INDIAN INFRASTRUCTURE SECTOR: MAXIMIZATION OF PROJECT OUTPUT THROUGH OPTIMIZING FLEXIBILITY AND CONTROLLABILITY

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Abstract: *The objective of this paper is to study the nature of one key flexibility parameter of Infrastructure Project and its implications on performance over the controllability issue. Any infrastructure project would call for creating interim constraint over the public goods and public functions, High Capital expenditure, Long gestation period and uncertain returns. These Projects are susceptible to the perils related to Technology/ Design, Construction, Operations, Market, Foreign Exchange. This is also susceptible to Macroeconomic risks like – Political or Regulatory risk, Environmental Risk, Force Majeure Risk. The ideal situation for any Government is to achieve equilibrium between Flexibility and Risk Evasiveness by introducing proper measures in the area of controllability. This paper tries to analyze the impact of Flexibility and controllability over the output of Infrastructure Projects.*

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Introduction:

Indian infrastructure sector was deeply influenced by the state led policies till 90s. Initially the model worked well but gradually it started losing its focus and there were severe productivity efficiency issues. The fast growth of Indian economy demanded speedy and efficient implementation of infrastructure projects, which brought forth a felt deprivation to augment capacity and improve deficiency. The necessity to bring in flexibility within the project delivery system became a key issue. A key transition has been observed from monopolistic to a competitive market structure with regulatory oversight. However the result of this transition has been a "mixed bag performances", (Economic Survey, Ministry of Finance, 2010-11). The challenge is to keep pace with the growing Indian economy. Acknowledging this, Govt of India has adopted the approach of "faster, sustainable and more inclusive growth" to the Twelfth Five year plan. This would require an investment of 1 trillion as described in Table 1.

Table 1: Projected Investment during the 12th Five Year Plan:

	Base Year (2011-12)	Year 2012-13	Year 2013-14	Year 2014-15	Year 2015-16	Year 2016-17	Total 12th Plan
GDP at Market Prices (Rs. Crore)	63,14,265	68,82,549	75,01,978	81,77,156	89,13,100	97,15,280	4,11,90,064
Rate of Growth of GDP (%)	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Infrastructure investment as a percentage of GDP	8.37	9.00	9.50	9.90	10.30	10.70	9.95
Infrastructure Investment (Rs. CroreI	5,28,316	6,19,429	7,12,688	8,09,538	9,18,049	10,39,535	40,99,240

Source: Planning Commission of India, January 2011

Definition of Flexibility – External Flexibility is best described by the maxim of not putting all of one's eggs in a single basket (Ansoff, 1965) Flexibility can be defined as 'the ability to change or react with little penalty in time, effort, cost or performance' (Sushil, 2000 and 2000a). Flexibility is a multi-faceted concept with different connotations, paradigms, foundations and dimensions. Strategic, Organizational, Financial, Information Systems and Manufacturing flexibility have been identified as cornerstones of enterprise flexibility (Sushil, 2000). Flexibility is not shifting to extremes, but to dynamically balance them. There are many connotations of flexibility like agility, adaptiveness, responsiveness, versatility, etc. One popular view of flexibility can emerge by mapping it on to functional structure (Sushil ed., 2000): Strategic Flexibility, Manufacturing Flexibility, Human Resources Flexibility, Financial Flexibility, Technology Management Flexibility, Marketing Flexibility, Organizational Flexibility, IT/ IS Flexibility.

During the past few years, organizational agility has gained prominence as a competitive weapon in both the academic and business communities. This can be applied to the Project Organization (PMO) of a large infrastructure project.

Key Flexibility Parameter (large scale infrastructure Project) – Public Private Partnership (PPP) delivery Model [Variable: P]

Overview of Infrastructure Projects in India:

Recent statistics from MoSPI, for May 2011 continue to show cost and schedule overruns specially in the high value projects category. For 567 central sector projects above Rs 150 Crores being monitored by MoSPI, the anticipated completion cost is likely to be 7,58,172 Crores vis a vis total original cost of about Rs 6,32,244 Crores reflecting a cost overrun of 19.90 %.

In the early 1990s, developing countries incurred annual losses of about $180 billion due to mispricing and technical inefficiency in water, railroads, roads and electricity nearly as much as annual investments in these sectors. Debt and Fiscal crisis combined with weak performance simulated string pressure for infrastructure reform. At the same time infrastructure has risen up the political agenda and attracting public attention.

As per the details available from the PPP India data base maintained by DEA, 300 PPP Projects were undertaken on PPP mode with total project cost of Rs135876 crores as reflected in Table 2.

Table 2: Sector-wise figures

Sector	Total Number of Projects	Based on 100 Crore	Between 100 to 250 Crore	Between 251 to 500 crore	More than 500 Crore	Value of contracts (in Rs Crores)
Airports	6	-	-	1	5	20.041
Ports	38	4	5	6	23	43,053
Railways	3	-	1	2	-	1,007
Roads	186	86	23	54	23	47,756
Urban Development	35	28	4	1	2	6,218
Energy	32	13	4	7	8	17,802
Total	300	131	37	71	61	135,876

(Source: PPP India Data Base)

The objective is to create a conducive environment so as to utilize the efficiencies, innovativeness and flexibility of the private sector to provide better infrastructure and service at an optimal cost. This would require setting up of a transparent, consistent, efficient administrative mechanism to create a level playing field for all participants and protect interest of all stakeholders. It's important to prepare a shelf of projects to be offered for PPP and take them forward with assistance of the owner departments through a transparent selection process. Putting up in place an effective and efficient institutional mechanism for speedy clearance of the projects. Provide the necessary risk sharing framework in the project structure so as to assign risks to the entity most suited to manage them. Create a robust dispute redressal mechanism / regulatory framework for PPP projects. To provide the required viability gap funding where the essential projects are intrinsically unviable.

Public Utility Projects such as road, sanitation, water supply, health care, etc. have been traditionally funded out of budgetary allocation. Whereas, there has been incremental addition to the budgetary support since independence, budgetary provisions towards development and upkeep of these services have remained grossly inadequate over the years.
Since beginning of last decade, as a result of economic reforms, a paradigm shift in funding of such projects has been taking place. Acts have been amended to allow private investment in public utility projects.

The Central government has formulated a scheme for supporting such projects in a big way. The intention is to help develop a better infrastructure by involving the private sector, whereas the Government plays the role of a facilitator and sets the frameworks in place, and the private sector chips in with the financial support for such infrastructure projects.

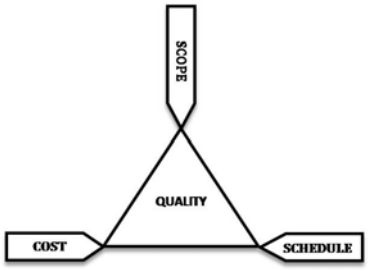
To offer a proper financial support to public private partnerships in infrastructure, the central government has devised a scheme known as VGF (Viability gap Funding). Under this, the central government provides a grant up to 20% of the total project cost to the private developer.

State Govt [Government of Madhya Pradesh for example] also decided to extend grant up to 20% for such projects. This way, the project, which could otherwise remain unviable, become financially viable and attractive to the private sector.

Let us analyze the reasons for necessity of Private Investment:

Inflow of Private Investment (PI): Budgetary allocation for such infrastructure project is limited. There is acute need of private investment to address VGF.

Increase in Efficiency (E): The sheer objective of Private sector to follow Project Management Triangle would reduce the cost and schedule keeping the quality aspect same. Management of scope is on of the key area that needs to be addressed.



Innovation aspect (I): The Innovation aspect has to be brought into the system to cut cost and time. This will bring in innovative design and construction practices in the field of Infrastructure Sector.

Assured Maintenance (M): During the Concession Period, the PPP Concessionaire will be required to maintain the Projects in a predetermined manner.

So P is the function of {PI,E,I,M} = mathematically we may Flexibility parameter PPP denoted by P as P=f{PI,E,I,M} with Constraint (Controllability = 0)

Infrastructure Project Result (Output) = f(P) All other flexibility parameters are constant; and Constraint parameter (Controllability) = 0

Our intent is to maximize one key parameter of Output (O), that is Quality (Q) with inclusion of Controllability Parameter for the Infrastructure sector.

Let us analyze the sub parameters of Output(O) = F{Quality ,Cost ,Scope , Schedule}

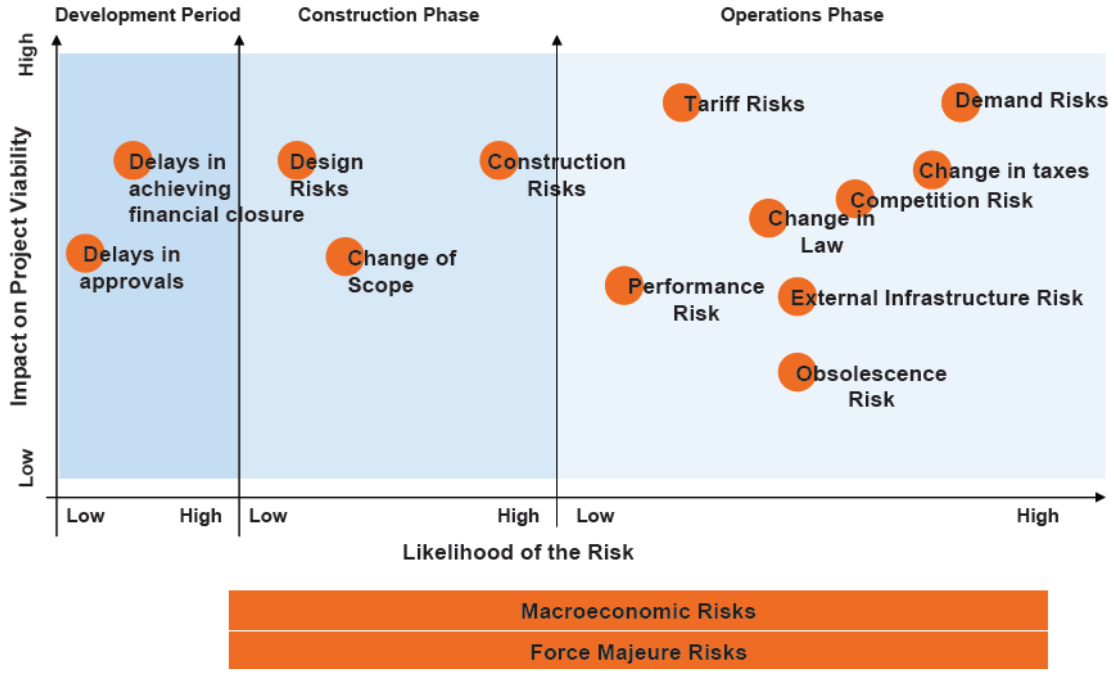
The objective is to Maximize (Q) by optimizing (C,S,SH) which is eventually a function of (Private Investment, Efficiency, Innovation, Maintenance)

Issue of controllability:

Indian infrastructure sector is ushered with several opportunities (flexibility variables/parameters) such was exponential demand to support economic growth, technological sophistication to attain innovation, information technology implementation, innovative service delivery model such as PPP amongst others. Though all this positive indicators bring in unprecedented Flexibility in Project delivery system but the success of this sector also depends on the extent of achievement in terms of timely and within budget completion. It is needless to say that a proper control system needs to be imbibed through PMO, which would reduce the risk of the Project.

The diagram below depicts the intensity of Risk in a PPP project with respect to different phases of its deliverables:

Diagram 1: Intensity of Risk in a PPP Project.



Definition of Controllability: In order to be able to do whatever we want with the given Dynamic system under control input, the system must be controllable.

General Control mechanism:
(KPMG and PMI conducted a survey in the year 2010 on this, and key findings are as follows)

- Progress reports are the most frequently used tool for project monitoring – This needs to be generated / monitored/ discussed and audited on a periodic basis.
- Responsibility-accountability matrix is the most effective control currently in use
- Robust review mechanisms are most preferred to control overrun
- Project management office is gaining acceptance as an independent monitoring agency

Mostly the infrastructure projects are high valued projects with long timeline. As projects become more and more complex the key stakeholders of Project organization depends fully on the team members for the information related to large value capital expenditure. As a result the PMO system becomes vulnerable to the considerable amount of risk of over dependence on the Project Team. This calls for independent project monitoring and reviews mechanism with mature oversights.

Which includes not only the monitoring of project governance vis a vis baseline but also in terms of over all project objective (desired output), HR, Predictive analytics in terms of capital expenditure, risk assessment and mitigation plan etc.

Componentization of key operation modules and optimization of resource allocation in a flexible manner is the key success factor to achieve over all project deliverables. So this is imperative that success of the project lies in the process of controls embedded in their respective delivery framework.

The objective of controllability (PMO) is to create value beyond created by the individual project teams.

To address the issue of controllability in a specific large scale PPP project, a Supreme Audit Institution has been formed in view of the following:

In a PPP engagement Private Partner controls the majority of the stake, where as Public Sector owns usually a minority share of stakes of the whole engagement entity.

The core objectivity of the PPP model is to bring in funds through the private sector partner as this would allow perceived risks to get transferred to the private sector partner. This would

also bring in much effective work culture and faster decision making process (free from red tapism). The focus is the end result and creating a differentiating means to achieve them.

The Govt intervention to this whole initiative can be explained through controllability issues. Almost all the infrastructure projects have a political angle to accomplish and needless to say that it has a very strong public view. The Govt is answerable to the public for the result of the project but not on the means of it.

Govt needs to ensure value for money to all transactions. This can only be done through covering all aspects of the project such as contracting and execution. The objective is to create an environment, which provides enough freedom to the arrangements. As these projects have very strong public view, its important to control scope creep to achive desired result. Involvement of Govt is aimed to provide assurance to all the key stake holders about the wisdom, faithfulness, integrity, economy, efficiency and effectiveness of the PPP arrangement and to protect Public Interest by restoring accountability and integrity, improve operations, and install confidence among citizens and stakeholders

The SAI conducted PPP Project audit considers following aspects of the engagement:

1. Data Management and Documentation of records, which include process of document management. The documents include accounting documents as well. This controllability measure can be parameterized as D.
2. Private sector partner identification and selection – the whole bidding process can be denoted as (Ps)
3. Quality measurement and restoration of standard of services can be denoted as (Vm)
4. Asset Management and Revenue sharing model escrow accounts.(Om)
5. End of the project operations including valuation of residual assets, decommissioning, dispute resolution mechanism, etc (AM).

Maximize Project Output/performance by optimizing {(D),(Ps), (Vm), (Om), (AM) }

The model that can be built from the above understanding -

Flexibility perspective: The objective is to Maximize Quality (Q) by Optimizing Cost, Scope and Schedule (C,S,SH) which is eventually a function of Private Investment, Efficiency, Innovation and Maintenance (PI,E,I,M)

Controllability Perspective:

Maximize Project Output/performance by optimizing Documentation, Private Partnering Process, Quality measurement, Asset Management and End of Project Operation activities {(D),(Ps), (Vm), (Om), (AM) }

Case Study:

Hyderabad International Airport : Hyderabad International Airport is situated at a strategic location of Shamshabad. With a capacity of servicing 5 million passengers per annum. The objective is to scale up the capacility level to service 40 million passengers per annum. The airport was commissioned on March 2008. The initial estimated project cost was Rs 1760 crs. The estimated project cost was revised to Rs 2478 crs on account of construction of additional facilities including a common fuel farm and business hotel.

The PPP was conceived on on BOOT model. The concession period was 30 years. The parameter was the percentage of share of Revenue. It is the only airport under PPP which has used cash grant of Rs 107 crs from the government. As Concession fee in lieu of the concession granted, HIAL will pay GOI a fee amounting to four per cent of Gross Revenue annually.

Table 3: Details of Equity:

Srl No	Investor	Country	% Holding	Amount in Crores
1	Airport Authority of India (AAI)	India	13	49.14
2	Government of Andhra Pradesh	India	13	49.14
3	GMR Group	India	63	238.14
4	Malaysian Airport Holding Berhard	Malaysia	11	41.58
	Total Equity		100	378.00

Analysis:

Let us analyze the case in terms of Flexibility perspective. The objective was to deliver quality service delivery model to public by minimizing cost over-run, schedule over-run and

scope creep. For which it was necessary to have Private Investment, efficiency, Innovation and assured maintenance. Engagement of Private parties brought in enough private investment mentioned in Table 3 to commission the project. GMR Group brought in efficiency (flexibility in processes) and Innovation derived over the experience of delivering similar kind of projects.

Innovative Modular scalable service delivery infrastructures were created to adopt flexibility. The airport which was commissioned in a record time of 31 months, has an initial capacity of 12 million passengers per annum (MPPA) and 100,000 tons of cargo handling capacity per annum. The Project has the flexibility to increase capacity to accommodate over 40 MPPA and shall be developed in a phased manner.

From controllability Stand Point:

Let us analyze the control parameters which include the following:

- Effective Share Holder communication –
- Sound Financial Controls
- Market Knowledge and procurement advice
- Contract Management and delivery skills
- Benefit realization process
- Robust Business Case
- Adequate skills and resources
- Ongoing Risk Management Process
- Clearly defined roles and responsibilities
- Pre-agreed critical success factors
- Project Governance

AAI and Govt of AP ensured the flow of healthy communication between all the stake holders. A communication matrix (plan) was set up across the PMO , which was monitored and executed properly. SAI (Supreme Audit Institution) ensured sound financial control of the project. They also informed PMO about the risk involved in the procurement process. Macroeconomic Risk elements were also determined. Tangible benefit realization process was set up and monitored.

From Controllability perspective following issues were observed (end of project operations)

1. Charge out rate: Severe Resistance was observed for increasing the user charges.
2. **Absorption of Existing Staff:** Existing staff of the airport are not too keen in joining the private sector. Govt has offered them VRS and the cost is borne by the Private sector. The challenges were more at the Delhi and Mumbai airports. This issue is going to be there in other airports also. It needs to be dealt convincingly.

3. **Subsidies and Concessions:** Because of the recession Aviation Industry is passing through a rough phase. Steep fall in the air passenger traffic has caused Private Developers asking for subsidies and concessions in the form of increasing User Development Fee (UDF). This was not included in the agreed terms and conditions. There may be a provision incorporated in the concession agreement in extending or removing the subsidies and concessions if the traffic numbers falls outside the expected or predefined range. So the entire risk of traffic is not born by the private developer.

Conclusion:

Infrastructure sector in India have been feeling the pressures of coping up with the economic growth. Govt of India has taken a policy to incorporate flexibility in the delivery model by introducing PPP. To ensure public interest/quality of service enough measures have been taken in terms of controllability. The growth of this Infrastructure sector largely depends upon the point of equilibrium between flexibility and controllability parameters. Today the success of infrastructure sector depends on its contribution towards achieving overall economic growth of the country. Attempt has been done through this study to understand the relationship between flexibility and controllability on the infrastructure project performance. There is huge scope for exploring and understanding the dynamics of flexibility and controllability for the infrastructure sector in India. Some of the areas of further research include identification of flexibility and controllability parameters, developing a flexibility / controllability index for the Indian Infrastructure sector.

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