in receipt of engineering inputs from OEMs / Vendors / Customers / Delay in issue of engineering deliverables / delay in finalization of Engineering / late Design decisions and drawings / frequent design changes / design changes by Customer / design change in site topography / constructability issues / poor design / incomplete design	1	1		1		1	1	1	1			1	1			1	1	1	1			1	1	1
24	Working in severe weather / climatic conditions / heavy monsoon & flooding / unforeseen ground & site conditions / inclement weather		1				1		1	1							1		1			1	1	1	1
25	Change of specification / new and emerging technology / Lack of technical know-how / Too high-quality standard	1			1										1				1				1		

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26	Socio-economic-political-cultural issues / uprising issues / lack of stability of government / war/problem with neighbour / revolution/riots/ civil disorder/ consistency of government policy / culture / language / religion / social acceptance / laws		1		1									1	1		1	1			1		1	1	1
27	Technology change / obsolescence risk																								
28	Lack of reliable logistics vendors / logistics risks / issues / In-transit delay		1														1								
29	Defect Liability Period (DLP) / Latent Defect Period / O&M liability in DLP																						1	1	
30	Delay in securing Retention money & Bank Guarantee / Invocation of BG by Customer																								
31	Legal risks / Disputes / Arbitration /														1										

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32	Variation of soil characteristics; water/fuel analysis & other input data provided by the Customer / Differing / Unknown site conditions; Actual ground conditions / Geological Conditions	1	1						1	1	1		1	1					1						
33	Prolonged delay in contract / project closure																								
34	Underutilization / Sub-optimal use of Assets / wrong allocation of human resources / Inadequate Resource Management and lack of Resources	1							1		1		1	1	1				1				1		
35	Degradation of brand image / reputation / credit rating / lack of credibility / blacklisting of company / poor or negative feedback on company's performance		1																						
36	Steep minimum wage hike not covered in Price Variation Clause (PVC) / Fixed Price Contract without Price Variation clause																								

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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37	Poor access/connectivity of site by road, rail, air / poor infrastructure in and around site		1																						
38	Lack of leadership / Organisational failure / Inadequate Management Skills/ Lack of requisite competence / No previous experience in the line of work / Improper organization structure				1						1			1	1	1			1		1	1	1		
39	Not meeting shareholders expectations / erosion of share price / market cap / shareholders losing interest																								
40	Delay / idling due to non-finalisation of order / non-readiness / non-availability of fronts/facilities by Customer (interfaces) or by other contractors																								
41	Country risk																								
42	Hostile takeover threat																								
43	Not meeting Customer satisfaction																								

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
44	Improper Communication / coordination inadequate consultation with project stakeholders		1												1							1	1	1	
45	New vendor approval by customer																								
46	Lack of data / inadequate data at proposal time / inadequate cost estimation / errors in cost estimation at bidding time	1		1												1				1		1	1	1	
47	Extended stay at site and cost overrun (including P&M and overheads) / Cost overrun / Cost increase														1	1	1								
48	Contractual gaps (between customer and contractor & contractor and the vendor)	1																							
49	Inadequate procurement planning / Delay in ordering / Poor purchase / Other procurement risks														1							1	1		
50	Claim management / Change Management with customers / vendors / Claim settlement and dispute resolution	1																		1		1			1

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
51	Geological risks																								
52	Insufficient space for office, storage, laydown and construction areas																						1		
53	Construction error / rework / lack of proper construction technologies / Unpredicted technical problems in construction																				1			1	1
54	Right of Way																								
55	Consequential Damage																								
56	Plant Outage Risks																								
57	Absence of Price Variation clauses (PVC)																								
58	Delay in taking decisions / slow decision making & approvals	1																							
59	Material Reconciliation Risk																								
60	Lack of internal control																								
61	Erosion of paid up capital																								
62	Morale / motivation of Employees																					1			
63	Monetary Policy / Restrictions																							1	

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
64	Lack of IPPs / Private Sector Participation																								
65	Design errors / defective design / omissions, misinterpretation of technical document, errors in technical / project doc, drawing errors / using wrong reference specs, codes or standards	1																							1
66	Poor / Inadequate Resource Planning & allocation / Scheduling/ Micro-planning / Construction Planning / Inadequate post- project review / management of float / delay due to inadequate planning and scheduling	1																		1		1	1		
67	Construction pollution and environmental degradation / pollution	1	1																				1	1	
68	Change in owner's organisation and personnel change	1																							
69	Unethical work practices / bribery / corruption / lobby (legal/illegal)	1																					1	1	1
70	Inadequate housekeeping	1																							

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
71	Delay in construction	1						1		1		1							1						
72	Increased cost due to fast tracking / crashing of activities for accelerating time schedule	1																							
73	Financial / Economic stability, Inflation, Legal stability, unavailability of funds / Rules & Regulations / financial uncertainty		1			1		1	1	1	1	1	1			1			1	1	1				
74	Import / Export Restriction																							1	
75	Environmental compliance		1														1								
76	Resolution of disputes and contractual issues / conflict management / unjust arbitration		1																			1	1		
77	Inadequately defined roles & responsibilities / accountability / Improper coordination amongst teams / coordination failure				1						1			1					1		1	1			
78	Unstable relationships amongst project participants / Disputes amongst entities				1																		1		
79	Project Execution Risks														1										

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
80	Installation Risks of Mechanical and Electrical Works														1										
81	Inadequate sales															1									
82	Insufficient profit															1									
83	Over-expansion															1									
84	Improper use of Project Management techniques															1									
85	Lack of experience in line of work / non-familiarity with the technology / working in new region															1									
86	Lack of early warning measures															1									
87	Lack of Documentation System															1									
88	Heavy Operating Expenses																								
89	Materials and Plant availability / Equipment availability / Productivity and efficiency of equipment																1	1			1				
90	Owner's improper intervention / involvement in construction phases															1									1
91	Consequence of ignoring risk / Inadequacy of Risk Management																					1			

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
92	Poor Security																					1			
93	Poor Maintenance																					1			
94	Monopolistic bidding																						1		
95	Inadequate Insurance coverage and difficulties in claiming insurance compensation / Insurance deductibles																						1	1	
96	Faulty job field survey																						1		
97	Traffic & work hour restrictions																						1		
98	Third party objections / Relation with third party																						1		
99	Low working morale																						1		
100	Constraints on Employment																							1	
101	Criminal Acts																								1
102	Substance abuse																								1
103	Local Protections																								1
104	Unfairness in tendering																								1
105	Effective date / zero date of contract and date of contract signing																								

Risk Factors per Literature Review

Sr No	Risk Factors	Literature Survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Alireza Atin (2016)	AsbjÖrg (2012)	Williams (2004)	Price Water House	Mustafa (1991)	Dey (2002)	Ghosh (2004)	Laryea (2011)	Enhassi et al (2008)	Sun & Meng (2009)	Wang et al. (2004)	Eybpoosh (2011)	Rezakhani (2012)	Goh et al (2013)	Bali et al (2014)	Gadekar et al (2013)	Nakagawa	Altoryman (2014)	Mishra et. al. (2016)	Tipili et. al. (2014)	Rawash et al. (2014)	Tsai et. Al. (2010)	Zhi (1995)	El-Sayegh (2008)
106	Increase in CIF Value for imported items																								
107	Change in material sourcing - indigenous & imported resulting in financial implication and delay in delivery																								
108	Surrounding property damage, cost escalation for reordering in case of damage, third party liability																								
109	Mechanism of payments e.g. direct, through L/C, etc.																								

Appendix - 6

Risk Factors per Risk Map of EPC Power Projects

1.0 Technical /Engineering Risks

Sr. No.	Risks	Source of Risk	Project Phase
1.1	New/ Emerging Technology	Bidding, Execution	B, E, P, C
1.2	Technical Guarantees of the Plant/Equipment e.g. Capacity Heat Rate, Aux. Power Consumption, etc.	OEMs, Vendors, Contractor	B, E, P, C
1.3	Variations in soil characteristics, water analysis, fuel analysis & other site data provided by the Customer	Customer	E, C
1.4	Increase in Bill of Quantities	Customer, Contractor	E, P, C
1.5	Inadequate/incomplete specifications for the scope of work	Customer	B, E, P, C
1.6	Inadequate/insufficient site information (including soil data)	Customer	B, E, C
1.7	Heavy rainfall/flooding at site	Environment	C

B: Bidding; E: Engineering; P: Procurement; C: Construction

2.0 Contractual & Commercial Risks

Sr. No.	Risks	Source of Risk	Project Phase
2.1	Tight Project Schedule & Liquidated Damages	Customer, OEMs, Vendors, Sub-contractors, Statutory Authorities	B, E, P, C
2.2	Effective date/zero date of contract and date of contract signing	Customer	E, P, C
2.3	Fixed Price Contract vis-à-vis Contract with Price Variation (PV) Clause	Customer, Macro-economic conditions	P, C
2.4	Taxes & Duties and imposition of new levies	Government / Statutory Authorities	B, P, C
2.5	Defect Liability period (typically 24 months from the date of Provisional Acceptance of the Unit)	Customer, OEMs, Vendor	B, P, C
2.6	Latent Defect Period (typically 5 years from the end of Defect Liability Period)	Customer, OEMs, Vendors	B, P, C
2.7	Bank Guarantee (BG) and invocation of BG a. Advance BG b. Contract Performance BG c. Performance BG for Warranty Period	Customer	B, P, C
2.8	Force Majeure clause	Act of God, Environment	E, P, C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Sr. No.	Risks	Source of Risk	Project Phase
2.9	Consequential Damages	Contractor, Vendor, Environment	P, C
2.10	Contractual Terms- Legal aspects/Disputes/ Arbitration	Customer, Contractor, Vendor, Govt. & Statutory Authorities	B, P, C
2.11	Increase in CIF Value for imported items	OEMs, Vendors	B, P

3.0 Execution Risks

Sr. No.	Risks	Source of Risk	Project Phase
3.1	Scope Creep	Customer	E, P, C
3.2	Limited Vendors/Contractors for equipment & packages	Customer, Vendors	P
3.3	Delay in vendor inputs for engineering.	Vendors	E, P, C
3.4	Short supply of materials	Vendor	C
3.5	Idle time due to non- availability of work front and interface issues with other contractors (of Customer)	Customer / Other Contractors	C
3.6	Space for office, storage, fabrication yard, labour colony, etc. at site	Customer	C
3.7	Non availability of requisite skilled/semi- skilled employees/manpower	Environment	C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Sr. No.	Risks	Source of Risk	Project Phase
3.8	Non-availability of competent sub-contractors/vendors having proper resources and delay due to them	Environment	C
3.9	Lack of security and safety at remote and politically disturbed areas	Environment	C
3.10	• Inadequate Environment, Health & Safety (EHS) system and occurrence of accidents including housekeeping, protection of environment • Lack of site security	Contractor / Sub-Contractor	C
3.11	Inadequate QA/QC system and poor quality of work	Contractor / Sub-Contractor	C
3.12	• Resolution of labour problems, strikes & disputes • Interferences by local interest groups, political parties, society, interest groups, etc.	Customer, Statutory Authorities, Vendors	C
3.13	Logistics (inadequate route survey, unreliable transporters etc.)	Transporters	P, C
3.14	Post-order deviations by vendors	Vendors / Sub-vendors	P, C
3.15	Change of material sourcing – indigenous to imported resulting in financial implication and delay in delivery	Customer, Vendors	P, C
3.16	Poor infrastructure in and around site	Environment	C
3.17	In-transit delay	Transporter	C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Sr. No.	Risks	Source of Risk	Project Phase
3.18	Non-availability of work permits	Customer	C
3.19	Delay in demonstrating performance test guarantees	Customer	C
3.20	Surrounding property damage, cost escalation for reordering in case of damage, third party liability	Customer, Contractor / Sub-Contractor	P, C
3.21	• Delay due to inadequate planning & scheduling	Contractor	E, P, C
3.22	• Cost increase due to crashing of activities		C

4.0 Financial Risks

Sr. No.	Risks	Source of Risk	Project Phase
4.1	Inaccurate cost estimate	Contractor	B, P, C
4.2	Working capital management 1) Cash flows 2) Payment terms with vendors 3) Invoice processing	Customer	P, C
4.3	Increase in actual Taxes & Duties including Customs Duty	Statutory Authorities	B, P
4.4	Forex Variation	Microeconomic factor	B, P
4.5	Gaps in scope, Commercial Terms & Conditions of OEMs/ vendors/sub-contractors with those of the contract with Customer (e.g. price variation, terms of payment guarantee/warranty period, latent defect period, etc.)	Sub-contractor / Vendors	B, P, C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Sr. No.	Risks	Source of Risk	Project Phase
4.6	Insurance Deductibles	Insurer	B, P, C
4.7	Withdrawal of Deemed Export Benefits (DEB)	Government / Statutory Authority	B, P, C
4.8	Objectionable clauses in Bank Guarantee (bid / ABG / PBG) such as: a) Auto renewal b) Open-ended c) Restriction on issuing bank	Customer	B, C
4.9	Tender conditions requiring Interest During Construction (IDC) to be absorbed by the Contractor	Customer	B
4.10	International Projects: Permanent establishment status, corporate tax rate for non-residents, branch tax rate, treating on withholding tax rate, filing of returns, repatriation tax, immigration laws	Customer, Country Regulations	B, C

5.0 Risk Associated with Customer

Sr. No.	Risks	Source of Risk	Project Phase
5.1	Bankruptcy of Customer / Payment Security	Customer	B, P, C
5.2	Delays in approval of: a) Drawings/documents b) Additional/New Vendors	Customer	E, P, C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Sr. No.	Risks	Source of Risk	Project Phase
5.3	Customer not providing Essentiality/Project Authority Certificate	Customer	P, C
5.4	Delay in providing Land, Power, Water, Fuel Supply, Power Evacuation Facility, O&M Staff	Customer	C
5.5	Change in Customer's organization and personnel	Customer	E, P
5.6	Project funding 1) Non tie-up/delay in tie up of funds 2) Delay in releasing funds/payment by the funding agencies	Customer, Lenders	B, E, P, C
5.7	Delay in Statutory Approvals (CCOE, EC, IBR, Labour License, F.O. Storage, Electric Inspector, Factory Inspector, Aviation, etc.)	Customer, Statutory Authorities	B, E, C

6.0 Other Risks

Sr. No.	Risks	Source of Risk	Project Phase
6.1	Competition	Environment	B
6.2	Unethical work practice	Environment	C
6.3	Delay in decision making	Customer Customer Statutory Bodies	E, P, C
6.4	Site location – accessibility earthquake and flood prone area	Environment	C
6.5	Customer not in a hurry for project completion	Customer	C
6.6	Commodity Price	Environment	P, C
6.7	Interest Rates	Environment	P, C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Sr. No.	Risks	Source of Risk	Project Phase
6.8	Political Stability, Terrorism, Civil Unrest	Environment	C
6.9	Fuel Prices	Environment	P, C
6.10	Design Quality	Contractor	E
6.11	Operator Performance	Customer Contractor	C
6.12	Design Change from Customer	Customer	E, P, C

B: Bidding; E: Engineering; P: Procurement; C: Construction

Major Risks Factors encountered in EPC Power Projects – Case Studies

Sl. No.	Risk Item	Proj. 1 (ML2)	Proj. 2 (CHH)	Proj. 3 (KRD)	Proj. 4 (DBP)	Proj. 5 (BHRMR)	Proj. 6 (KHRG)	Proj. 7 (SKB)	Proj. 8 (APDCL)	Proj. 9 (JPN)	Total Frequency
1	Customer's claim on Contractor	1									1
2	Vendor's / Sub-contractor's claim on Contractor	1		1			1				3
3	Inadequate proposal cost estimation	1	1	1							3
4	No previous experience of the job / work / lack of technical knowledge / local statutory compliance	1					1	1			3
5	Increase in Steel price	1									1
6	Change in Government Policy / Law	1	1				1			1	4
7	Delay in Ordering	1									1
8	Time overrun/constraints	1							1		2
9	Increase/variation in BOQ	1	1	1			1		1	1	6
10	Lack of scope clarity and scope creep	1					1		1		3
11	Delay in delivery of equipment by the vendor / late finalisation of engineering	1	1	1	1		1		1		6
12	Delay in Engineering inputs / late finalisation of engineering / engineering deliverables including vendors' engineering	1					1		1		3
13	Delay in engineering approvals	1									1
14	LD for non-performance						1		1	1	3
15	Lack of experience of managing multiple small contractors leading to delay	1									1
16	Delay in execution / construction	1	1	1	1	1	1	1			7

Sl. No.	Risk Item	Proj. 1 (ML2)	Proj. 2 (CHH)	Proj. 3 (KRD)	Proj. 4 (DBP)	Proj. 5 (BHRMR)	Proj. 6 (KHRG)	Proj. 7 (SKB)	Proj. 8 (APDCL)	Proj. 9 (JPN)	Total Frequency
17	Forex variation		1								1
18	Financial soundness of the customer		1								1
19	Non-availability of statutory approvals		1								1
20	Delay in construction due to heavy monsoon		1		1						2
21	Law and order / political / local issues at site		1			1		1			3
22	Lack of skilled & unskilled workmen / poor quality of sub-contractor		1				1	1			3
23	Attrition of key personnel / talents							1			1
24	Poor quality of supplies		1								1
25	Delay due to non-availability of fronts by other Contractors / Customer				1				1	1	3
26	Delay in providing inputs by the customer (e.g. fuel / land / customs duty, etc.)		1			1		1	1		4
27	Cost overrun		1			1	1	1		1	5
28	Unilateral interpretation of contract by the customer			1							1
29	Difficulties in logistics					1					1
30	Inadequate insurance cover					1		1			2
31	Defect liabilities / O&M liability in DLP						1	1			2
32	Stringent delivery schedule						1				1
33	Right of way						1				1
34	Theft / security / short supplies							1			1
35	Delay in payment by customer							1		1	2

Criticality Scores of Risk Factors per Pilot Study (on 1-5 Likert Scale)

December 24, 2017

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)														Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
1	Liquidated Damages (LD) for delay / time overrun / stringent delivery schedule / Unrealistic Schedule / Risk of not having on-time completion / Schedule Risk / Disputes related to delay / Delay in demonstrating performance test guarantee			5		2	5	12	3	4		4	4	5	4	5	3	25	6	4.2		5	4	4		4		5	4	2		4	32	8	4	4	4	4		5	17	4	4.25	86	21	4.1
2	Uncertain future of coal and gas power businesses due to environmental issues/ government thrust on alternate technologies e.g. renewables / lack of demand for thermal power / changing market conditions / dimiished market size / lack of order booking / sustainability of business / meeting financial and non-financial targets / Industry Weakness / Low market demand / Structural Changes	5			5		5	15	3	5	5	5	5		5		3	23	5	4.6	5	4	5	5		5			4	3	5	4	40	9	4.4	5	5			5	15	3	5	93	20	4.7
3	Liquidated Damage for non-performance of Equipment / Plant; not meeting technical guarantee of plant and equipment			5		1	5	11	3	3.7		4	1	1	3	2	2	13	6	2.2		1	3	3		3		5	2	2		1	20	8	2.5	4	4			4	12	3	4	56	20	2.8
4	Lack of competent / skilled personnel / Specific skill / Productive / Efficeint Talent Acquisition; Retention; Employee Engagement; Attrition	4		3	4	2	4	17	5	3.4	2		3				4	9	3	3	1	2	4	2	4	3		1	3	1		2	23	10	2.3	5				4	9	2	4.5	58	20	2.9
5	Labour issues including labour union, labour disturbance, local issues / disputes / local culture / political issues / political stability / law & order issues, strikes, violence, terrorism / job site security & safety / insecurity / crime	3		3	4		3	13	4	3.3	3	3				4	3	13	4	3.3	1	2	4	2		3		3	2	4	3	2	26	10	2.6	2	3				5	2	2.5	57	20	2.9
6	Unpredictable price variations / increase of bulk Commodities e.g. structural steel, reinforcement steel, cement, equipment leading to cost overrun / erosion of profit margin, etc. / Fluctuation in material cost			4	3	4	3	14	4	3.5		3	3	4	3			13	4	3.3	3	3	3	2		3		4	3				21	7	3	3	3	4			10	3	3.33	58	18	3.2

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)															Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
7	Lack of competent / credithworthy / financially sound vendors / suppliers and under/non-performance of vendors / delay in supply of material / equipment / lead time changes / equipment by vendors / Availability of materials and equipment / poor quality of supplies / short supplies / defective materials / post-order deviation	2	4	3	4		4	17	5	3.4		3	3			3		9	3	3	3		4	2	3	2	5					19	6	3.2			3		3	6	2	3	51	16	3.2
8	Forex variation			3	3	1	3	10	4	2.5	2							2	1	2	2	1		1	4	3		4		3		2	20	8	2.5			3			3	1	3	35	14	2.5
9	Stringent Payment terms / Invoce processing / Collection of Payments / Payment terms with Customer / Payment terms with vendors / Lack of Cash Flow / Insufficient Working Capital / Management of CF & WC / Insolvency / cash flow imbalance		5	4	3		3	15	4	3.8	3			2				5	2	2.5			4	4	4						1	13	4	3.3						0	0	0	33	10	3.3
10	Poor Quality of work / Inadequate QA programme / Sub-standard design, workmanship / rejection of work and HSE risks / issues; Inadequate Quality & HSE Planning / Accidents / Poor quality of work	3			4		2	9	3	3		3						3	1	3	1				3	2			3			9	4	2.3		1		4	4	9	3	3	30	11	2.7
11	Cost of capital / increase in interest rate / increase in inflation rate / non-availability of financial resources / ability to raise money / rising NPA / funding risks / fund allocation issues / liquidity / Financial & Economical risk / Bank Policy / Insufficient Capital			3		1		4	2	2							2	2	1	2	4			2	3	2		4		4			19	6	3.2	5				3	8	2	4	33	11	3.0
12	Variation / increase / shortfall / error in Bill of Quantities (BOQ)	4			4	4	3	15	4	3.8		3						3	1	3				3		4					2	9	3	3	4	2				6	2	3	33	10	3.3
13	Changes in government policy, laws and regulations including increased taxation & duties, minimum wages / imposition of new levies / withdrawal of benefits like Deemed Export Benefits							0		0	4						3	7	2	3.5				5	3		3	3	3		1	18	6	3		3				3	1	3	28	9	3.1
14	Fierce competition (disruptive pricing)/ Pressure on profit margin / sub-contractor turning into competitors / Strong competitors			2	4			6	2	3		3			3		3	9	3	3	3		4			4			4			15	4	3.8						0	0	0	30	9	3.3
15	Credit worthiness & solvency / financial soundness of the customer / funding shortage / bankruptcy / payment risk / payment security / financial uncertainty / delay of payment / delay in tie-up of funds / delay in releasing payment				4			4	1	4					3			3	1	3		3	3					2	4			12	4	3					4	4	1	4	23	7	3.3

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)															Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
16	Lack of scope clarity and interface issues / unclear boundary of work / risks with Customer and other agencies / contractors / scope creep / scope increase / change in requirements in Project Scope without any time extension / Inadequate scpe control during implementation	3		2	4			9	3	3					3			3	1	3	5	3	3		3					3		17	5	3.4						0	0	0	29	9	3.2
17	Lack of competent subcontractors with required finances and resources / workmen / labour / skilled manpower / capital / equipment / sub-contractor acquisition & retention / low productivity / lack of experience of handling multiple small contractors leading to delay / poor performance / breach of contract & dispute	3					3	6	2	3			4					4	1	4		3	4				3	1			3		14	5	2.8	2				4	6	2	3	30	10	3.0
18	Unilateral / unequitable contract clauses favouring the customer/ contractual / commercial risks w.r.t. scope, taxes & duties / improper or unclear contractual assignment of risks / unfamiliarity with contract conditions for claims and litigations / special local requirements / owner's breach of contract & disputes / delay in resolving contractual disputes / resolution of disputes / objectionable clauses like auto-renewal / open-ended Bank Guarantee / restriction on issuing bank / tender condition requiring IDC to be absorbed by the Contractor		4		4			8	2	4			2				2	4	2	2		2	4					3		4		1	14	5	2.8						0	0	0	26	9	2.9
19	Design & Specification risks / multiple changes / cumbersome approval process by customer leading to delay / vague sepcifications / unfamiliarity with local codes and standards / lack of knowledge of construction method / inadequate or incomplete sepcification for the scope of work / inadequate or insufficient site information (including soil data)					2		2	1	2						4		4	1	4	3				3			3	3	3		15	5	3	1		2	3		6	3	2	27	10	2.7
20	Geo-political risks / Issues and International Geopolitics / new region	4	4		4		5	17	4	4.3								0	0	0			3	3								6	2	3		3		5		8	2	4	31	8	3.9

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)															Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
21	Delay and non-fulfillment of customers' inputs e.g. land, site access, permits, water, construction power, power evacuation, PAC, financial closure, non-finalization of PPA, FSA, CCOE, IBR, EC, Labour Licence, F.O. Storage, Electric Inspection, Factory INspection, Aviation, etc., Approvals and other Statutory Clearances / Government permits / Government Bureaucracy / O&M Staff	4		3	3			10	3	3.3		3						3	1	3				3	5	3				5	3		19	5	3.8						0	0	0	32	9	3.6
22	Natural calamities / Acts of God / other Force Majeure conditions / Ecological Risks / Impact of accidents, fire, theft / Earthquake, Tsunami, Storm, etc.			2	3			5	2	2.5	2							2	1	2	5					2			2			9	3	3		3		3		6	2	3	22	8	2.8
23	Delay in receipt of engineering inputs from OEMs / Vendors / Customers / Delay in issue of enginering deliverables / delay in finalization of Engineering / late Design decisions and drawings / frequent design changes / design changes by Customer / design change in site topography / constructibility issues / poor design / incomplete design	3			4	1	2	10	4	2.5								0	0	0		3	3									6	2	3						0	0	0	16	6	2.7
24	Working in severe weather / climatic conditions / heavy monsoon & flooding / unforeseen ground & site conditions / inclement weather	2		2	3		3	10	4	2.5							3	3	1	3		2					2					4	2	2						0	0	0	17	7	2.4
25	Change of specification / new and emerging technology / Lack of technical know-how / Too high quality standard			2	3			5	2	2.5								0	0	0						2	3		1			6	3	2		3				3	1	3	14	6	2.3
26	Socio-economic-political-cultural issues / uprising issues / lack of stability of government / war/problem with neighbour / revolution/riots/ civil disorder/ consistency of government policy / culture / language / religion / social acceptance / laws			2				2	1	2		4						4	1	4	2		3						3			8	3	2.7		4				4	1	4	18	6	3.0
27	Technology change / obsolence risk			2		1		3	2	1.5							2	2	1	2									2			2	1	2				3		3	1	3	10	5	2.0
28	Lack of reliable logistics vendors / logistics risks / issues / In-transit delay				4			4	1	4								0	0	0		1			5	1					3	10	4	2.5						0	0	0	14	5	2.8
29	Defect Liability Period (DLP) / Latent Defect Period / O&M liability in DLP				3			3	1	3					3		2	5	2	2.5				1									1	1	1					3	3	1	3	12	5	2.4
30	Delay in securing Retention money & Bank Guarantee / Invocation of BG by Customer							0		0		3			3			6	2	3						4						4	1	4		4				4	1	4	14	4	3.5
31	Legal risks / Disputes / Arbitration /				4		4	8	2	4								0	0	0		4		2				4			3	10	3	3.3						0	0	0	18	5	3.6

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)															Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
32	Variation of soil characteristics; water/fuel analysis & other input data provided by the Customer / Differeing / Unknown site conditions; Actual ground conditions / Geological Conditions				4			4	1	4	3							3	1	3				2					4			6	2	3				2		2	1	2	15	5	3.0
33	Prolonged delay in contract / project closure						4	4	1	4						3	4	7	2	3.5	2											2	1	2			2			2	1	2	15	5	3.0
34	Underutilization / Sub-optimal use of Assets / wrong allocation of human resources / Inadequate Resource Management and lack of Resources	3			4			7	2	3.5								0	0	0		4						4				8	2	4						0	0	0	15	4	3.8
35	Degradation of brand image / reputation / credit rating / lack of credibility / blacklisting of company / poor or negative feedback on company's performance						3	3	1	3				3				3	1	3						2		3				5	2	2.5						0	0	0	11	4	2.8
36	Steep minimum wage hike not covered in Price Variation Clause (PVC) / Fixed Price Contract without Price Variation clause			4				4	1	4	2							2	1	2						4		2				6	2	3						0	0	0	12	4	3.0
37	Poor access/connectivity of site by road, rail, air / poor infrastructure in and around site				4			4	1	4								0	0	0				3				3				6	2	3						0	0	0	10	3	3.3
38	Lack of leadership / Organisational failure / Inadequate Management Skills/ Lack of requisite competence / No previous experience in the line of work / Improper organization structure							0		0								0	0	0					2			2				6	3	2						0	0	0	6	3	2.0
39	Not meeting shareholders expectations / erosion of share price / market cap / shareholders losing interest							0		0					5			5	1	5				2						2		4	2	2			3			3	1	3	12	4	3.0
40	Delay / idling due to non-finalisation of order / non-readiness / non-availability of fronts/facilities by Customer (interfaces) or by other contractors							0		0			5					5	1	5							2					2	1	2						0	0	0	7	2	3.5
41	Country risk				4			4	1	4								0	0	0						3						3	1	3						0	0	0	7	2	3.5
42	Hostile takeover threat					2		2	1	2								0	0	0				3								3	1	3						0	0	0	5	2	2.5
43	Not meeting Customer satisfaction							0		0								0	0	0						3		2			1	6	3	2						0	0	0	6	3	2.0
44	Improper Communication / coordination inadequate consultation with project stakeholders							0		0								0	0	0												0	0	0					4	4	1	4	4	1	4.0
45	New vendor approval by customer							0		0								0	0	0	2											2	1	2						0	0	0	2	1	2.0
46	Lack of data / inadequate data at proposal time / inadequate cost estimation / errors in cost estimation at bidding time						2	2	1	2								0	0	0												0	0	0						0	0	0	2	1	2.0
47	Extended stay at site and cost overrun (including P&M and overheads) / Cost overrun / Cost increase							0		0						4		4	1	4												0	0	0						0	0	0	4	1	4.0

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)													Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
48	Contractual gaps (between customer and contractor & contractor and the vendor)				4			4	1	4								0	0	0												0	0	0						0	0	0	4	1	4.0
49	Inadequate procurement planning / Delay in ordering / Poor purchase / Other procurement risks						4	4	1	4								0	0	0												0	0	0						0	0	0	4	1	4.0
50	Claim management / Change Management with customers / vendors / Claim settlement and dispute resolution						3	3	1	3								0	0	0												0	0	0						0	0	0	3	1	3.0
51	Geological risks							0		0								0	0	0						2						2	1	2						0	0	0	2	1	2.0
52	Insufficient space for office, storage, laydown and construction areas							0		0								0	0	0				2								2	1	2						0	0	0	2	1	2.0
53	Construction error / rework / lack of proper construction technologies / Unpredicted technical problems in construction							0		0								0	0	0		2										2	1	2						0	0	0	2	1	2.0
54	Right of Way	3						3	1	3								0	0	0												0	0	0						0	0	0	3	1	3.0
55	Consequential Damage							0		0								0	0	0				2								2	1	2						0	0	0	2	1	2.0
56	Plant Outage Risks							0		0								0	0	0				1								1	1	1						0	0	0	1	1	1.0
57	Absence of Price Variation clauses (PVC)							0		0								0	0	0												0	0	0						0	0	0	0	0	0.0
58	Delay in taking decisions / slow decision making & approvals				5			5	1	5								0	0	0												0	0	0						0	0	0	5	1	5.0
59	Material Reconciliation Risk							0		0								0	0	0		3										3	1	3						0	0	0	3	1	3.0
60	Lack of internal control							0		0								0	0	0		2										2	1	2						0	0	0	2	1	2.0
61	Erosion of paid up capital							0		0								0	0	0					4							4	1	4						0	0	0	4	1	4.0
62	Morale / motivation of Employees							0		0								0	0	0								2				2	1	2						0	0	0	2	1	2.0
63	Monetary Policy / Restrictions							0		0								0	0	0								1				1	1	1						0	0	0	1	1	1.0
64	Lack of IPPs / Private Sector Participation							0		0								0	0	0									2			2	1	2						0	0	0	2	1	2.0
65	Design errors / defective design / omissions, misinterpretation of technical document, errors in technical / project doc, drawing errors / using wrong reference specs, codes or standards							0	0	0								0	0	0										4		4	1	4						0	0	0	4	1	4.0
66	Poor / Inadequate Resource Planning & allocation / Scheduling/ Micro-planning / Construction Planning / Inadequate post-project review / management of float / delay due to inadequate planing and scheduling							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
67	Construction pollution and environmental degradation / pollution							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
68	Change in owner's organisation and personnel change							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
69	Unethical work practices / bribery / corruption / lobby (legal/illegal)							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)													Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
70	Inadequate housekeeping							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
71	Delay in construction							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
72	Increased cost due to fast tracking / crashing of activities for acceleratiog time schedule							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
73	Financial / Economic stability, Inflation, Legal stability, unavailability of funds / Rules & Regulations / financial uncertainty							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
74	Import / Export Restriction							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
75	Environmental compliance							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
76	Resolution of disputes and contractual issues / conflict management / unjust arbitration							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
77	Inadequately defined roles & responsibilities / accountability / Improper coordination amonst teams / coordination failure							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
78	Unstable relatioships amongst project participants / Disputes amongst entities							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
79	Proejct Execution Risks							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
80	Installation Risks of Mechanical and Electrical Works							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
81	Inadequate sales							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
82	Insufficient profit							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
83	Over-expansion							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
84	Improper use of Project Management techniques							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
85	Lack of experience in line of work / non-familiarity with the technology / working in new region							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
86	Lack of early warning measures							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
87	Lack of Documentation System							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
88	Heavy Operating Expenses							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
89	Materials and Plant availability / Equipment availability / Productivity and efficiency of equipment							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
90	Owner's improper intervention / involvement in construction phases							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
91	Consequence of ignoring risk / Inadequacy of Risk Management							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
92	Poor Security							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
93	Poor Maintenance							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
94	Monopolistic bidding							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
95	Inadequate Insurance coverage and difficulties in claiming insurance compensation / Insurance deductibles							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
96	Faulty job field survey							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
97	Traffic & work hour restrictions							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0

Sr. No.	Risk Factors	Experience: 10 - 22 Years (Total : 6)									Experience: 23 - 30 Years (Total : 7)										Experience: 31 - 35 Years (Total : 12)														Experience: Above 35 years (Total : 5)									Grand Total		
		Expert 1 (10)	Expert 2 (15)	Expert 3 (20)	Expert 4 (20)	Expert 5 (20)	Expert 6 (22)	Total Score	Frequency	Average	Expert 1 (23)	Expert 2 (23)	Expert 3 (24)	Expert 4 (24)	Expert 5 (26)	Expert 6 (27)	Expert 7 (30)	Total Score	Frequency	Average	Expert 1 (31)	Expert 2 (31)	Expert 3 (32)	Expert 4 (33)	Expert 5 (33)	Expert 6 (34)	Expert 7 (35)	Expert 8 (35)	Expert 9 (35)	Expert 10 (35)	Expert 11 (35)	Expert 12 (35)	Total Score	Frequency	Average	Expert 1 (36)	Expert 2 (37)	Expert 3 (38)	Expert 4 (40)	Expert 5 (42)	Total Score	Frequency	Average	Score	Frequency	Average
98	Third party objections / Relation with third party							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
99	Low working morale							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
100	Constraints on Employment							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
101	Criminal Acts							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
102	Substance abuse							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
103	Local Protections							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
104	Unfairness in tendering							0	0	0								0	0	0												0	0	0						0	0	0	0	0	0
105	Effective date / zero date of contract and date of contract signing																																										
106	Increase in CIF Value for imported items																																										
107	Change in material sourcing - indigenous & imported resulting in financial implication and delay in delivery																																										
108	Surrounding property damage, cost escalation for reordering in case of damage, third party liability																																										
109	Mechanism of payments e.g. direct, through L/C, etc.																																										

Consolidation of Risk Factors and Criticality Scores

Appendix - 9

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
1	~~Liquidated Damages (LD) for delay / time overrun / stringent delivery schedule /~~ Unrealistic Schedule / Risk of not having on-time completion / Schedule Risk / Disputes related to delay / Delay in demonstrating performance test guarantee	86	21	4.1	7	3	1	32
2	Uncertain future of coal and gas power businesses due to environmental issues/ government thrust on alternate technologies e.g. renewables / lack of demand for thermal power / changing market conditions / dimiished market size / lack of order booking / sustainability of business / meeting financial and non-financial targets / Industry Weakness / Low market demand / Structural Changes	93	20	4.7	5	0	0	25
3	Liquidated Damage for non-performance of Equipment / Plant; not meeting technical guarantee of plant and equipment	56	20	2.8	3	3	1	27
4	Lack of competent / skilled personnel / Specific skill / Productive / Efficeint Talent Acquisition; Retention; Employee Engagement; Attrition	58	20	2.9	7	1	0	28
5 + 92	Labour issues including labour union, labour disturbance, local issues / disputes / local culture / political issues / political stability / law & order issues, strikes, violence, terrorism / job site security & safety / insecurity / crime	57	20	2.9	8 + 1	3	1	33
6	Unpredictable price variations / increase of bulk Commodities e.g. structural steel, reinforcement steel, cement, equipment leading to cost overrun / erosion of profit margin, etc. / Fluctuation in material cost	58	18	3.2	8	1	0	27

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
7 + 89	Lack of competent / credithworthy / financially sound vendors / suppliers and under/non-performance of vendors / delay in supply of material / equipment / lead time changes / equipment by vendors / Availability of materials, equipment & plants / poor quality of supplies / short supplies / defective materials / post-order deviation / deficient in productivity and efficienty	51	16	3.2	7 + 3	7	1	34
8	Forex variation	35	14	2.5	7	1	1	23
9	Stringent Payment terms / Invoce processing / Collection of Payments / Payment terms with Customer / Payment terms with vendors / Lack of Cash Flow / Insufficient Working Capital / Management of CF & WC / Insolvency / cash flow imbalance	33	10	3.3	2	0	1	13
10	Poor Quality of work / Inadequate QA programme / Sub-standard design, workmanship / rejection of work and HSE risks / issues; Inadequate Quality & HSE Planning / Accidents / Poor quality of work	30	11	2.7	13	1	1	26
11 + 73	Cost of capital / increase in interest rate / increase in inflation rate / non-availability of financial resources / Rules & Regulations / ability to raise money / rising NPA / funding risks / fund allocation issues / liquidity / Financial & Economical stability & risks / Bank Policy / Insufficient Capital / financial uncertaincy / legal stability	33	11	3.0	6 + 13	0	0	30
12	Variation / increase / shortfall / error in Bill of Quantities (BOQ)	33	10	3.3	1	6	1	18
13	Changes in government policy, laws and regulations including increased taxation & duties, minimum wages / imposition of new levies / withdrawal of benefits like Deemed Export Benefits	28	9	3.1	9	4	1	23
14	Fierce competition (disruptive pricing)/ Pressure on profit margin / sub-contractor turning into competitors / Strong competitors	30	9	3.3	1	0	1	11

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
15	Credit worthiness & solvency / financial soundness of the customer / funding shortage / bankruptcy / payment risk / payment security / financial uncertainty / delay of payment / delay in tie-up of funds / delay in releasing payment	23	7	3.3	4	3	1	15
16	Lack of scope clarity and interface issues / unclear boundary of work / risks with Customer and other agencies / contractors / scope creep / scope increase / change in requirements in Project Scope without any time extension / Inadequate scpe control during implementation	29	9	3.2	17	3	1	30
17	Lack of competent subcontractors with required finances and resources / workmen / labour / skilled manpower / capital / equipment / sub-contractor acquisition & retention / low productivity / lack of experience of handling multiple small contractors leading to delay / poor performance / breach of contract & dispute	30	10	3.0	11	4	1	26
18 + 76	Unilateral / unequitable contract clauses favouring the customer/ contractual / commercial risks w.r.t. scope, taxes & duties / improper or unclear contractual assignment of risks / unfamiliarity with contract conditions for claims and litigations / special local requirements / owner's breach of contract & disputes / delay in resolving contractual dispute / conflict management / unfair arbitration / resolution of disputes / objectionable clauses like auto-renewal and open-ended Bank Guarantee / restriction on issuing bank / tender condition requiring IDC to be absorbed by the Contractor	26	9	2.9	5	1	1	16

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
19	Design & Specification risks / multiple changes / cumbersome approval process by customer leading to delay / vague sepcifications / unfamiliarity with local codes and standards / lack of knowledge of construction method / inadequate or incomplete sepcification for the scope of work / inadequate specification for the scope of work / inadequate or specification for the scope of work / inadequate or insufficient site information (including soil data)	27	10	2.7	5	1	1	17
20 + 26	Geo-political risks / Issues and International Geopolitics / new region / socio-economic-political-cultural issues / religion / government stability / civil disorder / war / problem with neighbour	31 + 18	8 + 6	3.9	2 + 10	0	0	26
21 + 54 + 75 + 40	Delay and non-fulfillment of customers' inputs e.g. land, site access, permits, water, construction power, power evacuation, PAC, financial closure, non-finalization of PPA, FSA, CCOE, IBR, EC, Labour Licence, F.O. Storage, Electric Inspector, Factory Inspector, Aviation, Environmental Clearance, etc., Approvals and other Statutory Clearances / Government permits / Government Bureaucracy / Providing O&M Staff for plant operation / non-availability of fronts, facilities by customer or by other contractors (interfaces)	32 + 3 + 7	9 + 1 + 2	3.6	12	4 + 2 + 1 + 2	1 + 1	35
22 + 24	Natural calamities / Acts of God / other Force Majeure conditions / Ecological Risks / Impact of accidents, fire, theft / earthquake, heavy monsoon, flooding, unforeseen ground and site conditions, inclement weather, severe weather, Tsunami, storm, etc.	22 + 17	8 + 7	2.8	5 + 11	2	1 + 1	35

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
23 + 65	Delay in receipt of engineering inputs from OEMs / Vendors / Customers / Delay in issue of enginering deliverables / delay in finalization of Engineering / late Design decisions and drawings / frequent design changes / design changes by Customer / design change in site topography / constructibility issues / poor design / incomplete design / design & drawing errors / defective design / omission or misinterpretation of technical document / referring to wrong document, specs, codes / standards	16 + 4	6 + 1	2.7	17 + 2	5	1	32
24	~~Working in severe weather / climatic conditions / heavy monsoon & flooding / unforeseen ground & site conditions / inclement weather~~	~~17~~	~~7~~	~~2.4~~	~~11~~	~~2~~	~~1~~	~~21~~
25 + 85	Change of specification / new and emerging technology / technology change / obsolesce risk / lack of technical know-how / too high quality standard / lack of experience in line of work / non-failiarity with the technology / working in new region	14 + 10	6 + 5	2.3	5	0	1	17
26	~~Socio-economic-political-cultural issues / uprising issues / lack of stability of government / war/problem with neighbour / revolution/riots/ civil disorder/ consistency of government policy / culture / language / religion / social acceptance / laws~~	~~18~~	~~6~~	~~3.0~~	~~10~~	~~0~~	~~0~~	~~16~~
27	~~Technology change / obsolence risk~~	~~10~~	~~5~~	~~2.0~~	~~0~~	~~0~~	~~0~~	~~5~~
28	Lack of reliable logistics vendors / logistics risks / issues / In-transit delay	14	5	2.8	2	1	1	9
29	Defect Liability Period (DLP) / Latent Defect Period / O&M liability in DLP	12	5	2.4	2	2	1	10
30	Delay in securing Retention money & Bank Guarantee / Invocation of BG by Customer	14	4	3.5	0	0	1	5
31	Legal risks / disputes / arbitration / claim management / dispute resolution and settlement with Customer, Vendors and others	18 + 3	5 + 1	3.6	1 + 4	0 + 3	1	15

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
32	Variation of soil characteristics; water/fuel analysis & other input data provided by the Customer / Differeing and unknown site conditions; Actual ground conditions / Geological Conditions	15	5	3.0	8	0	1	14
33	Prolonged delay in contract / project closure	15	5	3.0	0	0	0	5
34 + 66	Underutilization / Sub-optimal use of assets / inadequate resource planning and allocation of resources / lack of micro-planning / scheduling / construction planning / inadequate post-project review / management of float / wrong allocation of human resources / inadequate resource management and lack of resources	15	4	3.8	8 + 4	0	0 + 1	17
35	~~Degradation of brand image / reputation / credit rating / lack of credibility / blacklisting of company / poor or negative feedback on company's performance~~	~~11~~	~~4~~	~~2.8~~	~~1~~	~~0~~	~~0~~	~~5~~
36	Fixed Price Contract without Price Variation clause / Steep minimum wage hike not covered in Price Variation Clause (PVC)	12	4	3.0	0	0	1	5
37	Poor access/connectivity of site by road, rail, air / poor infrastructure in and around site	10	3	3.3	1	0	1	5
38	Lack of leadership / Organisational failure / Inadequate Management Skills/ Lack of requisite competence / No previous experience in the line of work / Improper organization structure	6	3	2.0	9	3	0	15
39 + 35 + 43	Not meeting shareholders' including customers' expectations / erosion of share price / market cap / shareholders losing interest / degradation of brand image / reputation / credit rating / lack of credibility / black listing of the company / negative or poor feedback on company's performance	12 + 6 + 11	4 + 3 + 4	3.0	0 + 1	0	0	12
40	~~Delay / idling due to non-finalisation of order / non-readiness / non-availability of fronts/facilities by Customer (interfaces) or by other contractors~~	~~7~~	~~2~~	~~3.5~~	~~0~~	~~2~~	~~1~~	~~5~~
41	~~Country risk~~	~~7~~	~~2~~	~~3.5~~	~~0~~	~~0~~	~~0~~	~~2~~

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
42	~~Hostile takeover threat~~	~~5~~	~~2~~	~~2.5~~	~~0~~	~~0~~	~~0~~	~~2~~
43	~~Not meeting Customer satisfaction~~	~~6~~	~~3~~	~~2.0~~	~~0~~	~~0~~	~~0~~	~~3~~
44 + 77	Improper Communication / coordination inadequate consultation with project stakeholders, teams / inadeauately defined roles & responsibilities / accountability	4	1	4.0	5 + 6	0	0	12
45	~~New vendor approval by customer~~	~~2~~	~~1~~	~~2.0~~	~~0~~	~~0~~	~~1~~	~~2~~
46	Lack of data / inadequate data at proposal time / inadequate cost estimation / errors in cost estimation at bidding time	2	1	2.0	7	3	1	12
47	Extended stay at site and cost overrun (including P&M and overheads) / Cost overrun / Cost increase	4	1	4.0	3	5	0	9
~~48~~	~~Contractual gaps (between customer and contractor & contractor and the vendor)~~	~~4~~	~~1~~	~~4.0~~	~~1~~	~~0~~	~~1~~	~~3~~
~~49~~	~~Inadequate procurement planning / Delay in ordering / Poor purchase / Other procurement risks~~	~~4~~	~~1~~	~~4.0~~	~~3~~	~~2~~	~~0~~	~~6~~
~~50~~	~~Claim management / Change Management with customers / vendors / Claim settlement and dispute resolution~~	~~3~~	~~1~~	~~3.0~~	~~4~~	~~3~~	~~0~~	~~8~~
~~51~~	~~Geological risks~~	~~2~~	~~1~~	~~2.0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~52~~	~~Insufficient space for office, storage, laydown and construction areas~~	~~2~~	~~1~~	~~2.0~~	~~1~~	~~0~~	~~1~~	~~3~~
~~53~~	~~Construction error / rework / lack of proper construction technologies / Unpredicted technical problems in construction~~	~~2~~	~~1~~	~~2.0~~	~~3~~	~~0~~	~~0~~	~~4~~
~~54~~	~~Right of Way~~	~~3~~	~~1~~	~~3.0~~	~~0~~	~~1~~	~~0~~	~~2~~
~~55~~	~~Consequential Damage~~	~~2~~	~~1~~	~~2.0~~	~~0~~	~~0~~	~~1~~	~~2~~
~~56~~	~~Plant Outage Risks~~	~~1~~	~~1~~	~~1.0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~57~~	~~Absence of Price Variation clauses (PVC)~~	~~0~~	~~0~~	~~0.0~~	~~0~~	~~0~~	~~0~~	~~0~~
~~58~~	~~Delay in taking decisions / slow decision making & approvals~~	~~5~~	~~1~~	~~5.0~~	~~1~~	~~1~~	~~0~~	~~3~~
~~59~~	~~Material Reconciliation Risk~~	~~3~~	~~1~~	~~3.0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~60~~	~~Lack of internal control~~	~~2~~	~~1~~	~~2.0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~61~~	~~Erosion of paid up capital~~	~~4~~	~~1~~	~~4.0~~	~~0~~	~~0~~	~~0~~	~~1~~
~~62~~	~~Morale / motivation of Employees~~	~~2~~	~~1~~	~~2.0~~	~~1~~	~~0~~	~~0~~	~~2~~
~~63~~	~~Monetary Policy / Restrictions~~	~~1~~	~~1~~	~~1.0~~	~~1~~	~~0~~	~~0~~	~~2~~
~~64~~	~~Lack of IPPs / Private Sector Participation~~	~~2~~	~~1~~	~~2.0~~	~~0~~	~~0~~	~~0~~	~~1~~

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
65	Design errors / defective design / omissions, misinterpretation of technical document, errors in technical / project doc, drawing errors / using wrong reference specs, codes or standards	4	1	4.0	2	0	0	3
66	Poor / Inadequate Resource Planning & allocation / Scheduling/ Micro-planning / Construction Planning / Inadequate post- project review / management of float / delay due to inadequate planing and scheduling	0	0	0.0	4	0	1	5
67	Construction pollution and environmental degradation / pollution	0	0	0.0	4	0	0	4
68	Change in owner's organisation and personnel change	0	0	0.0	1	0	0	1
69	Unethical work practices / bribery / corruption / lobby (legal/illegal)	0	0	0.0	4	0	0	4
70	Inadequate housekeeping	0	0	0.0	1	0	0	1
71 + 53	Delay in construction / construction error / rework / lack of proper construction technologies / unpredictable technical problems in construction	0 + 2	0 + 1	0.0	5 + 3	7	0	16
72	Increased cost due to fast tracking / crashing of activities for accelerationg time schedule	0	0	0.0	1	0	0	1
73	Financial / Economic stability, Inflation, Legal stability, unavailability of funds / Rules & Regulations / financial uncertainty	0	0	0.0	13	0	0	13
74	Import / Export Restriction	0	0	0.0	1	0	0	1
75	Environmental compliance	0	0	0.0	2	0	0	2
76	Resolution of disputes and contractual issues / conflict management / unjust arbitration	0	0	0.0	3	0	0	3
77	Inadequately defined roles & responsibilities / accountability / Improper coordination amonst teams / coordination failure	0	0	0.0	6	0	0	6
78	Unstable relatioships amongst project participants / Disputes amongst entities	0	0	0.0	2	0	0	2
79	Proejct Execution Risks	0	0	0.0	1	0	0	1
80	Installation Risks of Mechanical and Electrical Works	0	0	0.0	1	0	0	1
81	Inadequate sales	0	0	0.0	1	0	0	1

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
82	Insufficient profit	0	0	0.0	1	0	0	1
83	Over-expansion	0	0	0.0	1	0	0	1
84	Improper use of Project Management techniques	0	0	0.0	1	0	0	1
85	Lack of experience in line of work / non-familiarity with the technology / working in new region	0	0	0.0	1	3	0	4
86	Lack of early warning measures	0	0	0.0	1	0	0	1
87	Lack of Documentation System	0	0	0.0	1	0	0	1
88	Heavy Operating Expenses	0	0	0.0	0	0	0	0
89	Materials and Plant availability / Equipment availability / Productivity and efficiency of equipment	0	0	0.0	3	0	0	3
90	Owner's improper intervention / involvement in construction phases	0	0	0.0	2	0	0	2
91	Consequence of ignoring risk / Inadequacy of Risk Management	0	0	0.0	1	0	0	1
92	Poor Security	0	0	0.0	1	0	0	1
93	Poor Maintenance	0	0	0.0	1	0	0	1
94	Monopolistic bidding	0	0	0.0	1	0	0	1
95	Inadequate Insurance coverage and difficulties in claiming insurance compensation / Insurance deductibles	0	0	0.0	2	2	1	5
96	Faulty job field survey	0	0	0.0	1	0	0	1
97	Traffic & work hour restrictions	0	0	0.0	1	0	0	1
98	Third party objections / Relation with third party	0	0	0.0	1	0	0	1
99	Low working morale	0	0	0.0	1	0	0	1
100	Constraints on Employment	0	0	0.0	1	0	0	1
101	Criminal Acts	0	0	0.0	1	0	0	1
102	Substance abuse	0	0	0.0	1	0	0	1
103	Local Protections	0	0	0.0	1	0	0	1
104	Unfairness in tendering	0	0	0.0	1	0	0	1
105	Effective date / zero date of contract and date of contract signing	0	0	0.0	0	0	1	1
106	Increase in CIF Value for imported items	0	0	0.0	0	0	1	1

Sr. No.	Risk Factors	Pilot Study (Total : 30)			Lit. Survey (Total : 24)	Case Study (Total : 9)	Risk Map	Total Frequency
		Total Score	Frequency	Average	Frequency	Frequency	Frequency	
107	Change in material sourcing - indigenous & imported resulting in financial implication and delay in delivery	0	0	0.0	0	0	1	1
108	Surrounding property damage, cost escalation for reordering in case of damage, third party liability	0	0	0.0	0	0	1	1
109	Mechanism of payments e.g. direct, through L/C, etc.	0	0	0.0	0	0	1	1

Appendix - 10

List of Selected Critical Risk Factors (CRF)

A. Critical Risk Factors (CRF)

Serial No.	Risk ID	Description of Critical Risk Factors (CRF)
	1.0	**Management Risk**
1	1.1	Drastic decline of Thermal Power Market
2	1.2	Fierce Competition
3	1.3	Shortage of Skilled Personnel
4	1.4	Quality & HSE Risks
5	1.5	Geo-political Risks
6	1.6	Emerging Technologies
7	1.7	Legal Risks
8	1.8	Sub-optimal Resource Planning
9	1.9	Lack of managerial Bandwidth
10	1.10	Improper Communication
11	1.11	Not meeting Shareholders' expectations
	2.0	**Proposal & Contract Risk**
12	2.1	Time Overrun / LD Risk
13	2.2	Scope Clarity / Creep
14	2.3	Unequitable Contract favouring the Customer
15	2.4	Variation in Soil / Site Conditions
16	2.5	Fixed Price Contract without PVC / steep wage hike not included in PVC
	3.0	**Engineering Risks**
17	3.1	LD for Non-performance of Equipment and Plant
18	3.2	Variation in BOQ / Cost Estimate
19	3.3	Engineering Delays
	4.0	**Procurement Risks**
20	4.1	Unpredictable Price Increase
21	4.2	Lack of Financially Sound Competent Vendors/Suppliers
22	4.3	Change in Government Policies
23	4.4	Lack of Financially Sound competent Sub-contractors
24	4.5	Lack of reliable Logistics Vendor
	5.0	**Construction Risks**
25	5.1	Labour / Political / Law & Order issues
26	5.2	Natural Calamities / Acts of God
27	5.3	Delay in Construction
28	5.4	Extended Stay at Site & Cost Overrun.

Serial No.	Risk ID	Description of Critical Risk Factors (CRF)
	6.0	**Financial Risks**
29	6.1	Forex Variation
30	6.2	Stringent Payment Terms and delay in Payment Collection
31	6.3	Prolonged delay in Contract Closure
	7.0	**Customer Risks**
32	7.1	Delay in Customer's Inputs
33	7.2	Lack of Creditworthiness / Financial Soundness of the Customer
34	7.3	Project Funding and Financial Closure

Appendix - 11

Categories/ Groups of Risks

Sl No.	Risk Checklists of an EPC Organization	Jayasudha et al. (2016)	Nieto-Morote et al. (2011)	Dikmen et al. (2007)	Choudhry et al. (2014)	Perera et al. (2009)	Enhassi et al. (2015)	Shaikh (2015)	PMBOK 6th edition (2017)
1	Contractual	Contractual			Contractual	Contractual			
2	Approvals/ Clearances								
3	Engineering	Engineering	Engineering	Design/ Technical	Design	Technical	Design	Technical	Technical
4	Procurement/ SCM/ Logistics/ Sub-vendors	Procurement	Suppliers	Sub-contractor			Logistics	Logistics	
5	Construction				Construction		Construction	Construction	
6	Operation	Delivery/Operation							
7	Project Resources (Manpower, Plant & Machinery)	People		Resource, productivity					
8	Organizational Issues					Political			
9	Social, Political & Regulatory	Political					Political	Socio-Political	

Sl No.	Risk Checklists of an EPC Organization	Jayasudha et al. (2016)	Nieto-Morote et al. (2011)	Dikmen et al. (2007)	Choudhry et al. (2014)	Perera et al. (2009)	Enhassi et al. (2015)	Shaikh (2015)	PMBOK 6th edition (2017)
10	Financial	Financial			Financial	Economic & Financial		Financial	
11	Commercial								Commercial
12	Customer			Customer/ Consultant					
13	Partners								
14	Strategic								
15	Health, Quality & Safety				Health & safety			Physical	
16	Estimation								
17		Economic							
18		Social							
19		Reserves							
20		Materials							
21		Weather					Environment	Environment	
22		Insurance							
23			Project Management/ execution						
24				Managerial	Management	Managerial	Management	Management	Management
25					External	External			External
26						Site condition			
							Legal		

Suggested Risk Mitigation Strategies (RMS) for Corresponding Critical Risk Factors (CRF)

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
1.0	**Management Risks**		
1.1	Drastic decline of Thermal Power Market	1.	Secure few orders being cost competitive
		2.	Explore coal and gas-based power opportunities abroad, e.g. SE Asia, Middle East, North Africa, Latin America
		3.	Focus on FGD, SCR, ESP, replacement of old inefficient generating units
		4.	Diversify into adjacencies like R&M, Spares, O&M, Plant Performance Enhancement, etc.
		5.	Diversify into emerging power businesses e.g. Nuclear, Solar Thermal, Energy Storage, Waste-to-Energy, Fuel Cell, Plasma Energy, etc.
		6.	Diversify into Hydro-Power, Geo-Thermal Power, Roads, Railways, Coal Mining, Water Treatment, High Ash underground gasification, Transmission and Distribution, building infrastructure for power charging of EV along the highways
1.2	Fierce Competition	1.	Cost leadership through continuous cost reduction, innovative engineering, procurement, construction and tax optimization while creating a lean organization
		2.	Develop low cost competent vendors
		3.	Continuous improvement of Heat Rate & Aux Power Consumption and reduction of Plant Footprint Area
		4.	Excellent Market Intelligence of projects and competition
		5.	Maintain lean organization to ensure low cost
1.3	Shortage of Skilled Personnel	1.	Effective HR policies to acquire, train and retain talent, performance-based compensation & career growth, work environment that promotes innovation and employee engagement
		2.	Hands-on training for engineering, construction & commissioning teams
		3.	Job enhancement, enrichment and job rotation including posting at project sites
		4.	Outsource non-critical functions on contract basis to maintain a lean organization
		5.	Identify and nurture talent
1.4	Quality & HSE Risks	1.	Quality & HSE to have top management sponsorship with strict adherence to global benchmarks

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
		2	Review Quality & HSE credentials of Vendors / Contractors before their selection
		3	Impart Quality & HSE Training to all employees and workmen
		4.	Conduct reviews at sites / workshops, reward / penalize performance and report to the corporate management
		5.	Use digital technology like mobile apps, virtual realities for training, monitoring & reporting incidents
		6.	Accord priority to Safety over project schedule and cost
1.5	Geo-political Risks	1.	Due diligence of Geo-Political risks, Country assessment, macro-economic and environmental factors, geographical survey before bid / no-bid decision
		2.	Tie-ups with resourceful local Partners / Agents for business acquisition & execution, interpretation of local codes. Post own person/s at target countries
		3.	Collaborate with companies already operating in these regions
		4.	Excellent leadership at site for execution and to strategically engage with local community
		5.	Provide adequate insurance cover for assets and people
1.6	Emerging Technologies	1.	Continuous scanning of environment, adoption of contemporary / new technology to stay ahead in business
		2.	Selection of global JV Partners / Collaborators and transfer of technology
		3.	Strong in-house Engineering / R&D team to explore, assimilate new technologies and knowledge management
		4.	Hire Subject Matter Experts / Specialists
		5.	Use Digital Technologies and innovative solutions
1.7	Legal Risks	1.	Smart Contract Drafting to have provisions to address major risks. Proposal team to be fully aware of legal risks and mitigation measures
		2.	In-house competent Contract & Risk Management and Legal teams, for managing Contracts, dispute resolution, litigation, Arbitration, etc.
		3.	Enforce Contractual rights and Claim Management including time extension and additional compensation from Customer
		4.	Complete awareness and strict compliance to legal and statutory requirements

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
1.8	Sub-optimal Resource Planning	1.	Develop micro-plans and integrated project schedule with resource loading
		2.	Frequent Project Review, Monitoring and Control as per the agreed schedule
		3.	Use database of past projects, norms and standards for fixing productivity of resources and keep challenging the set norms
		4.	Strong Construction Capability and large vendor base for timely mobilization of resources
		5.	Use Digital Technology and advance Analytics for deciding resource planning, mobilisation and utilization
1.9	Lack of managerial Bandwidth	1.	Visionary and dynamic top leadership having robust leadership development programs
		2.	Establish a lean and adaptable organization, strong business processes and faster decision making
		3.	Periodic skill mapping, gap evaluation, training, job rotation
		4.	Hire talents for critical positions for competencies not available in-house
		5.	Sharing of knowledge and learning from past projects
1.10	Improper Communication	1.	Clear Role definitions with Responsibility and Accountability through RASCI matrix, SOPs, DACPs, etc.
		2.	Project communication protocol agreed upon at the beginning of the project to be strictly followed
		3.	Project Review at all levels and feedback mechanism driven by Project Control Team
		4.	Conduct annual team building exercise for the entire project team and all stakeholders, encourage people to participate
1.11	Not meeting Shareholders' expectations	1.	Annual Communication from MD & CEO / Chairman to all employees to meet Customer Satisfaction and enhance Shareholders' value
		2.	Execution excellence for completing projects within time and cost for customer satisfaction
		3.	Corporate communication keeping shareholders abreast of important developments including revised guidance, if any, in advance
		4.	Brand building through employees, customers, vendors, shareholders, success stories, Corporate Governance, CSR – use media, various forums and word of mouth
		5.	Annual survey by a Third Party for customer satisfaction level, analyse the gaps and take corrective actions

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
2.0	**Proposal & Contracts Risks**		
2.1	Time Overrun / LD Risk	1.	Develop integrated project schedule based on micro-planning, delivery of long-lead items, resource availability, constraints, required construction time, ground realities and real-time progress monitoring through state-of-the-art digital technologies
		2.	Use pre-NTP period for planning & scheduling, critical engineering, procurement specification for long-delivery items, reconfirmation of soil data and BOQ
		3.	Document Customer delays in providing inputs, drawings/statutory approvals for securing time extension and additional compensation
		4.	Conduct Design Freeze meetings with Customers and all stakeholders, follow up with Customer / Customer's Engineer for timely approval of drawings / document
		5.	Back-to-back LD clause with all major Vendors / Contractors
		6.	Complete Projects within time, reduce completion time
2.2	Scope Clarity / Creep	1.	Review bid document, visit site and clarify scope with Customer
		2.	Effective Contract drafting with exclusions, interfaces and provisions for Change Orders
		3.	Conduct Design Freeze meetings with Customer and all stakeholders reconfirming the scope of supply & service
		4.	Scope clarity with vendors and ensure early resolution of issues
2.3	Unequitable Contract favouring the Customer	1.	Risk Reviews & Analysis of contract clauses and price estimation before taking bid / no-bid decision
		2.	Negotiate better contract terms, establish clear definition of project completion pursuant to which DLP/LDP would commence and also take deviations to highly risky clauses like absorption of IDC
		3.	Transfer contract conditions back-to-back to Vendors / Contractors
		4.	QAP/FQP to be strictly followed, multiple design checks and supervision of quality workmanship for civil foundations and structures to be done
		5.	Initial plant operations to be done through experienced O&M staff and plant to be preserved as per OEM recommendations
2.4	Variation in Soil / Site Conditions	1.	Validation of inputs including soil data, seismic zone, water/fuel analysis etc. through tests and geo-tech investigation at the bidding stages

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
		2.	Insist for "unexpected variation" clause in contract with Customers for compensation / time extension
		3.	Conduct periodic testing of fuel and water during commissioning stage and inform Customer for any variation
		4.	Plan contingency
		5.	100% soil investigation before starting engineering work
2.5	Fixed Price Contract without PVC / steep wage hike not included in PVC	1.	Make all out efforts to include PV clause in the contract
		2.	Take help of financial experts to model price variation impact and provide for the same in bid cost
		3.	Transfer risks back-to-back to Vendors / Contractors and have forward Contracts with bulk material suppliers
		4.	Have contractual provisions to seek extra compensation from Customer for extraordinary price / wage hike
3.0	**Engineering Risks**		
3.1	LD for Non-performance of Equipment and Plant	1.	Cold-eye / Per review of critical engineering deliverables and Performance Guarantees by Engineering Consultant / Experts
		2.	Pass on LD back-to-back to the OEMs / Vendors
		3.	Stage Inspection & Testing at shops and at site as per QAP
		4.	Commission equipment and plant strictly as per OEMs' recommendations
3.2	Variation in BOQ / Cost Estimate	1.	Engineering Consultant to do Proposal Engineering, to generate layouts, 3D Models and accurate BOQ
		2.	Optimise engineering
		3.	Carry out geo-technical investigation and Digital topographic survey before BOQ estimation
		4.	Validate BOQ with Analytics tools through analysis of past BOQ data and market intelligence on competitors' BOQ
		5.	Bid Cost Review by (a) a committee comprising of people from various disciplines and (b) by Senior Management
		6.	Pre-bid tie-ups for major / critical / long delivery equipment and specialized work
3.3	Engineering Delays	1.	Pre-bid tie-ups with major OEMs/Vendors for engineering inputs
		2.	Contractually keep some percentage of payment against timely submission of inputs by OEM / Vendors

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
		3.	Utilize pre-NTP period to initiate design work with past data to be validated subsequently through project specific data
		4.	Conduct Design Freeze Meets (multiple – discipline meetings) with Customer / Customer's Engineer for finalizing design and securing inputs
		5.	Document Customer's delay in providing inputs / approving drawings for seeking time extension and additional compensation
4.0	**Procurement Risks**		
4.1	Unpredictable Price Increase	1.	Pre-bid tie-ups with OEMs / Major Vendors, transfer back-to-back price increase risks to them
		2.	Insist on Price Variation (PV) clause in the contract
		3.	SCM to carry out commodity price trend analysis including seasonal fluctuations at both bid & execution stage and forecast price of materials / equipment
		4.	Bulk materials e.g. Structural / Reinforcement Steel, Cables, Earthing materials, RCC etc. stall be negotiated on rate-contract basis
		5.	SCM to look for alternate low-cost Vendors
4.2	Lack of Financially Sound Competent Vendors / Suppliers	1.	Continuous Vendor development / global sourcing to increase base of financially sound vendors having proven track record
		2.	Tap Competitors' vendor base
		3.	Pre-bid tie-ups with OEMs / Vendors for critical / long delivery items
		4.	Closer vendor follow-up and expediting including stage inspection as per QAP
4.3	Change in Government Policies	1.	Have contractual provisions to cover impact of "change of policy during project execution" including levy of new taxes, extraordinary wage hikes, etc.
		2.	Pass on the risks back to back to the Vendors / Contractors, to the extent possible
		3.	Tracking Government Policies / Regulations and aligning corporate actions accordingly
4.4	Lack of Financially Sound competent Sub-contractors	1.	Identify, assess and register competent and financially sound contractors with proven track record
		2.	Retention of Labour through labour welfare initiatives like providing hygienic labour colony facilities, timely payment of wages and transparent dispute settlement process
		3.	Contractors with workmen to be sustained by using them at multiple project sites

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
		4.	Develop front line experienced supervisors in the company role
		5.	Training of workmen at site, on safety, quality and other construction skills
4.5	Lack of reliable Logistics Vendor	1.	Engage competent and resourceful logistics vendors with proven track record, not merely on L1 basis
		2.	Detailed Route survey to identify potential bottlenecks, check adequacy of strength of culverts, bridges, by-pass arrangement, etc.
		3.	Use more than one proven logistics vendors to have more options
		4.	Provide escort vehicle, GPRS tracking, expediting approvals and arrange food for the driver / helper to reduce transit delay
5.0	**Construction Risks**		
5.1	Labour / Political / Law & Order issues	1.	Due diligence of site ground realities like political and labour environment, other risks involved before bidding
		2.	Engage an experienced IR team at project site to ensure smooth labour / trade union relations and to build rapport with Customer and local authorities
		3.	Strict compliance to statutory obligations in letter and spirit
		4.	Provide adequate labour facilities – proper stay & sanitation, safety, timely payment of wage, medical facilities, etc.
		5.	Carry out local community development, CSR activities and have contingency for the safety of people and assets
5.2	Natural Calamities/ Acts of God	1.	Assessment of historical events, its impact on the project and plan accordingly
		2.	Have suitable provisions incorporated in contract for time extension and compensation
		3.	Plant roads and drains to be constructed before commencement of construction and to be monsoon ready
		4.	Have comprehensive insurance coverage and emergency preparedness for Disaster Management
		5.	Invoke Force Majeure and other contract Clauses
5.3	Delay in Construction	1.	Engineering and procurement activities to be driven by early start dates so that construction activities can have more floats
		2.	Select Contractors with proven track record having modern construction techniques
		3.	Have competent site team including good supervisors

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
		4.	FQP, Testing & Inspection, on-site Kaizen / Quality Circle Team to ensure minimum errors
		5.	Field Engineering Group to expeditiously resolve all field changes
		6.	Develop Method Statement for critical erection as well as commissioning activities
5.4	Extended Stay at Site & Cost Overrun.	1.	Have suitable provision in the contract for Deemed Completion and Compensation & time extension, in case delay is not due to the Contractor
		2.	Strong Project Management & Execution Team to ensure project completion within time and cost
		3.	Reduce manpower significantly, keeping a small, empowered team of people to liquidate punch points expeditiously and close the project
		4.	A strong and empowered Project team
6.0	**Financial Risks**		
6.1	Forex Variation	1.	Contract provision for Customer to pay in equivalent INR as per forex selling rate on the day of payment to Vendors
		2.	Bidding in appropriate currency for hedging / natural hedging
		3.	Increase localisation, indigenous vendor development
		4.	Have provision in contract for compensation of forex
6.2	Stringent Payment Terms and delay in Payment Collection	1.	Negotiate better terms of payment with Customer with 10 to 15% interest free Advance and timely payment
		2.	Work measurement, proper documentation & immediate invoicing through SAP/ERP system
		3.	Transfer back to back payment terms to OEMs and major Vendors / Contractors
		4.	Improve Working Capital position by having longer vendor credit period / bill discounting
		5.	Make a front-loaded billing break-up to improve Working Capital position
		6.	Working Capital Management
6.3	Prolonged delay in Contract Closure	1.	System wise handover of facilities with As built Drawings/Manuals
		2.	Establish delays with Customer to seek time extension and compensation
		3.	Have “Deemed Completion” clause in Contract for securing Retention Money and BGs in case delay is not due to Contractor

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS Description	
		4.	Be prepared for legal recourse / litigation / Arbitration, if such need arises
		5.	Have contractual provision for quarterly/half-yearly pro-rata reduction of Advance BG
7.0	**Customer Risks**		
7.1	Delay in Customer's Inputs	1.	Facilitate Customer on securing various statutory approvals
		2.	Delay in availability of Customer inputs e.g. land, statutory clearances etc. to be documented for securing time extension and compensation
		3.	Place orders on vendors only after receipt of basic inputs e.g. Land, MOEF clearance, financial closures etc.
		4.	Contract should have provision that non-availability of fuel, water, power evacuation beyond a certain time shall be considered as "Deemed Completion" and in turn, Customer would return Retention Money and BGs
		5.	Mobilize resources as per front availability
7.2	Lack of Creditworthiness / Financial Soundness of the Customer	1.	Due diligence of Customer's financial strength, creditworthiness, risk exposure and past performances before bid / no-bid decision through formal and informal sources
		2.	Try to secure payments through Letter of Credit
		3.	Negotiate decent contract terms with 10 to 15% interest-free Advance Payment
		4.	Pursue Customer to accept Corporate Guarantee in lieu of BGs
		5.	There shall be no auto-renewal of BG and value of Advance BG to be reduced periodically
7.3	Project Funding and Financial Closure	1.	Due diligence on Project funding and Financial Institutions involved, before bid-no bid decision
		2	Facilitate customers for financial closure as well as various approvals from statutory authorities
		3.	Have Contract link "zero" date with payment of advance and providing land, other inputs & all approvals required to start work
		4.	Place order on vendors only after the financial closure happens
		5.	Submit CPBG to Customer only after the financial closure happens
Total No. of CRF: 34		**Total No. of RMS: 165**	

List of Selected Risk Mitigation Strategies (RMS) for Corresponding Critical Risk Factors (CRF)

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	RMS Description
1.0	**Management Risks**		
1.1	Drastic decline of Thermal Power Market	1.1_1_(d)	Secure few orders being cost competitive
		1.1_2_(d)	Explore coal and gas-based power opportunities abroad, e.g. SE Asia, Middle East, North Africa, Latin America
		1.1_3_(d)	Focus on FGD, SCR, ESP, replacement of old inefficient generating units
		1.1_4_(d)	Diversify into adjacencies like R&M, Spares, O&M, Plant Performance Enhancement, etc.
		1.1_5_(d)	Diversify into emerging power businesses e.g. Nuclear, Solar Thermal, Energy Storage, Waste-to-Energy, Fuel Cell, Plasma Energy, etc.
1.2	Fierce Competition	1.2_1_(d)	Cost leadership through continuous cost reduction, innovative engineering, procurement, construction and tax optimization while creating a lean organization
		1.2_2_(d)	Develop low cost competent vendors
		1.2_3_(d)	Continuous improvement of Heat Rate & Aux Power Consumption and reduction of Plant Footprint Area
		1.2_4_(d)	Excellent Market Intelligence of projects and competition
1.3	Shortage of Skilled Personnel	1.3_1_(d)	Effective HR policies to acquire, train and retain talent, performance-based compensation & career growth, work environment that promotes innovation and employee engagement
		1.3_2_(d)	Hands-on training for engineering, construction & commissioning teams
		1.3_3_(d)	Job enhancement, enrichment and job rotation including posting at project sites
		1.3_4_(d)	Outsource non-critical functions on contract basis to maintain a lean organization
1.4	Quality & HSE Risks	1.4_1_(d)	Quality & HSE to have top management sponsorship with strict adherence to global benchmarks
		1.4_2_(d)	Review Quality & HSE credentials of Vendors / Contractors before their selection
		1.4_3_(d)	Impart Quality & HSE Training to all employees and workmen

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
		1.4_4_(d)	Conduct reviews at sites / workshops, reward / penalize performance and report to the corporate management
		1.4_5_(d)	Use digital technology like mobile apps, virtual realities for training, monitoring & reporting incidents
1.5	Geo-political Risks	1.5_1_(d)	Due diligence of Geo-Political risks, Country assessment, macro-economic and environmental factors, geographical survey before bid / no-bid decision
		1.5_2_(d)	Tie-ups with resourceful local Partners / Agents for business acquisition & execution, interpretation of local codes. Post own person/s at target countries
		1.5_3_(d)	Collaborate with companies already operating in these regions
		1.5_4_(d)	Excellent leadership at site for execution and to strategically engage with local community
		1.5_5_(d)	Provide adequate insurance cover for assets and people
1.6	Emerging Technologies	1.6_1_(d)	Continuous scanning of environment, adoption of contemporary / new technology to stay ahead in business
		1.6_2_(d)	Selection of global JV Partners / Collaborators and transfer of technology
		1.6_3_(d)	Strong in-house Engineering / R&D team to explore, assimilate new technologies and knowledge management
		1.6_4_(d)	Hire Subject Matter Experts / Specialists
		1.6_5_(d)	Use Digital Technologies and innovative solutions
1.7	Legal Risks	1.7_1_(d)	Smart Contract Drafting to have provisions to address major risks. Proposal team to be fully aware of legal risks and mitigation measures
		1.7_2_(d)	In-house competent Contract & Risk Management and Legal teams, for managing Contracts, dispute resolution, litigation, Arbitration, etc.
		1.7_3_(d)	Enforce Contractual rights and Claim Management including time extension and additional compensation from Customer
		1.7_4_(d)	Complete awareness and strict compliance to legal and statutory requirements
1.8		1.8_1_(d)	Develop micro-plans and integrated project schedule with resource loading

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	RMS Description
	Sub-optimal Resource Planning	1.8_2_(d)	Frequent Project Review, Monitoring and Control as per the agreed schedule
		1.8_3_(d)	Use database of past projects, norms and standards for fixing productivity of resources and keep challenging the set norms
		1.8_4_(d)	Strong Construction Capability and large vendor base for timely mobilization of resources
		1.8_5_(d)	Use Digital Technology and advance Analytics for deciding resource planning, mobilisation and utilization
1.9	Lack of managerial Bandwidth	1.9_1_(d)	Visionary and dynamic top leadership having robust leadership development programs
		1.9_2_(d)	Establish a lean and adaptable organization, strong business processes and faster decision making
		1.9_3_(d)	Periodic skill mapping, gap evaluation, training, job rotation
		1.9_4_(d)	Hire talents for critical positions for competencies not available in-house
		1.9_5_(d)	Sharing of knowledge and learning from past projects
1.10	Improper Communication	1.10_1_(d)	Clear Role definitions with Responsibility and Accountability through RASCI matrix, SOPs, DACPs, etc.
		1.10_2_(d)	Project communication protocol agreed upon at the beginning of the project to be strictly followed
		1.10_3_(d)	Project Review at all levels and feedback mechanism driven by Project Control Team
		1.10_4_(d)	Conduct annual team building exercise for the entire project team and all stakeholders, encourage people to participate
1.11	Not meeting Shareholders' expectations	1.11_1_(d)	Annual Communication from MD & CEO / Chairman to all employees to meet Customer Satisfaction and enhance Shareholders' value
		1.11_2_(d)	Execution excellence for completing projects within time and cost for customer satisfaction
		1.11_3_(d)	Corporate communication keeping shareholders abreast of important developments including revised guidance, if any, in advance
		1.11_4_(d)	Brand building through employees, customers, vendors, shareholders, success stories, Corporate Governance, CSR – use media, various forums and word of mouth

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
		1.11_5_(d)	Annual survey by a Third Party for customer satisfaction level, analyse the gaps and take corrective actions
2.0	**Proposal & Contracts Risks**		
2.1	Time Overrun / LD Risk	2.1_1_(d)	Develop integrated project schedule based on micro-planning, delivery of long-lead items, resource availability, constraints, required construction time, ground realities and real-time progress monitoring through state-of-the-art digital technologies
		2.1_2_(d)	Use pre-NTP period for planning & scheduling, critical engineering, procurement specification for long-delivery items, reconfirmation of soil data and BOQ
		2.1_3_(d)	Document Customer delays in providing inputs, drawings/statutory approvals for securing time extension and additional compensation
		2.1_4_(d)	Conduct Design Freeze meetings with Customers and all stakeholders, follow up with Customer / Customer's Engineer for timely approval of drawings / document
		2.1_5_(d)	Back-to-back LD clause with all major Vendors / Contractors
2.2	Scope Clarity / Creep	2.2_1_(d)	Review bid document, visit site and clarify scope with Customer
		2.2_2_(d)	Effective Contract drafting with exclusions, interfaces and provisions for Change Orders
		2.2_3_(d)	Conduct Design Freeze meetings with Customer and all stakeholders reconfirming the scope of supply & service
		2.2_14(d)	Scope clarity with vendors and ensure early resolution of issues
2.3	Unequitable Contract favouring the Customer	2.3_1_(d)	Risk Reviews & Analysis of contract clauses and price estimation before taking bid / no-bid decision
		2.3_2_(d)	Negotiate better contract terms, establish clear definition of project completion pursuant to which DLP/LDP would commence and also take deviations to highly risky clauses like absorption of IDC
		2.3_3_(d)	Transfer contract conditions back-to-back to Vendors / Contractors
		2.3_4_(d)	QAP/FQP to be strictly followed, multiple design checks and supervision of quality

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
			workmanship for civil foundations and structures to be done
		2.3_5_(d)	Initial plant operations to be done through experienced O&M staff and plant to be preserved as per OEM recommendations
2.4	Variation in Soil / Site Conditions	2.3_1_(d)	Validation of inputs including soil data, seismic zone, water/fuel analysis etc. through tests and geo-tech investigation at the bidding stages
		2.3_2_(d)	Insist for "unexpected variation" clause in contract with Customers for compensation / time extension
		2.3_3_(d)	Conduct periodic testing of fuel and water during commissioning stage and inform Customer for any variation
		2.3_4_(d)	Plan contingency
2.5	Fixed Price Contract without PVC / steep wage hike not included in PVC	2.5_1_(d)	Make all out efforts to include PV clause in the contract
		2.5_2_(d)	Take help of financial experts to model price variation impact and provide for the same in bid cost
		2.5_3_(d)	Transfer risks back-to-back to Vendors / Contractors and have forward Contracts with bulk material suppliers
		2.5_4_(d)	Have contractual provisions to seek extra compensation from Customer for extraordinary price / wage hike
3.0	**Engineering Risks**		
3.1	LD for Non-performance of Equipment and Plant	3.1_1_(d)	Cold-eye / Per review of critical engineering deliverables and Performance Guarantees by Engineering Consultant / Experts
		3.1_2_(d)	Pass on LD back-to-back to the OEMs / Vendors
		3.1_3_(d)	Stage Inspection & Testing at shops and at site as per QAP
		3.1_4_(d)	Commission equipment and plant strictly as per OEMs' recommendations
3.2	Variation in BOQ / Cost Estimate	3.2_1_(d)	Engineering Consultant to do Proposal Engineering, to generate layouts, 3D Models and accurate BOQ
		3.2_2_(d)	Carry out geo-technical investigation and Digital topographic survey before BOQ estimation
		3.2_3_(d)	Validate BOQ with Analytics tools through analysis of past BOQ data and market intelligence on competitors' BOQ

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
		3.2_4_(d)	Bid Cost Review by (a) a committee comprising of people from various disciplines and (b) by Senior Management
		3.2_5_(d)	Pre-bid tie-ups for major / critical / long delivery equipment and specialized work
3.3	Engineering Delays	3.3_1_(d)	Pre-bid tie-ups with major OEMs/Vendors for engineering inputs
		3.3_2_(d)	Contractually keep some percentage of payment against timely submission of inputs by OEM / Vendors
		3.3_3_(d)	Utilize pre-NTP period to initiate design work with past data to be validated subsequently through project specific data
		3.3_4_(d)	Conduct Design Freeze Meets (multiple – discipline meetings) with Customer / Customer's Engineer for finalizing design and securing inputs
		3.3_5_(d)	Document Customer's delay in providing inputs / approving drawings for seeking time extension and additional compensation
4.0	**Procurement Risks**		
4.1	Unpredictable Price Increase	4.1_1_(d)	Pre-bid tie-ups with OEMs / Major Vendors, transfer back-to-back price increase risks to them
		4.1_2_(d)	Insist on Price Variation (PV) clause in the contract
		4.1_3_(d)	SCM to carry out commodity price trend analysis including seasonal fluctuations at both bid & execution stage and forecast price of materials / equipment
		4.1_4_(d)	Bulk materials e.g. Structural / Reinforcement Steel, Cables, Earthing materials, RCC etc. stall be negotiated on rate-contract basis
		4.1_5_(d)	SCM to look for alternate low-cost Vendors
4.2	Lack of Financially Sound Competent Vendors / Suppliers	4.2_1_(d)	Continuous Vendor development / global sourcing to increase base of financially sound vendors having proven track record
		4.2_2_(d)	Tap Competitors' vendor base
		4.2_3_(d)	Pre-bid tie-ups with OEMs / Vendors for critical / long delivery items
		4.2_4_(d)	Closer vendor follow-up and expediting including stage inspection as per QAP
4.3	Change in Government Policies	4.3_1_(d)	Have contractual provisions to cover impact of "change of policy during project execution" including levy of new taxes, extraordinary wage hikes, etc.

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
		4.3_2_(d)	Pass on the risks back to back to the Vendors / Contractors, to the extent possible
		4.3_3_(d)	Tracking Government Policies / Regulations and aligning corporate actions accordingly
4.4	Lack of Financially Sound competent Sub-contractors	4.4_1_(d)	Identify, assess and register competent and financially sound contractors with proven track record
		4.4_2_(d)	Retention of Labour through labour welfare initiatives like providing hygienic labour colony facilities, timely payment of wages and transparent dispute settlement process
		4.4_3_(d)	Contractors with workmen to be sustained by using them at multiple project sites
		4.4_4_(d)	Develop front line experienced supervisors in the company role
		4.4_5_(d)	Training of workmen at site, on safety, quality and other construction skills
4.5	Lack of reliable Logistics Vendor	4.5_1_(d)	Engage competent and resourceful logistics vendors with proven track record, not merely on L1 basis
		4.5_2_(d)	Detailed Route survey to identify potential bottlenecks, check adequacy of strength of culverts, bridges, by-pass arrangement, etc.
		4.5_3_(d)	Use more than one proven logistics vendors to have more options
		4.5_4_(d)	Provide escort vehicle, GPRS tracking, expediting approvals and arrange food for the driver / helper to reduce transit delay
5.0	**Construction Risks**		
5.1	Labour / Political / Law & Order issues	5.1_1_(d)	Due diligence of site ground realities like political and labour environment, other risks involved before bidding
		5.1_2_(d)	Engage an experienced IR team at project site to ensure smooth labour / trade union relations and to build rapport with Customer and local authorities
		5.1_3_(d)	Strict compliance to statutory obligations in letter and spirit
		5.1_4_(d)	Provide adequate labour facilities – proper stay & sanitation, safety, timely payment of wage, medical facilities, etc.
		5.1_5_(d)	Carry out local community development, CSR activities and have contingency for the safety of people and assets
5.2		5.2_1_(d)	Assessment of historical events, its impact on the project and plan accordingly

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
	Natural Calamities/ Acts of God	5.2_2_(d)	Have suitable provisions incorporated in contract for time extension and compensation
		5.2_3_(d)	Plant roads and drains to be constructed before commencement of construction and to be monsoon ready
		5.2_4_(d)	Have comprehensive insurance coverage and emergency preparedness for Disaster Management
		5.2_5_(d)	Invoke Force Majeure and other contract Clauses
5.3	Delay in Construction	5.3_1_(d)	Engineering and procurement activities to be driven by early start dates so that construction activities can have more floats
		5.3_2_(d)	Select Contractors with proven track record having modern construction techniques
		5.3_3_(d)	Have competent site team including good supervisors
		5.3_4_(d)	FQP, Testing & Inspection, on-site Kaizen / Quality Circle Team to ensure minimum errors
		5.3_5_(d)	Field Engineering Group to expeditiously resolve all field changes
5.4	Extended Stay at Site & Cost Overrun.	5.4_1_(d)	Have suitable provision in the contract for Deemed Completion and Compensation & time extension, in case delay is not due to the Contractor
		5.4_2_(d)	Strong Project Management & Execution Team to ensure project completion within time and cost
		5.4_3_(d)	Reduce manpower significantly, keeping a small, empowered team of people to liquidate punch points expeditiously and close the project
6.0	**Financial Risks**		
6.1	Forex Variation	6.1_1_(d)	Contract provision for Customer to pay in equivalent INR as per forex selling rate on the day of payment to Vendors
		6.1_2_(d)	Bidding in appropriate currency for hedging / natural hedging
		6.1_3_(d)	Increase localisation, indigenous vendor development
		6.1_4_(d)	Have provision in contract for compensation of forex
6.2	Stringent Payment Terms and delay in	6.2_1_(d)	Negotiate better terms of payment with Customer with 10 to 15% interest free Advance and timely payment

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
	Payment Collection	6.2_2_(d)	Work measurement, proper documentation & immediate invoicing through SAP/ERP system
		6.2_3_(d)	Transfer back to back payment terms to OEMs and major Vendors / Contractors
		6.2_4_(d)	Improve Working Capital position by having longer vendor credit period / bill discounting
		6.2_5_(d)	Make a front-loaded billing break-up to improve Working Capital position
6.3	Prolonged delay in Contract Closure	6.3_1_(d)	System wise handover of facilities with As built Drawings/Manuals
		6.3_2_(d)	Establish delays with Customer to seek time extension and compensation
		6.3_3_(d)	Have "Deemed Completion" clause in Contract for securing Retention Money and BGs in case delay is not due to Contractor
		6.3_4_(d)	Be prepared for legal recourse / litigation / Arbitration, if such need arises
		6.3_5_(d)	Have contractual provision for quarterly/half-yearly pro-rata reduction of Advance BG
7.0	**Customer Risks**		
7.1	Delay in Customer's Inputs	7.1_1_(d)	Facilitate Customer on securing various statutory approvals
		7.1_2_(d)	Delay in availability of Customer inputs e.g. land, statutory clearances etc. to be documented for securing time extension and compensation
		7.1_3_(d)	Place orders on vendors only after receipt of basic inputs e.g. Land, MOEF clearance, financial closures etc.
		7.1_4_(d)	Contract should have provision that non-availability of fuel, water, power evacuation beyond a certain time shall be considered as "Deemed Completion" and in turn, Customer would return Retention Money and BGs
		7.1_5_(d)	Mobilize resources as per front availability
7.2	Lack of Creditworthiness / Financial Soundness of the Customer	7.2_1_(d)	Due diligence of Customer's financial strength, creditworthiness, risk exposure and past performances before bid / no-bid decision through formal and informal sources
		7.2_2_(d)	Try to secure payments through Letter of Credit
		7.2_3_(d)	Negotiate decent contract terms with 10 to 15% interest-free Advance Payment

Risk ID	Risk Description	Risk Mitigation Strategy (RMS)	
		RMS ID	**RMS Description**
		7.2_4_(d)	Pursue Customer to accept Corporate Guarantee in lieu of BGs
		7.2_5_(d)	There shall be no auto-renewal of BG and value of Advance BG to be reduced periodically
7.3	Project Funding and Financial Closure	7.3_1_(d)	Due diligence on Project funding and Financial Institutions involved, before bid-no bid decision
		7.3_2_(d)	Facilitate customers for financial closure as well as various approvals from statutory authorities
		7.3_3_(d)	Have Contract link "zero" date with payment of advance and providing land, other inputs & all approvals required to start work
		7.3_4_(d)	Place order on vendors only after the financial closure happens
		7.3_5_(d)	Submit CPBG to Customer only after the financial closure happens
Total No. of CRF: 34		**Total No. of RMS: 155**	

Business Success and Business Success Indicators per Pilot Study – Stage 1

Following is a summary of responses of the 30 Experts participated:

A. EPC Project Success – What it means

Serial No.	Project Success	Serial No.	Project Success
	Financial		**Non-Financial**
1	Sales	1	Executing project within the agreed scope, time, cost, quality and safety standards
2	Profit After Tax (PAT)	2	Successful project closure
3	ROCE	3	Meeting customer satisfaction
4	Management of Net Working Capital	4	Minimum lost -time incident
5	Collection of Payments, Retention Money, Bank Guarantees	5	Technology and Innovative solutions
6	Settlement of extra claims	6	Low manpower attrition
7	Project Cost Control	7	Brand Image
8	Cost of Financing	8	Effective Risk management
		9	Happy Local Community
		10	Training & Development

B. Business Success – What it means

Serial No.	Sustained Business Success	Serial No.	Sustained Business Success
1	Continuous order inflow	11	Excellent Receivable Management
2	Business with growing revenue and profit on year-on-year basis	12	Effective Risk Management
3	Healthy Cash Flow situation	13	Reputation to do complex projects
4	Excellent Working Capital Management	14	Excellent track record
5	Low cost of borrowing	15	Social Acceptance
6	Significant Market Share	16	Internationalization
7	Excellent Technology & Innovation	17	Ability to respond to new challenges successfully
8	World class Quality and Safety track records	18	Flexible and adaptable to change
9	Meeting Stakeholders' expectations – Customer, vendors, investors, employees, society etc.	19	Learning Organization
10	Trusted Brand		

C. Business Success Indicators (BSI)

Serial No.	Business Success Indicators (BSI)	Serial No.	Business Success Indicators (BSI)
	Financial		**Non-Financial**
1	Order Book/Order in pipeline	1	Excellent Relationship with Stakeholders
2	Sales, PAT, ROCE, EPS, EVA	2	Acquisition of new Market/ Customers / Repeat Orders
3	Year on year growth of Revenue, PAT, ROCE, EPS, EVA	3	Competent & skilled employees
4	Net Cash Flows – always positive	4	Leadership & Entrepreneurship
5	Working Capital (absolute and as % of revenue)	5	High Employee Engagement Index/ Low Attrition Rate
6	Debt/Equity Ratio	6	Creation/Enhancement of Shareholders' Value
7	Share Price and Market Capitalization	7	Excellent Risk Management System
8	Cost of borrowing	8	Balanced Score Card
9	Credit Rating	9	Corporate Governance & fully Compliant

Business Success and Business Success Indicators per Literature Review

Following is a summary of findings of the 30 Literature Review:

A. EPC Project Success – What it means

Serial No.	Researchers	Project Success
1	Chan (2010)	Is measured by construction speed & time, variation of time & cost, quality, customer satisfaction
2	Huges et al. (2004)	Success parameters are cost, time and quality
3	Abraham (2003)	The ability to plan and execute projects

B. Business Success – What it means

Serial No.	Researchers	Business Success
1	Gadekar et al (2013, 2014)	Extent to which goals and expectations are met
2	Van Frederikslust (1978)	Failure is the inability of a firm to pay its obligation when they are due
3	Rolland Berger Strategy Consultants (2004)	Employee development, Effective risk management, innovations, partnering with customer, Good cashflow management, material cost, sales, planning, lean organization structure

C. Business Success Indicators (BSI)

Serial No.	Researcher	Business Success Indicators (BSI)
	Financial	
1	Perez et al. (2009)	Growth, revenue, profit, human capital, production process, market share, customers etc.
2	Kay (1993)	ROI, EPS, Shareholders' Return
3	Brown et al. (1994)	ROCE, Profit, Profitability, EPS
4	Kangari et al. (1992)	Liquidity, efficiency, profitability

Serial No.	Researcher	Business Success Indicators (BSI)
	Non-Financial	
1	Kangari et al. (1992)	Product/service quality, customer satisfaction, business processes
2	Kaplan et al. (1992, 1994)	Balanced Score Card
3	US Dept. of Defence (1986)	Capability Maturity Model (CMM)
4	Software Engineering Institute (SEI) and Carnegie Melon University, USA (2006)	CMMI Version 2.0 5 maturity levels in the business processes
5	European Foundation for Quality Management (EFQM) (1999)	Meeting short-term and long-term needs of shareholders, adding value to customers, leading with vision, inspiration, integrity, people, process for a sustained future

Appendix - 16

List of Selected Business Success Indicators (BSI)

1. BSI 1: Financial Performance

Serial No.	Performance Parameters	Project Level	Business Level
1	Order Book/Continuous Order Flow	-	✓
2	Revenue, Profit After Tax (PAT), Profitability, Return on Capital Employed (ROCE), Economic Value Added (EVA)	✓	✓
3	Net Cash Flows – always positive/ Healthy Cash Flow condition	✓	✓
4	Working Capital (in absolute and as % of Revenue)	✓	✓
5	Year - on - Year growth of Revenue, PAT, ROCE, EPS, EVA	-	✓
6	Liquidity	✓	✓
7	Debt/Equity Ratio	-	✓
7	Cost of Financing	✓	✓
8	Receivable Management, Collection of payments, Retention Money, Bank Guarantees (BG)		✓
9	Cost Control	✓	✓
10	**Credit Rating**	-	✓
11	Competent and skilled employees	✓	✓
12	Market Share	✓	✓
13	Acquisition of new markets/customers/repeat orders	-	✓

2. BSI 2: Project Performance

Serial No.	Performance Parameters
1	Financial Performance Parameters as applicable (given in BSI 1)
2	Executing Projects meeting Time, Cost, Quality, Safety standards Constraints
3	Minimum lost-time incident
4	Successful Project closure
5	Effective Risk Management
6	Meeting expectations of various stakeholders of the project e.g. customers, vendors, statutory authorities, local community etc.
7	Corporate governance and full compliance to statutory requirements
8	Reputation to do complex Projects
9	Effective planning and execution of projects
10	Competent Project team

3. BSI 3: Brand Image

Serial No.	Performance Parameters
1	Excellent Track Record of quality and safety standards
2	Technology and Innovative solutions
3	Trusted Brand
4	Social Acceptance
5	Ability to respond to new challenges successfully
6	Flexibility and adaptable to changes
7	Learning Organization
8	Balanced Score Card
9	Nation Builder

4. BSI 4: Creation/ Enhancement of Shareholders' Value

Serial No.	Performance Parameters
1	European Foundation for Quality Management (EFQM) Excellence Model – Meeting short-term and long-term needs of the shareholders, adding value to customers. Leading with vision, inspiration, integrity, people, process for a sustained future
2	Capability Maturity Model (CMMI Version2.0) of Software Engineering Institute (SEI) and Carnegie Melon University, USA – 5 level maturity levels in the business processes
3	Leadership & Entrepreneurship
4	High employee engagement Index
5	Corporate Governance
6	Satisfied Shareholders and other stakeholders
7	Shareholders' Return
8	Care for the Environment
9	Engagement of the Shareholders through effective communication
10	Share Price and Market Capitalization
11	Effective Enterprise Risk Management

Upon scrutiny, it was found that these Business Success Indicators (BSI) came out of this study are of two basic types – Short-Term and Long-Term. While BSI 1 (Financial Performance) and BSI 2 (Project Performance) are Short-Term BSIs, BSI 3 (Brand Image) and BSI 4 (Creation/ Enhancement of Shareholders' Value) are Long-Term in nature.

Questionnaire for Final Survey

Step 1 of 5

Please follow the guidelines given below while answering the questions:
a) Column 2: List of all possible risks encountered in EPC business.
b) Column 3: Criticality of each Risk is to be rated in a scale of 1 to 5 (1 = least critical, 5 = most critical).
c) Column 4: Business Success Indicator (select only 1 out of 4 options provided) shall be identified which, according to you, is most adversely affected by the Risk.
d) Column 5: Multiple Risk Mitigation Strategies are suggested. You may select as many as you deem fit.
e) Column 6: Impact of the Risk Mitigation Strategy (given in Col. 5) on the Business Success Indicator (given in Col. 4) shall be rated in a scale of 1 to 5. (1 = least positive impact, 5 = maximum positive impact).

1	2	3					4	5	6					7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**					**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy** (Select options as you deem fit from list below)	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**					
		1	**2**	**3**	**4**	**5**			**1**	**2**	**3**	**4**	**5**	
1.0	**Management Risks**													
1.1	Decline & uncertainty of Thermal (Coal & Gas based) Power drastically reducing market size	○	○	○	○	○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Secure few orders being cost competitive ☐ Explore coal and gas based power opportunities abroad e.g. SE Asia, Middle East, North Africa, Latin America ☐ Focus on FGD, SCR, ESP, replacement of old inefficient generating units ☐ Diversify into adjacencies like R&M, Spares, O&M, Plant Performance Enhancement, etc. ☐ Diversify into emerging power businesses e.g. Nuclear, Solar Thermal, Energy Storage, Waste-to-Energy, Fuel Cell, Plasma Energy, etc.	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy** (Select options as you deem fit from list below)	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
1.2	Fierce competition	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Cost leadership through continuous cost reduction, innovative engineering, procurement, construction and tax optimization while creating a lean organization ☐ Develop low cost competent vendors ☐ Continuous improvement of Heat Rate & Aux Power Consumption and reduction of Plant Foot Print Area ☐ Excellent Market Intelligence of projects and competition	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**
1.3	Shortage of skilled & competent personnel - Acquisition, Development & Retention of Talent	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Effective HR policies to acquire, train and retain talent, performance based compensation & career growth, work environment that promotes innovation and employee engagement ☐ Hands-on training for engineering, construction & commissioning teams ☐ Job enhancement, enrichment and job rotation including posting at project sites ☐ Outsource non-critical functions on contract basis to maintain a lean organization	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy** (Select options as you deem fit from list below)	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
1.4	Quality and Health, Safety & Environment (HSE) risks	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Quality & HSE to have top management sponsorship with strict adherence to global benchmarks ☐ Review Quality & HSE credentials of Vendors / Contractors before their selection ☐ Impart Quality & HSE Training to all employees and workmen ☐ Conduct reviews at sites / workshops, reward / penalize performance and report to the corporate management ☐ Use digital technology like mobile apps, virtual realities for training, monitoring & reporting incidents	○ ○	**View**
1.5	Geo-Political issues, New Geography / Socio-Economic-Political-Cultural issues / Religion / Language/ Government stability / Civil disorder / War / problem with neighbour	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Due diligence of Geo-Political risks, Country assessment, macro-economic and environmental factors, geographical survey before bid / no-bid decision ☐ Tie-ups with resourceful local Partners / Agents for business acquisition & execution, interpretation of local codes. Post own person/s at target countries ☐ Collaborate with companies already operating in these regions ☐ Excellent leadership at site for execution and to strategically engage with local community ☐ Provide adequate insurance cover for assets and people	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy** (Select options as you deem fit from list below)	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			1 2 3 4 5	
1.6	New and Emerging Technology, lack of technical know-how and experience	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Continuous scanning of environment, adoption of contemporary / new technology to stay ahead in business ☐ Selection of global JV Partners / Collaborators and transfer of technology ☐ Strong in-house Engineering / R&D team to explore, assimilate new technologies and knowledge management ☐ Hire Subject Matter Experts / Specialists ☐ Use Digital Technologies and innovative solutions	○ ○ ○ ○ ○	**View**
1.7	Legal Risks / Disputes / Litigation / Arbitration / Claim Management & Settlement with Customer, Vendors and other parties / Dispute Resolution	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Smart Contract Drafting to have provisions to address major risks. Proposal team to be fully aware of legal risks and mitigation measures ☐ In-house competent Contract & Risk Management and Legal teams, for managing Contracts, dispute resolution, litigation, Arbitration, etc. ☐ Enforce Contractual rights and Claim Management including time extension and additional compensation from Customer ☐ Complete awareness and strict compliance to legal and statutory requirements	○ ○ ○ ○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy** (Select options as you deem fit from list below)	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
1.8	Inadequate Resource Planning, Sub-optimal resource utilization, mobilization, lack of micro-planning and project reviews	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Develop micro-plans and integrated project schedule with resource loading ☐ Frequent Project Review, Monitoring and Control as per the agreed schedule ☐ Use database of past projects, norms and standards for fixing productivity of resources and keep challenging the set norms ☐ Strong Construction Capability and large vendor base for timely mobilization of resources ☐ Use Digital Technology and advance Analytics for deciding resource planning, mobilisation and utilization	○ ○	**View**
1.9	Lack of Leadership, Managerial skills & bandwidth, Competence, Organizational failure	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Visionary and dynamic top leadership having robust leadership development programs ☐ Establish a lean and adaptable organization, strong business processes and faster decision making ☐ Periodic skill mapping, gap evaluation, training, job rotation ☐ Hire talents for critical positions for competencies not available in-house ☐ Sharing of knowledge and learning from past projects	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy** (Select options as you deem fit from list below)	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
1.10	Improper communication / coordination amongst stakeholders, teams, inadequately defined roles, responsibilities & accountabilities	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Clear Role definitions with Responsibility and Accountability through RASCI matrix, SOPs, DACPs, etc. ☐ Project communication protocol agreed upon at the beginning of the project to be strictly followed ☐ Project Review at all levels and feedback mechanism driven by Project Control Team ☐ Conduct annual team building exercise for the entire project team and all stakeholders, encourage people to participate	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**
1.11	Not meeting shareholders' (including customers') expectations / Degradation of brand value, image, reputation / Erosion of Share Price and Market Capitalization	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Annual Communication from MD & CEO / Chairman to all employees to meet Customer Satisfaction and enhance Shareholders' value ☐ Execution excellence for completing projects within time and cost for customer satisfaction ☐ Corporate communication keeping shareholders abreast of important developments including revised guidance, if any, in advance ☐ Brand building through employees, customers, vendors, shareholders, success stories, Corporate Governance, CSR – use media, various forums and word of mouth ☐ Annual survey by a Third Party for customer satisfaction level, analyze the gaps and take corrective actions	○ ○	**View**

Step 2 of 5

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)** **1 2 3 4 5**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)** **1 2 3 4 5**	
2.0	**Proposal & Contract Risks**					
2.1	Schedule / Time overrun / LD Risk	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Develop integrated project schedule based on micro-planning, delivery of long-lead items, resource availability, constraints, required construction time, ground realities and real-time progress monitoring through state-of-the-art digital technologies ☐ Use pre-NTP period for planning & scheduling, critical engineering, procurement specification for long-delivery items, reconfirmation of soil data and BOQ ☐ Document Customer delays in providing inputs, drawings / statutory approvals for securing time extension and additional compensation ☐ Conduct Design Freeze meetings with Customers and all stakeholders, follow up with Customer / Customer's Engineer for timely approval of drawings / document ☐ Back-to-back LD clause with all major Vendors / Contractors	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
2.2	Lack of Scope Clarity / Risk of Scope Creep	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Review bid document, visit site and clarify scope with Customer ☐ Effective Contract drafting with exclusions, interfaces and provisions for Change Orders ☐ Conduct Design Freeze meetings with Customer and all stakeholders reconfirming the scope of supply & service ☐ Scope clarity with vendors and ensure early resolution of issues	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**
2.3	Unilateral / unequitable Contractual clauses favouring the Customers including Defect Liability Period (DLP), Latent Defect Period (LDP) / O&M Liabilities in DLP / Other liabilities	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Risk Reviews & Analysis of contract clauses and price estimation before taking bid / no-bid decision ☐ Negotiate better contract terms, establish clear definition of project completion pursuant to which DLP/LDP would commence and also take deviations to highly risky clauses like absorption of IDC ☐ Transfer contract conditions back-to-back to Vendors / Contractors ☐ QAP/FQP to be strictly followed, multiple design checks and supervision of quality workmanship for civil foundations and structures to be done ☐ Initial plant operations to be done through experienced O&M staff and plant to be preserved as per OEM recommendations	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			1 2 3 4 5	
2.4	Variations of Soil characteristics, Water/Fuel analysis / Site Ambient conditions	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Validation of inputs including soil data, seismic zone, water/fuel analysis etc. through tests and geo-tech investigation at the bidding stages ☐ Insist for “unexpected variation” clause in contract with Customers for compensation / time extension ☐ Conduct periodic testing of fuel and water during commissioning stage and inform Customer for any variation ☐ Plan contingency	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**
2.5	Fixed Price Contract without Price Variation Clause (PVC) / steep wage hike not included in PVC	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Make all out efforts to include PV clause in the contract ☐ Take help of financial experts to model price variation impact and provide for the same in bid cost ☐ Transfer risks back-to-back to Vendors / Contractors and have forward Contracts with bulk material suppliers ☐ Have contractual provisions to seek extra compensation from Customer for extraordinary price / wage hike	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**

Step 3 of 5

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
3.0	**Engineering Risks**					
3.1	LD for Non-performance of Equipment and Plant	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Cold-eye / Per review of critical engineering deliverables and Performance Guarantees by Engineering Consultant / Experts ☐ Pass on LD back-to-back to the OEMs / Vendors ☐ Stage Inspection & Testing at shops and at site as per QAP ☐ Commission equipment and plant strictly as per OEMs' recommendations	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	View

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
3.2	Variations / Error in Bill of Quantities (BOQ) / Inaccurate Cost Estimate	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Engineering Consultant to do Proposal Engineering, to generate layouts, 3D Models and accurate BOQ ☐ Carry out geo-technical investigation and Digital topographic survey before BOQ estimation ☐ Validate BOQ with Analytics tools through analysis of past BOQ data and market intelligence on competitors' BOQ ☐ Bid Cost Review by (a) a committee comprising of people from various disciplines and (b) by Senior Management ☐ Pre-bid tie-ups for major / critical / long delivery equipment and specialized work	○ ○	**View**
3.3	Delay in engineering inputs from OEMs / Vendors / Customers / Delay in finalization and Approval of Engineering / Design Errors	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Pre-bid tie-ups with major OEMs/Vendors for engineering inputs ☐ Contractually keep some percentage of payment against timely submission of inputs by OEM / Vendors ☐ Utilize pre-NTP period to initiate design work with past data to be validated subsequently through project specific data ☐ Conduct Design Freeze Meets (multiple – discipline meetings) with Customer / Customer's Engineer for finalizing design and securing inputs ☐ Document Customer's delay in providing inputs / approving drawings for seeking time extension and additional compensation	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
4.0	**Procurement Risks**					
4.1	Unpredictable Price Increase / Variations of material, equipment, Plant / Cost over-run	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Pre-bid tie-ups with OEMs / Major Vendors, transfer back-to-back price increase risks to them ☐ Insist on Price Variation (PV) clause in the contract ☐ SCM to carry out commodity price trend analysis including seasonal fluctuations at both bid & execution stage and forecast price of materials / equipment ☐ Bulk materials e.g. Structural / Reinforcement Steel, Cables, Earthing materials, RCC etc. stall be negotiated on rate-contract basis ☐ SCM to look for alternate low cost Vendors	○ ○	**View**
4.2	Lack of financially sound competent vendors / suppliers for on-time delivery of materials / equipment meeting specification requirement	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Continuous Vendor development / global sourcing to increase base of financially sound vendors having proven track record ☐ Tap Competitors' vendor base ☐ Pre-bid tie-ups with OEMs / Vendors for critical / long delivery items ☐ Closer vendor follow-up and expediting including stage inspection as per QAP	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
4.3	Change in Government policies, taxes & duties, new levies, new guidelines on availing benefits (e.g. Mega Power, Deemed Export, etc.)	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Have contractual provisions to cover impact of “change of policy during project execution” including levy of new taxes, extraordinary wage hikes, etc. ☐ Pass on the risks back to back to the Vendors / Contractors, to the extent possible ☐ Tracking Government Policies / Regulations and aligning corporate actions accordingly	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**
4.4	Lack of competent and financially sound sub-contractors with required skilled / unskilled workmen	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Identify, assess and register competent and financially sound contractors with proven track record ☐ Retention of Labour through labour welfare initiatives like providing hygienic labour colony facilities, timely payment of wages and transparent dispute settlement process ☐ Contractors with workmen to be sustained by using them at multiple project sites ☐ Develop front line experienced supervisors in the company role ☐ Training of workmen at site, on safety, quality and other construction skills	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			1 2 3 4 5	
4.5	Lack of reliable logistics vendor / in-transit delay of deliveries	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Engage competent and resourceful logistics vendors with proven track record, not merely on L1 basis ☐ Detailed Route survey to identify potential bottlenecks, check adequacy of strength of culverts, bridges, by-pass arrangement, etc. ☐ Use more than one proven logistics vendors to have more options ☐ Provide escort vehicle, GPRS tracking, expediting approvals and arrange food for the driver / helper to reduce transit delay	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	View

Step 4 of 5

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			1 2 3 4 5	
5.0	**Construction Risks**					
5.1	Labour / Trade Unions / local / political / strikes / law & order issues	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Due diligence of site ground realities like political and labour environment, other risks involved before bidding ☐ Engage an experienced IR team at project site to ensure smooth labour / trade union relations and to build rapport with Customer and local authorities ☐ Strict compliance to statutory obligations in letter and spirit ☐ Provide adequate labour facilities – proper stay & sanitation, safety, timely payment of wage, medical facilities, etc. ☐ Carry out local community development, CSR activities and have contingency for the safety of people and assets	○ ○	View

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
5.2	Natural calamities / Acts of God / Force Majeure conditions / Impacts of fire, Earthquake, Heavy monsoon & flooding, Tsunami, Ecological Risks, etc.	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Assessment of historical events, its impact on the project and plan accordingly ☐ Have suitable provisions incorporated in contract for time extension and compensation ☐ Plant roads and drains to be constructed before commencement of construction and to be monsoon ready ☐ Have comprehensive insurance coverage and emergency preparedness for Disaster Management ☐ Invoke Force Majeure and other contract Clauses	○ ○	**View**
5.3	Delay in Construction, Construction Error, Rework, unpredictable construction problem	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Engineering and procurement activities to be driven by early start dates so that construction activities can have more floats ☐ Select Contractors with proven track record having modern construction techniques ☐ Have competent site team including good supervisors ☐ FQP, Testing & Inspection, on-site Kaizen / Quality Circle Team to ensure minimum errors ☐ Field Engineering Group to expeditiously resolve all field changes	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
5.4	Extended stay at site & Cost overrun	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Have suitable provision in the contract for Deemed Completion and Compensation & time extension, in case delay is not due to the Contractor ☐ Strong Project Management & Execution Team to ensure project completion within time and cost ☐ Reduce manpower significantly, keeping a small empowered team of people to liquidate punch points expeditiously and close the project	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**
6.0	**Financial Risks**					
6.1	Forex variation	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Contract provision for Customer to pay in equivalent INR as per forex selling rate on the day of payment to Vendors ☐ Bidding in appropriate currency for hedging / natural hedging ☐ Increase localisation, indigenous vendor development ☐ Have provision in contract for compensation of forex	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			1 2 3 4 5	
6.2	Stringent payment terms and delay in collection of payment, lack of Cash Flows and Working Capital	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Negotiate better terms of payment with Customer with 10 to 15% interest free Advance and timely payment ☐ Work measurement, proper documentation & immediate invoicing through SAP/ERP system ☐ Transfer back to back payment terms to OEMs and major Vendors / Contractors ☐ Improve Working Capital position by having longer vendor credit period / bill discounting ☐ Make a front-loaded billing break-up to improve Working Capital position	○ ○	**View**
6.3	Prolonged delay in Contract/Project Closure, Liquidation of Punch Points, Delay in securing Retention Money, Bank Guarantees (BG), risk of invocation of BG	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ System wise handover of facilities with As built Drawings/Manuals ☐ Establish delays with Customer to seek time extension and compensation ☐ Have “Deemed Completion” clause in Contract for securing Retention Money and BGs in case delay is not due to Contractor ☐ Be prepared for legal recourse / litigation / Arbitration, if such need arises ☐ Have contractual provision for quarterly/half-yearly pro-rata reduction of Advance BG	○ ○	**View**

Step 5 of 5

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)** 1 2 3 4 5	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)** 1 2 3 4 5	
7.0	**Customer Risks**					
7.1	Delay in providing Customer's inputs - Land, Site Access, Right of Way, Construction Water/Power, Power Evacuation, PAC, Permits, Approvals, Statutory Clearances / Approvals - EC, CCOE, PPA, FSA, IBR, Factory Inspector, Electrical Inspector, Aviation, Environment, etc. / Timely Payment	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Facilitate Customer on securing various statutory approvals ☐ Delay in availability of Customer inputs e.g. land, statutory clearances etc. to be documented for securing time extension and compensation ☐ Place orders on vendors only after receipt of basic inputs e.g. Land, MOEF clearance, financial closures etc. ☐ Contract should have provision that non-availability of fuel, water, power evacuation beyond a certain time shall be considered as “Deemed Completion” and in turn, Customer would return Retention Money and BGs ☐ Mobilize resources as per front availability	○ ○	**View**

1	2	3	4	5	6	7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**	**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**	
		1 2 3 4 5			**1 2 3 4 5**	
7.2	Lack of Creditworthiness / Financial soundness of the Customer / Customer's past experience in similar projects	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Due diligence of Customer's financial strength, creditworthiness, risk exposure and past performances before bid / no-bid decision through formal and informal sources ☐ Try to secure payments through Letter of Credit ☐ Negotiate decent contract terms with 10 to 15% interest-free Advance Payment ☐ Pursue Customer to accept Corporate Guarantee in lieu of BGs ☐ There shall be no auto-renewal of BG and value of Advance BG to be reduced periodically	○ ○	**View**
7.3	Project Funding – financial tie-ups and financial closure	○ ○ ○ ○ ○	○ Year-on-Year Growth of Revenue, Profit, Return on Capital Employed (ROCE), Return on Equity (ROE), Order Book ○ Project Completion within scheduled time and cost meeting Quality and EHS Standards ○ Brand Image (Customer Satisfaction, Engaged Workforce, Technology Leadership, Corporate Governance, CSR) ○ Enhancement of Shareholder Value	☐ Due diligence on Project funding and Financial Institutions involved, before bid-no bid decision ☐ Facilitate customers for financial closure as well as various approvals from statutory authorities ☐ Have Contract link "zero" date with payment of advance and providing land, other inputs & all approvals required to start work ☐ Place order on vendors only after the financial closure happens ☐ Submit CPBG to Customer only after the financial closure happens	○ ○	**View**

1	2	3					4	5	6					7
Sl. No.	**Risk**	**Criticality of Risk (1-Low, 5-High)**					**Business Success Indicator affected by the Risk** (Select only 1 from options provided)	**Risk Mitigation Strategy**	**Positive Impact of Risk Mitigation on Business Success Indicator as in Col. No. 4 (1-Low, 5-High)**					
		1	**2**	**3**	**4**	**5**			**1**	**2**	**3**	**4**	**5**	
8	**Your recommendation for ensuring sustained business success of an EPC company**													**View**

Survey Started on : 15th Feb 2018

Summary of Final Survey Data

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.0	**Management Risks**									
1.1	Drastic decline of Thermal Power Market	1	0	0.00	4.20	4	4	1	243	91.35
		2	6	2.26				2	9	3.383
		3	39	14.66				3	2	0.752
		4	117	43.98				4	12	4.511
		5	104	39.10						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.1	1	Secure few orders being cost competitive	3	1.99	27	17.88	37	24.50	44	29.14	40	26.49	151	56.77%	3.60	4	4
	2	Explore coal and gas-based power opportunities abroad, e.g. SE Asia, Middle East, North Africa, Latin America	1	0.45	11	4.98	40	18.10	106	47.96	63	28.51	221	83.08%	3.99	4	4
	3	Focus on FGD, SCR, ESP, replacement of old inefficient generating units	6	3.35	21	11.73	61	34.08	55	30.73	36	20.11	179	67.29%	3.53	4	3
	4	Diversify into adjacencies like R&M, Spares, O&M, Plant Performance Enhancement, etc.	12	8.22	30	20.55	49	33.56	35	23.97	20	13.70	146	54.89%	3.14	3	3
	5	Diversify into emerging power businesses e.g. Nuclear, Solar Thermal, Energy Storage, Waste-to-Energy, Fuel Cell, Plasma Energy, etc.	10	4.98	18	8.96	44	21.89	76	37.81	53	26.37	201	75.56%	3.72	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.2	Fierce Competition	**1**	0	0.00	4.17	4	4	**1**	197	74.06
		2	12	4.51				**2**	31	11.65
		3	37	13.91				**3**	15	5.639
		4	110	41.35				**4**	23	8.647
		5	107	40.23						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.2	**1**	Cost leadership through continuous cost reduction, innovative engineering, procurement, construction and tax optimization while creating a lean organization	3	1.22	7	2.86	38	15.51	78	31.84	119	48.57	245	92.11 %	4.24	4	5
	2	Develop low cost competent vendors	4	2.16	16	8.65	41	22.16	80	43.24	44	23.78	185	69.55 %	3.78	4	4
	3	Continuous improvement of Heat Rate & Aux Power Consumption and reduction of Plant Footprint Area	5	2.78	16	8.89	50	27.78	61	33.89	48	26.67	180	67.67 %	3.73	4	4
	4	Excellent Market Intelligence of projects and competition	2	1.06	13	6.91	41	21.81	61	32.45	71	37.77	188	70.68 %	3.99	4	5

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.3	Shortage of Skilled Personnel	**1**	5	1.88	3.52	4	4	**1**	18	6.767
		2	33	12.41				**2**	179	67.29
		3	92	34.59				**3**	68	25.56
		4	91	34.21				**4**	1	0.376
		5	45	16.92						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.3	**1**	Effective HR policies to acquire, train and retain talent, performance-based compensation & career growth, work environment that promotes innovation and employee engagement	1	0.42	1	0.42	29	12.18	99	41.60	108	45.38	238	89.47%	4.31	4	5
	2	Hands-on training for engineering, construction & commissioning teams	2	1.33	13	8.67	53	35.33	60	40.00	22	14.67	150	56.39%	3.58	4	4
	3	Job enhancement, enrichment and job rotation including posting at project sites	4	2.22	18	10.00	57	31.67	82	45.56	19	10.56	180	67.67%	3.52	4	4
	4	Outsource non-critical functions on contract basis to maintain a lean organization	6	3.53	17	10.00	65	38.24	57	33.53	25	14.71	170	63.91%	3.46	3	3

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.4	Quality & HSE Risks	**1**	11	4.14	3.44	4	4	**1**	5	1.88
		2	36	13.53				**2**	143	53.76
		3	85	31.95				**3**	117	43.98
		4	94	35.34				**4**	1	0.376
		5	40	15.04						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.4	**1**	Quality & HSE to have top management sponsorship with strict adherence to global benchmarks	3	1.35	7	3.15	20	9.01	81	36.49	111	50.00	222	83.46%	4.31	4	5
	2	Review Quality & HSE credentials of Vendors / Contractors before their selection	3	1.47	8	3.92	45	22.06	102	50.00	46	22.55	204	76.69%	3.88	4	4
	3	Impart Quality & HSE Training to all employees and workmen	2	1.06	9	4.76	50	26.46	86	45.50	42	22.22	189	71.05%	3.83	4	4
	4	Conduct reviews at sites / workshops, reward / penalize performance and report to the corporate management	5	2.59	18	9.33	46	23.83	75	38.86	49	25.39	193	72.56%	3.75	4	4
	5	Use digital technology like mobile apps, virtual realities for training, monitoring & reporting incidents	8	4.71	20	11.76	46	27.06	60	35.29	36	21.18	170	63.91%	3.56	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.5	Geo-political Risks	**1**	12	4.51	3.36	4	3	**1**	88	33.08
		2	45	16.92				**2**	149	56.02
		3	79	29.70				**3**	18	6.767
		4	94	35.34				**4**	11	4.135
		5	36	13.53						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.5	**1**	Due diligence of Geo-Political risks, Country assessment, macro-economic and environmental factors, geographical survey before bid / no-bid decision	3	1.28	9	3.85	31	13.25	92	39.32	99	42.31	234	87.97%	4.18	4	5
	2	Tie-ups with resourceful local Partners / Agents for business acquisition & execution, interpretation of local codes. Post own person/s at target countries	2	0.90	8	3.62	40	18.10	95	42.99	76	34.39	221	83.08%	4.06	4	4
	3	Collaborate with companies already operating in these regions	3	1.60	10	5.35	44	23.53	78	41.71	52	27.81	187	70.3%	3.89	4	4
	4	Excellent leadership at site for execution and to strategically engage with local community	2	1.14	6	3.43	40	22.86	59	33.71	68	38.86	175	65.79%	4.06	4	5
	5	Provide adequate insurance cover for assets and people	11	7.80	21	14.89	38	26.95	44	31.21	27	19.15	141	53.01%	3.39	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.6	Emerging Technologies	**1**	6	2.26	3.67	4	4	**1**	87	32.71
		2	28	10.53				**2**	62	23.31
		3	75	28.20				**3**	96	36.09
		4	97	36.47				**4**	21	7.895
		5	60	22.56						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.6	**1**	Continuous scanning of environment, adoption of contemporary / new technology to stay ahead in business	2	0.95	6	2.86	32	15.24	84	40.00	86	40.95	210	78.95%	4.17	4	5
	2	Selection of global JV Partners / Collaborators and transfer of technology	3	1.50	2	1.00	40	20.00	91	45.50	64	32.00	200	75.19%	4.06	4	4
	3	Strong in-house Engineering / R&D team to explore, assimilate new technologies and knowledge management	2	1.01	9	4.52	42	21.11	77	38.69	69	34.67	199	74.81%	4.02	4	4
	4	Hire Subject Matter Experts / Specialists	5	2.99	22	13.17	52	31.14	64	38.32	24	14.37	167	62.78%	3.48	4	4
	5	Use Digital Technologies and innovative solutions	10	6.90	10	6.90	40	27.59	55	37.93	30	20.69	145	54.51%	3.59	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.7	Legal Risks	**1**	5	1.88	3.56	3	4	**1**	73	27.44
		2	29	10.90				**2**	102	38.35
		3	84	31.58				**3**	70	26.32
		4	107	40.23				**4**	21	7.895
		5	41	15.41						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.7	**1**	Smart Contract Drafting to have provisions to address major risks. Proposal team to be fully aware of legal risks and mitigation measures	4	1.85	8	3.70	29	13.43	77	35.65	98	45.37	216	81.2%	4.19	4	5
	2	In-house competent Contract & Risk Management and Legal teams, for managing Contracts, dispute resolution, litigation, Arbitration, etc.	2	0.87	7	3.03	31	13.42	115	49.78	76	32.90	231	86.84%	4.11	4	4
	3	Enforce Contractual rights and Claim Management including time extension and additional compensation from Customer	4	2.14	10	5.35	42	22.46	73	39.04	58	31.02	187	70.3%	3.91	4	4
	4	Complete awareness and strict compliance to legal and statutory requirements	2	1.16	10	5.78	41	23.70	65	37.57	55	31.79	173	65.04%	3.93	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.8	Sub-optimal Resource Planning	**1**	4	1.50	3.96	4	4	**1**	27	10.15
		2	11	4.14				**2**	227	85.34
		3	53	19.92				**3**	10	3.759
		4	122	45.86				**4**	2	0.752
		5	76	28.57						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.8	**1**	Develop micro-plans and integrated project schedule with resource loading	0	0.00	6	2.69	25	11.21	90	40.36	102	45.74	223	83.83%	4.29	4	5
	2	Frequent Project Review, Monitoring and Control as per the agreed schedule	4	2.13	10	5.32	42	22.34	78	41.49	54	28.72	188	70.68%	3.89	4	4
	3	Use database of past projects, norms and standards for fixing productivity of resources and keep challenging the set norms	0	0.00	13	6.88	53	28.04	96	50.79	27	14.29	189	71.05%	3.72	4	4
	4	Strong Construction Capability and large vendor base for timely mobilization of resources	1	0.49	7	3.45	34	16.75	79	38.92	82	40.39	203	76.32%	4.15	4	5
	5	Use Digital Technology and advance Analytics for deciding resource planning, mobilisation and utilization	4	2.21	16	8.84	40	22.10	76	41.99	45	24.86	181	68.05%	3.78	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.9	Lack of managerial Bandwidth	**1**	2	0.75	4.23	4	5	**1**	87	32.71
		2	13	4.89				**2**	73	27.44
		3	32	12.03				**3**	85	31.95
		4	95	35.71				**4**	21	7.895
		5	124	46.62						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.9	**1**	Visionary and dynamic top leadership having robust leadership development programs	0	0.00	3	1.33	15	6.67	60	26.67	147	65.33	225	84.59%	4.56	5	5
	2	Establish a lean and adaptable organization, strong business processes and faster decision making	1	0.51	3	1.52	28	14.14	88	44.44	78	39.39	198	74.44%	4.21	4	4
	3	Periodic skill mapping, gap evaluation, training, job rotation	2	1.13	13	7.34	53	29.94	79	44.63	30	16.95	177	66.54%	3.69	4	4
	4	Hire talents for critical positions for competencies not available in-house	3	1.79	10	5.95	53	31.55	64	38.10	38	22.62	168	63.16%	3.74	4	4
	5	Sharing of knowledge and learning from past projects	3	1.70	15	8.52	52	29.55	65	36.93	41	23.30	176	66.17%	3.72	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.10	Improper Communication	**1**	4	1.50	3.73	4	4	**1**	21	7.895
		2	22	8.27				**2**	188	70.68
		3	77	28.95				**3**	47	17.67
		4	103	38.72				**4**	10	3.759
		5	60	22.56						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI													
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.10	**1**	Clear Role definitions with Responsibility and Accountability through RASCI matrix, SOPs, DACPs, etc.	0	0.00	3	1.33	33	14.67	79	35.11	110	48.89	225	84.59%	4.32	4	5
	2	Project communication protocol agreed upon at the beginning of the project to be strictly followed	4	2.08	4	2.08	41	21.35	92	47.92	51	26.56	192	72.18%	3.95	4	4
	3	Project Review at all levels and feedback mechanism driven by Project Control Team	1	0.52	11	5.67	45	23.20	80	41.24	57	29.38	194	72.93%	3.93	4	4
	4	Conduct annual team building exercise for the entire project team and all stakeholders, encourage people to participate	6	3.49	28	16.28	63	36.63	50	29.07	25	14.53	172	64.66%	3.35	3	3

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
1.11	Not meeting Shareholders' expectations	**1**	7	2.63	3.89	4	4	**1**	17	6.391
		2	21	7.89				**2**	2	0.752
		3	56	21.05				**3**	117	43.98
		4	93	34.96				**4**	130	48.87
		5	89	33.46						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI													
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
1.11	**1**	Annual Communication from MD & CEO / Chairman to all employees to meet Customer Satisfaction and enhance Shareholders' value	6	3.51	6	3.51	45	26.32	67	39.18	47	27.49	171	64.29%	3.84	4	4
	2	Execution excellence for completing projects within time and cost for customer satisfaction	0	0.00	5	2.35	27	12.68	73	34.27	108	50.70	213	80.08%	4.33	5	5
	3	Corporate communication keeping shareholders abreast of important developments including revised guidance, if any, in advance	1	0.60	11	6.63	48	28.92	65	39.16	41	24.70	166	62.41%	3.81	4	4
	4	Brand building through employees, customers, vendors, shareholders, success stories, Corporate Governance, CSR – use media, various forums and word of mouth	3	1.55	10	5.15	59	30.41	76	39.18	46	23.71	194	72.93%	3.78	4	4
	5	Annual survey by a Third Party for customer satisfaction level, analyse the gaps and take corrective actions	7	4.52	21	13.55	58	37.42	45	29.03	24	15.48	155	58.27%	3.37	3	3

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
2.1	Time Overrun / LD Risk	**1**	2	0.75	4.34	5	5	**1**	82	30.83
		2	3	1.13				**2**	173	65.04
		3	35	13.16				**3**	6	2.256
		4	89	33.46				**4**	5	1.88
		5	137	51.50						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
2.1	**1**	Develop integrated project schedule based on micro-planning, delivery of long-lead items, resource availability, constraints, required construction time, ground realities and real-time progress monitoring through state-of-the-art digital technologies	1	0.43	3	1.30	24	10.43	93	40.43	109	47.39	230	86.47%	4.33	4	5
	2	Use pre-NTP period for planning & scheduling, critical engineering, procurement specification for long-delivery items, reconfirmation of soil data and BOQ	2	0.97	10	4.85	43	20.87	82	39.81	69	33.50	206	77.44%	4.00	4	4
	3	Document Customer delays in providing inputs, drawings / statutory approvals for securing time extension and additional compensation	1	0.49	11	5.34	44	21.36	83	40.29	67	32.52	206	77.44%	3.99	4	4
	4	Conduct Design Freeze meetings with Customers and all stakeholders, follow up with Customer / Customer's Engineer for timely approval of drawings / document	1	0.50	9	4.50	53	26.50	86	43.00	51	25.50	200	75.19%	3.89	4	4
	5	Back-to-back LD clause with all major Vendors / Contractors	9	4.52	32	16.08	43	21.61	60	30.15	55	27.64	199	74.81%	3.60	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
2.2	Scope Clarity / Creep	**1**	8	3.01	3.73	4	4	**1**	47	17.67
		2	24	9.02				**2**	211	79.32
		3	70	26.32				**3**	7	2.632
		4	93	34.96				**4**	1	0.376
		5	71	26.69						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
2.2	**1**	Review bid document, visit site and clarify scope with Customer		0.00	5	2.14	33	14.10	83	35.47	113	48.29	234	87.97%	4.30	4	5
	2	Effective Contract drafting with exclusions, interfaces and provisions for Change Orders	2	0.93	5	2.31	33	15.28	84	38.89	92	42.59	216	81.2%	4.20	4	5
	3	Conduct Design Freeze meetings with Customer and all stakeholders reconfirming the scope of supply & service	4	2.25	5	2.81	54	30.34	66	37.08	49	27.53	178	66.92%	3.85	4	4
	4	Scope clarity with vendors and ensure early resolution of issues	3	1.37	11	5.02	53	24.20	94	42.92	58	26.48	219	82.33%	3.88	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
2.3	Unequitable Contract favouring the Customer	1	3	1.13	3.89	4	4	1	133	50
		2	17	6.39				2	103	38.72
		3	59	22.18				3	20	7.519
		4	115	43.23				4	10	3.759
		5	72	27.07						

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
2.3	1	Risk Reviews & Analysis of contract clauses and price estimation before taking bid / no-bid decision	2	0.88	8	3.52	31	13.66	97	42.73	89	39.21	227	85.34%	4.16	4	4
	2	Negotiate better contract terms, establish clear definition of project completion pursuant to which DLP/LDP would commence and also take deviations to highly risky clauses like absorption of IDC	1	0.44	14	6.22	35	15.56	97	43.11	78	34.67	225	84.59%	4.05	4	4
	3	Transfer contract conditions back-to-back to Vendors / Contractors	6	3.08	21	10.77	63	32.31	56	28.72	49	25.13	195	73.31%	3.62	4	3
	4	QAP/FQP to be strictly followed, multiple design checks and supervision of quality workmanship for civil foundations and structures to be done	5	3.55	18	12.77	36	25.53	55	39.01	27	19.15	141	53.01%	3.57	4	4
	5	Initial plant operations to be done through experienced O&M staff and plant to be preserved as per OEM recommendations	5	3.21	13	8.33	37	23.72	59	37.82	42	26.92	156	58.65%	3.77	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
2.4	Variation in Soil / Site Conditions	**1**	11	4.14	3.42	3	4	**1**	29	10.9
		2	37	13.91				**2**	231	86.84
		3	87	32.71				**3**	4	1.504
		4	92	34.59				**4**	2	0.752
		5	39	14.66						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
2.4	**1**	Validation of inputs including soil data, seismic zone, water/fuel analysis etc. through tests and geo-tech investigation at the bidding stages	0	0.00	7	2.83	21	8.5	93	37.65	126	51.01	247	92.36	4.37	5	5
	2	Insist for “unexpected variation” clause in contract with Customers for compensation / time extension	1	0.53	10	5.32	27	14.36	82	43.62	68	36.17	188	70.66	4.10	4	4
	3	Conduct periodic testing of fuel and water during commissioning stage and inform Customer for any variation	1	0.64	22	14.01	56	35.67	53	33.76	25	15.92	157	59.02	3.5	3	3
	4	Plan contingency	6	3.70	20	12.35	58	35.80	43	26.54	35	21.60	162	60.9	3.5	3	3

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
2.5	Fixed Price Contract without PVC / steep wage hike not included in PVC	**1**	9	3.38	3.77	4	4	**1**	155	58.27
		2	15	5.64				**2**	94	35.34
		3	74	27.82				**3**	8	3.008
		4	99	37.22				**4**	9	3.383
		5	69	25.94						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
2.5	**1**	Make all out efforts to include PV clause in the contract	4	1.98	6	2.97	30	14.85	65	32.18	97	48.02	202	75.94%	4.21	4	5
	2	Take help of financial experts to model price variation impact and provide for the same in bid cost	2	1.09	9	4.89	37	20.11	83	45.11	53	28.80	184	69.17%	3.96	4	4
	3	Transfer risks back-to-back to Vendors / Contractors and have forward Contracts with bulk material suppliers	5	2.48	11	5.45	56	27.72	77	38.12	53	26.24	202	75.94%	3.80	4	4
	4	Have contractual provisions to seek extra compensation from Customer for extraordinary price / wage hike	4	2.05	7	3.59	38	19.49	70	35.90	76	38.97	195	73.31%	4.06	4	5

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
3.1	LD for Non-performance of Equipment and Plant	**1**	12	4.51	3.72	4	4	**1**	90	33.83
		2	20	7.52				**2**	85	31.95
		3	72	27.07				**3**	83	31.2
		4	89	33.46				**4**	8	3.008
		5	73	27.44						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
3.1	**1**	Cold-eye / Per review of critical engineering deliverables and Performance Guarantees by Engineering Consultant / Experts	1	0.46	7	3.24	42	19.44	84	38.89	82	37.96	216	81.2%	4.11	4	4
	2	Pass on LD back-to-back to the OEMs / Vendors	3	1.37	16	7.31	46	21.00	78	35.62	76	34.70	219	82.33 %	3.95	4	4
	3	Stage Inspection & Testing at shops and at site as per QAP	4	2.20	14	7.69	45	24.73	75	41.21	44	24.18	182	68.42 %	3.77	4	4
	4	Commission equipment and plant strictly as per OEMs' recommendations	0	0.00	12	6.78	27	15.25	75	42.37	63	35.59	177	66.54 %	4.07	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
3.2	Variation in BOQ / Cost Estimate	**1**	2	0.75	4.08	4	4	**1**	118	44.36
		2	15	5.64				**2**	135	50.75
		3	45	16.92				**3**	5	1.88
		4	103	38.72				**4**	8	3.008
		5	101	37.97						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
3.2	**1**	Engineering Consultant to do Proposal Engineering, to generate layouts, 3D Models and accurate BOQ	2	0.94	6	2.82	40	18.78	69	32.39	96	45.07	213	80.08%	4.18	4	5
	2	Carry out geo-technical investigation and Digital topographic survey before BOQ estimation	2	1.13	6	3.39	36	20.34	67	37.85	66	37.29	177	66.54%	4.07	4	4
	3	Validate BOQ with Analytics tools through analysis of past BOQ data and market intelligence on competitors' BOQ	2	0.90	7	3.17	58	26.24	93	42.08	61	27.60	221	83.08%	3.92	4	4
	4	Bid Cost Review by (a) a committee comprising of people from various disciplines and (b) by Senior Management	2	1.06	10	5.29	45	23.81	81	42.86	51	26.98	189	71.05%	3.89	4	4
	5	Pre-bid tie-ups for major / critical / long delivery equipment and specialized work	5	2.98	10	5.95	38	22.62	55	32.74	60	35.71	168	63.16%	3.92	4	5

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
3.3	Engineering Delays	**1**	4	1.50	3.78	4	4	**1**	9	3.383
		2	15	5.64				**2**	254	95.49
		3	72	27.07				**3**	3	1.128
		4	119	44.74						
		5	56	21.05						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
3.3	**1**	Pre-bid tie-ups with major OEMs/Vendors for engineering inputs	5	2.48	9	4.46	39	19.31	80	39.60	69	34.16	202	75.94%	3.99	4	4
	2	Contractually keep some percentage of payment against timely submission of inputs by OEM / Vendors	4	1.99	12	5.97	53	26.37	86	42.79	46	22.89	201	75.56%	3.79	4	4
	3	Utilize pre-NTP period to initiate design work with past data to be validated subsequently through project specific data	2	1.00	16	8.00	57	28.50	86	43.00	39	19.50	200	75.19%	3.72	4	4
	4	Conduct Design Freeze Meets (multiple – discipline meetings) with Customer / Customer's Engineer for finalizing design and securing inputs	0	0.00	10	4.65	54	25.12	91	42.33	60	27.91	215	80.83%	3.93	4	4
	5	Document Customer's delay in providing inputs / approving drawings for seeking time extension and additional compensation	4	2.03	17	8.63	48	24.37	72	36.55	56	28.43	197	74.06%	3.81	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
4.1	Unpredictable Price Increase	**1**	2	0.75	3.93	4	4	**1**	128	48.12
		2	16	6.02				**2**	129	48.5
		3	56	21.05						
		4	117	43.98				**4**	9	3.383
		5	75	28.20						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
4.1	**1**	Pre-bid tie-ups with OEMs / Major Vendors, transfer back-to-back price increase risks to them	3	1.47	6	2.94	41	20.10	77	37.75	77	37.75	204	76.69%	4.07	4	4
	2	Insist on Price Variation (PV) clause in the contract	2	1.00	6	2.99	32	15.92	75	37.31	86	42.79	201	75.56%	4.18	4	5
	3	SCM to carry out commodity price trend analysis including seasonal fluctuations at both bid & execution stage and forecast price of materials/equipment	4	1.97	10	4.93	52	25.62	88	43.35	49	24.14	203	76.32%	3.83	4	4
	4	Bulk materials e.g. Structural / Reinforcement Steel, Cables, Earthing materials, RCC etc. stall be negotiated on rate-contract basis	1	0.47	4	1.86	63	29.30	94	43.72	53	24.65	215	80.83%	3.90	4	4
	5	SCM to look for alternate low-cost Vendors	9	5.81	17	10.97	43	27.74	53	34.19	33	21.29	155	58.27%	3.54	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
4.2	Lack of Financially Sound Competent Vendors/Suppliers	**1**	9	3.38	3.68	4	4	**1**	19	7.143
		2	20	7.52				**2**	230	86.47
		3	72	27.07				**3**	17	6.391
		4	111	41.73						
		5	54	20.30						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
4.2	**1**	Continuous Vendor development / global sourcing to increase base of financially sound vendors having proven track record	1	0.41	7	2.88	42	17.28	102	41.98	91	37.45	243	91.35%	4.13	4	4
	2	Tap Competitors' vendor base	3	1.96	15	9.80	47	30.72	60	39.22	28	18.30	153	57.52%	3.62	4	4
	3	Pre-bid tie-ups with OEMs / Vendors for critical / long delivery items	2	1.14	7	3.98	41	23.30	70	39.77	56	31.82	176	66.17%	3.97	4	4
	4	Closer vendor follow-up and expediting including stage inspection as per QAP	7	3.45	11	5.42	53	26.11	76	37.44	56	27.59	203	76.32%	3.80	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
4.3	Change in Government Policies	**1**	12	4.51	3.61	4	4	**1**	156	58.65
		2	27	10.15				**2**	90	33.83
		3	72	27.07				**3**	4	1.50
		4	98	36.84				**4**	16	6.02
		5	57	21.43						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
4.3	**1**	Have contractual provisions to cover impact of "change of policy during project execution" including levy of new taxes, extraordinary wage hikes, etc.	0	0.00	10	4.05	30	12.15	79	31.98	128	51.82	247	92.86%	4.32	5	5
	2	Pass on the risks back to back to the Vendors / Contractors, to the extent possible	5	2.82	19	10.73	57	32.20	63	35.59	33	18.64	177	66.54%	3.56	4	4
	3	Tracking Government Policies / Regulations and aligning corporate actions accordingly	6	2.91	17	8.25	54	26.21	79	38.35	50	24.27	206	77.44%	3.73	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
4.4	Lack of Financially Sound competent Sub-contractors	**1**	7	2.63	3.70	4	4	**1**	22	8.27
		2	22	8.27				**2**	226	84.96
		3	66	24.81				**3**	17	6.39
		4	119	44.74				**4**	1	0.38
		5	52	19.55						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI													
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
4.4	**1**	Identify, assess and register competent and financially sound contractors with proven track record	2	0.84	7	2.93	47	19.67	99	41.42	84	35.15	239	89.85%	4.07	4	4
	2	Retention of Labour through labour welfare initiatives like providing hygienic labour colony facilities, timely payment of wages and transparent dispute settlement process	5	2.70	7	3.78	48	25.95	77	41.62	48	25.95	185	69.55%	3.84	4	4
	3	Contractors with workmen to be sustained by using them at multiple project sites	2	1.23	10	6.13	54	33.13	69	42.33	28	17.18	163	61.28%	3.68	4	4
	4	Develop front line experienced supervisors in the company role	4	2.19	10	5.46	42	22.95	78	42.62	49	26.78	183	68.8%	3.86	4	4
	5	Training of workmen at site, on safety, quality and other construction skills	5	3.11	8	4.97	49	30.43	66	40.99	33	20.50	161	60.53%	3.71	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
4.5	Lack of reliable Logistics Vendor	**1**	10	3.76	3.37	3	4	**1**	12	4.51
		2	41	15.41				**2**	248	93.23
		3	89	33.46				**3**	6	2.26
		4	93	34.96						
		5	33	12.41						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
4.5	**1**	Engage competent and resourceful logistics vendors with proven track record, not merely on L1 basis	1	0.44	3	1.32	37	16.23	83	36.40	104	45.61	228	85.71%	4.25	4	5
	2	Detailed Route survey to identify potential bottlenecks, check adequacy of strength of culverts, bridges, by-pass arrangement, etc.	1	0.43	8	3.48	41	17.83	88	38.26	92	40.00	230	86.47%	4.14	4	5
	3	Use more than one proven logistics vendors to have more options	4	2.26	13	7.34	47	26.55	77	43.50	36	20.34	177	66.54%	3.72	4	4
	4	Provide escort vehicle, GPRS tracking, expediting approvals and arrange food for the driver / helper to reduce transit delay	7	3.93	19	10.67	71	39.89	52	29.21	29	16.29	178	66.92%	3.43	3	3

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
5.1	Labour / Political / Law & Order issues	**1**	2	0.75	3.69	4	4	**1**	8	3.01
		2	20	7.52				**2**	231	86.84
		3	91	34.21				**3**	27	10.15
		4	98	36.84						
		5	55	20.68						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI													
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
5.1	**1**	Due diligence of site ground realities like political and labour environment, other risks involved before bidding	2	0.93	8	3.72	49	22.79	86	40.00	70	32.56	215	80.83%	4.00	4	4
	2	Engage an experienced IR team at project site to ensure smooth labour / trade union relations and to build rapport with Customer and local authorities	1	0.45	8	3.59	44	19.73	90	40.36	80	35.87	223	83.83%	4.08	4	4
	3	Strict compliance to statutory obligations in letter and spirit	4	2.42	7	4.24	33	20.00	67	40.61	54	32.73	165	62.03%	3.97	4	4
	4	Provide adequate labour facilities – proper stay & sanitation, safety, timely payment of wage, medical facilities, etc.	1	0.47	11	5.14	54	25.23	82	38.32	66	30.84	214	80.45%	3.94	4	4
	5	Carry out local community development, CSR activities and have contingency for the safety of people and assets	6	3.08	14	7.18	70	35.90	55	28.21	50	25.64	195	73.31%	3.66	4	3

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
5.2	Natural Calamities / Acts of God	**1**	22	8.27	3.12	3	3	**1**	30	11.28
		2	60	22.56				**2**	228	85.71
		3	84	31.58				**3**	2	0.75
		4	63	23.68				**4**	6	2.26
		5	37	13.91						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
5.2	**1**	Assessment of historical events, its impact on the project and plan accordingly	10	5.95	18	10.71	50	29.76	61	36.31	29	17.26	168	63.16%	3.48	4	4
	2	Have suitable provisions incorporated in contract for time extension and compensation	2	0.90	8	3.60	27	12.16	82	36.94	103	46.40	222	83.46%	4.24	4	5
	3	Plant roads and drains to be constructed before commencement of construction and to be monsoon ready	5	2.84	18	10.23	47	26.70	56	31.82	50	28.41	176	66.17%	3.73	4	4
	4	Have comprehensive insurance coverage and emergency preparedness for Disaster Management	5	2.30	10	4.61	38	17.51	70	32.26	94	43.32	217	81.58%	4.10	4	5
	5	Invoke Force Majeure and other contract Clauses	1	0.51	5	2.54	33	16.75	62	31.47	96	48.73	197	74.06%	4.25	4	5

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
5.3	Delay in Construction	**1**	4	1.50	3.65	4	4	**1**	25	9.40
		2	30	11.28				**2**	224	84.21
		3	76	28.57				**3**	16	6.02
		4	102	38.35				**4**	1	0.38
		5	54	20.30						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
5.3	**1**	Engineering and procurement activities to be driven by early start dates so that construction activities can have more floats	4	1.90	10	4.76	41	19.52	68	32.38	87	41.43	210	78.95%	4.07	4	5
	2	Select Contractors with proven track record having modern construction techniques	1	0.46	5	2.28	34	15.53	90	41.10	89	40.64	219	82.33%	4.19	4	4
	3	Have competent site team including good supervisors		0.00	7	3.20	37	16.89	80	36.53	95	43.38	219	82.33%	4.20	4	5
	4	FQP, Testing & Inspection, on-site Kaizen / Quality Circle Team to ensure minimum errors	7	4.22	10	6.02	48	28.92	60	36.14	41	24.70	166	62.41%	3.71	4	4
	5	Field Engineering Group to expeditiously resolve all field changes	3	1.65	11	6.04	45	24.73	74	40.66	49	26.92	182	68.42%	3.85	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
5.4	Extended Stay at Site & Cost Overrun.	**1**	3	1.13	3.73	4	4	**1**	100	37.59
		2	24	9.02				**2**	145	54.51
		3	69	25.94				**3**	12	4.51
		4	117	43.98				**4**	9	3.38
		5	53	19.92						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
5.4	**1**	Have suitable provision in the contract for Deemed Completion and Compensation & time extension, in case delay is not due to the Contractor	1	0.46	11	5.09	31	14.35	86	39.81	87	40.28	216	81.2%	4.14	4	5
	2	Strong Project Management & Execution Team to ensure project completion within time and cost	2	0.85	4	1.70	32	13.62	83	35.32	114	48.51	235	88.35%	4.29	4	5
	3	Reduce manpower significantly, keeping a small empowered team of people to liquidate punch points expeditiously and close the project	6	3.24	12	6.49	60	32.43	73	39.46	34	18.38	185	69.55%	3.63	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
6.1	Forex Variation	**1**	9	3.38	3.61	4	4	**1**	203	76.32
		2	30	11.28				**2**	50	18.80
		3	74	27.82				**3**	1	0.38
		4	95	35.71				**4**	12	4.51
		5	58	21.80						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI													
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
6.1	**1**	Contract provision for Customer to pay in equivalent INR as per forex selling rate on the day of payment to Vendors	2	1.13	9	5.08	32	18.08	68	38.42	66	37.29	177	66.54%	4.06	4	4
	2	Bidding in appropriate currency for hedging / natural hedging	1	0.43	7	3.04	34	14.78	86	37.39	102	44.35	230	86.47%	4.22	4	5
	3	Increase localisation, indigenous vendor development	1	0.63	9	5.70	39	24.68	78	49.37	31	19.62	158	59.4%	3.82	4	4
	4	Have provision in contract for compensation of forex	3	1.70	12	6.82	38	21.59	54	30.68	69	39.20	176	66.17%	3.99	4	5

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
6.2	Stringent Payment Terms and delay in Payment Collection	**1**	1	0.38	4.15	4	4	**1**	193	72.56
		2	9	3.38				**2**	62	23.31
		3	38	14.29						0.00
		4	120	45.11				**4**	11	4.14
		5	98	36.84						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
6.2	**1**	Negotiate better terms of payment with Customer with 10 to 15% interest free Advance and timely payment	3	1.33	9	4.00	30	13.33	88	39.11	95	42.22	225	84.59%	4.17	4	5
	2	Work measurement, proper documentation & immediate invoicing through SAP/ERP system	2	0.98	6	2.94	34	16.67	77	37.75	85	41.67	204	76.69%	4.16	4	5
	3	Transfer back to back payment terms to OEMs and major Vendors / Contractors	4	2.01	11	5.53	47	23.62	81	40.70	56	28.14	199	74.81%	3.87	4	4
	4	Improve Working Capital position by having longer vendor credit period / bill discounting	4	2.12	20	10.58	46	24.34	78	41.27	41	21.69	189	71.05%	3.70	4	4
	5	Make a front-loaded billing break-up to improve Working Capital position	4	2.09	14	7.33	31	16.23	72	37.70	70	36.65	191	71.8%	3.99	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
6.3	Prolonged delay in Contract Closure	**1**	2	0.75	3.90	4	4	**1**	142	53.38
		2	16	6.02				**2**	97	36.47
		3	62	23.31				**3**	13	4.89
		4	112	42.11				**4**	14	5.26
		5	74	27.82						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI													
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
6.3	**1**	System wise handover of facilities with As built Drawings/Manuals	3	1.46	11	5.37	40	19.51	84	40.98	67	32.68	205	77.07%	3.98	4	4
	2	Establish delays with Customer to seek time extension and compensation	3	1.39	10	4.63	31	14.35	95	43.98	77	35.65	216	81.2%	4.08	4	4
	3	Have “Deemed Completion” clause in Contract for securing Retention Money and BGs in case delay is not due to Contractor	0	0.00	6	2.65	28	12.39	88	38.94	104	46.02	226	84.96%	4.28	4	5
	4	Be prepared for legal recourse / litigation / Arbitration, if such need arises	15	10.07	18	12.08	48	32.21	46	30.87	22	14.77	149	56.02%	3.28	3	3
	5	Have contractual provision for quarterly/half-yearly pro-rata reduction of Advance BG	4	2.12	15	7.94	55	29.10	61	32.28	54	28.57	189	71.05%	3.77	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
7.1	Delay in Customer's Inputs	**1**	1	0.38	4.07	4	5	**1**	23	8.65
		2	14	5.26				**2**	238	89.47
		3	54	20.30				**3**	2	0.75
		4	94	35.34				**4**	3	1.13
		5	103	38.72						
		TOTAL	**266**	**100.00**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
7.1	**1**	Facilitate Customer on securing various statutory approvals	4	2.27	24	13.64	70	39.77	44	25.00	34	19.32	176	66.17%	3.45	3	3
	2	Delay in availability of Customer inputs e.g. land, statutory clearances etc. to be documented for securing time extension and compensation	0	0.00	7	2.87	34	13.93	78	31.97	125	51.23	244	91.73%	4.32	5	5
	3	Place orders on vendors only after receipt of basic inputs e.g. Land, MOEF clearance, financial closures etc.	4	2.55	13	8.28	49	31.21	50	31.85	41	26.11	157	59.02%	3.71	4	4
	4	Contract should have provision that non-availability of fuel, water, power evacuation beyond a certain time shall be considered as "Deemed Completion" and in turn, Customer would return Retention Money and BGs	2	0.93	8	3.72	35	16.28	69	32.09	101	46.98	215	80.83%	4.20	4	5
	5	Mobilize resources as per front availability	5	3.05	10	6.10	51	31.10	58	35.37	40	24.39	164	61.65%	3.72	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
7.2	Lack of Creditworthiness / Financial Soundness of the Customer	**1**	2	0.75	4.21	4	5	**1**	150	56.39
		2	14	5.26				**2**	69	25.94
		3	39	14.66				**3**	18	6.77
		4	83	31.20				**4**	29	10.90
		5	128	48.12						
		TOTAL	266	100.00					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
7.2	**1**	Due diligence of Customer's financial strength, creditworthiness, risk exposure and past performances before bid / no-bid decision through formal and informal sources	2	0.80	3	1.20	26	10.44	81	32.53	137	55.02	249	93.61%	4.40	5	5
	2	Try to secure payments through Letter of Credit	1	0.49	5	2.44	35	17.07	80	39.02	84	40.98	205	77.07%	4.18	4	5
	3	Negotiate decent contract terms with 10 to 15% interest-free Advance Payment	5	2.81	16	8.99	31	17.42	76	42.70	50	28.09	178	66.92%	3.84	4	4
	4	Pursue Customer to accept Corporate Guarantee in lieu of BGs	6	3.66	10	6.10	48	29.27	60	36.59	40	24.39	164	61.65%	3.72	4	4
	5	There shall be no auto-renewal of BG and value of Advance BG to be reduced periodically	7	4.40	16	10.06	41	25.79	56	35.22	39	24.53	159	59.77%	3.65	4	4

Risk ID	Risk Description	Risk Criticality						Business Success Indicator (BSI)		
		RISK SCALE	Total	(%)	Mean	Median	Mode	BSI	Total	%
7.3	Project Funding and Financial Closure	**1**	2	0.75	3.93	4	4	**1**	143	53.76
		2	16	6.02				**2**	100	37.59
		3	63	23.68				**3**	4	1.50
		4	103	38.72				**4**	19	7.14
		5	82	30.83						
		TOTAL	**266**	**100**					**266**	**100**

Risk ID	Risk Mitigation Strategy (RMS)		Positive Impact of RMS on BSI														
	RMS	RMS Description	1	%	2	%	3	%	4	%	5	%	Total	Total %	Mean	Median	Mode
7.3	**1**	Due diligence on Project funding and Financial Institutions involved, before bid-no bid decision	2	0.86	3	1.29	37	15.95	86	37.07	104	44.83	232	87.22%	4.24	4	5
	2	Facilitate customers for financial closure as well as various approvals from statutory authorities	6	3.77	18	11.32	54	33.96	59	37.11	22	13.84	159	59.77%	3.46	4	4
	3	Have Contract link “zero” date with payment of advance and providing land, other inputs & all approvals required to start work	1	0.49	7	3.40	40	19.42	77	37.38	81	39.32	206	77.44%	4.12	4	5
	4	Place order on vendors only after the financial closure happens	5	3.21	12	7.69	39	25.00	57	36.54	43	27.56	156	58.65%	3.78	4	4
	5	Submit CPBG to Customer only after the financial closure happens	3	2.01	7	4.70	39	26.17	57	38.26	43	28.86	149	56.02%	3.87	4	4

Appendix - 19

Criticality Score of Critical Risk Factors (CRF)

(Mean, Median and Mode)

Serial No.	Risk ID	Description of Critical Risk Factors (CRF)	Mean	Median	Mode
	1.0	**Management Risk**			
1	1.1	Drastic decline of Thermal Power Market	4.20	4	4
2	1.2	Fierce Competition	4.17	4	4
3	1.3	Shortage of Skilled Personnel	3.52	4	4
4	1.4	Quality & HSE Risks	3.44	4	4
5	1.5	Geo-political Risks	3.36	4	3
6	1.6	Emerging Technologies	3.67	4	4
7	1.7	Legal Risks	3.56	3	4
8	1.8	Sub-optimal Resource Planning	3.96	4	4
9	1.9	Lack of managerial Bandwidth	4.23	4	5
10	1.10	Improper Communication	3.73	4	4
11	1.11	Not meeting Shareholders' expectations	3.89	4	4
	2.0	**Proposal & Contract Risk**			
12	2.1	Time Overrun / LD Risk	4.34	5	5
13	2.2	Scope Clarity / Creep	3.73	4	4
14	2.3	Unequitable Contract favouring the Customer	3.89	4	4
15	2.4	Variation in Soil / Site Conditions	3.42	3	4
16	2.5	Fixed Price Contract without PVC / steep wage hike not included in PVC	3.77	4	4
	3.0	**Engineering Risks**			
17	3.1	LD for Non-performance of Equipment and Plant	3.72	4	4
18	3.2	Variation in BOQ / Cost Estimate	4.08	4	4
19	3.3	Engineering Delays	3.78	4	4
	4.0	**Procurement Risks**			
20	4.1	Unpredictable Price Increase	3.93	4	4
21	4.2	Lack of Financially Sound Competent Vendors/Suppliers	3.68	4	4
22	4.3	Change in Government Policies	3.61	4	4
23	4.4	Lack of Financially Sound competent Sub-contractors	3.70	4	4
24	4.5	Lack of reliable Logistics Vendor	3.37	3	4
	5.0	**Construction Risks**			
25	5.1	Labour / Political / Law & Order issues	3.69	4	4
26	5.2	Natural Calamities / Acts of God	3.12	3	3
27	5.3	Delay in Construction	3.65	4	4
28	5.4	Extended Stay at Site & Cost Overrun.	3.73	4	4

Serial No.	Risk ID	Description of Critical Risk Factors (CRF)	Mean	Median	Mode
	6.0	**Financial Risks**			
29	6.1	Forex Variation	3.61	4	4
30	6.2	Stringent Payment Terms and delay in Payment Collection	4.15	4	4
31	6.3	Prolonged delay in Contract Closure	3.90	4	4
	7.0	**Customer Risks**			
32	7.1	Delay in Customer's Inputs	4.07	4	5
33	7.2	Lack of Creditworthiness / Financial Soundness of the Customer	4.21	4	5
34	7.3	Project Funding and Financial Closure	3.93	4	4

Structural Equation Modelling - Analysis

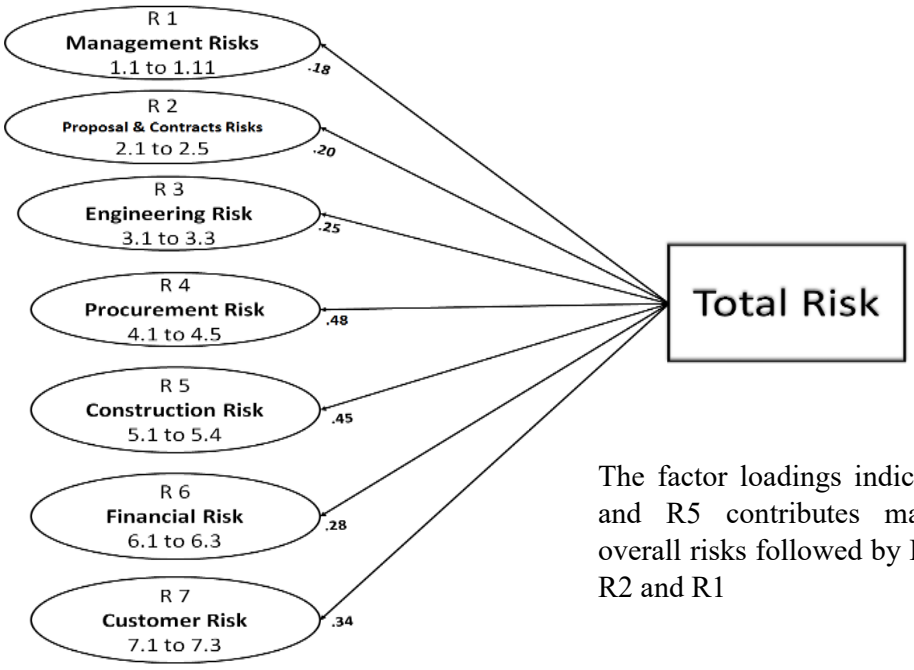
1. **Contribution of Critical Risk Factors (CRF) under different Groups on Total Risk**

Testing of Hypothesis 1 (ref. Chapter 3) related to Research Objective 1 is given below:

Null-Hypothesis, H_{1a}: There will be no significant contributions of the risks under the 7 Risk Groups to Total Risk

Alternative Hypothesis, H_{1b}: There will be significant contribution of the risks under 7 Risk Groups on Total Risk

A structural equation model was tested to investigate the hypothesis that various risks influence the total overall risk. All the seven risks categories were latent variables in this model. The model specified one direct path from various risk categories to overall risk in the business. Although the Chi-square for the model was significant, $\chi 2 = 65.121$, $p < .05$, alternative fit indices indicated a good fit to the data, CFI = .981, CMIN/df = 2.73. Results indicated that all the risks category significantly predict the overall risk, R^2= 78.46, SE =0.066, p value = 0.002 (ref, Figure below).



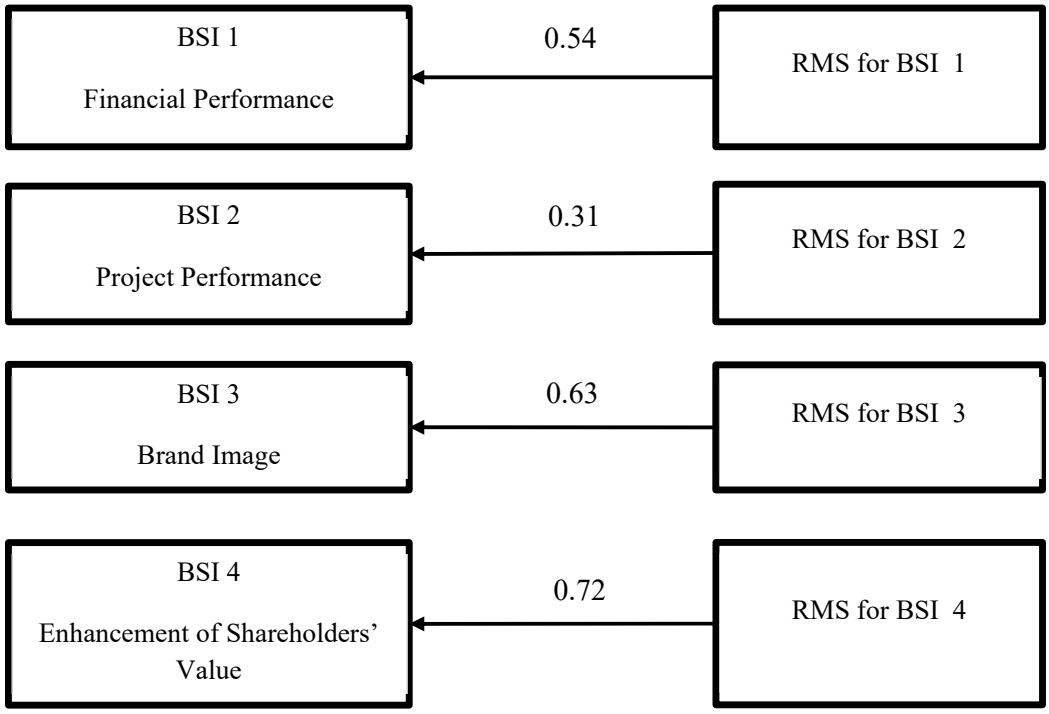
The factor loadings indicate that R4 and R5 contributes maximum to overall risks followed by R7, R6, R3, R2 and R1

2. Impacts of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI)

Null-Hypothesis, H_{6a}: There will be no significant impacts of the Risk Mitigation Strategies (RMS) on the Business Success Indicators (BSI 1, BSI 2, BSI 3 and BSI 4)

Alternative Hypothesis, H_{6b}: There will be significant impacts of the Risk Mitigation Strategies (RMS) on the Business Success Indicators (BSI 1, BSI 2, BSI 3 and BSI 4)

A structural equation model was carried out to investigate the hypothesis whether various RMSs have impacts on the BSIs. The model specified one direct path from various RMS to their respective impact on the specific BSI. The Chi-Square for the model was significant, $\chi 2 = 46.89$, $p < 0.05$, alternative fit indices indicated a good fit to the data, CFI = 0.912, CMIN/df = 2.81. Results indicated that all the RMS significantly impact the BSIs, R2= 88.67, SE = 0.071, p value = 0.015 (Ref. Figure 8.2.2.1below).



Path coefficients indicate that RMS have maximum impact on BSI 4, BSI 3 and BSI 1 while its impact has been lowest for BSI 2.

Impact of Critical Risk Factors (CRF) on Business Success Indicators (BSI 1. BSI 2, BSI 3 and BSI 4)

ANOVA Results

		Sum of Squares	df	Mean Square	F	Sig.
BSI-01-P	Between Groups	5420.824	6	903.471	1.507	.214
	Within Groups	16190.779	27	599.658		
	Total	21611.603	33			
BSI-02-P	Between Groups	8333.486	6	1388.914	2.016	.098
	Within Groups	18603.460	27	689.017		
	Total	26936.947	33			
BSI-03-P	Between Groups	2480.136	6	413.356	3.356	.013
	Within Groups	3325.150	27	123.154		
	Total	5805.286	33			
BSI-04-P	Between Groups	315.894	6	52.649	.718	.639
	Within Groups	1981.081	27	73.373		
	Total	2296.974	33			

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk#1.1: Drastic Decline of Thermal Power Market

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
1.1_1_(d)	151	3.60	1.120	15.366	0.000	1.1_4_(d)	Diversify into adjacencies like R&M, Spares, O&M, Plant Performance Enhancement, etc.	3.14		
1.1_2_(d)	221	3.99	0.842			1.1_3_(d)	Focus on FGD, SCR, ESP, replacement of old inefficient generating units		3.53	
1.1_3_(d)	179	3.53	1.046			1.1_1_(d)	Secure few orders being cost competitive		3.60	
1.1_4_(d)	146	3.14	1.145			1.1_5_(d)	Diversify into emerging power businesses e.g. Nuclear, Solar Thermal, Energy Storage, Waste-to-Energy, Fuel Cell, Plasma Energy, etc.		3.72	
1.1_5_(d)	201	3.72	1.102			1.1_2_(d)	Explore coal and gas-based power opportunities abroad, e.g. SE Asia, Middle East, North Africa, Latin America			3.99

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there were three homogenous groups of RMS exist wherein strategy 1.1_2_(d) shows the most significant effect amongst all the strategies, while strategy 1.1_3_(d), 1.1_1_(d) and 1.1_5_(d) are equally effective at moderate level. The set of these strategies was found to be significantly higher than 1.1_4_(d) but lesser than 1.1_2_(d). While, strategy 1.1_4_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.2: Fierce Competition

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
1.2_1_(d)	245	4.24	0.901	12.258	0.000	1.2_3_(d)	Continuous improvement of Heat Rate & Aux Power Consumption and reduction of Plant Footprint Area	3.73		
1.2_2_(d)	185	3.78	0.978			1.2_2_(d)	Develop low cost competent vendors		3.78	
1.2_3_(d)	180	3.73	1.040			1.2_4_(d)	Excellent Market Intelligence of projects and competition		3.99	
1.2_4_(d)	188	3.99	0.986			1.2_1_(d)	Cost leadership through continuous cost reduction, innovative engineering, procurement, construction and tax optimization while creating a lean organization			4.24

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 1.2_1_(d) shows the most significant effect amongst all the strategies, while strategy 1.2_2_(d) and 1.2_4_(d) are effective at moderate level and strategy1.2_3_(d) is effective at a lower level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.3: Shortage of Skilled Personnel

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
1.3_1_(d)	238	4.31	0.732	45.567	0.000	1.3_4_(d)	Outsource non-critical functions on contract basis to maintain a lean organization	3.46	
1.3_2_(d)	150	3.58	0.892			1.3_3_(d)	Job enhancement, enrichment and job rotation including posting at project sites	3.52	
1.3_3_(d)	180	3.52	0.894			1.3_2_(d)	Hands-on training for engineering, construction & commissioning teams	3.58	
1.3_4_(d)	170	3.46	0.979			1.3_1_(d)	Effective HR policies to acquire, train and retain talent, performance-based compensation & career growth, work environment that promotes innovation and employee engagement		4.31

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the post hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategy 1.3_1_(d) shows the high impact amongst all the strategies, while strategy 1.3_4_(d), 1.3_3_(d) and 1.3_2_(d) are effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.4: Quality & HSE Risks

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
1.4_1_(d)	222	4.31	0.845	17.316	0.000	1.4_5_(d)	Use digital technology like mobile apps, virtual realities for training, monitoring & reporting incidents	3.56		
1.4_2_(d)	204	3.88	0.851			1.4_4_(d)	Conduct reviews at sites / workshops, reward / penalize performance and report to the corporate management		3.75	
1.4_3_(d)	189	3.83	0.865			1.4_3_(d)	Impart Quality & HSE Training to all employees and workmen		3.83	
1.4_4_(d)	193	3.75	1.02			1.4_2_(d)	Review Quality & HSE credentials of Vendors / Contractors before their selection		3.88	
1.4_5_(d)	170	3.56	1.09			1.4_1_(d)	Quality & HSE to have top management sponsorship with strict adherence to global benchmarks			4.31

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 1.4_1_(d) shows the most significant effect amongst all the strategies, while strategy 1.4_4_(d), 1.4_3_(d) and 1.4_2_(d) are effective at moderate level, while strategy 1.4_5_(d) is found to be the least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.5: Geo-political Risks

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
1.5_1_(d)	234	4.18	0.893	17.138	0.000	1.5_5_(d)	Provide adequate insurance cover for assets and people	3.39		
1.5_2_(d)	221	4.06	0.866			1.5_3_(d)	Collaborate with companies already operating in these regions		3.89	
1.5_3_(d)	187	3.89	0.929			1.5_4_(d)	Excellent leadership at site for execution and to strategically engage with local community		4.06	
1.5_4_(d)	175	4.06	0.927			1.5_2_(d)	Tie-ups with resourceful local Partners / Agents for business acquisition & execution, interpretation of local codes. Post own person/s at target countries		4.06	
1.5_5_(d)	141	3.39	1.18			1.5_1_(d)	Due diligence of Geo-Political risks, Country assessment, macro-economic and environmental factors, geographical survey before bid/ no-bid decision			4.18

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 1.5_1_(d) shows the most significant effect amongst all the strategies, while strategy 1.5_3_(d), 1.5_4_(d) and 1.5_2_(d) are effective at moderate level. Strategy 1.5_5_(d) is found to be the least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.6: Emerging Technologies

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
1.6_1_(d)	210	4.17	0.858	19.204	0.000	1.6_4_(d)	Hire Subject Matter Experts / Specialists	3.48	
1.6_2_(d)	200	4.06	0.834			1.6_5_(d)	Use Digital Technologies and innovative solutions	3.59	
1.6_3_(d)	199	4.02	0.913			1.6_3_(d)	Strong in-house Engineering / R&D team to explore, assimilate new technologies and knowledge management		4.02
1.6_4_(d)	167	3.48	0.993			1.6_2_(d)	Selection of global JV Partners / Collaborators and transfer of technology		4.06
1.6_5_(d)	145	3.59	1.103			1.6_1_(d)	Continuous scanning of environment, adoption of contemporary / new technology to stay ahead in business		4.17

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 1.6_1_(d), 1.6_2_(d) and 1.6_3_(d) show high impact, while strategies 1.6_4_(d) and 1.6_5_(d) are effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk #1.7: Legal Risks

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
				F Statistics	p value			1	2
ID	N	Mean	SD			ID		Low Impact	High Impact
1.7_1_(d)	216	4.19	0.933	4.385	0.005	1.7_3_(d)	Enforce Contractual rights and Claim Management including time extension and additional compensation from Customer	3.91	
1.7_2_(d)	231	4.11	0.808			1.7_4_(d)	Complete awareness and strict compliance to legal and statutory requirements	3.93	
1.7_3_(d)	187	3.91	0.969			1.7_2_(d)	In-house competent Contract & Risk Management and Legal teams, for managing Contracts, dispute resolution, litigation, Arbitration, etc.		4.11
1.7_4_(d)	173	3.93	0.944			1.7_1_(d)	Smart Contract Drafting to have provisions to address major risks. Proposal team to be fully aware of legal risks and mitigation measures		4.19

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there ae two homogenous groups of RMS exist wherein strategies 1.7_1_(d), and 1.7_2_(d) show high impact, while strategies 1.7_3_(d) and 1.7_4_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.8: Sub-optimal Resource Planning

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
								1	2	3
ID	N	Mean	SD	F Statistics	p value	ID		Lowest Impact	Moderate Impact	Highest Impact
1.8_1_(d)	223	4.29	0.771	15.875	0.000	1.8_3_(d)	Use database of past projects, norms and standards for fixing productivity of resources and keep challenging the set norms	3.72		
1.8_2_(d)	188	3.89	0.953			1.8_5_(d)	Use Digital Technology and advance Analytics for deciding resource planning, mobilization and utilization		3.78	
1.8_3_(d)	189	3.72	0.791			1.8_2_(d)	Frequent Project Review, Monitoring and Control as per the agreed schedule		3.89	
1.8_4_(d)	203	4.15	0.857			1.8_4_(d)	Strong Construction Capability and large vendor base for timely mobilization of resources			4.15
1.8_5_(d)	181	3.78	0.991			1.8_1_(d)	Develop micro-plans and integrated project schedule with resource loading			4.29

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 1.8_4_(d), and 1.8_1_(d) show the most significant effect, strategies 1.8_5_(d) and 1.8_2_(d) are equally effective at moderate level. While the impact of strategy 1.8_3_(d) has been at the lowest level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 1.9: Lack of Managerial Bandwidth

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
								1	2	3
ID	N	Mean	SD	F Statistics	p value	ID		Lowest Impact	Moderate Impact	Highest Impact
1.9_1_(d)	225	4.56	0.679	42.571	0.000	1.9_3_(d)	Periodic skill mapping, gap evaluation, training, job rotation	3.69		
1.9_2_(d)	198	4.21	0.776			1.9_5_(d)	Sharing of knowledge and learning from past projects	3.72		
1.9_3_(d)	177	3.69	0.879			1.9_4_(d)	Hire talents for critical positions for competencies not available in-house	3.74		
1.9_4_(d)	168	3.74	0.937			1.9_2_(d)	Establish a lean and adaptable organization, strong business processes and faster decision making		4.21	
1.9_5_(d)	176	3.72	0.973			1.9_1_(d)	Visionary and dynamic top leadership having robust leadership development programs			4.56

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 1.9_1_(d) shows the most significant effect amongst all the strategies, while strategy 1.9_2_(d) is effective at moderate level. Set of these strategies was found significantly higher than 1.9_4_(d), but lesser strategies 1.9_3_(d), 1.9_5_(d) and 1.9_4_(d) are found to be least effective.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk # 1.10: Improper Communication

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
1.10_1_(d)	225	4.32	0.769	38.867	0.000	1.10_4_(d)	Conduct annual team building exercise for the entire project team and all stakeholders, encourage people to participate	3.35		
1.10_2_(d)	192	3.95	0.867			1.10_3_(d)	Project Review at all levels and feedback mechanism driven by Project Control Team		3.93	
1.10_3_(d)	194	3.93	0.894			1.10_2_(d)	Project communication protocol agreed upon at the beginning of the project to be strictly followed		3.95	
1.10_4_(d)	172	3.35	1.029			1.10_1_(d)	Clear Role definitions with Responsibility and Accountability through RASCI matrix, SOPs, DACPs, etc.			4.32

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 1.10_1_(d) shows the most significant effect amongst all the strategies, while strategies 1.10_3_(d) and 1.10_2_(d) are equally effective at moderate level. Strategy 1.10_4_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 1.11: Not Meeting Shareholders' Expectations

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
1.11_1_(d)	171	3.84	0.990	24.975	0.000	1.11_5_(d)	Annual survey by a Third Party for customer satisfaction level, analyse the gaps and take corrective actions	3.38		
1.11_2_(d)	213	4.33	0.787			1.12_4_(d)	Brand building through employees, customers, vendors, shareholders, success stories, Corporate Governance, CSR – use media, various forums and word of mouth		3.78	
1.11_3_(d)	166	3.81	0.902			1.11_3_(d)	Corporate communication keeping shareholders abreast of important developments including revised guidance, if any, in advance		3.81	
1.11_4_(d)	194	3.78	0.920			1.11_1_(d)	Annual Communication from MD & CEO / Chairman to all employees to meet Customer Satisfaction and enhance Shareholders' value		3.84	
1.11_5_(d)	155	3.38	1.051			1.11_2_(d)	Execution excellence for completing projects within time and cost for customer satisfaction			4.33

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 1.11_2_(d) shows the most significant effect amongst all the strategies, while strategies 1.11_4_(d), 1.11_3_(d) and 1.11_1_(d) are equally effective at moderate level. Strategy 1.11_5_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 2.1: Time Overrun / LD Risk

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
								1	2	3
ID	N	Mean	SD	F Statistics	p value	ID		Lowest Impact	Moderate Impact	Highest Impact
2.1_1_(d)	230	4.33	0.750	17.090	0.000	2.1_5_(d)	Back-to-back LD clause with all major Vendors / Contractors	3.60		
2.1_2_(d)	206	4.00	0.911			2.1_4_(d)	Conduct Design Freeze meetings with Customers and all stakeholders, follow up with Customer / Customer's Engineer for timely approval of drawings / document		3.89	
2.1_3_(d)	206	3.99	0.894			2.1_3_(d)	Document Customer delays in providing inputs, drawings / statutory approvals for securing time extension and additional compensation		3.99	
2.1_4_(d)	200	3.89	0.858			2.1_2_(d)	Use pre-NTP period for planning & scheduling, critical engineering, procurement specification for long-delivery items, reconfirmation of soil data and BOQ		4.00	
2.1_5_(d)	199	3.60	1.180			2.1_1_(d)	Develop integrated project schedule based on micro-planning, delivery of long-lead items, resource availability, constraints, required construction time, ground realities and real-time progress monitoring through state-of-the-art digital technologies			4.33

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS wherein strategy 2.1_1_(d) shows the most significant effect amongst all the strategies, while strategies 2.1_4_(d), 2.1_3_(d) and 2.1_2_(d) are equally effective at moderate level. Strategy 2.1_5_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk # 2.2 Scope Clarity / Creep

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
				F Statistics	p value			1	2
ID	N	Mean	SD			ID		Low Impact	High Impact
2.2_1_(d)	234	4.30	0.789	14.390	0.000	2.2_3_(d)	Conduct Design Freeze meetings with Customer and all stakeholders reconfirming the scope of supply & service	3.85	
2.2_2_(d)	216	4.20	0.848			2.2_4_(d)	Scope clarity with vendors and ensure early resolution of issues	3.88	
2.2_3_(d)	178	3.85	0.936			2.2_2_(d)	Effective Contract drafting with exclusions, interfaces and provisions for Change Orders		4.20
2.2_4_(d)	219	3.88	0.906			2.2_1_(d)	Review bid document, visit site and clarify scope with Customer		4.30

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 2.2_2_(d) and 2.2_1_(d) show high impact amongst all the strategies, while strategies 2.2_3_(d) and 2.2_4_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk# 2.3: Unequitable Contract favouring the Customer

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
2.3_1_(d)	227	4.16	0.853	13.915	0.000	2.3_4_(d)	QAP/FQP to be strictly followed, multiple design checks and supervision of quality workmanship for civil foundations and structures to be done	3.57	
2.3_2_(d)	225	4.05	0.890			2.3_3_(d)	Transfer contract conditions back-to-back to Vendors / Contractors	3.62	
2.3_3_(d)	195	3.62	1.069			2.3_5_(d)	Initial plant operations to be done through experienced O&M staff and plant to be preserved as per OEM recommendations	3.77	
2.3_4_(d)	141	3.57	1.050			2.3_2_(d)	Negotiate better contract terms, establish clear definition of project completion pursuant to which DLP/LDP would commence and also take deviations to highly risky clauses like absorption of IDC		4.05
2.3_5_(d)	156	3.77	1.040			2.3_1_(d)	Risk Reviews & Analysis of contract clauses and price estimation before taking bid / no-bid decision		4.16

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 2.3_2_(d) and 2.3_1_(d) show high impact amongst all the strategies, while strategies 2.3_4_(d), 2.3_3_(d) and 2.3_5_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk # 2.4: Variation in Soil / Site Conditions

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
2.4_1_(d)	247	4.37	0.758	45.605	0.000	2.4_4_(d)	Plan contingency	3.50		
2.4_2_(d)	188	4.09	0.872			2.4_3_(d)	Conduct periodic testing of fuel and water during commissioning stage and inform Customer for any variation	3.50		
2.4_3_(d)	157	3.50	0.945			2.4_2_(d)	Insist for "unexpected variation" clause in contract with Customers for compensation / time extension		4.09	
2.4_4_(d)	162	3.50	1.076			2.4_1_(d)	Validation of inputs including soil data, seismic zone, water/fuel analysis etc. through tests and geo-tech investigation at the bidding stages			4.37

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategy 2.4_1_(d) shows the most significant effect amongst all the strategies, while strategy 2.4_2_(d) is effective at moderate level. The strategy 2.4_2_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk# 2.5: Fixed Price Contract without PVC / Steep Wage Hike not Included in PVC

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
2.5_1_(d)	202	4.21	0.941	6.822	0.000	2.5_3_(d)	Transfer risks back-to-back to Vendors / Contractors and have forward Contracts with bulk material suppliers	3.80		
2.5_2_(d)	184	3.96	0.842			2.5_2_(d)	Take help of financial experts to model price variation impact and provide for the same in bid cost		3.96	
2.5_3_(d)	202	3.80	0.972			2.5_4_(d)	Have contractual provisions to seek extra compensation from Customer for extraordinary price / wage hike			4.06
2.5_4_(d)	195	4.06	0.956			2.5_1_(d)	Make all out efforts to include PV clause in the contract			4.21

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 2.5_4_(d) and 2.5_1_(d) show the most significant effect amongst all the strategies, while strategy 2.5_2_(d) is effective at moderate level. The strategy 2.5_3_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 3.1: LD for Non-performance of Equipment and Plant

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
3.1_1_(d)	216	4.11	0.859	4.914	0.002	3.1_3_(d)	Stage Inspection & Testing at shops and at site as per QAP	3.78	
3.1_2_(d)	219	3.95	0.987			3.1_2_(d)	Pass on LD back-to-back to the OEMs / Vendors		3.95
3.1_3_(d)	182	3.77	0.974			3.1_4_(d)	Commission equipment and plant strictly as per OEMs' recommendations		4.07
3.1_4_(d)	177	4.07	0.883			3.1_1_(d)	Cold eye / Per review of critical engineering deliverables and Performance Guarantees by Engineering Consultant / Experts		4.11

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 3.1_2_(d), 3.1_4_(d) and 3.1_1_(d) show high impact amongst all the strategies. Strategy 3.1_3_(d) is found to be least effective.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk# 3.2: Variation in BOQ / Cost Estimate

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
3.2_1_(d)	213	4.18	0.899	3.565	0.007	3.2_4_(d)	Bid Cost Review by (a) a committee comprising people from various disciplines and (b) by Senior Management	3.89	
3.2_2_(d)	177	4.07	0.902			3.2_5_(d)	Pre-bid tie-ups for major / critical / long delivery equipment and specialized work	3.92	
3.2_3_(d)	221	3.92	0.863			3.2_3_(d)	Validate BOQ with Analytics tools through analysis of past BOQ data and market intelligence on competitors' BOQ	3.92	
3.2_4_(d)	189	3.89	0.899			3.2_2_(d)	Carry out geo-technical investigation and Digital topographic survey before BOQ estimation		4.07
3.2_5_(d)	168	3.92	1.043			3.2_1_(d)	Engineering Consultant to do Proposal Engineering, to generate layouts, 3D Models and accurate BOQ		4.18

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 3.2_2_(d) and 3.2_1_(d) show the most significant effect amongst all the strategies, while strategies 3.2_4_(d), 3.2_5_(d) and 3.2_3_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk # 3.3: Engineering Delays

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
3.3_1_(d)	202	3.99	0.969	2.816	0.024	3.3_3_(d)	Utilize pre-NTP period to initiate design work with past data to be validated subsequently through project specific data	3.72	
3.3_2_(d)	201	3.79	0.932			3.3_2_(d)	Contractually keep some percentage of payment against timely submission of inputs by OEM / Vendors	3.79	
3.3_3_(d)	200	3.72	0.903			3.3_5_(d)	Document Customer's delay in providing inputs / approving drawings for seeking time extension and additional compensation	3.81	
3.3_4_(d)	215	3.93	0.846			3.3_4_(d)	Conduct Design Freeze Meets (multiple – discipline meetings) with Customer / Customer's Engineer for finalizing design and securing inputs		3.93
3.3_5_(d)	197	3.81	1.01			3.3_1_(d)	Pre-bid tie-ups with major OEMs/Vendors for engineering inputs		3.99

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 3.3_4_(d) and 3.3_1_(d) show the most significant effect amongst all the strategies, while strategies 3.3_3_(d), 3.3_2_(d) and 3.3_5_(d) are equally effective at a lower level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk$ 4.1: Unpredictable Price Increase

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)					
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS			
				F Statistics	p value			1	2	3	4
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	High Impact	Highest Impact
4.1_1_(d)	204	4.07	0.909	12.476	0.000	4.1_5_(d)	SCM to look for alternate low-cost Vendors	3.54			
4.1_2_(d)	201	4.18	0.876			4.1_3_(d)	SCM to carry out commodity price trend analysis including seasonal fluctuations at both bid & execution stage and forecast price of materials / equipment		3.83		
4.1_3_(d)	203	3.83	0.919			4.1_4_(d)	Bulk materials e.g. Structural / Reinforcement Steel, Cables, Earthing Materials, RCC etc. stall be negotiated on rate-contract basis			3.90	
4.1_4_(d)	215	3.90	0.806			4.1_1_(d)	Pre-bid tie-ups with OEMs / Major Vendors, transfer back-to-back price increase risks to them				4.07
4.1_5_(d)	155	3.54	1.118			4.1_2_(d)	Insist on Price Variation (PV) clause in the contract				4.18

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are four homogenous groups of RMS wherein strategies 4.1_2_(d) and 4.1_1_(d) show the most significant effect amongst all the strategies, followed by 4.1_4_(d) and 4.1_3_(d). Strategy 4.1_5_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk# 4.2: Lack of Financially Sound Competent Vendors / Suppliers

P value is significant at 0.05 (5%)

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
4.2_1_(d)	243	4.13	0.828	10.847	0.000	4.2_2_(d)	Tap Competitors' vendor base	3.62		
4.2_2_(d)	153	3.62	0.959			4.2_4_(d)	Closer vendor follow-up and expediting including stage inspection as per QAP		3.80	
4.2_3_(d)	176	3.97	0.904			4.2_3_(d)	Pre-bid tie-ups with OEMs / Vendors for critical / long delivery items			3.97
4.2_4_(d)	203	3.80	1.105			4.2_1_(d)	Continuous Vendor development / global sourcing to increase base of financially sound vendors having proven track record			4.13

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 4.2_3_(d) and 4.2_1_(d) show the most significant effect amongst all the strategies, while strategy 4.2_4_(d) is effective at moderate level. Strategy 4.2_2_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 4.3: Change in Government Policies

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
4.3_1_(d)	247	4.32	0.839	38.263	0.000	4.3_2_(d)	Pass on the risks back to back to the Vendors / Contractors, to the extent possible	3.57	
4.3_2_(d)	177	3.56	1.00			4.3_3_(d)	Tracking Government Policies / Regulations and aligning corporate actions accordingly	3.73	
4.3_3_(d)	206	3.73	1.01			4.3_1_(d)	Have contractual provisions to cover impact of "change of policy during project execution" including levy of new taxes, extraordinary wage hikes, etc.		4.32

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategy 4.3_1_(d) shows the most significant effect amongst all the strategies, while strategies 4.3_2_(d) and 4.3_3_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 4.4: Lack of Financially Sound competent Sub-contractors

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
4.4_1_(d)	239	4.07	0.859	5.877	0.000	4.4_3_(d)	Contractors with workmen to be sustained by using them at multiple project sites	3.68	
4.4_2_(d)	185	3.84	0.945			4.4_5_(d)	Training of workmen at site, on safety, quality and other construction skills	3.71	
4.4_3_(d)	163	3.68	0.873			4.4_2_(d)	Retention of Labour through labour welfare initiatives like providing hygienic labour colony facilities, timely payment of wages and transparent dispute settlement process	3.84	
4.4_4_(d)	183	3.86	0.948			4.4_4_(d)	Develop front line experienced supervisors in the company role		3.86
4.4_5_(d)	161	3.71	0.953			4.4_1_(d)	Identify, assess and register competent and financially sound contractors with proven track record		4.07

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the post hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 4.4_4_(d) and 4.4_1_(d) show the most significant effect amongst all the strategies, while strategies 4.4_3_(d), 4.4_5_(d) and 4.4_2_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 4.5: Lack of Reliable Logistics Vendor

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
				F Statistics	p value			1	2
ID	N	Mean	SD			ID		Low Impact	High Impact
4.5_1_(d)	228	4.25	0.805	35.214	0.000	4.5_4_(d)	Provide escort vehicle, GPRS tracking, expediting approvals and arrange food for the driver / helper to reduce transit delay	3.43	
4.5_2_(d)	230	4.14	0.860			4.5_3_(d)	Use more than one proven logistics vendors to have more options	3.72	
4.5_3_(d)	177	3.72	0.946			4.5_2_(d)	Detailed Route survey to identify potential bottlenecks, check adequacy of strength of culverts, bridges, by-pass arrangement, etc.		4.14
4.5_4_(d)	178	3.43	1.103			4.5_1_(d)	Engage competent and resourceful logistics vendors with proven track record, not merely on L1 basis		4.25

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 4.5_2_(d) and 4.5_1_(d) show the most significant effect amongst all the strategies, while strategies 4.5_4_(d) and 4.5_3_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk# 5.1: Labour / Political / Law & Order Issues

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
5.1_1_(d)	215	3.99	0.889	5.835	0.000	5.1_5_(d)	Carry out local community development, CSR activities and have contingency for the safety of people and assets	3.66	
5.1_2_(d)	223	4.08	0.859			5.1_4_(d)	Provide adequate labour facilities – proper stay & sanitation, safety, timely payment of wage, medical facilities, etc.		3.94
5.1_3_(d)	165	3.97	1.046			5.1_3_(d)	Strict compliance to statutory obligations in letter and spirit		3.97
5.1_4_(d)	214	3.94	0.899			5.1_1_(d)	Due diligence of site ground realities like political and labour environment, other risks involved before bidding		3.99
5.1_5_(d)	195	3.66	1.03			5.1_2_(d)	Engage an experienced IR team at project site to ensure smooth labour / trade union relations and to build rapport with Customer and local authorities		4.08

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 5.1_4_(d), 5.1_3_(d), 5.1_1_(d) and 5.1_2_(d) show the most significant effect amongst all the strategies, while strategy 5.1_5_(d) is effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 5.2: Natural Calamities / Acts of God

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
								1	2	3
ID	N	Mean	SD	F Statistics	p value	ID		Lowest Impact	Moderate Impact	Highest Impact
5.2_1_(d)	168	3.48	1.08	22.660	0.000	5.2_1_(d)	Assessment of historical events, its impact on the project and plan accordingly	3.48		
5.2_2_(d)	222	4.24	0.869			5.2_3_(d)	Plant roads and drains to be constructed before commencement of construction and to be monsoon ready		3.73	
5.2_3_(d)	176	3.73	1.071			5.2_4_(d)	Have comprehensive insurance coverage and emergency preparedness for Disaster Management			4.09
5.2_4_(d)	217	4.09	0.998			5.2_2_(d)	Have suitable provisions incorporated in contract for time extension and compensation			4.24
5.2_5_(d)	197	4.25	0.861			5.2_5_(d)	Invoke Force Majeure and other contract Clauses			4.25

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 5.2_2_(d), 5.2_4_(d), and 5.2_5_(d) show the most significant effect, while strategy 5.2_3_(d) is effective at moderate level. Strategy 5.2_1_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 5.3: Delay in Construction

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
5.3_1_(d)	210	4.07	0.986	10.382	0.000	5.3_4_(d)	FQP, Testing & Inspection, on-site Kaizen / Quality Circle Team to ensure minimum errors	3.71		
5.3_2_(d)	219	4.19	0.813			5.3_5_(d)	Field Engineering Group to expeditiously resolve all field changes		3.85	
5.3_3_(d)	219	4.20	0.837			5.3_1_(d)	Engineering and procurement activities to be driven by early start dates so that construction activities can have more floats			4.07
5.3_4_(d)	166	3.71	1.039			5.3_2_(d)	Select Contractors with proven track record having modern construction techniques			4.19
5.3_5_(d)	182	3.85	0.943			5.3_3_(d)	Have competent site team including good supervisors			4.20

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 5.3_1_(d), 5.3_2_(d), and 5.3_3_(d) show the most significant effect, while strategy 5.3_5_(d) is effective at moderate level. Strategy 5.2_4_(d) is found to be least effective amongst all the strategies

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk# 5.4: Extended Stay at Site & Cost Overrun

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
5.4_1_(d)	216	4.14	0.880	30.265	0.000	5.4_3_(d)	Reduce manpower significantly, keeping a small, empowered team of people to liquidate punch points expeditiously and close the project	3.63	
5.4_2_(d)	235	4.29	0.828			5.4_1_(d)	Have suitable provision in the contract for Deemed Completion and Compensation & time extension, in case delay is not due to the Contractor		4.14
5.4_3_(d)	185	3.63	0.964			5.4_2_(d)	Strong Project Management & Execution Team to ensure project completion within time and cost		4.29

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 5.4_1_(d) and 5.4_2_(d) show high impact amongst all the strategies, while strategy 5.4_3_(d) is effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk # 6.1: Forex Variation

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
								1	2
ID	N	Mean	SD	F Statistics	p value	ID		Low Impact	High Impact
6.1_1_(d)	177	4.06	0.928	6.501	0.000	6.1_3_(d)	Increase localization, indigenous vendor development	3.82	
6.1_2_(d)	230	4.22	0.840			6.1_4_(d)	Have provision in contract for compensation of forex		3.99
6.1_3_(d)	158	3.82	0.836			6.1_1_(d)	Contract provision for Customer to pay in equivalent INR as per forex selling rate on the day of payment to Vendors		4.06
6.1_4_(d)	176	3.99	1.019			6.1_2_(d)	Bidding in appropriate currency for hedging / natural hedging		4.22

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 6.1_1_(d), 6.1_2_(d) and 6.1_4_(d) show the most significant effect amongst all the strategies, while strategy 6.1_3_(d) is effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 6.2: Stringent Payment Terms and Delay in Payment Collection

P value is significant at 0.05 (5%)

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
6.2_1_(d)	225	4.17	0.900	8.942	0.000	6.2_4_(d)	Improve Working Capital position by having longer vendor credit period / bill discounting	3.69		
6.2_2_(d)	204	4.16	0.876			6.2_3_(d)	Transfer back to back payment terms to OEMs and major Vendors / Contractors		3.87	
6.2_3_(d)	199	3.87	0.953			6.2_5_(d)	Make a front-loaded billing break-up to improve Working Capital position			3.99
6.2_4_(d)	189	3.69	0.994			6.2_2_(d)	Work measurement, proper documentation & immediate invoicing through SAP/ERP system			4.16
6.2_5_(d)	191	3.99	1.008			6.2_1_(d)	Negotiate better terms of payment with Customer with 10 to 15% interest free Advance and timely payment			4.17

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 6.2_1_(d), 6.2_2_(d) and 6.2_5_(d) show the most significant effect amongst all the strategies, while strategy 6.2_3_(d) is effective at moderate level. Strategy 6.2_4_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

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Risk #6.3 (Prolonged Delay in Contract Closure)

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)					
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS			
				F Statistics	p value			1	2	3	4
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	High Impact	Highest Impact
6.3_1_(d)	205	3.98	0.934	27.897	0.000	6.3_4_(d)	Be prepared for legal recourse/litigation/ Arbitration, if such need arises	3.28			
6.3_2_(d)	216	4.08	0.899			6.3_5_(d)	Have contractual provision for quarterly/half-yearly pro-rata reduction of Advance BG		3.77		
6.3_3_(d)	226	4.28	0.783			6.3_1_(d)	System wise handover of facilities with As-built Drawings/Manuals			3.98	
6.3_4_(d)	149	3.28	1.16			6.3_2_(d)	Establish delays with Customer to seek time extension and compensation				4.08
6.3_5_(d)	189	3.77	1.019			6.3_3_(d)	Have "Deemed Completion" clause in Contract for securing Retention Money and BGs in case delay is not due to Contractor				4.28

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are four homogenous groups of RMS exist wherein strategies 6.3_2_(d) and 6.3_3_(d) show the highest impact amongst all the strategies followed by 6.3_1_(d) and 6.3_5_(d). Strategy 6.3_4_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 7.1: Delay in Customer's Inputs

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
7.1_1_(d)	176	3.45	1.024	29.993	0.000	7.1_1_(d)	Facilitate Customer on securing various statutory approvals	3.45		
7.1_2_(d)	244	4.32	0.818			7.1_3_(d)	Place orders on vendors only after receipt of basic inputs e.g. Land, MOEF clearance, financial closures etc.		3.71	
7.1_3_(d)	157	3.71	1.027			7.1_5_(d)	Mobilize resources as per front availability		3.72	
7.1_4_(d)	215	4.20	0.909			7.1_4_(d)	Contract should have provision that non-availability of fuel, water, power evacuation beyond a certain time shall be considered as "Deemed Completion" and in turn, Customer would return Retention Money and BGs			4.20
7.1_5_(d)	164	3.72	1.000			7.1_2_(d)	Delay in availability of Customer inputs e.g. land, statutory clearances etc. to be documented for securing time extension and compensation			4.32

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 7.1_4_(d) and 7.1_2_(d) show the most significant effect amongst all the strategies, while strategies 7.1_3_(d) and 7.1_5_(d) are equally effective at moderate level. Strategy 7.1_1_(d) is found to be least effective amongst all the strategies.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk # 7.2: Lack of Creditworthiness / Financial Soundness of the Customer

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)			
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS	
				F Statistics	p value			1	2
ID	N	Mean	SD			ID		Low Impact	High Impact
7.2_1_(d)	249	4.39	0.787	23.234	0.000	7.2_5_(d)	There shall be no auto-renewal of BG and value of Advance BG to be reduced periodically	3.65	
7.2_2_(d)	205	4.18	0.834			7.2_4_(d)	Pursue Customer to accept Corporate Guarantee in lieu of BGs	3.72	
7.2_3_(d)	178	3.84	1.024			7.2_3_(d)	Negotiate decent contract terms with 10 to 15% interest-free Advance Payment	3.84	
7.2_4_(d)	164	3.72	1.019			7.2_2_(d)	Try to secure payments through Letter of Credit		4.18
7.2_5_(d)	159	3.65	1.091			7.2_1_(d)	Due diligence of Customer's financial strength, creditworthiness, risk exposure and past performances before bid / no-bid decision through formal and informal sources		4.39

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are two homogenous groups of RMS exist wherein strategies 7.2_2_(d) and 7.2_1_(d) show high impact amongst all the strategies, while strategies 7.2_5_(d), 7.2_4_(d) and 7.2_3_(d) are equally effective at a low level.

Impact of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI) for each Critical Risk Factor

Risk 7.3: Project Funding and Financial Closure

Risk Mitigation Strategies	Descriptive Statistics			One Way ANOVA		Impact of Risk Mitigation Strategies (Lowest to Highest)				
	Effects on Business Success					Risk Mitigation Strategies	Description	No. of Homogenous Groups of RMS		
				F Statistics	p value			1	2	3
ID	N	Mean	SD			ID		Lowest Impact	Moderate Impact	Highest Impact
7.3_1_(d)	232	4.24	0.827	19.940	0.000	7.3_2_(d)	Facilitate customers for financial closure as well as various approvals from statutory authorities	3.46		
7.3_2_(d)	159	3.46	0.992			7.3_4_(d)	Place order on vendors only after the financial closure happens		3.78	
7.3_3_(d)	206	4.12	0.870			7.3_5_(d)	Submit CPBG to Customer only after the financial closure happens		3.87	
7.3_4_(d)	156	3.78	1.038			7.3_3_(d)	Have Contract link "zero" date with payment of advance and providing land, other inputs & all approvals required to start work			4.12
7.3_5_(d)	149	3.87	0.954			7.3_1_(d)	Due diligence on Project funding and Financial Institutions involved, before bid-no bid decision			4.24

P value is significant at 0.05 (5%)

From above table, it is observed that Mean value of effect of all the Risk Mitigation Strategies (RMS) are above the average level of 3. Further p value of One-Way ANOVA was found significant. Therefore, it is inferred that all the strategies are not equally effective. The above table indicates the Post Hoc statistics of ANOVA by grouping the homogenous strategies for effect on business success as per Tukey B Test of Homogeneous Subset. From above table, there are three homogenous groups of RMS exist wherein strategies 7.3_3_(d) and 7.3_1_(d) show the most significant effect amongst all the strategies, while strategies 7.3_4_(d) and 7.3_5_(d) are equally effective at moderate level. Strategy 7.3_2_(d) is found to be least effective amongst all the strategies.

Mean Impact Score of Risk Mitigation Strategies (RMS) on Business Success Indicators (BSI)
(BSI 1, BSI2, BSI 3 and BSI 4)

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
1	1.1	1.1_1_(d)	Secure few orders being cost competitive	140	3.65	4	2.75	0	0.00	7	3.14	151
2	1.1	1.1_2_(d)	Explore coal and gas-based power opportunities abroad e.g. SE Asia, Middle East, North Africa, Latin America	206	3.99	7	3.43	1	5.00	7	4.43	221
3	1.1	1.1_3_(d)	Focus on FGD, SCR, ESP, replacement of old inefficient generating units	168	3.49	5	3.60	0	0.00	6	4.50	179
4	1.1	1.1_4_(d)	Diversify into adjacencies like R&M, Spares, O&M, Plant Performance Enhancement, etc.	137	3.11	1	2.00	1	5.00	7	3.71	146
5	1.1	1.1_5_(d)	Diversify into emerging power businesses e.g. Nuclear, Solar Thermal, Energy Storage, Waste-to-Energy, Fuel Cell, Plasma Energy, etc.	185	3.66	7	4.14	1	5.00	8	4.38	201
6	1.10	1.10_1_(d)	Clear Role definitions with Responsibility and Accountability through RASCI matrix, SOPs, DACPs, etc.	18	4.22	159	4.35	40	4.18	8	4.50	225
7	1.10	1.10_2_(d)	Project communication protocol agreed upon at the beginning of the project to be strictly followed	15	3.40	139	4.06	32	3.75	6	3.67	192
8	1.10	1.10_3_(d)	Project Review at all levels and feedback mechanism driven by Project Control Team	17	4.12	138	3.91	32	3.91	7	4.00	194
9	1.10	1.10_4_(d)	Conduct annual team building exercise for the entire project team and all stakeholders, encourage people to participate	15	3.53	124	3.27	25	3.48	8	3.88	172

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
10	1.11	1.11_1_(d)	Annual Communication from MD & CEO / Chairman to all employees to meet Customer Satisfaction and enhance Shareholders' value	16	3.88	1	5.00	65	3.80	89	3.84	171
11	1.11	1.11_2_(d)	Execution excellence for completing projects within time and cost for customer satisfaction	12	4.67	1	5.00	92	4.29	108	4.32	213
12	1.11	1.11_3_(d)	Corporate communication keeping shareholders abreast of important developments including revised guidance, if any, in advance	10	3.80	1	4.00	68	3.68	87	3.91	166
13	1.11	1.11_4_(d)	Brand building through employees, customers, vendors, shareholders, success stories, Corporate Governance, CSR – use media, various forums and word of mouth	12	4.17	1	3.00	86	3.74	95	3.78	194
14	1.11	1.11_5_(d)	Annual survey by a Third Party for customer satisfaction level, analyze the gaps and take corrective actions	9	3.67	0		65	3.40	81	3.32	155
15	1.2	1.2_1_(d)	Cost leadership through continuous cost reduction, innovative engineering, procurement, construction and tax optimization while creating a lean organization	185	4.32	28	3.86	13	4.31	19	3.95	245
16	1.2	1.2_2_(d)	Develop low cost competent vendors	139	3.76	23	4.00	6	4.00	17	3.53	185
17	1.2	1.2_3_(d)	Continuous improvement of Heat Rate & Aux Power Consumption and reduction of Plant Footprint Area	134	3.66	21	4.00	8	3.75	17	3.88	180
18	1.2	1.2_4_(d)	Excellent Market Intelligence of projects and competition	144	4.05	19	3.74	10	3.80	15	3.87	188

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
19	1.3	1.3_1_(d)	Effective HR policies to acquire, train and retain talent, performance-based compensation & career growth, work environment that promotes innovation and employee engagement	16	4.31	159	4.35	62	4.21	1	4.00	238
20	1.3	1.3_2_(d)	Hands-on training for engineering, construction & commissioning teams	10	3.80	107	3.59	33	3.48	0	0.00	150
21	1.3	1.3_3_(d)	Job enhancement, enrichment and job rotation including posting at project sites	12	3.92	124	3.52	44	3.41	0	0.00	180
22	1.3	1.3_4_(d)	Outsource non-critical functions on contract basis to maintain a lean organization	11	3.45	113	3.50	45	3.36	1	3.00	170
23	1.4	1.4_1_(d)	Quality & HSE to have top management sponsorship with strict adherence to global benchmarks	4	4.00	119	4.28	98	4.36	1	4.00	222
24	1.4	1.4_2_(d)	Review Quality & HSE credentials of Vendors / Contractors before their selection	4	4.25	111	3.88	88	3.85	1	5.00	204
25	1.4	1.4_3_(d)	Impart Quality & HSE Training to all employees and workmen	2	4.50	107	3.79	79	3.86	1	5.00	189
26	1.4	1.4_4_(d)	Conduct reviews at sites / workshops, reward / penalize performance and report to the corporate management	2	4.00	104	3.75	86	3.76	1	3.00	193
27	1.4	1.4_5_(d)	Use digital technology like mobile apps, virtual realities for training, monitoring & reporting incidents	2	4.00	96	3.56	72	3.56	0	0.00	170
28	1.5	1.5_1_(d)	Due diligence of Geo-Political risks, Country assessment, macro-economic and environmental factors, geographical survey before bid / no-bid decision	78	4.15	130	4.22	17	3.94	9	4.22	234

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
29	1.5	1.5_2_(d)	Tie-ups with resourceful local Partners / Agents for business acquisition & execution, interpretation of local codes. Post own person/s at target countries	77	4.08	121	4.03	15	4.13	8	4.25	221
30	1.5	1.5_3_(d)	Collaborate with companies already operating in these regions	66	3.94	103	3.84	11	4.00	7	3.86	187
31	1.5	1.5_4_(d)	Excellent leadership at site for execution and to strategically engage with local community	60	4.08	98	4.10	10	3.90	7	3.43	175
32	1.5	1.5_5_(d)	Provide adequate insurance cover for assets and people	54	3.56	77	3.23	5	3.60	5	3.80	141
33	1.6	1.6_1_(d)	Continuous scanning of environment, adoption of contemporary / new technology to stay ahead in business	70	4.26	52	4.15	70	4.07	18	4.28	210
34	1.6	1.6_2_(d)	Selection of global JV Partners / Collaborators and transfer of technology	69	4.06	39	4.13	75	4.01	17	4.06	200
35	1.6	1.6_3_(d)	Strong in-house Engineering / R&D team to explore, assimilate new technologies and knowledge management	61	4.16	45	4.09	76	3.82	17	4.18	199
36	1.6	1.6_4_(d)	Hire Subject Matter Experts / Specialists	53	3.43	38	3.42	64	3.61	12	3.17	167
37	1.6	1.6_5_(d)	Use Digital Technologies and innovative solutions	49	3.39	32	3.94	55	3.56	9	3.56	145
38	1.7	1.7_1_(d)	Smart Contract Drafting to have provisions to address major risks. Proposal team to be fully aware of legal risks and mitigation measures	59	4.29	81	4.11	59	4.19	17	4.24	216
39	1.7	1.7_2_(d)	In-house competent Contract & Risk Management and Legal teams, for managing Contracts, dispute resolution, litigation, Arbitration, etc.	67	4.18	88	4.02	60	4.15	16	4.13	231

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
40	1.7	1.7_3_(d)	Enforce Contractual rights and Claim Management including time extension and additional compensation from Customer	54	4.09	74	3.84	45	3.87	14	3.79	187
41	1.7	1.7_4_(d)	Complete awareness and strict compliance to legal and statutory requirements	45	3.91	64	3.73	48	4.13	16	4.19	173
42	1.8	1.8_1_(d)	Develop micro-plans and integrated project schedule with resource loading	18	4.11	196	4.35	8	3.38	1	3.00	223
43	1.8	1.8_2_(d)	Frequent Project Review, Monitoring and Control as per the agreed schedule	19	4.37	164	3.84	5	4.00	0	0.00	188
44	1.8	1.8_3_(d)	Use database of past projects, norms and standards for fixing productivity of resources and keep challenging the set norms	19	3.74	163	3.71	5	4.40	2	3.50	189
45	1.8	1.8_4_(d)	Strong Construction Capability and large vendor base for timely mobilization of resources	19	4.37	176	4.13	7	4.29	1	4.00	203
46	1.8	1.8_5_(d)	Use Digital Technology and advance Analytics for deciding resource planning, mobilisation and utilization	13	4.23	162	3.73	6	4.17	0	0.00	181
47	1.9	1.9_1_(d)	Visionary and dynamic top leadership having robust leadership development programs	78	4.63	63	4.46	63	4.57	21	4.57	225
48	1.9	1.9_2_(d)	Establish a lean and adaptable organization, strong business processes and faster decision making	64	4.23	51	4.18	70	4.21	13	4.15	198
49	1.9	1.9_3_(d)	Periodic skill mapping, gap evaluation, training, job rotation	57	3.72	47	3.47	58	3.79	15	3.87	177
50	1.9	1.9_4_(d)	Hire talents for critical positions for competencies not available in-house	52	3.62	48	3.75	54	3.91	14	3.50	168
51	1.9	1.9_5_(d)	Sharing of knowledge and learning from past projects	47	3.72	55	3.73	57	3.74	17	3.59	176

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
52	2.1	2.1_1_(d)	Develop integrated project schedule based on micro-planning, delivery of long-lead items, resource availability, constraints, required construction time, ground realities and real-time progress monitoring through state-of-the-art digital technologies	67	4.25	153	4.35	5	4.60	5	4.60	230
53	2.1	2.1_2_(d)	Use pre-NTP period for planning & scheduling, critical engineering, procurement specification for long-delivery items, reconfirmation of soil data and BOQ	65	3.88	132	4.05	5	4.00	4	4.25	206
54	2.1	2.1_3_(d)	Document Customer delays in providing inputs, drawings / statutory approvals for securing time extension and additional compensation	63	3.95	133	4.03	5	3.80	5	3.60	206
55	2.1	2.1_4_(d)	Conduct Design Freeze meetings with Customers and all stakeholders, follow up with Customer / Customer's Engineer for timely approval of drawings / document	62	3.94	129	3.84	4	4.00	5	4.40	200
56	2.1	2.1_5_(d)	Back-to-back LD clause with all major Vendors / Contractors	58	3.71	132	3.57	4	3.00	5	3.80	199
57	2.2	2.2_1_(d)	Review bid document, visit site and clarify scope with Customer	39	4.21	188	4.31	6	4.50	1	5.00	234
58	2.2	2.2_2_(d)	Effective Contract drafting with exclusions, interfaces and provisions for Change Orders	38	4.32	174	4.17	3	4.00	1	5.00	216
59	2.2	2.2_3_(d)	Conduct Design Freeze meetings with Customer and all stakeholders reconfirming the scope of supply & service	21	4.14	151	3.78	5	4.40	1	5.00	178
60	2.2	2.2_4_(d)	Scope clarity with vendors and ensure early resolution of issues	36	3.97	177	3.84	5	4.60	1	4.00	219

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
61	2.3	2.3_1_(d)	Risk Reviews & Analysis of contract clauses and price estimation before taking bid / no-bid decision	115	4.26	88	4.00	16	4.13	8	4.50	227
62	2.3	2.3_2_(d)	Negotiate better contract terms, establish clear definition of project completion pursuant to which DLP/LDP would commence and also take deviations to highly risky clauses like absorption of IDC	114	4.05	88	4.06	15	3.80	8	4.50	225
63	2.3	2.3_3_(d)	Transfer contract conditions back-to-back to Vendors / Contractors	95	3.49	80	3.75	12	3.58	8	3.88	195
64	2.3	2.3_4_(d)	QAP/FQP to be strictly followed, multiple design checks and supervision of quality workmanship for civil foundations and structures to be done	65	3.40	60	3.70	10	4.00	6	3.50	141
65	2.3	2.3_5_(d)	Initial plant operations to be done through experienced O&M staff and plant to be preserved as per OEM recommendations	79	3.75	61	3.77	9	3.67	7	4.14	156
66	2.4	2.4_1_(d)	Validation of inputs including soil data, seismic zone, water/fuel analysis etc. through tests and geo-tech investigation at the bidding stages	25	4.48	216	4.35	4	4.50	2	4.50	247
67	2.4	2.4_2_(d)	Insist for “unexpected variation” clause in contract with Customers for compensation / time extension	19	4.32	166	4.06	1	4.00	2	5.00	188
68	2.4	2.4_3_(d)	Conduct periodic testing of fuel and water during commissioning stage and inform Customer for any variation	12	3.50	141	3.50	3	3.67	1	3.00	157
69	2.4	2.4_4_(d)	Plan contingency	15	3.20	144	3.54	1	3.00	2	3.00	162
70	2.5	2.5_1_(d)	Make all out efforts to include PV clause in the contract	122	4.25	66	4.17	5	3.80	9	4.33	202

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
71	2.5	2.5_2_(d)	Take help of financial experts to model price variation impact and provide for the same in bid cost	99	3.96	72	3.93	5	4.00	8	4.13	184
72	2.5	2.5_3_(d)	Transfer risks back-to-back to Vendors / Contractors and have forward Contracts with bulk material suppliers	115	3.83	75	3.72	5	4.00	7	4.14	202
73	2.5	2.5_4_(d)	Have contractual provisions to seek extra compensation from Customer for extraordinary price / wage hike	117	4.08	70	4.00	3	4.00	5	4.60	195
74	3.1	3.1_1_(d)	Cold-eye / Per review of critical engineering deliverables and Performance Guarantees by Engineering Consultant / Experts	75	4.15	69	4.04	67	4.10	5	4.40	216
75	3.1	3.1_2_(d)	Pass on LD back-to-back to the OEMs / Vendors	79	4.05	72	3.88	62	3.90	6	4.00	219
76	3.1	3.1_3_(d)	Stage Inspection & Testing at shops and at site as per QAP	64	3.45	63	3.97	50	3.88	5	4.40	182
77	3.1	3.1_4_(d)	Commission equipment and plant strictly as per OEMs' recommendations	61	3.89	59	4.12	50	4.20	7	4.29	177
78	3.2	3.2_1_(d)	Engineering Consultant to do Proposal Engineering, to generate layouts, 3D Models and accurate BOQ	93	4.17	108	4.17	4	4.25	8	4.38	213
79	3.2	3.2_2_(d)	Carry out geo-technical investigation and Digital topographic survey before BOQ estimation	76	4.04	92	4.09	3	4.33	6	4.00	177
80	3.2	3.2_3_(d)	Validate BOQ with Analytics tools through analysis of past BOQ data and market intelligence on competitors' BOQ	95	3.95	117	3.87	2	4.00	7	4.43	221
81	3.2	3.2_4_(d)	Bid Cost Review by (a) a committee comprising of people from various disciplines and (b) by Senior Management	87	3.77	94	3.96	4	4.50	4	4.50	189

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
82	3.2	3.2_5_(d)	Pre-bid tie-ups for major / critical / long delivery equipment and specialized work	73	4.03	85	3.82	4	3.25	6	4.50	168
83	3.3	3.3_1_(d)	Pre-bid tie-ups with major OEMs/Vendors for engineering inputs	5	4.00	194	3.98	3	4.00	0	0.00	202
84	3.3	3.3_2_(d)	Contractually keep some percentage of payment against timely submission of inputs by OEM / Vendors	6	3.00	192	3.80	3	4.33	0	0.00	201
85	3.3	3.3_3_(d)	Utilize pre-NTP period to initiate design work with past data to be validated subsequently through project specific data	7	3.71	191	3.71	2	4.50	0	0.00	200
86	3.3	3.3_4_(d)	Conduct Design Freeze Meets (multiple – discipline meetings) with Customer / Customer's Engineer for finalizing design and securing inputs	7	3.57	206	3.94	2	5.00	0	0.00	215
87	3.3	3.3_5_(d)	Document Customer's delay in providing inputs / approving drawings for seeking time extension and additional compensation	6	4.17	189	3.79	2	4.00	0	0.00	197
88	4.1	4.1_1_(d)	Pre-bid tie-ups with OEMs / Major Vendors, transfer back-to-back price increase risks to them	97	4.11	101	4.00	0	0.00	6	4.67	204
89	4.1	4.1_2_(d)	Insist on Price Variation (PV) clause in the contract	96	4.33	97	4.00	0	0.00	8	4.50	201
90	4.1	4.1_3_(d)	SCM to carry out commodity price trend analysis including seasonal fluctuations at both bid & execution stage and forecast price of materials / equipment	95	3.76	102	3.85	0	0.00	6	4.50	203
91	4.1	4.1_4_(d)	Bulk materials e.g. Structural / Reinforcement Steel, Cables, Earthing Materials, RCC etc. stall be negotiated on rate-contract basis	100	3.92	109	3.87	0	0.00	6	4.17	215
92	4.1	4.1_5_(d)	SCM to look for alternate low-cost Vendors	75	3.57	75	3.49	0	0.00	5	3.80	155

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
93	4.2	4.2_1_(d)	Continuous Vendor development / global sourcing to increase base of financially sound vendors having proven track record	15	4.33	212	4.12	16	4.13	0	0.00	243
94	4.2	4.2_2_(d)	Tap Competitors' vendor base	9	3.44	136	3.63	8	3.63	0	0.00	153
95	4.2	4.2_3_(d)	Pre-bid tie-ups with OEMs / Vendors for critical / long delivery items	14	4.43	155	3.92	7	4.29	0	0.00	176
96	4.2	4.2_4_(d)	Closer vendor follow-up and expediting including stage inspection as per QAP	11	3.91	180	3.83	12	3.33	0	0.00	203
97	4.3	4.3_1_(d)	Have contractual provisions to cover impact of "change of policy during project execution" including levy of new taxes, extraordinary wage hikes, etc.	144	4.35	86	4.24	3	3.67	14	4.57	247
98	4.3	4.3_2_(d)	Pass on the risks back to back to the Vendors / Contractors, to the extent possible	104	3.70	60	3.37	2	4.50	11	3.18	177
99	4.3	4.3_3_(d)	Tracking Government Policies / Regulations and aligning corporate actions accordingly	116	3.81	74	3.62	2	4.50	14	3.50	206
100	4.4	4.4_1_(d)	Identify, assess and register competent and financially sound contractors with proven track record	19	3.84	204	4.10	15	4.13	1	2.00	239
101	4.4	4.4_2_(d)	Retention of Labour through labour welfare initiatives like providing hygienic labour colony facilities, timely payment of wages and transparent dispute settlement process	18	3.61	159	3.87	8	3.75	0	0.00	185
102	4.4	4.4_3_(d)	Contractors with workmen to be sustained by using them at multiple project sites	12	3.75	142	3.68	8	3.75	1	2.00	163
103	4.4	4.4_4_(d)	Develop front line experienced supervisors in the company role	13	4.00	163	3.85	7	4.00	0	0.00	183

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
104	4.4	4.4_5_(d)	Training of workmen at site, on safety, quality and other construction skills	10	3.50	141	3.72	10	3.70	0	0.00	161
105	4.5	4.5_1_(d)	Engage competent and resourceful logistics vendors with proven track record, not merely on L1 basis	9	4.44	215	4.25	4	4.25	0	0.00	228
106	4.5	4.5_2_(d)	Detailed Route survey to identify potential bottlenecks, check adequacy of strength of culverts, bridges, by-pass arrangement, etc.	10	4.20	217	4.13	3	4.33	0	0.00	230
107	4.5	4.5_3_(d)	Use more than one proven logistics vendors to have more options	9	3.67	166	3.73	2	3.00	0	0.00	177
108	4.5	4.5_4_(d)	Provide escort vehicle, GPRS tracking, expediting approvals and arrange food for the driver / helper to reduce transit delay	9	3.67	168	3.42	1	3.00	0	0.00	178
109	5.1	5.1_1_(d)	Due diligence of site ground realities like political and labour environment, other risks involved before bidding	4	4.75	191	4.00	20	3.80	0	0.00	215
110	5.1	5.1_2_(d)	Engage an experienced IR team at project site to ensure smooth labour / trade union relations and to build rapport with Customer and local authorities	6	4.50	195	4.06	22	4.14	0	0.00	223
111	5.1	5.1_3_(d)	Strict compliance to statutory obligations in letter and spirit	6	4.00	148	3.93	11	4.55	0	0.00	165
112	5.1	5.1_4_(d)	Provide adequate labour facilities – proper stay & sanitation, safety, timely payment of wage, medical facilities, etc.	3	4.00	187	3.93	24	4.00	0	0.00	214
113	5.1	5.1_5_(d)	Carry out local community development, CSR activities and have contingency for the safety of people and assets	4	4.50	173	3.62	18	3.83	0	0.00	195

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
114	5.2	5.2_1_(d)	Assessment of historical events, its impact on the project and plan accordingly	21	3.33	143	3.52	2	3.50	2	2.50	168
115	5.2	5.2_2_(d)	Have suitable provisions incorporated in contract for time extension and compensation	21	4.10	195	4.28	1	5.00	5	3.20	222
116	5.2	5.2_3_(d)	Plant roads and drains to be constructed before commencement of construction and to be monsoon ready	14	3.93	158	3.72	2	4.50	2	2.00	176
117	5.2	5.2_4_(d)	Have comprehensive insurance coverage and emergency preparedness for Disaster Management	26	4.27	185	4.07	1	5.00	5	4.00	217
118	5.2	5.2_5_(d)	Invoke Force Majeure and other contract Clauses	18	4.22	175	4.26	2	5.00	2	3.50	197
119	5.3	5.3_1_(d)	Engineering and procurement activities to be driven by early start dates so that construction activities can have more floats	22	3.91	176	4.09	12	4.08	0	0.00	210
120	5.3	5.3_2_(d)	Select Contractors with proven track record having modern construction techniques	20	4.25	188	4.17	11	4.45	0	0.00	219
121	5.3	5.3_3_(d)	Have competent site team including good supervisors	19	4.53	186	4.15	13	4.46	1	5.00	219
122	5.3	5.3_4_(d)	FQP, Testing & Inspection, on-site Kaizen / Quality Circle Team to ensure minimum errors	15	4.13	140	3.61	11	4.45	0	0.00	166
123	5.3	5.3_5_(d)	Field Engineering Group to expeditiously resolve all field changes	17	4.29	151	3.79	13	3.92	1	4.00	182
124	5.4	5.4_1_(d)	Have suitable provision in the contract for Deemed Completion and Compensation & time extension, in case delay is not due to the Contractor	85	4.19	117	4.14	8	3.50	6	4.50	216
125	5.4	5.4_2_(d)	Strong Project Management & Execution Team to ensure project completion within time and cost	84	4.40	135	4.22	8	4.13	8	4.38	235

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
126	5.4	5.4_3_(d)	Reduce manpower significantly, keeping a small empowered team of people to liquidate punch points expeditiously and close the project	70	3.69	101	3.61	7	3.43	7	3.57	185
127	6.1	6.1_1_(d)	Contract provision for Customer to pay in equivalent INR as per forex selling rate on the day of payment to Vendors	138	4.09	33	4.18	1	3.00	5	2.60	177
128	6.1	6.1_2_(d)	Bidding in appropriate currency for hedging / natural hedging	174	4.26	46	4.09	1	5.00	9	4.00	230
129	6.1	6.1_3_(d)	Increase localisation, indigenous vendor development	125	3.86	28	3.68	1	3.00	4	3.50	158
130	6.1	6.1_4_(d)	Have provision in contract for compensation of forex	140	3.99	31	4.16	1	3.00	4	3.00	176
131	6.2	6.2_1_(d)	Negotiate better terms of payment with Customer with 10 to 15% interest free Advance and timely payment	161	4.23	54	3.91	0	0.00	10	4.60	225
132	6.2	6.2_2_(d)	Work measurement, proper documentation & immediate invoicing through SAP/ERP system	145	4.19	48	4.08	0	0.00	11	4.09	204
133	6.2	6.2_3_(d)	Transfer back to back payment terms to OEMs and major Vendors / Contractors	142	3.89	46	3.72	0	0.00	11	4.27	199
134	6.2	6.2_4_(d)	Improve Working Capital position by having longer vendor credit period / bill discounting	138	3.73	41	3.56	0	0.00	10	3.80	189
135	6.2	6.2_5_(d)	Make a front-loaded billing break-up to improve Working Capital position	133	3.98	47	3.91	0	0.00	11	4.55	191
136	6.3	6.3_1_(d)	System wise handover of facilities with As built Drawings/Manuals	108	4.00	77	3.96	10	3.90	10	4.00	205
137	6.3	6.3_2_(d)	Establish delays with Customer to seek time extension and compensation	118	4.04	78	4.19	8	4.13	12	3.67	216

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
138	6.3	6.3_3_(d)	Have “Deemed Completion” clause in Contract for securing Retention Money and BGs in case delay is not due to Contractor	127	4.31	77	4.25	9	4.00	13	4.38	226
139	6.3	6.3_4_(d)	Be prepared for legal recourse / litigation / Arbitration, if such need arises	88	3.35	49	3.16	7	3.43	5	3.00	149
140	6.3	6.3_5_(d)	Have contractual provision for quarterly/half-yearly pro-rata reduction of Advance BG	103	3.87	65	3.65	9	3.44	12	3.83	189
141	7.1	7.1_1_(d)	Facilitate Customer on securing various statutory approvals	15	3.60	159	3.43	1	3.00	1	5.00	176
142	7.1	7.1_2_(d)	Delay in availability of Customer inputs e.g. land, statutory clearances etc. to be documented for securing time extension and compensation	19	4.53	220	4.31	2	4.00	3	3.67	244
143	7.1	7.1_3_(d)	Place orders on vendors only after receipt of basic inputs e.g. Land, MOEF clearance, financial closures etc.	12	4.08	143	3.69	0	0.00	2	3.00	157
144	7.1	7.1_4_(d)	Contract should have provision that non-availability of fuel, water, power evacuation beyond a certain time shall be considered as “Deemed Completion” and in turn, Customer would return Retention Money and BGs	20	4.30	191	4.19	2	4.00	2	5.00	215
145	7.1	7.1_5_(d)	Mobilize resources as per front availability	13	3.77	150	3.72	0	0.00	1	3.00	164
146	7.2	7.2_1_(d)	Due diligence of Customer’s financial strength, creditworthiness, risk exposure and past performances before bid / no-bid decision through formal and informal sources	140	4.46	64	4.19	18	4.22	27	4.70	249
147	7.2	7.2_2_(d)	Try to secure payments through Letter of Credit	114	4.24	54	4.17	14	3.93	23	4.04	205

SR. No	RISK ID	RMS ID	RMS Description	BSI-1		BSI-2		BSI-3		BSI-4		Total
				N	Mean	N	Mean	N	Mean	N	Mean	
148	7.2	7.2_3_(d)	Negotiate decent contract terms with 10 to 15% interest-free Advance Payment	97	3.88	49	3.96	12	3.83	20	3.40	178
149	7.2	7.2_4_(d)	Pursue Customer to accept Corporate Guarantee in lieu of BGs	88	3.66	47	3.87	11	3.73	18	3.61	164
150	7.2	7.2_5_(d)	There shall be no auto-renewal of BG and value of Advance BG to be reduced periodically	88	3.61	44	3.68	10	3.70	17	3.76	159
151	7.3	7.3_1_(d)	Due diligence on Project funding and Financial Institutions involved, before bid-no bid decision	120	4.28	91	4.22	4	4.00	17	4.12	232
152	7.3	7.3_2_(d)	Facilitate customers for financial closure as well as various approvals from statutory authorities	81	3.53	67	3.42	1	2.00	10	3.30	159
153	7.3	7.3_3_(d)	Have Contract link “zero” date with payment of advance and providing land, other inputs & all approvals required to start work	105	4.06	81	4.21	1	3.00	19	4.11	206
154	7.3	7.3_4_(d)	Place order on vendors only after the financial closure happens	84	3.86	60	3.73	1	2.00	11	3.55	156
155	7.3	7.3_5_(d)	Submit CPBG to Customer only after the financial closure happens	72	3.94	67	3.84	1	2.00	9	3.78	149

Appendix - 24

Details of Publication of Research Papers and Seminar Presentations

1. Publication of Research Papers

- Basu, B. K. (2020). Towards a Sustainable Business in a Changing World. *Interwoven: An Interdisciplinary Journal of Navrachana University, Vol 3* (1), May 2020. https://nuv.ac.in/wp-content/uploads/2020/06/MGMT_01_October_2019_29April2020-1.pdf
- Basu, B. K. & Baxi, D. Dr. (2020). Critical Risk Factors Impacting Business Success Indicators of EPC Organizations of Indian Thermal Power Sector. *NICMAR Journal of Construction Management (Registration No. 43770/86), Vol XXXV(*IV), October-December 2020, pp 18-26
- Basu, B. K. & Baxi, D. Dr. (2020). Sustained Business Success of EPC Companies in Indian Thermal Power Sector – A Literature Review. *SEMCOM Management & Technology Review, Vol 8(1), October 2020, pp. 74-79. URL:http://www.semcom.ac.in/smtr/*

2. Seminar Presentations

- Basu. B.K. & Bandyopadhyay, S. Future of Coal-based Power Plants in India and Its impact on Economy, *National Seminar on Indian Economy: Performance & Prospects. Department of Economics, Faculty of Arts, The Maharaja Sayajirao University, Vadodara, 5th January 2019*
- Basu. B. K. & Kothari, N. Dr. Business Sustainability of Indian EPC Organizations – Critical Success Factors and Major Risk Factors, *2nd National Conference. Innovating for Development and Sustainability, Navrachana University, Vadodara, 5th -6th October 2017*
- Thomas, A. Dr. & Basu, B. K. Exploring Role Stress and Role Efficacy in an Organization. *International Conference on Global Business, Economics, Finance & Social Sciences (ICGBEFSS – 18), Singapore, 14th October 2018, Published by International Institute for Technology and Research.* www.iiter.org