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APPENDIX

APPENDIX - 1

Risk Factor Assessment: Survey Questionnaire Sample Questionnaire to seek inputs for 133 Attributes

Investigating Risk Management Practices and Development of Strategic Risk Management Framework for Logistics Infrastructure Projects

Questionnaire - 1 : Probability Impact Matrix for Risk Factors

Respondent Name:
Designation:
Organization:

Please put (X) in the appropiate box based on the rating you want to give to respective Risk Factor

Criteria	Sub-Criteria	Attributes/ Risk Factor	Risk Probability					Cost Risk Impact					Schedule Risk Impact					Quality Risk Impact				
			Very Low	Low	Moderate	High	Very High	Very Low	Low	Moderate	High	Very High	Very Low	Low	Moderate	High	Very High	Very Low	Low	Moderate	High	Very High
			1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Project Planning	Pre-bid Assessment	Inadequate Project Feasibility Study		x							x						x	x				
		Ineffective Project Conceptualization		x								x					x	x				
		Improper Socio-Economic Assessment		x					x					x				x				
	Scope Assessment	Inadequate Project Scope Assessment		x								x					x		x			
		Improper Resource Planning				x						x					x				x	
	Regulatory Framework	Applicable Laws and Policies		x					x					x				x				
		Political Scenario		x						x					x				x			
		Regulatory Approvals			x					x					x				x			
	Time and Cost Assessment	Improper Project Schedule			x							x					x			x		
		Cost Assessment				x						x					x			x		
	Risk Assessment	Inadequate Risks Assessment				x						x					x			x		
Site Conditions	Environmental	Unpredicted Weather Conditions	x					x					x					x				
		Pollution			x					x					x			x				
		Earthquake/ Natural Calamity	x					x					x					x				
		Precipitation/ Flood	x					x					x					x				
	Site Sub-surface	Unexpected Surface conditions		x				x					x					x				
		Archeological survey done	x					x					x					x				
		Inadequate Geo-technical investigation		x							x					x			x			
	Site Location	Construction area (rural/urban)	x					x					x					x				
		Access conditions	x					x					x					x				
		On-site congestion	x					x					x					x				
		Delay in permits and licenses				x						x					x	x				
		Security requirements		x						x					x			x				
		Safety regulation		x						x				x				x				

Input Sheet used to seek inputs from Experts

Risk ID	Risk Source	Risk / Risk Factors	Associated Risk Attributes	Risk Factor Probability Factor	Cost Impact (Risk Factor level)	Schedule Impact (Risk Factor level)	Quality Impact (risk Fator level)
R1	**Project Planning**	**Pre-bid Assessment Planning**	Inadequate Project Feasibility Study				
R2			Ineffective Project Conceptualization				
R3			Improper Socio-Economic Assessment				
R4		**Scope Assessment Planning**	Inadequate Project Scope Assessment				
R5			Improper Resource Planning				
R6		**Regulatory Framework - Planning**	Applicable Laws and Policies				
R7			Political Scenario				
R8			Regulatory Approvals				
R9		**Timeline Assessment Planning**	Improper Project Schedule				
R10		**Cost Assessment Planning**	Cost Assessment				
R11		**Risk Assessment Planning**	Inadequate Risks Assessment				
R12	**Site Conditions**	**Site Conditions - Environmental Risk**	Unpredicted Weather Conditions				
R13			Pollution				
R14			Earthquake/ Natural Calamity				
R15			Precipitation/ Flood				
R16		**Site Conditions - Sub-surface**	Unexpected Surface conditions				
R17			Archeological survey done				
R18			Inadequate Geo-technical investigation				
R19		**Site Conditions - Location**	Construction area (rural/urban)				
R20			Access conditions				
R21			On-site congestion				
R22			Delay in permits and licenses				
R23			Security requirements				
R24			Safety regulation				
R25	**Resources - Risks**	**Resources - Labor Risk**	Labor Skills Level/ Productivity				
R26			Labor Availability				
R27			Labor disputes				
R28			Labor Accidents				
R29			Human Resource Planning				
R30			Working hours restrictions				
R31		**Resources - Equipment Risk**	Availability of new and effective Construction Technology				

Risk ID	Risk Source	Risk / Risk Factors	Associated Risk Attributes	Risk Factor Probability Factor	Cost Impact (Risk Factor level)	Schedule Impact (Risk Factor level)	Quality Impact (risk Fator level)
R32			Availability of efficient equipment onsite				
R33			Availability of Equipment Suppliers				
R34			Equipment Maintenance				
R35		**Resources - Material Risk**	Material Delivery				
R36			Material Shortage				
R37			Material Theft and Damage				
R38			Non-Conforming material and Rejection				
R39			Material Monopoly				
R40			Nominated vendors				
R41			Availability of Vendors				
R42			Material Procurement				
R43			Material price escalations				
R44	**Project Parties**	**Project Parties - Project Owner Engagement**	Owner Type (Public/ Private/ PPP)				
R45			Management Strategy				
R46			Organization Structure				
R47			Management Involvement and Control				
R48			Standing in the Industry				
R49		**Project Parties - Engineering and Design Team**	Team Experience				
R50			Project Goal clarity				
R51			Complexity of design				
R52			Ad-hoc Consultants				
R53			Design Error				
R54			Experienced Design Agency				
R55		**Project Parties - Contractor**	Contractor pre-qualified				
R56			Use of New Technology				
R57			Quality of Work				
R58			Skilled Resource Availability				
R59			No. of Subcontractors				
R60			Contractor Reputation				
R61			Speed of Execution				
R62			No. of Current Projects being				

Risk ID	Risk Source	Risk / Risk Factors	Associated Risk Attributes	Risk Factor Probability Factor	Cost Impact (Risk Factor level)	Schedule Impact (Risk Factor level)	Quality Impact (risk Fator level)
			handled				
R63			Resource Utilization				
R64			Non-Compliance to Contractual Commitments (PPP)				
R65		**Project Parties - Project Management (PMC)**	Deployed Resource Experience				
R66			Quality Assurances				
R67			Scope Adherence checks				
R68			Resource Availability for the Project				
R69			Type of Contract				
R70			Speed of Execution				
R71	**Project Features**	**Land Acquisition Risk**	Social Issues in land acquisition				
R72			Difficulties in Compensation				
R73			Land Availaibility				
R74			Government Support				
R75		**Financial Risk**	Fluctuation in Prices				
R76			Invoice delay				
R77			Change in Currency Rate				
R78			Owner Financial Capacity				
R79			Timely Progress Payment				
R80			Rate of Interest Volatility				
R81			Tax Rate Volatility				
R82			Project Size				
R83			Equity Risk				
R84			Liquidity Risk				
R85			Labor rate sensitivity				
R86			Poor financial Market Design deficiency				
R87			Funding Constraints				
R88			Ineffective financial management of projects				
R89		**Political Risk**	Bribery and Construction				
R90			Wars and Revolutions				
R91			Changes in Law and Regulations				
R92			Change in Political Leadership/				

Risk ID	Risk Source	Risk / Risk Factors	Associated Risk Attributes	Risk Factor Probability Factor	Cost Impact (Risk Factor level)	Schedule Impact (Risk Factor level)	Quality Impact (risk Fator level)
			Scenario				
R93		**Socio-Economic Risk**	Language/ Cultural barrier				
R94			public opposition				
R95			Law and Order				
R96		**Regulatory Risk**	Non-compliance with regulatory, contractual or quality requirements;				
R97			Requirement for permits and their approval				
R98			delay in regulatory approvals				
R99			Unpredictive Regulatory Policies				
R100		**Legal Risk**	Litigations during Project Execution				
R101			Litigations Operationalization				
R102		**Commercial Risk**	Contractual Requirements, Conditions				
R103			Transparency in Contract Evaluation and Award Process				
R104			Dispute among the Process Owners and Contractors, Litigations				
R105			Contract Variations				
R106			Non-Compliance to Contractual Commitments (PPP)				
R107		**Technical Risk**	Incomplete Design				
R108			Inadequate Specification				
R109			Inadequate Site Investigation				
R110			Change in Scope				
R111			Too many Design changes				
R112			Unproven Engineering and Construction Techniques				
R113			Inefficient Construction Procedures				
R114			Insufficient Resource Availability				
R115			Non-Compliance to Quality Requirements				
R116		**Project Schedule Risk**	Fast Track Schedule				
R117			Project Duration				
R118		**Project Management Risk**	Ineffective project planning and project monitoring				

Risk ID	Risk Source	Risk / Risk Factors	Associated Risk Attributes	Risk Factor Probability Factor	Cost Impact (Risk Factor level)	Schedule Impact (Risk Factor level)	Quality Impact (risk Fator level)
R119			Time and cost escalation on account of ineffective resource utilization				
R120			Management of Schedule Risks				
R121			Unavailability of skilled Project Managers and Contractors				
R122			Estimate Completeness				
R123			Productivity of Resources				
R124		**Force Majeure Risk**	Damage to Structure, Sabotage				
R125			Natural Disaster				
R126			Wars and Revolutions				
R127	**Operations**	**Operations and Management Risk**	Operator Incompetence				
R128			High Operating Cost				
R129			Operational Quality or Capacity				
R130			Economic Viability				
R131	**Market**	**Customer Risk**	Demand Risk				
R132			Social Impact Risk				
R133			Market Environment Risk				

APPENDIX 2

Paired Comparison Matrix for Risk Assessment through ANP Technique

Table 1 : Pair wise comparison matrix with respect to construction

Construction	Contractu	Customer	Design	Financial	Force Maj	Labour	Legal	Operation
Contractual	1	2	0.8	1	4	1.333333	2	1
Customer	0.5	1	0.4	0.5	2	0.666667	1	0.5
Design	1.25	2.5	1	1.25	5	1.666667	2.5	1.25
Financial	1	2	0.8	1	4	1.333333	2	1
Force Majeure	0.25	0.5	0.2	0.25	1	0.333333	0.5	0.25
Labour	0.75	1.499999	0.6	0.75	3.000003	1	1.499999	0.75
Legal	0.5	1	0.4	0.5	2	0.666667	1	0.5
Operation	1	2	0.8	1	4	1.333333	2	1

Table 2 : Paired comparison with respect to Contractual

Contractual	Constructi	Customer	Design	Financial	Force Maj	Labour	Legal	Operation
Construction	1	1.5	0.6	0.75	1	0.75	1	0.75
Customer	0.666667	1	0.4	0.5	0.666667	0.5	0.666667	0.5
Design	1.666667	2.5	1	1.25	1.666667	1.25	1.666667	1.25
Financial	1.333333	2	0.8	1	1.333333	1	1.333333	1
Force Majeure	1	1.499999	0.6	0.75	1	0.75	1	0.75
Labour	1.333333	2	0.8	1	1.333333	1	1.333333	1
Legal	1	1.499999	0.6	0.75	1	0.75	1	0.75
Operation	1.333333	2	0.8	1	1.333333	1	1.333333	1

Table 3 : Paired comparison with respect to Customer

Customer	Construction	Contractu	Design	Financial	Force Maj	Labour	Legal	Operation
Construction	1	1.333333	4	4	0.8	4	1.333333	8
Contractual	0.750000188	1	3.000003	3.000003	0.6	3	1	5.999988
Design	0.25	0.333333	1	1	0.2	1	0.333333	2
Financial	0.25	0.333333	1	1	0.2	1	0.333333	2
Force Majeure	1.25	1.666667	5	5	1	5	1.666667	10
Labour	0.25	0.333333	1	1	0.2	1	0.333333	2
Legal	0.750000188	1	3.000003	3.000003	0.6	3.000003	1	6
Operation	0.125	0.166667	0.5	0.5	0.1	0.5	0.166667	1

Table 4 : Paired comparison with respect to Operation

Operation	Constructi	Contractu	Customer	Design	Financial	Force Maj	Labour	Legal
Construction	1	2	1.333333	0.8	0.8	2	1.333333	0
Contractual	0.5	1	0.666667	0.4	0.4	1	0.666667	0
Customer	0.75	1.499999	1	0.6	0.6	1.5	1	0
Design	1.25	2.5	1.666667	1	1	2.5	1.666667	0
Financial	1.25	2.5	1.666667	1	1	2.5	1.666667	0
Force Majeure	0.5	1	0.666667	0.4	0.4	1	0.666667	0
Labour	0.75	1.499999	1	0.6	0.6	1.499999	1	0
Legal	0	0	0	0	0	0	0	1

Table 5 : Paired comparison with respect to Design

Design	Construct	Contractu	Customer	Financial	Force Maj	Labour	Legal	Operation
Construction	1	1.25	1.25	2.5	5	1.666667	1.25	2.5
Contractual	0.8	1	1	2	4	1.333333	1	2
Customer	0.8	1	1	2	4	1.333333	1	2
Financial	0.4	0.5	0.5	1	2	0.666667	0.5	1
Force Majeure	0.2	0.25	0.25	0.5	1	0.333333	0.25	0.5
Labour	0.6	0.75	0.75	1.499999	3.000003	1	0.75	1.499999
Legal	0.8	1	1	2	4	1.333333	1	2
Operation	0.4	0.5	0.5	1	2	0.666667	0.5	1

Table 6 : Paired comparison with respect to Financial

Financial	Constructi	Contractu	Customer	Design	Force Maj	Labour	Legal	Operation
Construction	1	0.25	0.333333	1	0.333333	0.2	0.2	0.4
Contractual	4	1	1.333333	4	1.333333	0.8	0.8	1.6
Customer	3.000003	0.75	1	3.000003	1	0.6	0.6	1.2
Design	1	0.25	0.333333	1	0.333333	0.2	0.2	0.4
Force Majeure	3.000003	0.75	1	3.000003	1	0.6	0.6	1.2
Labour	5	1.25	1.666667	5	1.666667	1	1	2
Legal	5	1.25	1.666667	5	1.666667	1	1	2
Operation	2.5	0.625	0.833333	2.5	0.833333	0.5	0.5	1

Table 7 : Paired comparison with respect to Force Majeure

Force Majure	Constructi	Contractu	Customer	Design	Financial	Labour	Legal	Operation
Construction	1	0.5	2	2	0.4	0.5	1	0.666667
Contractual	2	1	4	4	0.8	1	2	1.333333
Customer	0.5	0.25	1	1	0.2	0.25	0.5	0.333333
Design	0.5	0.25	1	1	0.2	0.25	0.5	0.333333
Financial	2.5	1.25	5	5	1	1.25	2.5	1.666667
Labour	2	1	4	4	0.8	1	2	1.333333
Legal	1	0.5	2	2	0.4	0.5	1	0.666667
Operation	1.499999	0.75	3.000003	3.000003	0.6	0.75	1.499999	1

Table 8 : Paired comparison with respect to Labor

Labour	Constructi	Contractu	Customer	Design	Financial	Force Maj	Legal	Operation
Construction	1	1.666667	5	2	1.666667	5	1.25	1
Contractual	0.6	1	3.000003	1.2	1	3	0.75	0.6
Customer	0.2	0.333333	1	0.4	0.333333	1	0.25	0.2
Design	0.5	0.833333	2.5	1	0.833333	2.5	0.625	0.5
Financial	0.6	1	3.000003	1.2	1	3	0.75	0.6
Force Majeure	0.2	0.333333	1	0.4	0.333333	1	0.25	0.2
Legal	0.8	1.333333	4	1.6	1.333333	4	1	0.8
Operation	1	1.666667	5	2	1.666667	5	1.25	1

Table 9 : Paired comparison with respect to Legal

Legal	Constructi	Contractu	Customer	Design	Financial	Force Maj	Labour	Operation
Construction	1	0.4	2	0.5	0.4	2	2	0.4
Contractual	2.5	1	5	1.25	1	5	5	1
Customer	0.5	0.2	1	0.25	0.2	1	1	0.2
Design	2	0.8	4	1	0.8	4	4	0.8
Financial	2.5	1	5	1.25	1	5	5	1
Force Majeure	0.5	0.2	1	0.25	0.2	1	1	0.2
Labour	0.5	0.2	1	0.25	0.2	1	1	0.2
Operation	2.5	1	5	1.25	1	5	5	1

APPENDIX 3

Conditional Probabilities for Critical Success Factors Modeling in Infrastructure Projects using Bayesian Belief Network

1. **Root Nodes**

   EF- External Funding

   RP- Project Proposal

   RT- Project Team

   DAM- Data Management

   LM - Leadership and Management

   OWC - Other Works Commitment

2. **Nodes with Parents**

   RF - Resources and Facility

   BA- Budget Allocation

   SP - Schedule Planning

   MM - Motivation and Morale

   EROS - Clarity on Scope, Objectives, Requirements and Expectations

   SR - Schedule Risk

3. **Conditional Probabilities of Risk Factors**

   A. Conditional Probability of risk of Budget Allocation (BUA)

LM	Probability P (%)
L	35.38
H	60

B. Conditional Probability of risk of Clarity of Scope, Objectives, Requirements and Expectations (SCORE)

LM	**Probability P (%)**
L	23.08
H	65.38

C. Conditional Probability of risk of L Motivation and Morale

EROS	**RP**	**RF**	**Probability P (%)**
L	H	L	6.26
L	H	H	24.14
L	L	L	1.73
L	L	H	7.74
H	H	L	31.63
H	H	H	68.80
H	L	L	10.87
H	L	H	36.77
L	H	L	26.74
L	H	H	63.51
L	L	L	8.78
L	L	H	31.45
H	H	L	71.68
H	H	H	92.35

EROS	RP	RF	Probability P (%)
H	L	L	40.02
H	L	H	76.08

D. Conditional Probability of risk of Insufficient Resources and Facility

EF	BA	Probability P(%)
L	L	21.19
L	H	41.56
H	L	48.38
H	H	71.25

E. Conditional Probability of risk of improper Schedule Planning

LM	Probability P(%)
L	23.85
H	66.92

4. Query Variables

A. Conditional Probability of risk of not meeting objectives

RF	RT	MM	SR	RP	Probability P (%)
L	L	L	L	H	1.36
L	L	L	L	L	0.31
L	L	L	H	H	3.50
L	L	L	H	L	0.81
L	L	H	L	H	7.23
L	L	H	L	L	1.72
L	L	H	H	H	16.98
L	L	H	H	L	4.39
L	H	L	L	H	6.95
L	H	L	L	L	1.65
L	H	L	H	H	16.39
L	H	L	H	L	4.21
L	H	H	L	H	29.65
L	H	H	L	L	8.63
L	H	H	H	H	52.52
L	H	H	H	L	19.87
H	L	L	L	H	6.21
H	L	L	L	L	1.46
H	L	L	H	H	14.80

RF	RT	MM	SR	RP	Probability P (%)
H	L	L	H	L	3.75
H	L	H	L	H	27.20
H	L	H	L	L	7.73
H	L	H	H	H	49.51
H	L	H	H	L	18.02
H	H	L	L	H	26.36
H	H	L	L	L	7.43
H	H	L	H	H	48.45
H	H	L	H	L	17.40
H	H	H	L	H	66.89
H	H	H	L	L	31.17
H	H	H	H	H	84.13
H	H	H	H	L	54.32

B. Conditional Probability of Schedule risk

OWC	SP	RT	MM	RF	DAM	RP	Probability P (%)
H	L	L	L	L	H	H	50.86
H	L	L	L	L	H	L	19.25
H	L	L	L	L	L	H	26.09
H	L	L	L	L	L	L	7.52
H	L	L	L	H	H	H	72.84
H	L	L	L	H	H	L	38.18
H	L	L	L	H	L	H	47.77
H	L	L	L	H	L	L	17.40
H	L	L	H	L	H	H	82.61
H	L	L	H	L	H	L	52.24
H	L	L	H	L	L	H	61.84
H	L	L	H	L	L	L	27.17
H	L	L	H	H	H	H	92.49
H	L	L	H	H	H	L	73.92
H	L	L	H	H	L	H	80.76
H	L	L	H	H	L	L	49.16
H	L	H	L	L	H	H	81.97
H	L	H	L	L	H	L	51.14
H	L	H	L	L	L	H	60.79
H	L	H	L	L	L	L	26.31

OWC	SP	RT	MM	RF	DAM	RP	Probability P (%)
H	L	H	L	H	H	H	92.17
H	L	H	L	H	H	L	73.06
H	L	H	L	H	L	H	80.07
H	L	H	L	H	L	L	48.05
H	L	H	H	L	H	H	95.43
H	L	H	H	L	H	L	82.77
H	L	H	H	L	L	H	87.68
H	L	H	H	L	L	L	62.10
H	L	H	H	H	H	H	98.18
H	L	H	H	H	H	L	92.56
H	L	H	H	H	L	H	94.86
H	L	H	H	H	L	L	80.94
H	H	L	L	L	H	H	87.31
H	H	L	L	L	H	L	61.31
H	H	L	L	L	L	H	70.12
H	H	L	L	L	L	L	35.08
H	H	L	L	H	H	H	94.69
H	H	L	L	H	H	L	80.41
H	H	L	L	H	L	H	85.88
H	H	L	L	H	L	L	58.34
H	H	L	H	L	H	H	96.93

OWC	SP	RT	MM	RF	DAM	RP	Probability P (%)
H	H	L	H	L	H	L	87.91
H	H	L	H	L	L	H	91.51
H	H	L	H	L	L	L	71.27
H	H	L	H	H	H	H	98.79
H	H	L	H	H	H	L	94.96
H	H	L	H	H	L	H	96.54
H	H	L	H	H	L	L	86.54
H	H	H	L	L	H	H	96.80
H	H	H	L	L	H	L	87.43
H	H	H	L	L	L	H	91.16
H	H	H	L	L	L	L	70.36
H	H	H	L	H	H	H	98.74
H	H	H	L	H	H	L	94.75
H	H	H	L	H	L	H	96.39
H	H	H	L	H	L	L	86.01
H	H	H	H	L	H	H	99.28
H	H	H	H	L	H	L	96.96
H	H	H	H	L	L	H	97.93
H	H	H	H	L	L	L	91.59
H	H	H	H	H	H	H	99.72
H	H	H	H	H	H	L	98.81
H	H	H	H	H	L	H	99.19

OWC	SP	RT	MM	RF	DAM	RP	Probability P (%)
H	H	H	H	H	L	L	96.58
L	L	L	L	L	H	H	19.86
L	L	L	L	L	H	L	5.40
L	L	L	L	L	L	H	7.79
L	L	L	L	L	L	L	1.91
L	L	L	L	H	H	H	39.10
L	L	L	L	H	H	L	12.88
L	L	L	L	H	L	H	17.96
L	L	L	L	H	L	L	4.80
L	L	L	H	L	H	H	53.21
L	L	L	H	L	H	L	20.75
L	L	L	H	L	L	H	27.95
L	L	L	H	L	L	L	8.20
L	L	L	H	H	H	H	74.66
L	L	L	H	H	H	L	40.42
L	L	L	H	H	L	H	50.12
L	L	L	H	H	L	L	18.79
L	L	H	L	L	H	H	52.11
L	L	H	L	L	H	L	20.03
L	L	H	L	L	L	H	27.07
L	L	H	L	L	L	L	7.87
L	L	H	L	H	H	H	73.82

OWC	SP	RT	MM	RF	DAM	RP	Probability P (%)
L	L	H	L	H	H	L	39.36
L	L	H	L	H	L	H	49.02
L	L	H	L	H	L	L	18.13
L	L	H	H	L	H	H	83.32
L	L	H	H	L	H	L	53.49
L	L	H	H	L	L	H	63.01
L	L	H	H	L	L	L	28.17
L	L	H	H	H	H	H	92.83
L	L	H	H	H	H	L	74.87
L	L	H	H	H	L	H	81.53
L	L	H	H	H	L	L	50.41
L	H	L	L	L	H	H	62.22
L	H	L	L	L	H	L	27.50
L	H	L	L	L	L	H	35.97
L	H	L	L	L	L	L	11.45
L	H	L	L	H	H	H	81.02
L	H	L	L	H	H	L	49.56
L	H	L	L	H	L	H	59.28
L	H	L	L	H	L	L	25.10
L	H	L	H	L	H	H	88.32
L	H	L	H	L	H	L	63.51
L	H	L	H	L	L	H	72.05

OWC	SP	RT	MM	RF	DAM	RP	Probability P (%)
L	H	L	H	L	L	L	37.25
L	H	L	H	H	H	H	95.14
L	H	L	H	H	H	L	81.85
L	H	L	H	H	L	H	86.98
L	H	L	H	H	L	L	60.61
L	H	H	L	L	H	H	87.85
L	H	H	L	L	H	L	62.48
L	H	H	L	L	L	H	71.16
L	H	H	L	L	L	L	36.23
L	H	H	L	H	H	H	94.93
L	H	H	L	H	H	L	81.19
L	H	H	L	H	L	H	86.47
L	H	H	L	H	L	L	59.55
L	H	H	H	L	H	H	97.08
L	H	H	H	L	H	L	88.43
L	H	H	H	L	L	H	91.89
L	H	H	H	L	L	L	72.28
L	H	H	H	H	H	H	98.85
L	H	H	H	H	H	L	95.19
L	H	H	H	H	L	H	96.70
L	H	H	H	H	L	L	87.11

APPENDIX 4

Demography of Interviewee

Name of Organization: Date:

Time:

Type of Project:

Size of Project:

1. Interviewee Details:

Designation:

Role/Responsibility of Interviewee:

a. What was your role on the Project?

b. How long were you involved in megaproject construction?

2. Project Goal/Scope:

a. What were the main goals and objectives?

b. How did the project scope change over time?

3. Generic Risk Events:

a. What were the generic risk events inherit in the project?

b. How did the generic risk events affect the project schedule overtime?

c. How did the generic risk events affect the project cost?

7. Funding:

a. Was the project funding source a dedicated fund source?

b. How were additional funds obtained as project costs increased?

c. Was the funding source stable over time?

List of Publications/ Participation in Conferences

Publications: International

Sharma, V. K., Sharma, S. K., & Singh, A. P. (2019). Risk enablers modelling for infrastructure projects using Bayesian belief network. *International Journal of Construction Management*, 1-18. https://doi.org/10.1080/15623599.2019.1678218 [SCOPUS]

Sharma, V. K., Sharma, S. K., & Singh, A. P. (Accepted). Assessment for Risk of Logistics Infrastructure Projects Using Analytic Network Process. *International Journal of Process Management and Benchmarking*, (MS No.: IJPM-28745). [SCOPUS]

Sharma, V. K., Sharma, S. K., & Singh, A. P. (2019). Financial Risk Modeling of Infrastructure BOT Projects. *Journal of Infrastructure Systems*. (Submitted and under review).

Papers Presented in Conferences

Sharma, V.K., Sharma, S.K. (2015), "Risk Management in Infrastructure Projects " in the proceedings of *International Conference on Evidence Based Management at BITS, Pilani (20-21 Mar., 2015)*, pp. 620-625.

Sharma, V.K., Sharma, S.K. (2017), "Application of Project Management Methodology for Airline Ground time Reduction" in the proceedings of *International Conference on Evidence Based Management at BITS, Pilani (17-18 Mar., 2017)*, pp. 320-326.

VITA

Candidate: VIJAY KUMAR SHARMA

Vijay Kumar Sharma is a practicing techno-managerial professional possessing diverse industry experience of over 25 years and currently working with GMR Group at Delhi International Airport Limited New Delhi heading the Cargo business at the Airport.

He has done his technical education B.E. (Hons) Civil and M. E. (Civil) from BITS Pilani achieving 1st Rank in both the programmes. He possesses degree in Masters in Business Administration (MBA) from Faculty of Management Studies, Delhi. Prior to joining GMR group in 2008, he has been worked with Engineers India Limited for 14 years in various capacities working on multiple engineering projects Oil and Gas infrastructure projects of country's interest. He has led multiple assignments at GMR in Business Strategy, Project development and execution, New Product Development, Business Integration, Process enhancements, etc. and have been associated during the development of Terminal 3 project, Airport Cargo Logistics Centre development at the Airport. In his current role, he is responsible for successfully driving the Cargo Strategy for Delhi Airport, development and execution of Airport logistics infrastructure and Cargo City projects.

His interest areas are Project Risk management in logistics infrastructure and project management. His research work has been published in various international and national journals and conferences. He has undergone Management Development Programmes at IIM Ahmedabad, IIM Kolkata including Emerging Leaders Programme from IIM Kozhikode. He is a member of the Project Management Institute, a leading professional body on project management. He has been received various awards for standing first in his academic programmes as well as during his distinguished professional carrier.

Supervisor: Dr Satyendra Kumar Sharma

Dr Satyendra Kumar Sharma is B.E., MBA from MNIT Jaipur and PhD from BITS, Pilani. Dr Sharma carried out his PhD research on Supply Chain Risk Management. He has more than 16 years of experience in industry and academics.

Currently, he is working as an Assistant Professor in the Department of Management and is the nucleus member of the Planning Cell in Practice School Division, BITS, Pilani. Currently he is also heading the Centre for innovation, incubation and entrepreneurship since Aug 2018. His research interest areas are Supply Chain Management, Enterprise Risk Management, Project Management and Market and Supply Intelligence. He has published more than 35 papers in international journals of repute, 9 papers in national journals and 22 papers in international conferences. He had completed two govt funded R & D projects and three industry consultancy projects. He has conducted several MDPs. He is a member of professional bodies like Society of Operations and Production Management and AIMS international.

Co-Supervisor: Professor Ajit Pratap Singh

Professor Ajit Pratap Singh is presently working as a Professor of Civil Engineering and Dean, Academic-Undergraduate Studies at Birla Institute of Technology and Science, Pilani, Rajasthan (India).

He is a Fellow of the Institution of Engineers (India) and Indian Association of Hydrologists (FIAH). He has also been working as Coordinator, Principal Technical Agency, for National Rural Infrastructure Development Agency (NRIDA), Government of India, New Delhi. He has published over 90 papers and reports. He has more than 24 years of teaching and research experience in the area of sustainable water resources management, hydraulics and water resources engineering with a special focus on surface water-quality modeling and advanced computer applications: water quality and quantity assessment, water pollution analysis, solid waste management, prediction and management of surface waters, and groundwater contaminant transport modelling, climate change, pavement management systems, soft computing techniques, fuzzy-based decision making, simulation and modelling.