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TITLE OF THE PAPER

CREATING INFRASTRUCTURE FOR POWER QUALITY IMPROVEMENT IN WESCO, ODISHA

THEME

Project Management Leadership - To accelerate Economic Growth

KEYWORDS

Heuristic Decision Making, Adaptive, Iterative, Agile, CCPM, Risk Analysis, WESCO, Power Quality Improvement, Accelerated Economic Growth

ABSTRACT

Power Distribution sector plays a vital role in the progress of country's economy. Taking this into account, Government of India has taken initiatives to strengthen the Power Distribution sector under the flagship schemes of Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS) with objectives of strengthening sub-transmission and distribution networks in urban as well as rural areas, providing separate feeders for agriculture and electrification of un-electrified villages & households.

Department of Energy, Government of Odisha has initiated the project with a fund of INR 517 Crores to enhance the distribution sector in the Western Odisha, reeling under poverty and under development.

Power Transmission & Distribution wing of L&T Construction has taken up this first of its kind project in power sector in terms of area that is spread across 47,800 sq. km comprising all 9 districts of western Odisha under a single contract. Major challenges involve negotiating elephant corridors of Sundergarh, hilly terrains of Deogarh, mines of Jharsuguda, submerged areas of Sambalpur, cultivation lands of Bargarh, hottest climates of Bolangir, tribal habitats of Nuapada & Maoist regions of Kalahandi. Also, the climate across the region varies between extremes in summer and winter with considerable rainfall in monsoon.
The work involves 5500 km of power distribution lines, 1050 distribution transformers and 50 power transformers energizing 36400 households and renovating 1200 feeders.
The paper covers the Project Management Techniques and Leadership approach that play a crucial role in successful implementation of schemes, thus accelerating economic growth.

INTENT

The intention of the subject paper is to implement modern project management techniques in place of traditional techniques that may not be a perfect fit in this VUCA world.

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INTRODUCTION

The major objective of this project is to improve Power Quality across nine districts of Western Odisha. With this intention the Government of India has initiated this project under its flagship schemes of DDUGJY and IPDS with a limited budget.

The key characteristics of this project are:

1. Lack of clarity in Scope of Work :

The scope under this contract is not definite and to be defined on time to time basis. This is basically due to variation in customer preferences based on the political, geographical and financial priorities

2. Uncertainty in Bill of Quantities :
   Under such circumstances, for awarding the contract, the Customer has arrived with tentative Bill of Quantities during the bidding stage. The Quantities provided along with the Letter of Award are subject to variance without any ceiling limit.

3. Limited Funds :
   The funds allocated for the project by Government of India are limited. The overall contract value remains the same throughout the contract period.

4. Spread Out Works :
   The works cover an area of 47,800 sq.km and are to be carried in a phase manner rather than concentrating in entire region.

5. Volatile Cost Packages :
   Due to constraints such as Limited Budget & Varying BOQ, there is volatility in the Cost packages. These cost packages shall be stabilized upon survey during execution period.

6. Critical Timelines :
   The Project timelines are well-defined in the contract. However due to above scenarios and lot of interdependency with various third party agencies for approvals and clearances such as Right of Way (ROW), statutory approvals from Forest, Irrigation, Revenue, Railways, etc. there shall be some hindrances in achieving the timelines of the project. The project schedule will vary between the 18 to 24 months and in some cases it may extend up to 30 months.

The three sides of Golden Triangle of Project Management – Scope, Cost & Time, all the three constraints are varying and dynamic in nature in this type of projects. For efficient and optimized execution of these projects, modern project management techniques like Heuristic approach, Adaptive, Iterative, Critical Chain Project Management (CCPM), and Agile are to be applied for faster execution and better control.

POWER QUALITY IMPROVEMENT WORKS IN WESTERN REGION OF ODISHA – A CASE STUDY

Milieu:

1. Works can be broadly classified into

a) Village electrification works
b) Distribution backbone system strengthening works

2. Under the village electrification works, the following works are involved.
   i. Electrification of Un-electrified Villages
   ii. Intensive electrification of partially electrified villages
   iii. Providing Service Connection to BPL households

3. The project is mainly concentrated in the left over / spill over villages after the coverage of villages under Biju Gram Jyoti Yojana, RGGVY 10th, 11th& 12th plans (earlier Power Distribution Schemes by GoI). These villages are located in inaccessible locations like hilly areas and deep pockets where the access for materials is only through head loading. Even the population in these villages is very scant, even to expect some kind of support and help for the workmen from local villagers.

4. Under the Distribution backbone system strengthening, the following works are involved.
   i. Reconductoring of existing 33 kV lines
   ii. Reconductoring of existing 11 kV lines
   iii. Feeder Separation of existing 11 kV lines

5. All these works have to be carried out under power shutdown and in tight time schedule with due safety precautions.

6. The works are spread out in 9 districts of Western Odisha (Koshal region) namely Sundergarh, Deogarh, Jharsuguda, Sambalpur, Bargarh, Bolangir, Sonepur, Nuapada& Kalahandi covering 47,800 sq. km. This involves negotiating elephant corridors of Sundergarh, hilly terrains of Deogarh, mines of Jharsuguda, submerged areas of Sambalpur, plain lands of Bargarh, hottest climates of Bolangir, tribal habitats of Nuapada & Maoist regions of Kalahandi. Also, the climate across the region varies between extremes in summer and winter with considerable rainfall in monsoon.

7. Scope of Works are as follows :

Description	UOM	Qty
33kV New Lines	CKM	213
11kV New Lines	CKM	1086
Distribution Transformer	Nos	776
LT New Lines	CKM	490
33kV Augmentation Lines	CKM	593

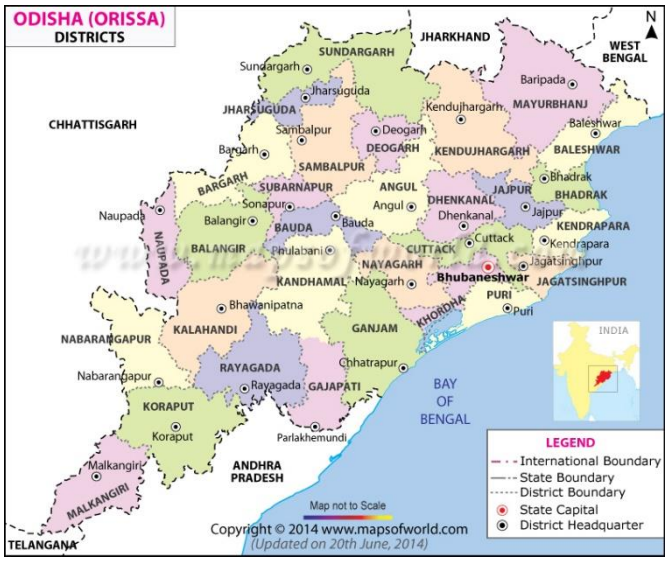

Figure 1 : Odisha Map

Figure 2 : WESCO Region , Odisha

11kV Augmentation Lines	CKM	1188
Distribution Transformer Augmentation	Nos	570
LT Augmentation Lines	CKM	210

8. Any of these works can be carried out at any of the location without any interdependency. Hence, there is no hard logic in scheduling the project in entire region.

KEY CHALLENGES:

The following are the key challenges faced in the current project

- Diversified & Wide spread distributed Project Area :
  The project sites are scattered in different geographical conditions comprising of Hilly Terrains, Dense Forests, Cultivation lands, Red Corridors, therefore arising the need for Right of Way approvals from concerned government authorities.
- Extreme Climatic Conditions :
  The weather conditions are extreme and the temperatures vary from 10°C (in winter) to 50°C (in peak summer) with heavy rainfall during the monsoons.
- Daily Commute to Site :
  As the works are in remote areas, 60% of the day is spent in travel to & fro site.
- Resource Planning :

Once the resources are planned in a particular job location, then the designated team should be equipped with material on Complete Kit Basis. Missing of any material or tool to complete the specific activity shall hamper the progress of the activity and lead to idling of resources.

Project of such vast area should be equipped with required Plant & Machinery to cater the material mobilization required at sites

- Lack of experience of Discoms to implement such large projects on turn-key basis
- Delay in transfer of Central government funds by the State Governments to SEBs/ Utilities
- Delay in processing of tendering, evaluation and award of contracts
- Non-availability of equipment / contractors to execute the works
- Frequent transfer of the officers in charge of implementation from customer side
- Volatility in cost of electrical equipment and steel
- Delay in receipt of Detailed Project Reports (DPRs).
- Delays in the issue of road permit and way bills.
- Delays in taking over of physical assets created by Central Public Sector Undertakings (CPSUs).
- Delays in Panchayat certificates for village electrification as per revised definition.
- Lack of awareness among villagers for taking new connections.
- Very poor upstream rural electricity infrastructure in some states.
- Delay in finalization of BPL lists by some states.

METHODOLOGY /PROCESS FOLLOWED:

A. PROJECT SCHEDULING METHODS

The activities involved in the Project are independent and has no logical sequence. Hence, Traditional Project scheduling techniques like Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Schedule Network Analysis, GANTT chart, etc. could not be used. As the project is not in a confined area and is resource constraint. Modern techniques like Heuristic approach, Adaptive, Iterative, Critical Chain Project Management (CCPM), and Agile are to be applied for faster execution and better control.

SCHEDULING ON EVER SHIFTING GROUNDS – HEURISTIC APPROACH

The completion of these projects within the Project Completion schedule at optimum cost depends on the way the resources are mobilized. The project can be termed successful, when entire scope of works are completed at Optimum cost as Cost and Scope are dynamic in nature.

In this resource constraint environment, the project scheduling in a VUCA world has to be done on Heuristic basis. The following are the major resource constraints for the project of this nature.

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Figure 3: Heuristic Method - Resource Constraint in Project Scheduling

1. Work Force

   Work Force Management is key driving factor of the project. Initially the workforce requirements are to be calculated in terms of Man-months and based on the site conditions & Parametric Estimate the monthly work force requirements are to be arrived.

   The monthly workforce requirements shall not be constant and are variant in nature.

2. Material

   To engage the workforce, materials have to be supplied in time. For better material management, materials with limited lead process time like drawing approvals, type test certifications, third party inspections etc. are to be procured in initial phases and executed.

   Materials with huge lead time in terms of GTP approvals, Type Test reports shall be taken up at latter stage of the project.

3. Work front availability

   The following factors are to be managed for better availability of Work Fronts

   a) Power Shutdown
   b) Less Inconvenience to the Consumers
   c) Priority for obtaining the Forest Approvals
   d) Timely Approvals from other statutory authorities like Railways, Irrigation, etc.

4. Customer Preferences

   At times, the customers change their priorities for reasons attributable to Political, Social and Economic considerations and sometimes it supersedes the other two constraints namely Workforce and Material.

   Apart from the above, Staff, Plant and Machinery, Logistics, Stores are to be planned to meet the execution requirements.

APPLICATION OF *ADAPTIVE PROJECT MANAGEMENT TECHNIQUE*

Considering the complexity of the project, the overall scope of the project can be termed as a “Program” of value say ‘k’. This Program is further categorized into Projects which can ‘n’ in no’s with similar defined scope. Therefore each project is allocated with ‘k/n’ value of scope, which shall ease the monitoring and control process.

As the project is being executed in a phase manner, adapting to changing circumstances, challenges becomes easier, thus mitigating the major risks which may affect the entire project. By applying this model, at any point of time only ‘k/n’ scope of the project is exposed to risk.

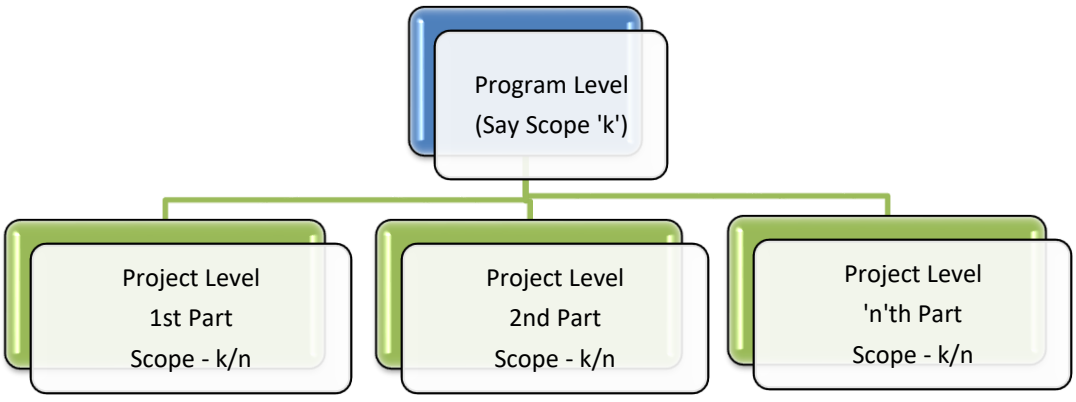

Figure 4: Adaptive Method of Approach

APPLICATION OF *ITERATIVE PROJECT MANAGEMENT TECHNIQUE*

By selecting similar or equal works in each phase viz. electrification of un-electrified villages as a single unit which needs to be iterated, we can reduce project cycle time by incorporating the lessons learnt in previous unit executions

For illustration, as a part of DDUGJY Project, 100 Nos of Un-electrified villages are to be energized. With more or less identical scope of work in each village, by adopting this technique and rectifying the bottlenecks faced in each execution cycle, the cycle time of next activity can be brought down.

APPLICATION OF *CRITICAL CHAIN PROJECT MANAGEMENT (CCPM) TECHNIQUE*

The project execution can be treated as a chain of activities wherein project progress is restricted by the resource constraint in one of the activity. The strength of the chain is equal to the strength of the weakest link. By using CCPM techniques, bottlenecks are identified and are addressed. An additional buffer by increasing the capacity or removing the constraint for that particular bottleneck activity is created to ensure the progress of the entire project. As & when the project is progressing the bottleneck shifts from one activity to other this needs to address accordingly.

APPLICATION OF *AGILE PROJECT MANAGEMENT TECHNIQUE*

As mentioned above, the project scope and BOQ are dynamic in nature and also it is highly dependent on Climatic and Geographical conditions, hence the project team shall be agile in revising their plans and adaptive to the Site scenarios. Thus revisiting the schedule on time to time basis.

B. MATERIAL PROCUREMENT

The supply and services portion in this project are in the ratio of 80:20. Therefore, material procurement has plays a major role in achieving physical and financial progress.

Profitability of the project mainly vests with Better Material procurement principles. Some of them are

- Large Vendor Base
- Central Procurement team

- Bulk Procurement

In general, 20% of the items in the project usually account for 80% of the Project Sales. Based on this concept the materials are majorly categorized into Class A, B & C

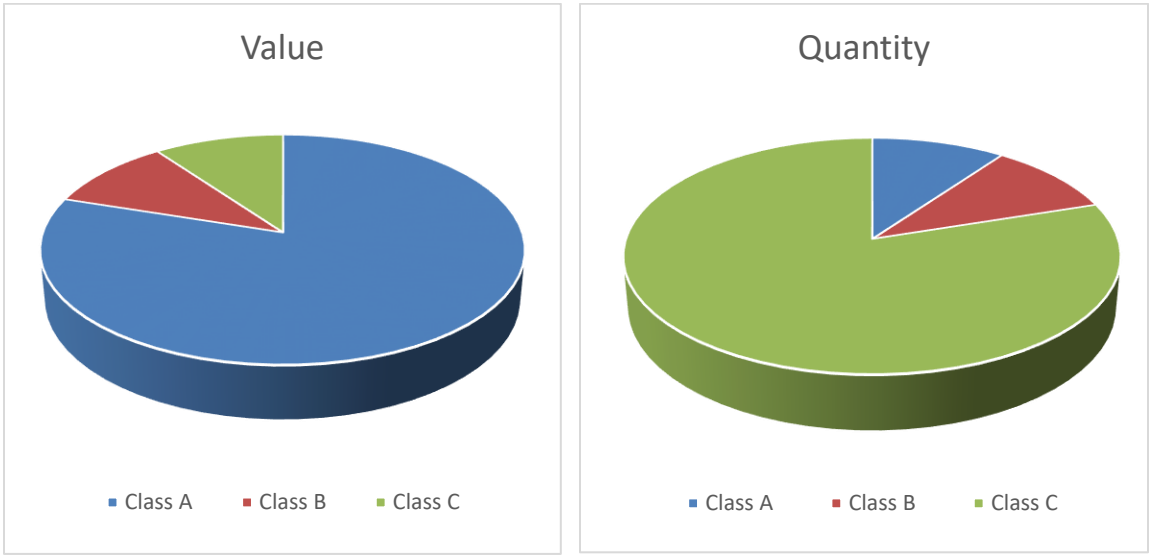

Figure 5: Classification of Materials

Class A	Class B	Class C
AAA Conductor	Switchgear	33KV & 11KV Railway Crossing
AB Cables with Bare Messenger	LT Distribution Box	PC & PC+6 type Towers
Distribution Transformers	1.1 KV XLPE Cable	AAAC Accessories
RS Joists	LT XLPE Insulated Cable	Compression Mid-span joints
PSC Poles	Insulators	PG clamps
Steel Tubular Poles	Disc Insulators	Bi-metallic connectors
	Pin Insulators	PVC sleeves
	Post Insulators	Aluminium Binding materials
	HT ABC Accessories	Anti Climbing Device /Danger Board/Name Board
	LT ABC Accessories	GI Bolt & Nuts
	BPL Connections	GI Wire

	Earthing	
	Stay Set	
	MS Structures	

Table No. 1: Classification of A-Class Items

On contrary to the above, at times heuristic decisions like Staggered Procurement method is to be employed where Bulk Procurement method cannot be insisted due to widespread area, scope ambiguity and to avoid supply stock pile.

Even though Bulk Procurement eases the cost of inventory freight, it affects the project working capital if materials are not consumed immediately as the supply payment is linked with erection.

Hence, we have employed staggered method of procurement for Class A & Class B items and Bulk Procurement method for Class C items.

Detailed Procurement plan is to be prepared in line with the Activity schedule. Any missing of material that is required for completion of an activity will obstruct the progress.

JUST IN TIME APPROACH

Scheduling a complex-volatile project for a long period of time practically not feasible. Hence, Just in Time methodology is deployed and once schedule is arrived, material delivery plan is designed in such a way that the stock of one month buffer and not exceeding two months to works is maintained.

TEAM STRUCTURING

Upon completion of Material procurement planning, the organogram of the execution team is to be planned and set up.

For a widespread job of ours, decentralized organizational set up is to be formed. The factors to be considered are as follows:

1. Time for daily commute to site
2. Customer representative presence
3. Facilities for basic standard of living
4. Transportation & Communication

Our execution philosophy deals with Periphery to Core approach, by starting the works at the farthest area. Based upon the volume of work in the particular zone/area, zonal stores are planned and accordingly labour and staff are allocated.

C. *RISK ANALYSIS*

The following risks that have impact on the profitability of the project are identified and risk mitigation measures that are in place are also enlisted.

Sl. No.	Risk	Description	Mitigation Plan
1.	Completion risk	Extension of project duration due to various reasons – Levying of Liquidated damages	Effective documentation of the sequence of events and hindrances for progress to convince customer for time extension without levying LD.
2.	Cost overrun due to time overrun	Due to extended stay, cost expended towards overheads may overrun the budget reducing the Gross Margin	Meticulous planning of overheads, mobilistaion and demobilistaion based on the work front availability avoids cost overrun even in the case of time overrun.
3.	Inflation / Escalation risk	In general, Distribution projects are awarded on Firm price basis. Also, project duration ranges from 18 months to 24 months. High volatility in Aluminum, Steel and Cement prices is the main concern.	Hedging of Aluminum and steel can help mitigate the risk of price escalation.
4.	Supply risk	Unavailability of materials or the inability to deliver materials to the job site due to a remote location. For some items like poles, local manufacturers has	Contingency needs to be provided while quoting prices for such items carefully analysing the available suppliers and the remoteness of site location.

		the monopoly due to client approvals etc.	
5.	Reduction in quantity/ contract value	This may happen in most of the projects as BOQ items in tender are rough estimate.	Revised Contract value has to be arrived by detailed site survey before ordering of materials to avoid excess supply. Overheads also to be planned as per revised value.
6.	Payment risk	Poor financial health of Discoms results in long pending outstanding and thus high working Capital	Due diligence has to be carried out on client's financial viability before bidding and ensuring of flow of central government funds
7.	Material Pilferage / damage	Materials may get damaged due to transport to remote far away locations. Also, conductor/cables may be stolen in some areas	Contingency of 1-2% for damage to poles and insulators need to be inbuilt in the prices. Strict vigilance is required in theft prone areas on materials erected and yet to handover to client.
8.	Site Safety	As works are spread out and involves power shut down, there are chances of electrical shock, mechanical injuries, fall from height etc.	Standard operating procedures and work methodology involving all safety precautions need to be implemented. All workers and staff need to be trained in Safe work procedures. Safe work culture needs to be developed.
9.	High working Capital	Chances of operating at high working capital due to terms of payment and supply of materials in far ahead in time than required.	Execution needs to be planned in conjunction with payment terms. Just in Time procurement of materials to be adopted.

10.	Risk of payment due to quantity variation	Quantity variation limits for individual items are specified in the contract. Payment is under hold from finance department for quantity beyond the specified limits.	For QV beyond specified limits, approval is required from competent authority. Estimates need to be submitted after detailed survey and to be sanctioned before the start of work execution.

Table No. 2: Risk Analysis

CRITICAL SUCCESS FACTORS

1. Lead Self
2. Lead Others
3. Flexible Project Schedule
4. Real Time Communication
5. Agile Team
6. Being GLocal
7. Retaining ≥ Recruiting

QUANTIFIED BENEFITS TO BUSINESS

1. Avoiding surplus materials at the end of the project – Savings of around 2-3% of the project value.
2. Optimum working capital – Savings on interest portion to the tune of 1% of the project value.
3. Resource optimization – Staff, Plant & Machinery
4. Reduction in mobilizing & demobilizing cost – Savings of around 0.5% of the project value.

CONCLUSION

The traditional project management techniques that include heavy weight waterfall methodologies which focused on micro management and required defining all resources upfront, contradicted the ways in which engineers were actually performing their work in this high change and high uncertainty work. The need of the hour is Planning, De-planning & Re-Planning.

In these kind of projects, we can expect to encounter any number of unknown events. Key is to be proactive. We must anticipate and respond accordingly. Our methodologies should be adaptive and agile.

These are the projects whose goals are not clearly defined and may be ever changing. Methodologies for effective management and control are to be discovered and done so while working under conditions of high complexity, high volatility and high stress.

The methodologies discussed are only a step towards finding solution but not a comprehensive and perfect solution. By employing the above methodologies we are in a better position to mobilize, manage and control the project progress for electrification of un-electrified villages, thus leading to upliftment of the social stature in Western region of Odisha and accelerating economic growth.