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Choosing the appropriate project management structure, project financing, land acquisition and contractual process for Indian railway mega-projects-a case study of the Dedicated Freight Corridor Project

by

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designed such that it can be upgraded to 32.5 tone axle load in future. The track, bridge, electrification and signalling infrastructure are being designed and constructed to operate the DFCs as heavy haul network with maximum speeds of 100 kmph and average speeds of 65 kmph. Modern high horsepower locomotives and high capacity wagons are also being concurrently developed for moving traffic on these corridors. In order to enable seamless movement of traffic between DFC network and IR, feeder routes on the existing IR network are also been upgraded; the feeder route length for both Western and Eastern DFC are given in Table 3. The Western DFC will complement the Delhi-Mumbai Industrial Corridor (DMIC) initiative, which is a Japanese-Indian collaborative project for comprehensive infrastructure development to create India's largest industrial belt zone by linking the industrial parks and harbours of the six states between Delhi and Mumbai to promote foreign export and direct investment. Under the DMIC initiative, industrial parks and logistics bases will be created in the area 150 km to either side of the Western DFC.

The DFCs are conceived as corridors complementing the IR network. DFCCIL will create and maintain infrastructure which would be used by IR to operate its trains. IR feeder routes will bring the traffic from originating terminals on IR, wherein it would be transferred to DFCs at junctions and vice versa for destination terminals on IR.

Table 3:Salient Features of DFCs

Feature	Western DFC	Eastern DFC
Route length (km)	1534	1839
Route	JNPT-Dadri	Dankuni-Ludhiana
Feeder Route length (km)	1516	3071
Projected traffic in million tonnes (2021)	128	144
Land Acquisition required	6587 hectares	4592 hectares
Project cost (Rs.billion)	406	161
Funding Agency	Japan International Cooperation Agency	World Bank
Loan component (%)	80	67
Number of Field Project Units	7	6
Project Completion Target	2017	2016

(Dedicated Freight Corridor Corporation of India Ltd 2012)

A large number of similar railway mega-projects are planned or are under implementation for capacity augmentation or serving needs of trade in specific regions or industry sectors. Since transport capacity is one of the main levers of economic progress, it is essential that augmentation of transport capacity is not held up. It is therefore essential to choose the

appropriate project management structure, project financing, land acquisition and contractual

engineers have been actively involved in building metro systems (eg.410 km underground metro system in Delhi) and the challenging mountain railways (eg. 738 km Mumbai-Mangalore Konkan railways and the 345 km Jammu-Udhampur-Srinagar- Baramulla railway link(JUSBRL)).

Table 4

Year	BG as % of total network route km	Double line as % of total network route km	Electrified line as % of total network route km
1950-51	46	9	0.7
2010-11	86	30	30

(Indian Railways 2012), (Saxena 1991), (Ministry of Railways, Government of India 1952)

However as in other Indian infrastructure sectors, IR's projects also suffer from cost and time over runs. The major reasons for time and cost overruns of IR projects is the inadequacy of funds being allotted for the projects, problems in acquisition of land required for the project and security problems in the project area. Other reasons for time overrun are lack of supporting infrastructure facilities, delay in finalization of detailed engineering plans, scope changes, delays in scope finalization, underestimated geological conditions and lack of familiarity with latest technology. Other reasons for cost overruns are time overruns, changes in foreign exchange rates and statutory duties, increase in cost of rehabilitation of displaced persons and providing environmental safeguards, increase in cost of land acquisition and inflation over project duration. (Ministry of Statistics and Programme Implementation (Infrastructure & Project Monitoring Division), Government of India 2008) Doloi et.al.'s (Doloi et al. 2012) study of delays of Indian construction projects identified the following seven critical factors in descending order of importance:

(i) lack of commitment by client, contractor and vendors leading to accidents, improper or obsolete construction methods, delay in material delivery

(ii) inefficient site management due to ambiguous specifications, unskilled labour, ineffective supervision, inadequate experience of contractor, lack of control over sub-contractors

(iii) poor site coordination due to lack of coordination between site and design office, ty5.3(and( )]T85(ed(t)6(draw5.5s/y)-4.d)-9.4((m)12.)6.5(5(Del9(g).6(of Inds-4.3(.3(ti(r).6((te8

(iv) improper planning in ignoring extreme weather conditions which lead to low labour productivity and therefore lead to errors in time estimation; improper planning for recruitment of skilled operators for specialised equipment; improper planning the requirement of equipment and their utilisation

(v) lack of clarity of project scope resulting in rework or scope creep due to misunderstanding by the contractor or project manager

(vi) lack of communication with local authorities resulting in delays in permissions; lack of communication between contractor and client results in delay in approval of stages

(vii) substandard contract, selection of contractor with inadequate experience or skill sets, optimistic cost and time duration built in the contract

We examine the Eastern Dedicated Freight Corridor Project to determine the measures taken to mitigate the major reasons for time and cost overruns listed above.

There is no research available on the measures taken to improve the success rate of public sector or IR projects in India. This paper attempts to fill this gap, since it is worthwhile analysing the evolution of mechanisms for project success in an organization in existence in a developing country since 1853. The research is based on examination of IR's process

- The accounts of these PSCs are maintained independent of IR's system. This allows monitoring and control of these organizations, especially in situations where the SPVs receive funds from sources other than IR. PSCs have higher autonomy and financial powers in respect to capital expenditure, joint ventures and strategic alliances
- These PSCs have the freedom to modify procurement policies in line with lending agency requirements.

All the 16 PSCs of IR, were manned with IR personnel in the initial stages, with freedom given to the IR personnel to leave the PSC and return to IR. However, since the PSCs lose experienced project personnel as well as knowledge gained during the project, PSCs encourage the personnel to remain in the PSC permanently by taking absorption. DFCCIL has also been recruiting manpower from the open market, in addition to IR personnel presently manning the organization.

DFCCIL was created as a PSC under administrative control of IR, based on the performance of PSCs in project execution and operation. It has been registered under the Companies Act, 1956. Indian Railway Chairman is the Chairman of DFCCIL Board of Directors. The Board of Directors of DFCCIL comprises the Chairman, Managing Director, four whole time directors – Director Finance, Director Infrastructure, Director Project Planning and Director Operations & Business Development; two part-time official Directors and two part-time non-official independent directors. During the construction phase overall staff strength of DFCCIL would be 930, with 30 staff in each field office. Current staff strength is around 350, of which 140 are on deputation from Indian Railways (IR). Officers on deputation from IR are experienced in the project management systems, standards and practices of IR.
A MOU is drawn up annually between DFCCIL and IR in accordance with guidelines issued by the DPE. Construction targets and milestones are defined in the MOU. Progress of DFCCIL is appraised in respect to targets set in the MOU. There will also be suitable incentive/penalty scheme based on key performance indices.

Construction of the Eastern DFC is headed by Director Project Planning (PP) and that of Western DFC by Director Infrastructure located at DFCCIL corporate headquarters, working through its field units. Each field unit is headed by a Chief Project Manager (CPM).

DFCCIL has also adopted the matrix structure with personnel reporting to the CPM and their functional heads at headquarters. The advantages that are accrued from matrix structures are evident from various studies (Larson & Gobeli 1989), (Chuah, Tummala & Nkasu 1995).

3.Project Financing

IR projects are generally financed by Budgetary Support and internal resources. However IR has resorted to financing from external agencies in case of very large projects. KRC was the first BOT project constructed with equity participation of IR and the State Governments of Karnataka, Kerala, Goa and Maharashtra. This was followed by the Joint Venture Pipavav Railway Corporation Limited (PRCL) between IR and Gujarat Pipavav Port Limi-5.3(K)-6.4(3 Tc -.0015 T

Rewari section; the second phase for the 568 km JNPT-Vadodara section. JICA's loan flows to IR through MOF as part of GBS.

- World Bank-IBRD funding is proposed at USD 2.7 billion for construction of the 1188 km Ludhiana-Mughalsarai section of the Eastern DFC. World Bank Loan is structured through Adaptable Programme Loan (APL) scheme for sequential funding of the sections based on a trigger system which takes into account progress of previous sections with regard to land acquisition, civil contract award etc. For this purpose the 1188km Ludhiana-Mughalsarai section has been divided into 3 sections: the first section being funded is the 343 km Khurja-Kanpur section(termed as APL-1), followed by the Kanpur-Mughalsarai section(APL-2) and Ludhiana-Khurja section(APL-3). World Bank loan flows directly to IR and then to DFCCIL on back to back basis.
- The 122 km Mughalsarai-Sonnagar section of Eastern DFC is being funded by IR's internal resources.
- The 524 km Sonnagar-Dankuni section of Eastern DFC will be funded by a public-private partnership method.

IR will pay DFCCIL track access charges for use of DFCs' tracks by IR's freight trains. Track access charge will have a fixed component covering all the fixed charges including debt repayment and variable costs will cover operation and maintenance expenses.

4.Land acquisition process

Land acquisition for DFC involves over 11,170 hectares spread over 49 districts in seven states. Given the high population density of Indistruurate prs

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undertake land surveys and coordinate with the local revenue departments. DFCCIL is also hiring NGOs to assist in community participation, livelihood and skill improvement activities and to support affected persons in articulating their grievances.

IR/DFCCIL has developed a well-defined institutional procedure for handling grievances and complaints relating to land acquisition. The authority appointed for carrying out land

carries out preliminary site surveys and concept design whereas the contractor performs detailed engineering design and surveys appropriate to the contract time and cost. This type of contracting strategy is most appropriate in situations with low uncertainty of product and high uncertainty of the process of delivery (Turner & Simister 2001). DBLS type contracts effectively transfer the design risk from the owner to the contractor. The contract has an in-built incentive component for the contractor to ensure the accuracy of surveys and the quality of design (World Bank 2011).

Further, DFCCIL has adopted the FIDIC Yellow Book (Federation Internationale des Ingenieurs-Conseils(FIDIC) 1999), with certain modifications listed below, for all its contracts, instead of IR's General Conditions of Contract (Engineering Department, Indian Railways 2010) to transfer some risks from employer to contractor to achieve higher certainty of cost and time:

i. Clause 1.9 – Errors in Employer's requirements

ii. Clause 4.7 – Errors in setting out

iii. Clause 4.10 – interpretation of site data

iv. Clause 4.12 – unforeseeable physical conditions

v. Clause 8.3 – Programme – Deletion of variation on account of future events or circumstances

vi. Clause 8.4 – Extension of time for completion on account of adverse climatic conditions

Table 5: FIDIC Yellow Book vis-à-vis IR General Conditions of Contract

No	Railway general contract conditions	FIDIC Yellow Book conditions
1	Design responsibility with Employer	1. Only indicative design given by Employer to Contractor. Contractor is responsible for developing all design- Preliminary Design, Definitive Design and "Good for Construction Drawings".
2	Work is done and measured in terms of quantities for separate items. Payment as per Bill of Quantities. The quantity estimation risk is with the employer.	2.Works is done and payment made on Design Build Lumpsum basis. Quantity estimation risk transferred to Contractor substantially.
3	Contract Administration by Employer	3. Contract Administration by ENGINEER on behalf of Employer
4	Low price certainty	4. High price certainty

The implications of adoption of FIDIC Yellow Book vis-à-vis IR General Conditions of

-A “General Consultant(GC)/Engineering Services Consultant(EC)” appointed for each section of DFC to prepare the scope and the engineering plans before bidding and for rendering technical advice in the design of the project

- A “Project Management Consultant (PMC)” being appointed for supervision of construction work relating to contract management, construction supervision, monitoring time schedule, checking and approval of designs and drawings, quality checking, ensuring work site safety, preparation of operation & maintenance manuals for various components of works. The PMC will also perform the function of “Engineer” as required under FIDIC contracts.

-A “Design Review Consultant” appointed to review preliminary designs against international good practices, as well as to conduct value engineering.

-A “Civil Engineering Proof Consultant” appointed to verify the accuracy of surveys, quantities, material sources and cost estimates for civil and track works on a sample basis.

- A “Legal Advisor” appointed is to provide advisory on the preparation of bid documents, assistance during the bidding process and also to coordinate contract management activities once the main contracts have been awarded.

-A “Quality and Safety Audit Consultant” to be appointed to assist DFCCIL to monitor construction quality, and the implementation of safety plans during project implementation.

6.Discussion

A large number of stakeholders are involved in the DFC project implementation. They include the IR, zonal railways, Planning Commission, MOF, Ministry of External Affairs, DFCCIL, lending agencies (JICA and World Bank), nine state governments (Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Rajasthan, Gujarat, Maharashtra, Delhi), land owners and project affected persons, contractors, material suppliers and consultants. The relationship between these stakeholders is depicted in Figure 2. Effective coordination among these stakeholders is being facilitated by a cell in Ministry of Railways to expeditiously resolve financial, environmental, social, land compensation, resettlement, engineering, contractual, legal and organizational issues which are critical for successful completion of the project.

Figure 2: Stakeholder relationships

It may be recalled that the major reason for time and cost overruns of IR projects has been the

(iii) Changes in scope or delay in finalization of the scope

	control over sub-contractors	
(xiii)	poor site coordination due to lack of coordination between site and design office, non-availability of drawings/designs on time, unrealistic time schedule built in the contract	Suitable provisions such as periodic submission and review of drawings/designs by the contractor prior to commencement of relevant portion of work, adoption of consistent drawing software across all contracts etc. aim at reducing these risks. Extensive due diligence by DFCR and lending agencies (JICA and World Bank) has been carried out to avoid the error of committing to unrealistic time schedules.
(xiv)	improper planning in ignoring extreme weather conditions which lead to low labour productivity and therefore lead to errors in time estimation; in planning for recruitment of skilled operators for specialised equipment; in planning the requirement of equipment and their utilisation	Measures such as indicating site climatic conditions in the bid documents and preparation of Safety, Health and Environment with appropriate penalty/incentive mechanism aim at mitigating risks emanating from low labour productivity due to extreme weather conditions. To address the issue of errors in estimation of requirement and deployment of specialised equipment and skilled operators for such specialised equipment, bid conditions require bidders to include their deployment programme for construction machinery and specialised equipment and required construction organization as part of their Technical

contracting; supporting consultants evaluation and selection methodology; efficacy of