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ASSESSING THE STRATEGIC ROLE OF AIRPORTS IN SHAPING THE GROWTH AND COMPETITIVENESS OF THE AVIATION INDUSTRY

Poonam Vishwakarma,
Research Scholar, Taywade College, Nagpur,
Email: - asawari.durge@gmail.com

Dr. Asawari R. Durge,
Professor, Taywade College, Nagpur,
Email: - asawari.durge@gmail.com

Abstract
Airports are strategic assets of the aviation industry. These facilities are conducive to better connectivity, better operational efficiency, higher economic development, and competitiveness of the aviation industry. The strategic dimensions-the airport infrastructure, operational efficiency, technological innovation, and sustainability practices were taken for the study, which measures the strategic role of the airport for the growth and development of the aviation industry. A quantitative research methodology was utilized for conducting this study. We collected primary data from 250 respondents. The airport authorities, airline executives, aviation professionals and frequent air travellers make up the sample. The findings demonstrate that every strategic dimension makes an important contribution to improving the competitiveness of the aviation sector. The strongest predictor is technological innovation followed by sustainability practices and operational efficiency. The report on a stronger note states that the need of the hour is strategic development of airports for sustainable growth, improved service quality and enhanced future competitiveness.

Keywords: Airports, Aviation Industry, Airport Infrastructure, Operational Efficiency, Technological Innovation, Sustainability, Competitiveness.

Introduction

The airline sector is a key player in economic growth, international trade, tourism and regional integration. Due to a continuous increase in traffic in terms of passengers and freight, the strategic importance of airports has greatly increased. Role Of Airport Now, airport is not just an infrastructure to enable aircraft operations but also a business hub to enhance the economic competitiveness of a region and the industrial development of the region. Currently, an airport does not just act as a gateway for the operation of aircraft. The airport' s performance is a significant component of the extension of network. It is responsible for the connectivity of the passenger through the network of the airline. Further, it is about better offers of logistics. Technological innovation or industrial development foster greater regional economy of the region. The competitiveness of the airport industry is growing very rapidly and ecosystems are forming around the airport. These airport business ecosystems are receiving support through sustainable infrastructure investments and also digital transformation.

With globalization, the liberalization of air transport markets and the rapid growth of low-cost carriers, competition among airports is intensifying. India' s largest airline IndiGo has submitted a bid for Air India' s international business and is prepared to undertake a complete acquisition of the airline if it gets permission from the government. Airports are increasingly directed to strategic planning and decision making, focusing on customer and service quality, infrastructure and resource optimization, and sustainable development (Graham, 2020). The airports' competitive position is increasingly determined by the strategic governance, multi-modal accessibility, digital innovation, and stakeholder collaboration – and less so by physical infrastructure.

Earlier studies of Airport infrastructure is significant for the airline operating performance as well as regional economy productivity' . As per Button and Yuan (2013), efficiency at airports is crucial in reducing operational delays, aircraft ground turnaround times, improving passenger experience and promoting tourism and business activities. Most importantly, the airport generates significant direct, indirect, induced and catalytic economic benefits by creating jobs, enhancing airport-related commercial activities, attracting foreign investment and geographic clustering of industries. The creation of airport cities and aerotropolises around airports illustrates how airports are becoming engines of economic growth. In addition, it integrates logistics, hospitality, retail, and other business services within the functional geography of airports.

Technology has altered the airports and their competitiveness again. AI, biometrics, IOT, predictive analytics, automation and intelligent airport systems are Industry 4.0 technologies which improve operational efficiency with enhanced passenger experience (Tan & Masood, 2021). With digitalization, the airports can use the resources efficiently, manage passenger flows, increase security, and reduce operational costs to enhance competitiveness in the ecosystem.

Sustainability is now regarded, among other things, as a strategic priority. For instance, a large number of environmental legislation has an impact on the competitive position of airport. As a result, there is more emphasis on reducing carbon emissions, utilizing renewable energy, and sustainably operating airports. A number of airports are now adopting green infrastructure, energy-efficient technologies and environmentally friendly operational procedures. This has enhanced organizational performance and stakeholder confidence (Serio et al. 2021)

Despite the extensive studies on airline competitive behaviour and operational performance of the airport, very little empirical evidence suggests that airports play a strategic role in enhancing the growth and competitiveness of the aviation industry. Past studies related to airport efficiency, passenger' satisfaction and airline performance were analyzed. However, there wasn' t any evidential study on strategic role of airports in improving the growth and competition of aviation industry. Hence, the study aims at analysis the strategic role of airports in enhancing the development and competitiveness of the aviation industry. The research explored various facets of airport performance, including infrastructure growth,

innovative capabilities, network links, environmental sustainability, and collaboration and engagement with stakeholders.

Literature Review

In the last twenty years, due to increasing emphasis of airline performance and regional economic growth, a lot of attention has been paid to airport competitiveness in the academia. According to Graham (2020), airports are not public utilities anymore, but commercial organizations that compete with each other for airline routes, passengers and investment. The competitiveness of the airport is determined by strategic management, non-aeronautical revenue and customer services.

As per Forsyth (2006), the liberalization of aviation markets has modified airports' competition nature. It compels airports to enhance efficiency and develop differentiated services for their customers. Airport managers are using marketing strategies, price policies and infrastructure choices to attract airline operators to gain market share.

Button and Yuan (2013) found that investment into airport infrastructure creates economic spillover effects through four channels: creating new jobs, developing tourism, growing business and improving accessibility. The study shows that airports are key drivers of economic activity as well as transport activity.

Kasarda and Lindsay (2011) have recently strengthened the airport-led regional development idea by the Aerotropolis concept. The airports are now fast turning out to be an economic destination for businesses related to aviation, logistics warehouse, commercial complexes and knowledge intensive companies, according to their analysis. When activities clustering takes place around airport infrastructure, it contributes to the sustainable economic development of a region.

Airport route development strategies greatly boost an airport' s market competitiveness, as per Feng et al. (2022). This is accomplished through improved passenger connectivity, the establishment of new airline partnerships, and a growing volume of cargo operations. Moreover, the strategic planning of an airport through network planning further critically determines its development.

Airport service quality is an important airport competitiveness influencer along with the physical attributes. According to study by Fodness and Murray (2007), the terminal facilities, accessibility, safety, the efficiency and helpfulness of the service, and comfort are important criteria than costs for the passengers in choosing an airport and airline. They would be satisfied to travel by air.

Airline-airport relationships are another important dimension of competitiveness. According to de Neufville and Odoni (2013), airport and airline joint planning results in operational efficiencies, better use of capacity, and longer-term infrastructure development. These partnerships can improve the coordination of schedules and reduce operational congestion.

As the market dynamics evolve, so too is the importance of strategic adaptability in the aviation industry. Airports and airlines that evolve more rapidly to changes in their competitive landscape, whether through new products/services, alliances, or operating modes, enjoy higher performance in the long run (Arrigo, 2023).

In recent years, the competitiveness of airports has been largely attributed to digital transformation. The systematic review by Tan and Masood (2022) shows that technologies of Industry 4.0 including artificial intelligence, robotics, biometrics, digital twin-and predictive analytics can help improve operational efficiency, passenger processing, resource optimization and resilience to operational disturbances.

Airports are going green for better efficiency and organizational performance. Serio et al. (2022) analytically already demonstrated that spending money on environmental sustainability increases the efficiency of airports in their operations and performance in the long run. Eco-friendly airports have better regulatory compliance, stakeholder assurance andfinancial viability.

The vital importance of airports as a development agent has been further demonstrated within the national economic system. The research conducted by Wilczynska-Strawa et al. (2024) showed that airports contribute to the development of the airport.

There is an increasing significance of non-aeronautical sources in the airport which includes retail, restaurant, hotel, real estate and commercial operations by Freathy and O' Connell (1998). Airports can lower their dependence on aviation revenue and make airport strength resilient to global market disruptions by diversifying their revenue streams.

Doganis (2019) argued that airport capacity, slot management, operational efficiency, and ability to re-invest in infrastructure in the long-term are the aspects of the airports that affect airlines. This indicates.

The efficiency of an airport is impacted by its airport governance models and regulations. Gillen (2011) professed that the airport governance models, regulations, and PPPs have a huge impact on the performance of the airport and its strategic market power.
Airports that run under.

According to reviewed literature, competitiveness multidimensional includes infrastructure, connectivity, technological changes, sustainability, governance, service quality, economic integration and others of the airport. The empirical literature that uses these factors in one model to assess the strategic influence of airports on the overall development and competitiveness of the aviation industry is relatively limited.

Objectives:

The purpose of the research is to evaluate the role of airport in the development of aviation industry, to evaluate the impact of airport infrastructure, connectivity, operational efficiency, and to assess how technology and sustainable management augment long-term aviation performance and competitiveness.

Methodology:

This research has a quantitative descriptive and explanatory design. The data will be collected through self-administered questionnaires from the executives of airlines, professionals of aviation and frequent travellers by air using stratified random sampling method. Data gathered from various journals, documents, and official publications will be secondary.

Result and Analysis

According to the paper, data collected from the respondent has been analyzed and interpreted to access the strategic role of our airports to growth and competitiveness of the aviation industry. The findings of the study are interpreted and analyses has been done using the right statistics. The findings were interpreted to examine the relationship among the study variables and to realise the research objectives.

Table 1 Respondent Category

Category	Frequency	Percentage
Airport Authority	48	19.2
Airline Employees	62	24.8
Aviation Professionals	54	21.6
Frequent Air Travelers	86	34.4
Total	**250**	**100.0**

The majority of the respondents who had indicated their usage were frequent air travellers at 34.4% of the total. Other respondents include airline employees at 24.8%, aviation professionals at 21.6% and airport authority employees at 19.2%. Accordingly, it had an appropriate proportion of service providers and service users. A diverse sample would be able to evaluate airport performance from operational, managerial and client perspectives. An opportunity to encapsulate various facets impacting the competitiveness of the aviation industry.

Table 2 Reliability Analysis

Variable	No. of Items	Cronbach's Alpha
Airport Infrastructure	5	0.864
Operational Efficiency	5	0.887
Technological Innovation	5	0.903
Sustainability Practices	5	0.854
Aviation Competitiveness	5	0.918

Overall Alpha = 0.889

The value of Cronbach' s Alpha for all constructs of the study was in the range from 0.854 to 0.918 and overall reliability of study was 0.889. Since the values exceed the threshold standard of 0.70, it can be concluded that the survey exhibits excellent internal consistency and measurement reliability. This means that the items measuring each construct in the questionnaire are constant and free from error. As a result, the data collected is reliable in nature and can be used for further tests.

Table 3 Mean and Standard Deviation

Variable	Mean	Standard Deviation
Airport Infrastructure	4.24	0.63
Operational Efficiency	4.17	0.68
Technological Innovation	4.29	0.58
Sustainability Practices	4.05	0.71
Aviation Industry Competitiveness	4.33	0.55

All the variables on a five-point Likert scale have all the mean scores that are higher than 4.00, which reflect that the respondents strongly agreed with the viewpoints pertaining to strategic importance of airports. The relative importance of the aviation industry competitiveness leading mean score (4.33); technological innovation (4.29); airport infrastructure (4.24) In addition, as the standard deviation values are also very low, it indicates respondents were quite consistent with each other. The respondents show great awareness of the enhanced performance and competitiveness of aviation industry through airport infrastructure.

Table 4 Correlation Analysis

Variables	Infrastructure	Efficiency	Technology	Sustainability	Competitiveness
Infrastructure	1.000				
Efficiency	0.684**	1.000			
Technology	0.653**	0.721**	1.000		
Sustainability	0.611**	0.644**	0.688**	1.000	
Competitiveness	0.781**	0.807**	0.842**	0.736**	1.000

$p < 0.01$

The Pearson correlation analysis reveals that all study variables positively and significantly correlate with each other in a pairwise method at the one per cent significance level. According to the research study, technological innovations are positively associated with the competitiveness of the Aviation Industry. After that, the highest positive correlational relationship to passengers throughput was operational efficiency ($r = 0.807$). Upgrading airport infrastructure, operational efficiency, technological innovation, and sustainability practices make the aviation sector more competitive. The selected important strategies have not negatively correlated with any of the study variables, which is suggesting strengthen competitiveness of aviation industry.

Table 5 Model Summary

R	R^2	Adjusted R^2	Std. Error
0.884	0.781	0.777	0.341

The R value of the regression model is 0.884, indicating a strong relationship between the dependent and independent variable. The contribution of the Airport Infrastructure, Operational Efficiency, Technological Innovation, and Sustainability Practices to aviation competitiveness varies considerably. The validity of the proposed model propounded by the study is confirmed by high electrophoretic power ($R^2 = 0.781$). The variance of 21.9% can be attributed to external factors, like other variables that were not studied.

Table 6 ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	84.562	4	21.141	181.742	0.000
Residual	28.503	245	0.116		
Total	113.065	249			

By looking at the table ANOVA we see that the regression model as a whole is significant ($F = 181.742$, $p < 0.001$). Thus, the selected independent variables collectively have a significant contribution to explain the competitiveness of the aviation industry. It also is the low

significance value which shows the model will be better at predicting than a model with no independent variable. As a result of the findings, the regression model is fit enough to analyze the strategic role of airport in the aviation industry.

Table 7 Regression Coefficients

Predictor	Beta	t-value	Sig.
Airport Infrastructure	0.268	5.891	0.000
Operational Efficiency	0.291	6.462	0.000
Technological Innovation	0.372	8.114	0.000
Sustainability Practices	0.183	4.216	0.000

All four independent variables exert a positive and significant effect on the Competitiveness of Aviation Industry as indicated by regression coefficients. The most important predictor ($\beta = 0.372$) is Technological Innovation, which indicates that digital transformation, automation, smart airports' technology adoption and other innovations have a crucial role to play in improving the Competitiveness of Aviation Industry. The variable Operational Efficiency which has $\beta = 0.291$ has a significant effect on the Competitiveness of Aviation Industry followed by Airport Infrastructure and Sustainability Practices as well. So, by focusing on multiple integrated strategies, related to airport infrastructure, operational efficiency, technological innovations and sustainability, airports will be able to strengthen the long-term growth and Competitiveness of.

Hypothesis Testing

Hypothesis	Result
H1: Airport infrastructure significantly influences aviation industry competitiveness.	Supported
H2: Operational efficiency significantly influences aviation industry competitiveness.	Supported
H3: Technological innovation significantly influences aviation industry competitiveness.	Supported
H4: Sustainability practices significantly influence aviation industry competitiveness.	Supported

Hypothesis testing indicates all four hypotheses are supported at the 5% level of significance. The aviation industry competitiveness is significantly positively influenced by the airport infrastructure, operational efficiency, technological innovation and sustainability practices. The study results endorse the conceptual framework and the assertion that the airport development has already extended beyond its transportation functionality and is now becoming a facilitator for industry development. According to the findings, positive impact on the global competitiveness of the aviation industry could be ensured through modernised

infrastructure, digitalisation and innovation, operational excellence and sustainable management practices.

Through the statistical analysis, it is revealed how airports can strategically play a role in expanding the aviation industry. The development of modern airports can be integrated within any first mover regional strategies that enhance foothold competitive advantages. The development of the aviation sector can fast track the development of the region and improve international competitiveness. In addition, modern airport infrastructure and effective airport management practices have a significant positive impact on industry competitiveness.

Conclusion

According to the research, airports are strategically a very essential element in growth competitiveness of aviation industry. As the airports are the engines of the air transport system, they will enhance connectivity and demand response, the study concludes. The overall operations of the airport will improve because of the bigger size and capacity of the airport. Understanding this, governments and airport managers take up modernization and capacity expansion projects. According to the study, enhancements made at Airport have resulted in spillover impacts along the air transport industry value chain, including consumer and passenger interests. It is asserted in the study that sustainable growth would be possible through airports. Ecological aircraft terminals lower the emission of carbon footprint and are highly beneficial to the environment. In the end, green airports hold the key towards sustainable competitive advantage in aviation. Technological innovation in airport facilities largely determines aviation industry competitiveness.

Recommendations

According to the analysis, smart airport technology, digital airport transformation and infrastructure modernisation should be prioritised by airport authorities and policymakers for improving airport operational efficiency and passenger experience. Attention must be given to sustainable airports' development and operations, energy-efficient infrastructure, carbon emission and reduction measures and environmentally friendly operational practices. Further enhanced coordination is needed amongst airports, airlines, regulators and private stakeholders to improve connectivity, quality of services and achieve R&D excellence. Governments can develop a framework that can promote aviation and foster public-private partnership to improve airport capacity and investment climate and aviation industry' s global competitiveness.

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