

Aviation Development scenario in India- Experience from past projects to improve preparedness for expected traffic growth due to policy interventions

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Abstract: This paper examines the history of aviation industry in terms of creation of infrastructure and the sustainability of the current approach to the growing traffic. It reviews the drivers for aviation growth and challenges, including those related to the airport development stakeholders. A study of the time overrun aspects of projects has been undertaken during last growth phase of aviation sector in India, since mid-1990s, largely during post liberalization period. This study has also analyzed past airport development projects, which includes Greenfield as well as redevelopment/ up gradation of existing facilities to identify project procurement, planning, monitoring and control intervention required. This paper is part of a study that looks at wider implications of airport development policy directions to deal with challenges for the growth phase as a result of Aviation Policy in view of the past experiences; the objective being the readiness/ strengthening the capacity of airport development stakeholders to meet the objectives of Aviation Policy.

The second part of this paper identifies the delays in aviation infrastructure development through a comprehensive literature based studies, and archival database of Airports Authority of India. 13 categories of delay parameters have been established through this work, which have further consolidated under 10-heads and 60-factors.

Key words: Aviation infrastructure, time overruns, Greenfield airports, PPP mode, LCCs.

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I. Introduction

1.1. History of Aviation and Aviation Infrastructure in India: -

Indian aviation in last 25 years have witnessed unprecedented ups and downs for all stakeholders including Airlines, Airports, regulators and the primary users i.e. Passengers and Cargo agencies. Since 1953 only two National air carriers were allowed to operate. With the open sky policy of early 1990s, the monopoly of Government Airlines, Indian Airlines (Domestic carrier) and Air India (International flag carrier) ended when in 1994, Government of India allowed Private Operators to provide air transport services by repealing Air Corporation Act 1953.

However, within 6-7 years of liberalization, many airlines like ModiLuft, East west, NEPC airlines, Damania etc. were introduced and closed also, due to various reasons including viability issues. Again in 2003 Low cost carriers (LCCs) were introduced in India with air services by Air Deccan. Other Low cost carriers (LCCs) like Air Sahara etc. also started low cost services which resulted into cut throat competition and predatory pricing regime. However, this triggered an unprecedented traffic growth due to very low air fares as middle class Indians also started travelling by air. At one point of time the number of first time travelers were more than normal air travelers. The average annual growth of domestic traffic rose up to 38.6% in 2006-07 and at some of the airports the annual traffic growth was even more than 45%. The airport infrastructure capacity crossed saturation point within a year. The traffic growth figures shown in the table-1, indicate the sudden growth in air traffic during 2003 to 2008 when Indian middle class took to wings in an unprecedented way.

Table 1 Aviation Passenger Growth (1995-2018)

| YEAR | International | | Domestic | | Total | |
|---------|---------------|-------------|-------------|-------------|--------------|-------------|
| | No. in lakhs | %age change | No.in lakhs | %age change | No. in lakhs | %age change |
| 1995-96 | 114.50 | - | 255.64 | - | 370.14 | - |
| 1996-97 | 122.24 | 6.8 | 242.76 | (-)5.0 | 365.00 | (-)1.4 |
| 1997-98 | 127.83 | 4.6 | 238.49 | (-)1.8 | 366.32 | 0.4 |
| 1998-99 | 129.17 | 1.0 | 240.73 | 0.9 | 369.90 | 1.0 |
| 1999-00 | 132.93 | 2.9 | 257.42 | 6.9 | 390.35 | 5.5 |

| | | | | | | |
|---------|--------|--------|---------|--------|---------|--------|
| 2000-01 | 140.09 | 5.4 | 280.18 | 8.8 | 420.27 | 7.7 |
| 2001-02 | 136.25 | (-2.7) | 263.59 | (-5.9) | 399.84 | (-4.9) |
| 2002-03 | 148.26 | 8.8 | 288.97 | 9.6 | 437.23 | 9.4 |
| 2003-04 | 166.41 | 12.3 | 321.38 | 11.2 | 487.80 | 11.6 |
| 2004-05 | 194.24 | 16.7 | 398.59 | 24.0 | 592.84 | 21.73 |
| 2005-06 | 223.67 | 15.52 | 509.82 | 27.90 | 733.49 | 23.70 |
| 2006-07 | 257.78 | 15.2 | 706.25 | 38.6 | 964.03 | 31.4 |
| 2007-08 | 298.18 | 15.7 | 870.68 | 23.3 | 1168.86 | 21.2 |
| 2008-09 | 315.84 | 5.9 | 772.95 | -11.2 | 1088.79 | -6.8 |
| 2009-10 | 343.68 | 8.8 | 893.88 | 15.6 | 1237.55 | 13.7 |
| 2010-11 | 379.08 | 10.3 | 1055.23 | 18.1 | 1434.30 | 15.9 |
| 2011-12 | 407.96 | 7.6 | 1215.07 | 15.1 | 1623.03 | 13.2 |
| 2012-13 | 430.34 | 5.5 | 1163.67 | -4.2 | 1594.01 | -1.8 |
| 2013-14 | 466.20 | 6.9 | 1222.96 | 5.1 | 1689.16 | 6.0 |
| 2014-15 | 507.98 | 9.0 | 1392.04 | 13.8 | 1900.02 | 12.5 |
| 2015-16 | 550.00 | 8.1 | 1690.00 | 17.7 | 2240.00 | 17.90 |
| 2016-17 | 592.80 | 7.6 | 2016.80 | 18.2 | 2649.70 | 18.30 |
| 2017-18 | 655.00 | 10.4 | 2433.00 | 18.30 | 3088.00 | 16.5 |

Source: www.aai.aero, 2018

1.2 Growth Point in Aviation Infrastructure: -

Airports authority of India was not ready for this unprecedented traffic growth as traffic growth in preceding 5 years of the year 2002-03 was low and fluctuating. As a fire fighting measure AAI started working on a road map with two pronged approach. Considering limited funds available in terms of reserves and surpluses, AAI decided to take up tier II and Tier III level non metro airports for development and up gradation of facilities to create capacity before demand. Thus development of 35 non metro airports took off with internal resources generated by them. However, Delhi and Mumbai gateway metro airports which handled around 60% of total traffic at Indian airports, needed huge funds for upgradation to international standards. Considering huge investment requirements, Government of India decided that these two airports should be developed on Public Private Partnership mode (PPP mode) and at least one partner in Joint venture should be an airport operator of international repute. The JV agreements were signed in 2006 and both airports were handed over to JVCs in May 2006 for 30 years extendable to another 30 years.

Simultaneously decision was also taken for development of two more green field airports at metro cities of Bengaluru(Devanhalli) and Hyderabad(Shamshabad) in Private sector. However, these airports were to be developed at the cost of closure of two existing airports of Airports Authority of India(AAI) in these cities. The decision was opposed by staff Unions and officers' Associations of Airports Authority of India citing the examples of more than 25 cities in the world having more than one airport like London, New York etc. During the period of 2006 to 2009 six Joint Venture Airports were developed in India.

II. Airport Infrastructure Challenges:

2.1: Policy Initiatives for uniform traffic growth and airport Infrastructure:

There is a need to consider changes in Project Delivery modes including Joint Ventures for Airport Development to ensure low tariffs and low fares to attract 300 million strong Indian middle class to airports. Traffic growth by keeping low fares is considered the only remedy to attract highly price sensitive market of Indian middle class.

Government of India has announced a "National Civil Aviation Policy 2016" in June 2016 which primarily focuses on developing regional connectivity by capping one hour (around 500 kms) air travel fare to Rs.2500/- (almost equal to 2nd AC train fare) by introducing a levy on trunk route flights to establish the Regional Connectivity Fund. The rate of levy is Rs.5000/- per flight departure, being operated within India. The amount thus likely to be collected for Regional Connectivity Fund will be around Rs. 3600 Million. Under Regional Connectivity Scheme priority is to connect the remote areas of India through fixed wing aircraft and helicopters.

India has around 300 million strong middle class who can afford to travel by air, in case the fares are brought to a level of 2nd class AC train ticket. As envisaged in NCAP 2016, the economy class fare is to be capped to Rs.2500/ for one-hour air travel to remote cities (Tier II and Tier III cities) by introduction of a levy on trunk route air travel tickets to generate Regional Connectivity Fund (RCF) for providing subsidies to airlines operating to remote areas of India. The domestic traffic at Indian airports was 243 million passengers in 2017-18 and international traffic of 66 million passengers i.e. total 309 million Passengers against a total capacity of 270 million. Assuming that the whole middle class travels once in a year (to and fro), the traffic is expected to jump from 309 million to 600 million within 5 years. The domestic passenger traffic in last 5-6 years has grown at a rate of around 17% basically due to advantage of reduced crude oil prices, passed on by airlines to passengers to

some extent. This growth has triggered another round of congestion at airports as the buildings and other airport infrastructure has reached saturation and has started bringing down the level of Service (LOS).

2.2. Past Experience of Airport Projects-

Are our airports and airlines ready for this type of growth? The answer is no. Though airlines like Indigo, Spice Jet etc. have placed big orders for procurement of aircrafts, the time lines for supply are long. To tide over the situation, the airlines can go for leasing of the aircrafts till procurements are materialized. But Airports will have to immediately go for expansion and upgradation of facilities to meet the demand.

Around 2003-2004, AAI started developing 35 non metro airports and another 26 airports to tide over the problem of sudden capacity requirements. Simultaneously there was demand for development and upgradation of Metro Airports like Delhi and Mumbai also as these two airports were handling around 55 to 60% of the total traffic in India. Therefore, after detailed deliberations it was decided that AAI will invest in development of around 60 airports including 35 non metro airports and Joint venture route shall be adopted to attract investment in profitable Metro airports. Thereafter Delhi and Mumbai airports were handed over on lease to Joint Venture companies, DIAL and MIAL under Operations, Management and Development Agreement (OMDA) with JV partners on revenue sharing basis. Meanwhile two green field Airport projects at other two Metro cities of Hyderabad and Bengaluru were given green signal by Government of India. However, the existing airports in these cities which were almost saturated were decided to be closed on operationalization of new airports.

1. Though all efforts were made to ensure effective and efficient Project Management of these Projects, most of the projects faced various types of problems which resulted in time overruns in almost all AAI projects. A list showing projects during this period and time overruns is shown in table-2 (AAI Workshop on "Enforcement of contract clauses and Timely recovery"-Time and cost overrun in AAI projects-causes and solutions. 2012).

Table-2 Case study of Projects in AAI (2012)

| | | |
|---|----|---------|
| Total Ongoing Projects | 52 | Table 3 |
| Projects in Progress within time | 0 | |
| Projects delayed upto 25% of stipulated time | 06 | |
| Projects Delayed upto 50% of stipulated time | 08 | |
| Projects Delayed more than 50% of stipulated time | 38 | |
| Status of Mega Projects at Kolkata & Chennai Airports | | Table 5 |

Status Of Ongoing Projects

Engineering Works Table 3

| Region | Total On-going Projects | Projects in progress within time | Delay up to 25% of Stipulated time | Delay up to 50% of Stipulated time | Delay more than 50% of Stipulated time |
|---------------|-------------------------|----------------------------------|------------------------------------|------------------------------------|--|
| Northern | 06 | 0 | 01 | 01 | 04 |
| Southern | 08 | 0 | 02 | 0 | 06 |
| Western | 7 | 0 | 01 | 02 | 04 |
| Eastern | 11 | 0 | 01 | 03 | 07 |
| North-Eastern | 03 | 0 | - | - | 03 |
| TOTAL | 35 | 0 | 05 | 06 | 24 |

CNS Works Table 4

| Region | Total On-going Projects | Projects in progress within time | Delay up to 25% of Stipulated time | Delay up to 50% of Stipulated time | Delay more than 50% of Stipulated time |
|-------------|-------------------------|----------------------------------|------------------------------------|------------------------------------|--|
| All Regions | 17 | 0 | 01 | 02 | 14 |

Status Of Mega Projects At Kolkata & Chennai(In 2012)-Table 5

| PARAMETER | Kolkata Airport | Chennai Airport |
|-------------------------------|--------------------------|--------------------------|
| Estimated Cost (Crs.) | 1602.61 | 1808.00 |
| Stipulated Date of Completion | 05.05.2011(now complete) | 23.01.2011(now complete) |
| Physical Progress in 2012 | 93 % | 96.5% |
| Delay | 33% | 54% |

The review of documents related to projects indicate following as major reasons for time overrun and cost overrun: -

I Preparation of Faulty Estimates:

- Inadequate site condition survey/data for finalizing Scope of Work
- Improper Design & Drawings
- Unrealistic Time Period fixed for Completion
- User Consultation Process not done.
- Rates not based on actual market rates
- Narrow range of approved makes
- Non- consideration of rehabilitation of existing

Structure/services at the time of planning

- Factors of insurgency / disturbed area

II Delay in applying/issuing of NOC / clearance from statutory authorities

III Delay in Environmental Clearance

IV Non-availability of complete land/site free from encumbrances

V Selection of consultant & contract agencies:

- Selection without assessing Technical & Financial capability
- Lack of experience in similar nature of work

VI Delay in issue of working design & drawings

VII Delay in issue of NOTAM (Notice to airmen) – indicative of prior lack of coordination

VIII Frequent changes in scope of work, drawings & specifications

IX Delay in rehabilitation of existing structures / services

X Non-availability of construction material (points to inadequate site survey resulting into costly substitution at a later date)

XI Incomplete/Improper nomenclature of items in contract agreement

XII Lack of co-ordination amongst the various disciplines and other airport functionaries

XIII Inadequate monitoring system

It can be seen from the details that 38 projects (73%) out of 52 major projects were delayed beyond 50% of stipulated time of completion. 8nos (15.5%) delayed up to 50% and 11.5 % (6nos) delayed up to 25% of stipulated time. It is also observed that CNS (Communication Navigation and surveillance) Projects (Table-4) which have major portion as procurement of equipment, are delayed more than the Civil infrastructure projects.

A list of completed and ongoing projects based on review of records, is also shown in table-6. These projects also indicate similar reasons for time overruns in airport projects.

| | Rwy Ext at Hubli | C/o NTB at Vadodara | Expansion of apron at Imphal | C/o boundary wall at Imphal | C/o boundary wall at Raipur | Expansion/modification of TB at Jammu | C/o Green field at Pakyong | Tezu Airport | Expansion of Chennai airport | C/o ITB at Lucknow | Rwy extn at Jaipur i/c CAT-II light |
|------------------------------------|------------------|---------------------|------------------------------|-----------------------------|-----------------------------|---------------------------------------|----------------------------|--------------|------------------------------|--------------------|-------------------------------------|
| Date of Start | 16.11.13 | 06.07.14 | | 24.08.13 | 11.09.13 | | 29.01.09 | 22.08.12 | 24.11.08 | 20.10.07 | 02.01.14 |
| Schedule date of completion | 15.05.15 | 05.10.15 | 23.05.09 | 31.12.15 | 31.12.15 | 02.10.15 | 28.01.11 | 21.11.12 | 23.01.11 | 19.04.09 | 01.07.15 |
| Actual Date of completion | 31.03.16 | 30.04.16 | 31.03.16 | - | - | - | - | 18.02.16 | 15.05.12 | 31.05.12 | 15.03.16 |
| Revised date of completion | | | WIP | TBC | TBC | Mar'17 | Sept'17 | - | - | - | - |
| Awarded cost AA&ES | 141.44 Cr | 115.97 Cr | 11.83 Cr | 15.10 Cr | 8.2 Cr | | 309.46 Cr | 25.11 Cr | 1212 Cr | 80.10 Cr | 95.92 Cr |
| Completed cost/Revised cost | | 160.20 Cr | - | - | - | 75 Cr | 605.59 Cr | 28 Cr | - | 88.25 Cr | 112 Cr |
| Time overrun | 10 months | 07 months | 82 months | 03 months | 3 months | 06 months | 85 months | 39 months | 16 months | 38 months | 9 months |
| Cost overrun | | 44.23 Cr | | | | | 296.13 Cr | | | 8.15 Cr | 16.18 Cr |
| | | | | | | | | | | | - |

| | | | | | | | | | | | |
|--------------------------------|---|---|--|--|---|--|---|--|---|---|---|
| Factors of time overrun | Delayed DGCA clearance to start the work | Work rescinded and re-awarded -Scope/ design change due Deficiency at planning stage(fo undation changed to piles due wrong soil investigation) | Agitation/ bandh regarding ILP. -Incessant rain. -water logging -non availability of contractors due law and order problems | Legal dispute over land Temple on land (Work started without complete land in possession) | Non availability of complete land(only 75 % available from state authorities) | Space constraints - Hardly any space available for stacking of construction material/ machinery etc. -Due to operational reasons work divided into phases to ensure smooth pax movement | major site handed over in Oct 2009 only -Incessant Rain/Ltd.construction time for earth work (4 months only) -Agitation/ Bandh for 2 years by Gorakha land - attrition of labour due fear of earthquake in Nov2011 - Agitation and closure of work by villagers for Revised compensation. | Permissio n of cutting trees received in January 2014. - Heavy Rain | Decisio n of change of floorin g. - Diversi on of water/ power supply line. State - Bandh/ VIP movem ent | Permis sion to cut to trees at work site. - Handing over of site by the villagers. | -Rain -Extra work at Tango Taxi. -Non-availability of bitumen |
|--------------------------------|---|---|--|--|---|--|---|--|---|---|---|

Case studies of Airport Projects executed or under implementation in other countries were also carried out to examine the time overrun parameters and to ascertain the variation if any in the range of delay causes

International project case studies:

1. “ A study of Project Delay In Sudan Construction Industry” Mohamed BabikirIbrahiem Mohamad. University Tunku Abdul Rahman- Jan 2015

This paper mentions two case studies about airport projects; -

i. Khartoum International Airport(KNIA)- New Khartoum airport to replace existing airport.

Project Agency:-Dorsch Consult Airport Holdings with local sub-contractors.

Estimated Cost;-\$1.8 Billion.

Scheduled completion period - 2003 to 2010. Delayed to 2014.

Reasons;- Increase in cost of construction by \$1 billion., US sanction on Sudan, loss of oil fields due to Division of the country which weakened the economy.

ii. Kuala Lumpur International Airport (KLIA2)-

Reasons for delay were:

-**Design /Scope changes** by clients, M/s Malaysia Airport Holdings Bhd due to indecision regarding Terminal design and facilities to be installed. Automated baggage system was included on request of second stake holder M/s Air Asia Bhd. Air asia also requested for More parking stands and longer runway.

As a result of Scope changes by clients the project was delayed by 1 Year.

The ORAT(Operational Readiness and Transition) took 6 months , which was originally planned for 3 months.

iii. The paper also lists other airports which were delayed due similar problems as **Hong Kong Airport, Bangkok Suvernavhumi and South Korea Incheon Airport.**

2. Project Delays and Cost Overruns(<http://www.dawn.com/news/1175543>)-13th April 2015.

Benazir Bhutto International Airport(BBIA), Islamabad- The construction of new Islamabad airport began in April 2007 and it was scheduled to be completed by 2010 at estimated cost of Rs. 37 Billion.

Now its completion is not expected before December 2016 and actual cost of construction may escalate to Rs.95 billion.

The reasons identified by a high level Committee are;

- Project was redesigned to include longer runway. Various oversight committees at different stages suggested Scope changes which needed CAA Board approval. Land acquisition for Additional second runway also resulted into delay.
- Cost also increased due to dollar appreciation, execution delay and increase in cost of consultancy.
- Lack of expertise in handling mega projects with CAA of Pakistan.

3. Ciudad Real Central Airport in Spain was designed for a handling capacity of 600,000 Passengers annually and this airport was to give a good competition to capacity constrained Madrid Barajas airport. But when this airport was opened in 2009, it could attract only 53000 Pax during its first year of operations and never reached near the designed capacity, loosing several airlines' business and ceasing operations in April 2012. The study (Connectivity and Growth-Issues and challenges for airport investment-"Keeping airport projects on course in a turbulent world." Pierre-edouard Pichot and Richard Scott-2015) shows that the developers of the airport miscalculated a variety of parameters. The new airport was intended to offer competing services to capacity constrained Madrid airport, but Madrid Barajas' fourth terminal construction project reduced the constraint and hence the reason for Ciudad Real Central Airport's existence.

This paper reflects the complexities of the airport projects and therefore emphasises on requirement of designing and constructing airports with careful long-term thinking and integrated planning with flexibility embedded at all stages of the project. Following important aspects have been identified for successful implementation of the airport projects, based on case studies by the authors.

a. **Proper control over the projects** is essentially required to guard against the External factors before taking investment decisions like designed capacity of the airport terminal etc. The airport projects are highly sensitive to geopolitical changes, home contrary's GDP, fuel price fluctuations, devastating events like 9/11 bombing of World Trade Centre in 2001, global financial crisis of 2008, shooting of Malaysian airlines aircraft during Ukraine-Russian conflict (resulted in diversion of flight paths) etc.

These type of events can sharply change the air travel patterns and adversely affect the viability of the ongoing airport projects in the affected area.

b. It is essential that airport developers should engage in Stakeholders consultation well before finalisation of plans to help build a robust business case that is flexible enough to adapt to future shift in trends, including external factors where they have little control. Some of the developers fail to test various possible scenarios to validate model projections which needs both time and patience.

c. Planning For Inevitable Changes/scope changes:

Airport Projects are especially complex because they involve a wide variety of stakeholders, and revenue sources. Their large scope and long timelines from planning to completion, increases the likelihood of design and other changes along the way. In fact the paper goes to the extent of mentioning that "**Scope change is the one sure thing to count on with an airport construction project.**"

Therefore airport developers need to embed the flexibility in the plans and be ready to make changes along the way to take care of the changing scenarios influencing the traffic trends. For example, London's Heathrow airport Terminal 2 project changed the design midway into the project to accommodate the changed requirements triggered by merger and takeover of major stakeholder BMI (airline). This was possible because of strong project control to accommodate a new mix of carriers without time and cost overruns.

Sometimes overoptimistic estimation of revenue and underestimation of project costs results in failure of projects due unviability on opening like Ciudad Airport mentioned earlier. Therefore, designer and planners should be given adequate time to evaluate and analyse all possible scenarios before finalising the plan. The changes in the midst of the project are much more expensive. Qatar's new Hamad airport was delayed due changes and expansion resulting in the cost escalation to \$15 billion at the opening of the airport in 2014.

To minimise the cost of midway scope changes, designers are advised to build flexibility in design by adopting modular concept where the walls can be knocked down to accommodate changes.

Learning from the Past: - The industry can learn from past by maintaining a data bank of similar projects. This will also help planners and investors to get benefits of bench marking. London's Heathrow airport and British airways experienced multiple problems with Terminal 5 opening where on opening day 34 flights were cancelled and 42000 bags could not be shipped with the owners. However Terminal 2 opening had much more successful opening few years later.

4. "Factors contributing to cost Overruns of Construction Projects" By M.S. Ramabodu, JJP Verster University of Free state, Bloemfontein 9300. -ASOCSA 2010-66, Proceedings 5th Built Environment Conference 18-20 July 2010, Durban SA.

The objective of this study was to identify factors contributing to cost overruns in public sector projects based on literature review and a survey (interviews). Flyvbjerg and his colleagues Holm & Buhl in 2002, in a study of 258 mega transportation projects spanning 80 years and several countries reported that:

-Costs are underestimated in almost 90% of projects (to make them viable)

-Actual costs are on average 28% higher than estimated costs.

-percentage overrun increases with size of projects and

-Cost estimation has not improved over time (Maher & McGoey-smith 2006)

A formula seemed to be at work in Public Sector projects resulting in an unhealthy "**Survival of Unfittest**"- (underestimated cost) + (overestimated Revenues) + (overvalued environmental impacts) + (overvalued economic development effects)

= PROJECT APPROVAL

One of the high profile example of cost overrun includes **Denver's \$5 billion airport project** that experienced a cost overrun of 200%. According to Flyvbjerg (2009) there are two rudimentary reasons why projects experience cost overruns; Misrepresentation or deceptive actions by politicians and planners to ensure that project proceed and Over Optimism Bias including Overestimating the likelihood of positive events and under-estimating risks and losses.

The literature review and survey of 25 professionals of construction industry ie Architects, engineers, quantity surveyors and contractors resulted into following Factors, contributing to cost and time overruns: -

Very critical factors:

- a. Change in Scope of Work
- b. Incomplete design at the time of tendering
- c. Extension of time with claims
- d. Lack of cost planning and monitoring of funds
- e. Delays due additional works/cost variations

Moderately critical Factors:

- a. Variation orders
- b. Completeness of designs and specs(BOQs)
- c. Provisional BOQs
- d. Unexpected/unmeasured conditions at site.
- e. Delays in issuing information to contractors
- f. Ignoring items with abnormal rates(AHR/ALR Items tender evaluation)

Results of surveys also reveal that:

- a. Cost overruns appear to be a global phenomenon
- b. Cost overrun seems to be more pronounced in developing countries.
- c. No learning seems to take place as it has not reduced in last 70 years.
- d. Cost underestimation and overrun due misrepresentation, by lying with a view to getting projects started.
5. "Large Infrastructure Projects In Germany" -Between Ambition and Realities(working paper 1). A Cross – sectoral Analysis . by GeniaKostka and NiklasAnzinger, Hertie School Of Governance May 2015.

This paper gives recommendations for the governance of large scale projects based on a cross sectoral analysis of projects in Germany. Average cost overrun in building and transportation sector were lowest 944% AND 33%). The cost overruns in defence sector were around 87% and Energy sector had cost overruns of 136%. Aviation sector (under transportation head) had a cost overrun of 48%. There is variation across sectors and needs a more sector specific analysis. The paper also concludes that in public planning, the experience is not sufficiently institutionalised therefore each new large project is new "pioneer" that does not build on previous learning.

The study recommends following for large public projects: -

-Sector based benchmarking which includes three steps, a public megaproject database, a reference class forecasting(RCF) model for different sectors, a contract model based on micro-level risk allocation and cost contro.

-The public mega project database is essential for transparency also.In UK Major Project authority (MPA) maintains a database for around 200 infrastructure projects.

-Public project planners should introduce RCF method (Developed by Kahnemann and Tversky1979) to reduce Optimism bias.The Public planners establishes a probability distribution based on past cost overruns.

6. The case study of **Denver airport project** is a classic example of Over optimism, resulting into time and cost overruns(Denver International Airport Baggage Handling System-an illustration of ineffectual decision making. By Calleam Consulting Ltd- Why Technology Projects fail. 2008).

. The cost of construction increased by around 200% to \$5 billion and passenger traffic in first year was only half of forecast levels. The date of start of the project was November 1989 and scheduled date of completion was October 1993. However, the project could be completed and opened only in Feb 1995 after various changes in design and scope of work specially baggage handling system. Even after operationalisation, the system became a financial burden (maintenance cost \$1m/month) on airport and finally in August 2005, it was scrapped in favour of a fully manual system. Following reasons were attributed for failure of the project: -

- Underestimation of Complexity
- Lack of due diligence, planning resulting in subsequent changes.
- Making firm commitments in the face of massive risks and uncertainty.
- Poor stakeholder management and communication breakdown/working in silos.
- poor design resulting in change requests (Integrated baggage handling system for all concourses).
- Failure to perform risk management.
- Lack of management oversight

7. Berlin airport

After 15 years of planning, construction on Brandenburg airport project started in September 2006 with a target date of completion as 30th October 2011. Initial estimated cost of the project was 2.4 billion Euro.(Large Infrastructure Projects in Germany, Between Ambition and Realities(working paper 3)- Public Infrastructure Project Planning in Germany: The case of the BER Airport in Berlin-Brandenburg By Jobst Fiedler and Alexander Wendler, Hertie School of Governance, May 2015).

The Project is still incomplete and the cost is likely to cross 6.6 billion euros. The opening of the airport by fifth deadline of 2017 is also doubtful. The main reasons for time and cost overruns in this projects have been attributed to; -

1. Deficiencies in Project set up/monitoring mechanism.
2. Deficiencies at project definition stage and failure to carry out risk analysis of overambitious designs.
3. Deficiencies at planning/design stage resulting into huge Scope change requests at implementation stage (e.g. Smoke extraction system designed through basement instead of through roof, faulty wiring, fire walls etc.)
4. Absence of General Contractor(EPC)resulting in handling of subcontractors (50 nos) by Government agency in an adequate way.
5. Absence of expertise with Project manager. (the first project manager fired)

8. Management of issues in the delivery of Airport Infrastructure within Western Australia, Robert Lopez, Daniel Mascione, Henry Junxiao, October 2017. This paper brings out special characteristics of Airport Projects (case study of airport project in Western Australia), like Many stakeholders, various activities and functions, safety rules and regulations, critical time frame and issues related to projects in an operational airport. The paper also mentions delayed completion of Tom Bradeley International Terminal Project, Los Angeles, California, USA due to multiple stages of deliverables due to construction in a live airport where coordination with multiple stakeholders was a challenge.

Time Overrun Factors: Thus Around 20 case studies of Indian and International airport projects were carried out. The international case studies are based on the systematic Literature review for International airport projects and for Indian projects review of project records in Airports Authority of India was undertaken. The case studies indicate following 60 delay parameters. These parameters have been categorized in 10 broad categories in Table 6: -

Table 7 List of Categories of Delays and their sub factors

| | | |
|----------|-------------------------------------|--|
| A | Inadequacy at Planning stage | <ol style="list-style-type: none"> 1. Inadequate time given for planning 2. Non-availability of complete land 3. Site not free from encumbrances 4. Title disputes over land 5. Inaccurate geological/ soil investigation 6. Inaccurate topographical/ land survey 7. Delay due to relocation of existing operational facilities/ structures/ utilities 8. Non-availability of as built services drawings for integration with existing infrastructure 9. Inadequate DPR <ul style="list-style-type: none"> - Overestimation of revenues - Underestimation of cost of project at project definition stage - Lack of due diligence at planning stage 10. Lack of aviation specific experienced manpower/ consultant 11. Inadequate stakeholders involvement <ul style="list-style-type: none"> - Inadequacy in identification of stakeholders - Inadequate interest by stakeholders - Inadequate communication/ consultation with stakeholders |
| B | Inadequacy at Design stage | <ol style="list-style-type: none"> 1. Indecision among stakeholders regarding facilities to be provided/ scope change requests 2. Inadequate/ deficient design 3. Incomplete documents (drawings/ specs) 4. Underestimation of project complexities at design stage 5. Failure to carry out risk analysis while adopting complex design 6. Delay in preparation of working drawings/ GFC drawing 7. Incomplete/ uncoordinated working drgs/GFC drgs. 8. Unrealistic specs/ material specs decided without ascertaining availability 9. Indecision due to non-scheduled/ standard item. |
| C | Scope Change | <ol style="list-style-type: none"> 1. Change in scope of work during execution 2. Client/ stakeholder sponsored scope changes 3. Scope change due statutory authority requirement 4. Scope change due design issues. 5. Change request by stakeholders/ oversight bodies/ higher authorities in |

| | | |
|----------|--|--|
| | | govt. 6. Scope change due poor design 7. Scope change due poor initial survey |
| D | Unrealistic Completion Period | 1. Lack of due diligence before fixing completion period. 2. Fixing completion period arbitrarily without considering local factors. 3. Unreasonable method of completion time estimation adopted for airport projects |
| E | Government issues/ procedures | 1. Delays in regulatory clearances 2. Non availability of funds 3. Law and order problems 4. Bilateral issues between countries/states |
| F | Construction /Contractual issues | 2. Deficiency of Project delivery methods adopted 3. Improper method of selection of contractors. 4. Lack of experience with contractor 5. Lack of experienced engineers with contractors 6. Multiple agencies rather than general contractor 7. Unexpected weather problems/limited working season 8. Non-availability of specified material 9. Unplanned Phased construction at operational airport. 10. Delay in tendering/ordering sub packages/equipment 11. Pre-commissioning problems. 12. Price rise/inflation |
| G | Financial issues | 1. Increase in cost of construction 2. Inadequate finances with client 3. Increase in cost of consultancy 4. Foreign exchange variation 5. Under estimation of actual project cost 6. Poor financial management by contractor |
| H | Organizational problems | 1. Not learning from the past experience 2. Absence of sector specific bench marking norms 3. Lack of delegation to field level resulting in delayed decision making |
| I | Management of Resources/ material/ labour during construction phase | 1. Non availability of construction material near site 2. Delay during ORAT (Op Readiness and Transition 3. Pre-commissioning problems |
| J | Scheduling and Monitoring | 1. Lack of management oversight 2. Deficiency in project set up/ monitoring mechanism 3. Incompetent project management staff. |

2.3. Way Ahead for improvement in Project delivery: -

Based on the delay parameters, following steps have been identified for timely completion of projects.

1. Project cost estimates should be based on actual site data /drawings prepared after proper topographic and geotechnical surveys.
2. Scope of work should be prepared only after proper stakeholder's consultation including user agencies.
3. Realistic time frame should be arrived at after assessment of site conditions including availability of manpower and materials.
4. Proper market survey should be ensured before preparation of estimates.
5. Proprietary and imported items may be avoided to ensure timely delivery.
6. Timely action for statutory clearances.
7. Availability of complete land to be ensured before starting the project.
8. Timely action to be taken to divert the services and removal of structures/obstructions from project site.
9. Proper selection of consultants and implementation agencies based on their past experience.
10. Regular monitoring and course correction strategies to achieve completion targets preferably through a dedicated Monitoring set up at site and corporate head quarters. A web enabled, on line project monitoring system will greatly help visibility to the higher management.
11. Yearly performance evaluation mechanism for timely action to weed out non-performing contract agencies and consultants.
12. Timely availability of working/shop drawings to be ensured.
13. Proper coordination and consultation among stakeholders during project implementation.
14. Timely approvals and decisions on construction related issues. This can be achieved through decentralized delegation of power.

III. Conclusion

The literature and document review regarding post liberalization open sky policy of Government of India indicates that Civil aviation in India has seen tremendous growth in last 25 years, which triggered sudden demand for capacity enhancement at airports resulting into massive efforts in public projects and outsourcing of

mega projects at metro airports on PPP mode. The first phase of capacity enhancement projects has seen time overruns in projects due to many factors particularly deficiencies at planning stages resulting into deviations, change in scope at implementation stage, unrealistic time frames and project details worked out without adequate field studies.

The above study clearly indicates that extra ordinary project planning efforts are required to be initiated to cope up with the second phase of aviation growth in India which has been supported by lower oil prices and stable economic growth during last 4-5 years. This is further going to be accelerated with launching of Regional Connectivity Scheme, popularly known as UDAN(UdeDeshKaAamNagrik) in October 2016.

References:

- [1]. Connectivity and growth-Issues and challenges for airport investment-"Keeping airport projects on course in a turbulent world." Pierre-edouardPichot and Richard Scott- PWC 2015"
- [2]. "A study of Project Delay In Sudan Construction Industry" Mohamed BabikirIbrahiem Mohamad. University Tunku Abdul Rahman- Jan 2015.
- [3]. Project Delays and Cost Overruns(<http://www.dawn.com/news/1175543>)-13th April 2015.
- [4]. "Factors contributing to cost Overruns of Construction Projects" By M.S.Ramabodu, JJP Verster University of Free state, Bloemfontein9300.-ASOCSA2010-66,Proceedings 5th Built Environment Conference 18-20 July 2010, Durban SA
- [5]. Large Infrastructure Projects In Germany" -Between Ambition and Realities(working paper 1). A Cross -sectoral Analysis . by GeniaKostka and NiklasAnzinger, Hertie School Of Governance May 2015.
- [6]. Denver International Airport Baggage Handling System-an illustration of ineffectual decision making. By Callean Consulting Ltd-Why Technology Projects fail. 2008.
- [7]. Large Infrastructure Projects in Germany, Between Ambition and Realities(working paper 3)- Public Infrastructure Project Planning in Germany:The case of the BER Airport in Berlin-Brandenburg By Jobst Fiedler and Alexander Wendler, Hertie School of Governance, May 2015.
- [8]. Management of issues in the delivery of Airport Infrastructure within Western Australia,RobertLopez,DanielMascione, Henry Junxiao, October 2017.
- [9]. National Civil Aviation Policy 2016, Ministry of Civil Aviation, Government of India June 2016.
- [10]. Regional Connectivity Scheme, MinistryOf Civil Aviation, Government of India, October 2016.
- [11]. Study on project scheduling and cost overruns- PMI India and KPMG, 2012
- [12]. Workshop on "Enforcement of contract clauses and Timely recovery"-Time and cost overrun in AAI projects-causes and solutions. 2012

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