

“Evaluating Key Performance Indicators of Air Cargo Logistics at Hyderabad Airport Using AHP Analysis”

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Abstract

India being a developing nation aspires to tap the potential of the emerging air cargo logistics and accordingly has set a roadmap to become a strong air cargo hub with its vision, mission and objectives as spelt out in National Air Cargo Policy Outline 2019 (MoCA, 2012). Leading in its stride towards becoming same within India, Hyderabad airport is emerging as the main contender especially in pharma zone. Being at a strategic location at the centre of main land it boasts of India's first Integrated Cargo Terminal with International, Domestic and Pharma Zone under one roof (GMR Cargo, 2025). However in India, there are challenges in field of air cargo which are true for Hyderabad airport also. Taking a comparative analysis of air cargo's key parameters, a real perspective of challenges at hand is being brought out. In this paper, a methodology has been developed to evaluate these key performance indicators at Hyderabad airport. Adopting the AHP analysis, the challenges make up the criterias/ sub criterias to evaluate these Key Performance Indicators.

Keywords: NACP Outline 2019, Integrated Cargo Terminal, AHP Analysis, Key Performance Indicators

1. Introduction

Air Cargo Industry has been driving economic and social growth over the years as it accounts for an estimated 35 % of value of global trade volume even after accounting for less than 1%. The air transport industry which comprises of both passenger and air freight has seen an increasing trend in share of air freight traffic preceding passenger traffic by 1-2% each year (REYNOLDS-FEIGHAN). One of the fastest-growing sectors of transportation emerging now is the air cargo industry. Global demand in air cargo operations may rise as much as 5.9% per annum until 2029 as projected by Boeing (Magazine, 2025). This emergence of air cargo logistics across the globe is playing a pivotal role in the economic development of nations. India also in pursuit of becoming a developed nation is tapping the air cargo business with aspiration to become a strong Air Cargo Hub/ Transshipment Hub on lines of Hong Kong, Dubai, Singapore or Doha. The National Cargo Policy (NACP) outline-2019 also gives out same aspiration in the vision of air cargo logistics as **“to make air cargo and logistics in India the most efficient, seamless, cost and time effective in the world over a period of 10 years”**.

As per IATA reports, India's air freight market is growing at a compound annual growth rate (CAGR) of 5.65 per cent and is estimated to grow from US\$13.08 billion in 2023 and expected to reach US\$17.22 billion by 2028. As per Indian Air Cargo Outlook 2023 by Trade & Transport Group, Air cargo industry traffic volume globally declined by about 8%. On the other hand, India saw an increase in International traffic volume by 10% and growth by 10% in domestic market (Service, 2025). Leading in its stride towards becoming same within India, Hyderabad airport is emerging as the main contender especially in pharma zone. Being at a strategic location at the centre of main land it boasts of India's first Integrated Cargo Terminal with International, Domestic and Pharma Zone under one roof. However the challenges in India in the field of air cargo logistics be it in automation, infrastructure and regulatory reforms applies equally to Hyderabad also. Comparison of performance standards for key parameters of air cargo industry gives out real perspective of these challenges at hand. The key performance indicators selected in air cargo logistics which are widely acknowledged across are Dwell Time, Untraceable Cargo and Throughput Efficiency (MoCA, 2012). In this paper, a methodology has been developed to evaluate the key performance indicators of Hyderabad airport by adopting the AHP analysis wherein the challenges make up the criterias to evaluate these key performance indicators.

2. Literature Review

The topic of the researcher being “Evaluating Key Performance Indicators of Air Cargo Logistics at Hyderabad Airport.” the researcher’s preliminary search scanned through a plethora of books, e-journals, reports, policy compendium existing on air cargo logistics and AHP analysis. The notables ones are:-

- National Air Cargo Policy (NACP) Outline-2019. The NACP Outline-2019 is a vision document released by Ministry of Civil Aviation, GoI **which gives out the aspirations of India to become a strong cargo hub at the backdrop of emerging air cargo logistics.**
- Working Group Report(WGR) on Air Cargo logistics in India-2012.The WGR is a report by Ministry of Civil Aviation, GoI **on complete air cargo logistics that is taking shape in India including challenges in its way ahead.**
- Guidebook for Air Cargo Facility Planning and Development. As the name suggests it is a guidebook sponsored by the Federal Aviation Administration under Airport Co-operative Research Program **to provide the user a thorough understanding of air cargo logistics** including air cargo demand, airport facilities and best practices for planning facilities to meet present and future demands.
- Research Paper on “ Analytic Hierarchy Process-What It Is and How It Is Used” by R W Satty. This paper introduces the Analytic Hierarchy Process as a method of measurement with ratio scales and illustrates it with two examples.Then gives the axioms and some of the central theoretical underpinnings of the theory. Finally, discusses some of the ideas relating to this process and its ramifications.

Key Performance Indicators

As per Working Group Report 2012, the key performance indicators that are prominent in air cargo industry are Untraceable Cargo, Throughput Efficiency and Dwell Time. Let us understand each one of these as given in the report.

Untraceable/ Missing Cargo

The first KPI which reflects the performance of air cargo operations is Untraceable Cargo. It happens quite often that once the cargo which has been manifested is found later but only after suffering storage charges and more important loss of precious time..

The benchmark known internationally for mishandling rate as per WGR-2012 stands at 0.015% that comes to around 1.5 for every 10000 shipments.Therefore in order to check proliferation in the Domestic Air Cargo Net, the Domestic Air Cargo Agents Association of India have requested strongly in favour of a mechanism which lays down clearly quantifiable standard. Since cases going unreported are almost 75% wherein the claims are arbitrarily settled, the mechanism will provide a check on this.The pilferage issue affects not only the full cartons missing but also many a times part of the packages are reported missing. Till this day inspite of latest technology being incorporated in air cargo operations , the menace of missing cargo is very much there.

Throughput Efficiency

This is the next KPI which reflect the key performance. The Throughput Efficiency as per the International Standard is measured in terms of tonnage handled per sq meter(WGR-2012). It is therefore linked to the cargo handled in volume in a year in a terminal. Also the comparison between freight terminal efficiency and freight volume is the most significant factor established as per the Research (MoCA, 2012).

Dwell Time

The last KPI i.e. Dwell time is an important operational metric in aviation, representing the period an aircraft spends on the ground between flights, with implications for efficiency and scheduling (Dwell Time, 2025). Minimizing dwell time for air cargo is crucial for perishable goods and ensures optimal utilization of airport infrastructure.

3. Methodology

Descriptive Research design is adopted to map the key performance indicators of air cargo logistics. Both primary and secondary data collection method has been used to arrive at results. The qualitative data involving the study of air cargo logistics at Hyderabad airport was gathered via a questionnaire which was distributed to all stakeholders who were the respondents. Since air cargo logistics is a specialized field where the sample size is small, expert opinion technique was adopted to bring out answers to questionnaire based on study content. Then AHP analysis is done in order to evaluate the key performance indicators of air cargo logistics at Hyderabad airport. The challenges make up the criterias and sub criterias which will bring out in detail the comparison of performance standards for these key parameters of air cargo at Hyderabad airport thus giving out real perspective of challenges and progress of air cargo logistics.

AHP Analysis

AHP is a powerful and flexible decision making process to set priorities and make the best decision (TAHERDOOST, 2017). Therefore to set the inter se priorities amongst the alternatives and rank them in an order, it is proposed to use AHP , a multi criteria decision analysis which will work as as a decision support tool for process selection.

Developing the Questionnaire

The qualitative data involving the study of air cargo logistics at Hyderabad airport for evaluating key performance indicators was gathered via a questionnaire which was distributed to stakeholders. Since AHP evaluation is based on expert opinion, the number of questionnaire conducted depends on the study content. Saaty's scale has been utilized to gauge answers which are shown in fig 3 below:-

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to objective
3	Moderate Importance	Experience and Judgement strongly favour one activity over another
5	Essential or Strong Importance	Experience and Judgement strongly favour one activity over another
7	Very Strong Importance	An activity is strongly favoured and its dominance demonstrated in practice
9	Extreme Importance	The evidence favouring one activity over another is one of the highest possible order of affirmation.
2,4,6,8	Intermediate values between two adjacent judgements	When compromise is needed
Reciprocals	If activity I has one of the above numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining n numerical values to span the matrix

Fig 3. Saaty Scale

The questions have been arrived to seek response from all stakeholders who are capable of answering comprehensive questions and have enough experience to give reliable information about the KPIs. Fig 4 gives general info about the experts.

Stakeholders	No of Experts	Business Position
Cargo Terminal Operator	4-6	Top level Manager Middle level Executives Ground Supervisors
Freight Forwarders	2	Business Owners
Brokers/ CHA	1	Executive
Airline Operator	2	Operation Manager
Regulatory Authority	1	Custom Official

Fig 4. General Information of Experts

4. Analysis and Interpretation of Results

Determining the Criterias & Sub-Criterias

The criterias which will form the base of evaluating the key performance indicators(KPI) are the challenges. These have been arrived at both from the primary data i.e. expert opinion of the stakeholders and secondary data and are listed as:-

- Automation
- Regulatory Reforms
- Infrastructure.

Determining the sub criterias.

For Automation, these are:-

- Warehouse Management System
- RFID to track Shipment
- Seamless Information Flow

For Regulatory Reforms, these are:-

- Custom Procedural Delays
- 100% export shipment examination
- Duplication of documentation

For Infrastructure, these are:-

- Inadequate and overloaded infrastructure facility
- Lack of Skilled manpower
- Special Cargo Infrastructure

Structuring the Hierarchical Structure

The hierarchal structure defined for this purpose consists of general objective at first level i.e. Goal, the key performance attributes at second level also known as criterias , the sub-criterias at third level and finally the alternatives which in this case are KPIs. A four level hierarchal model has been developed which is illustrated in fig 5. below.

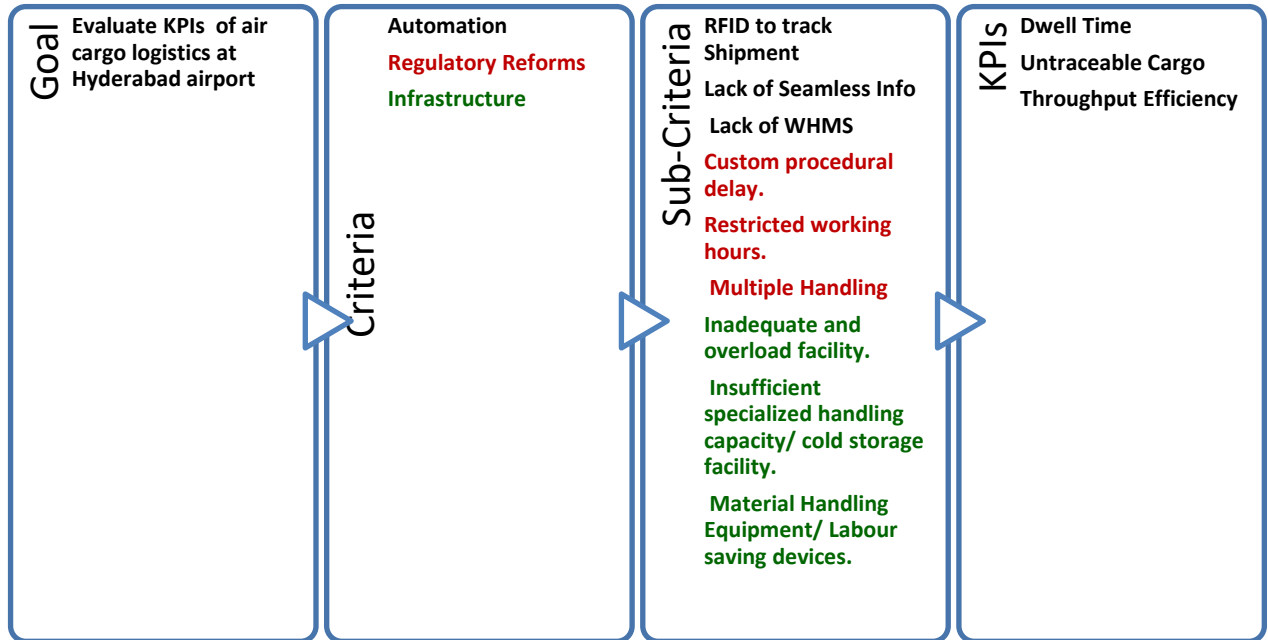


Fig 5. Four Level Hierarchical Model

Pairwise Comparison

After forming the hierarchical structure, the next step is to make a pair-wise comparison matrix of relative criteria. A questionnaire will be used to conduct criteria, sub-criteria and alternatives. It will facilitate in pairwise comparison by answering to the questions raised. The expert knowledge and experience will be used to determine the preference of one criteria to other. Firstly the pairwise criteria will be compared, the the sub-criteria with respect to criteria by the experts. Finally the experts will compare the improvement plans wrt to each sub-criteria. Thereafter using the AHP Analysis tool , priority weights will be calculated for each of the criteria, sub-criteria and alternatives. Finally alternative with highest weight selected will be the priority one KPI to reflect performance of air cargo logistics at Hyderabad airport.

Comparison of Main Criterias carried out and results shown in Table 1.

Criteria	Weight	C.I	Percentage (%)
Automation	0.412	0.0515	41
Infrastructure	0.327		33
Regulatory Reforms	0.259		26

Table 1: Relative Importance of Main Criterias

Automation with 41% comes as the most important criteria followed by Infrastructure at 33% and lastly among the three comes Regulatory Reforms at 26%. The consistency index comes at .05 which is less than 0.1 meaning our result is consistent. The same is calculated by the Super Decision Software and result reflected in fig 6 below.

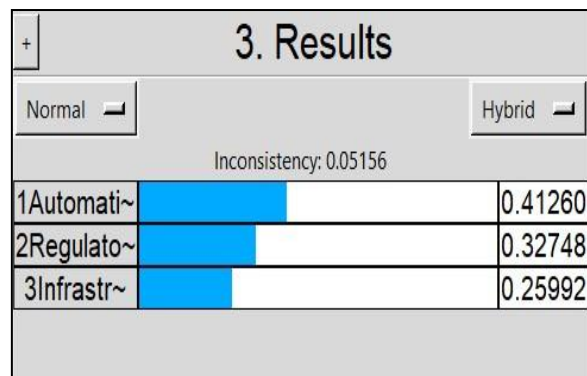


Fig 6 : Priorities of Main Criteria as Shown in Super Decision Software

Coming to the sub criterias priority within the criterias as shown in Tables 2,3 and 4. With respect to Automation criteria, sub-criteria of Seamless information comes first at 63%, followed by RFID to track shipment at 19% and lastly within close margins comes Lack of WMS at 17%.

Automotation (CI : 0.008)		
Sub-criteria	Alternatives	Weight
Lack of WMS 0.174	Dwell Time	0.332
	Untraceable Cargo	0.139
	Throughput Efficiency	0.527
RFID to Track Shipment 0.191	Dwell Time	0.157
	Untraceable Cargo	0.593
	Throughput Efficiency	0.249
Lack of Seamless Info 0.633	Dwell Time	0.209
	Untraceable Cargo	0.240
	Throughput Efficiency	0.549

Table 2: Relative Importance Of Sub Criterias within Main Criteria of Automation

The alternatives i.e. KPIs priority/rating for sub-criteria Seamless Information comes as Throughput Efficiency at 55%, Untraceable Cargo at 24% and Dwell Time at 21%. For sub-criteria RFID to track shipment the KPIs priorities are Untraceable Cargo at 59%, throughput Efficiency at 25% and Dwell time at 16% respectively. For last sub-criteria Lack of WMS, the KPIs stand at Throughput Efficiency at 53%, Dwell Time at 33% and Untraceable Cargo at 14% respectively.

With respect to Infrastructure criteria, sub-criteria of Special Cargo Facility comes first at 54%, followed by Inadequate & Overload Facility at 30% and lastly comes Lack of Skilled Manpower at 16 %.

Infrastructure (CI : 0.008)		
Sub-criteria	Alternatives	Weight
Inadequate & Overloaded Facility 0.269	Dwell Time	0.466
	Untraceable Cargo	0.100
	Throughput Efficiency	0.433

Lack of Skilled Manpower 0.163	Dwell Time	0.250
	Untraceable Cargo	0.500
	Throughput Efficiency	0.250
Special Cargo Facility 0.539	Dwell Time	0.332
	Untraceable Cargo	0.139
	Throughput Efficiency	0.527

Table 3 shows the relative importance of sub criterias within the main criteria of Infrastructure.

The alternatives i.e. KPIs priority/rating for sub-criteria Special Cargo Facility comes as Throughput Efficiency at 53%, Dwell Time at 33% and Untraceable Cargo at 14% . For sub-criteria Inadequate & Overload Facility the KPIs priorities are Dwell Time at 47%, Throughput Efficiency at 43% and Untraceable Cargo at 10% respectively. For last sub-criteria Lack of Skilled Manpower, the KPIs stand at Untraceable Cargo at 33%, Throughput Efficiency and Dwell Time both at 25% respectively.

With respect to Regulatory Reforms criteria, sub-criteria of Custom Procedural Delay comes first at 64%, followed by Duplication of Documentation at 30% and lastly comes Export Shipment Examination at 10 %.

Regulatory Reforms (CI : 0.037)		
Sub-criteria	Alternatives	Weight
Custom Procedural Delay 0.636	Dwell Time	0.428
	Untraceable Cargo	0.142
	Throughput Efficiency	0.428
100% Export Shipment Examination 0.104	Dwell Time	0.499
	Untraceable Cargo	0.859
	Throughput Efficiency	0.414
Duplication of Documentation 0.258	Dwell Time	0.581
	Untraceable Cargo	0.109
	Throughput Efficiency	0.309

Table 4 shows the relative importance of sub criterias within the main criteria of Regulatory Reforms

The alternatives i.e. KPIs priority/rating for sub-criteria Custom Procedural Delay comes as Throughput Efficiency and Dwell Time both at 43% and Untraceable Cargo at 14% . For sub-criteria Duplication of Documentation the KPIs priorities are Dwell Time at 58%, Throughput Efficiency at 31% and Untraceable Cargo at 11% respectively. For last sub-criteria Export Shipment Examination, the KPIs stand at Untraceable Cargo at 86 %, Dwell Time at 50% and Throughput Efficiency 25% respectively.

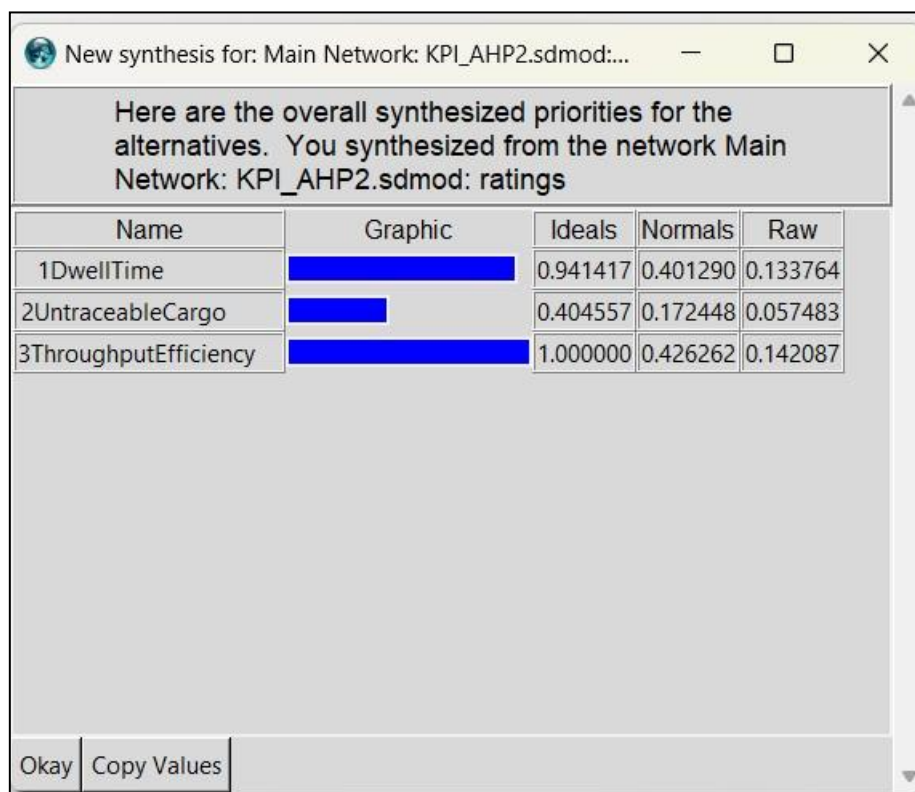


Fig 7 : Result of Priority of KPIs

5. Conclusion

After determining the priorities of criteria, sub-criterias and the KPIs within the sub-criterias, calculations were done to finally evaluate the Key Performance Indicators of air cargo logistics at Hyderabad airport. The Super Decision Software gave out the overall priorities of these KPIs as shown in Fig 7 above and placed them with topmost priority to Throughput Efficiency at 42%, secondmost priority following very closely to Dwell Time at 40% and last priority amongst the three to Untraceable Cargo at 17%. The inputs received both from primary and secondary data were empherically solved with the AHP Analysis through the Super Decision Software to arrive at the results. The paper shows that the problem of Untraceable Cargo has been brought down considerably with checks & balances in place. Throughput Efficiency has proved to be prime reflector of Key Performance at Hyderabad airport with right impetus given to enhance the capacity of handling total cargo volume.

Declarations

All authors declare that they have no conflicts of interest.

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