

COVID-19: KOTI AVIATION BRIEF





- The research results presented on this presentation is to deliver information on the Point of COVID-19 Recovery in South Korea.
- The opinions and research expressed in this article are those of the researchers who contributed to this report.
- The views stated in this report do not necessarily reflect the official policy or position of any agency of the Korean Government or KOTI.
- Our team plans to update this report continuously.
- Any comments, opinions, suggestions are welcome regarding this report.



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Issues

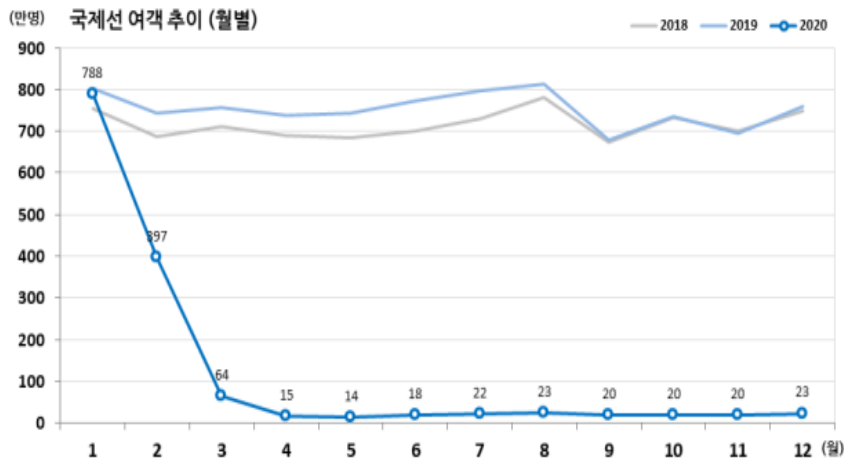




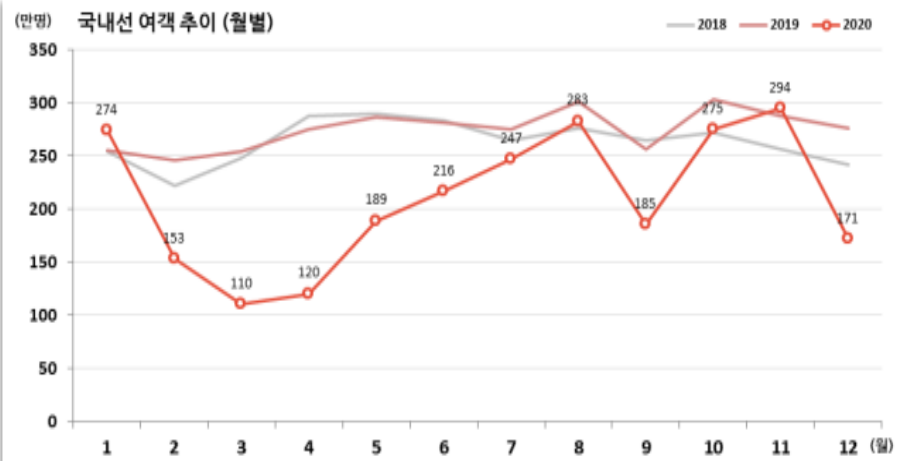
Introduction

❖ The Impact of COVID-19 on Air Passenger Traffic in 2020

- After COVID19 Outbreak, Most of the International Flights have been cancelled or decreased in number due to drop in Air Travel Demand in terms of Korea Entry Regulation
 - Number of Air Passengers in 2020 has declined 68.1%, compared to figures of 2019, which recorded 39.4 Million due to the COVID-19 Pandemic
 - (International Flights) Number of Air Passengers has declined 84.2%, compared to figures of 2019, which recorded 14.24 Million due to COVID-19 2nd Wave in latter half of the year
 - (Domestic Flights) Domestic Flights Air Passenger Demand has declined 23.7% (2.8% decrease in hinterland, 27.2% decrease in Jeju Island), compared to figures of 2019, which recorded 25.16 Million due to COVID-19



South Korea International passenger traffic 2020*



South Korea Internal passenger traffic 2020*

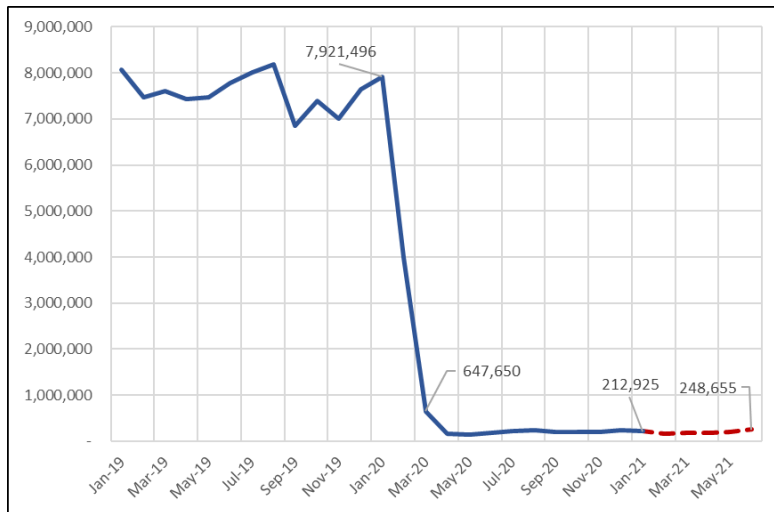
* Source: MOLIT(2021.02)



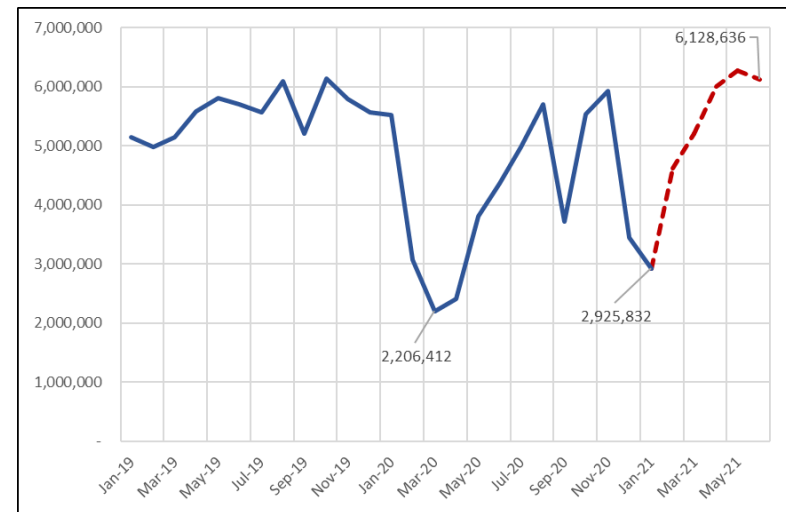
Introduction

❖ The Impact of COVID-19 on Air Passenger Traffic in 2021 Q1, Q2

- COVID-19 Status
 - Number of Air Passengers in 2021 has declined 47%, compared to figures of June, 2019, which recorded 6.38 Million due to the COVID-19 Pandemic
 - (International Flights) Number of Air Passengers recorded 250 Thousand, which is only 3% of figures in June, 2019 due to COVID-19 2nd Wave in latter half of the year
 - (Domestic Flights) Domestic Flights Air Passenger Demand recorded 6.13 Million, which has shown increase rate of 107% compared to figures in June 2019 due to high elasticity of COVID-19



South Korea International passenger traffic 2021 Q1, Q2*



South Korea Domestic passenger traffic 2021 Q1, Q2*

* Source: MOLIT(2021.02)



Issues

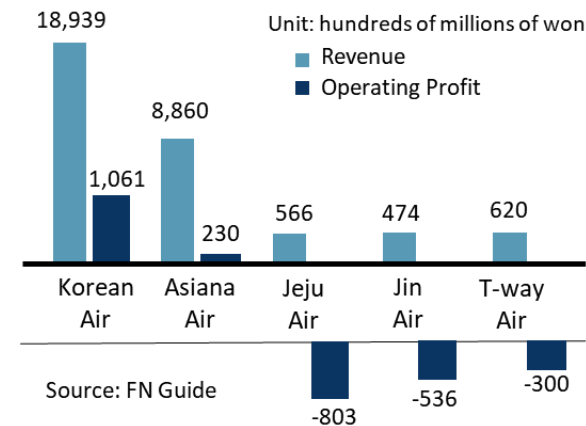
❖ Struggles for survival in Air Transport Industry

- A Merger of KAL and AAR for Top Mega Carrier in Korea
 - On December of 2020, KDB Bank(Korea Development Bank) invested total of 800 Billion Won (KRW 500 Billion through Paid-In Capital Increase & KRW 300 Billion through issuance of Exchangeable Bond) in HANJIN KAL
 - The birth of World Top Seven Mega Flag Carrier due to merger of Korean Air(Ranked 19th in terms of IATA Transport of Passengers & Cargoes) and Asiana Airlines(Ranked 29th in terms of IATA Transport of Passengers & Cargoes)



- FSCs turned a profit thanks to Air Cargo Transport, LCCs still in the red for survival
 - Korean Air & Asiana Airline turned a profit thanks to Air Cargo Transport
 - LCCs on Capital Impairment due to continuous decrease in profitability & increase in liabilities

2Q Korea Airlines operating profit forecast.





Policies

❖ Korean Government released [Plan for Recovery & Reform of Aviation Industry from COVID-19] (2021.03.03)

- (Short Term) Support Normal Life Recovery for Reform of Aviation Industry
 - Support Employment Stability for Airlines, Ground Handlings & Duty Free Shops
 - Increase Grace Period for Special Employment Support
 - Relief Recovery of Airport Usage Fee, Air Traffic Rights & Slots
 - Diversify in No-Landing Flights
 - Travel Bubble Agreement with Epidemiologically Safe Countries
 - Support Airlines through customized policies
 - Escalate People' Comfortability & Stability in advance of FSC M&A
 - Support Competitive LCCs
 - Support freshly born Regional Airlines
 - Support Sharing Strategies between Airlines

- (Medium-Long Term) Strengthening Competitiveness through Improving Aviation Industry Structure
 - Prepare Bases for Aviation Finance through establishing Aviation Industry Cooperatives
 - Supplement financial resources for establishing Cooperatives, Set up fund
 - Enhance MRO Global Competitiveness
 - R&D Expansion, Tax Reduction, FTA Utilization
 - Establishment of KAA, Korea Aviation Academy
 - ICAO Certified Education, Build International Education Center
 - Contactless Smart Airport, K-Airport Export
 - Strengthening Competitiveness Reinforcement through consisting Team-Korea, Support Strategical Consulting in Civil Overseas Expansion
 - Development of Win-Win Airport in nearby areas

* Source: Effects of Novel Coronavirus(COVID-19) on Civil Aviation: Economic Impact Analysis, ICAO, 20 July 2020

COVID-19 Aviation Index

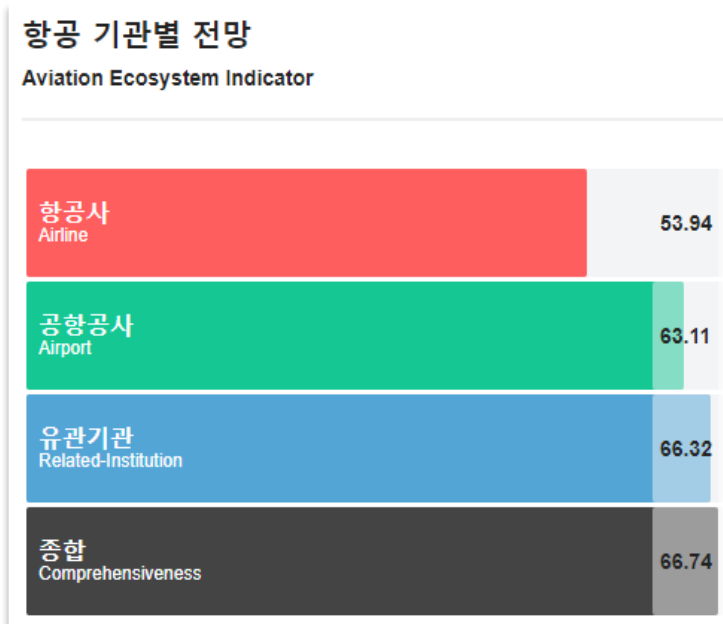




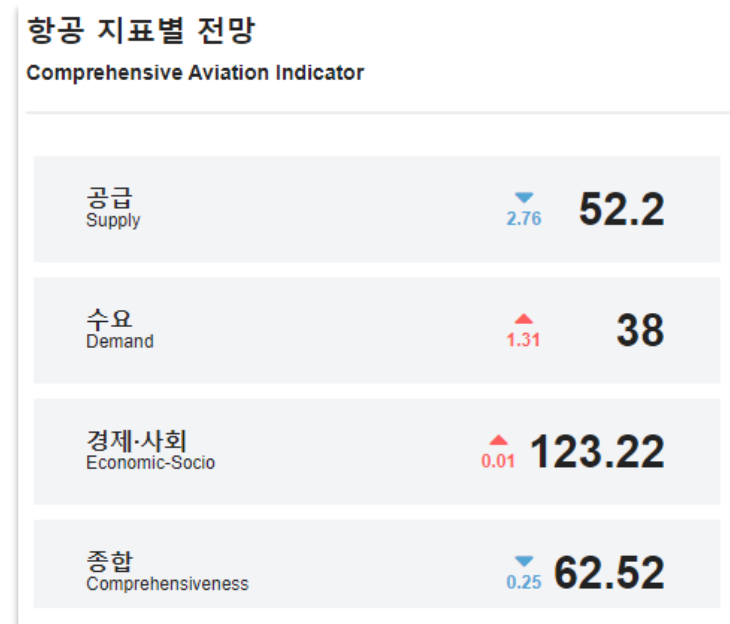
Aviation Indicator

❖ [KOTI AVIATION DASHBOARD] consists of four parts, Aviation Ecosystem Indicator, Comprehensive Aviation Indicator, Aviation Keyword Issue, Aviation Statistics & Forecast Analysis

- Purpose of building "Aviation Indicator" is to analyze COVID-19 Cases by providing monitoring system and urgency standard for new aviation policy



"Aviation Ecosystem Indicator" is to reflect public field opinions by aggregating internal surveys on Aviation Ecosystem

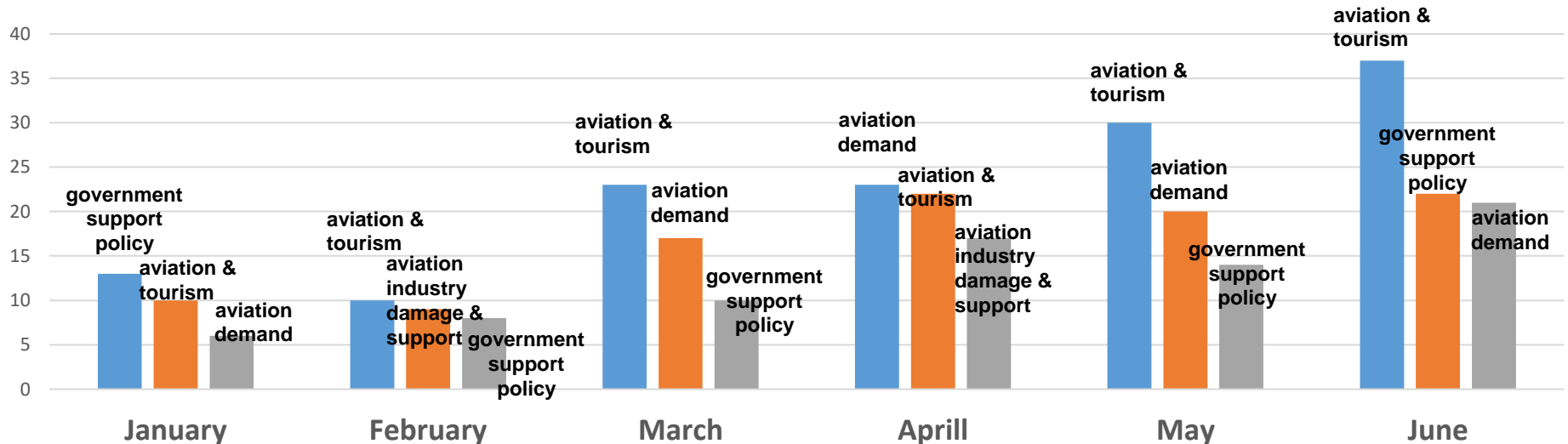


"Comprehensive Aviation Indicator" is computed by aggregating respective figures of each subjects, which are "Supply", "Demand" and "Society & Economics"



KOTI Aviation Policy Tracker

- ❖ **Completed based on 267 data, which were accumulated from January to June in 2021, by utilizing Global Policy Tracker of [Aviation Policy COVID19 Dashboard]**
 - Data gathered from foreign aviation policy articles, COVID-19 Keywords were directly categorized · organized by researchers
- ❖ **Government Support Policy & Aviation Industry Damage Support took large portion from January to February of 2021, while Aviation Tourism & Aviation Demand grew large from March**
 - On March, number of Policies for Recovery in Air Demand & Reopening of Tourism increased due to commencement of vaccination in developed countries such as US & European countries.





KOTI Aviation Policy Tracker

❖ Monthly "Detailed Aviation keyword" from January to June 2021.

★ 2021.01



★ 2021.02



★ 2021.03



★ 2021.04



★ 2021.05 ~ 06



Opinions





A Study on Korea's Air Transport Industry Competitiveness and Policy in the Post-COVID-19 Era

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The Dept. of Aviation of the Korea Transport Institute has been continuously studying aviation policies from the perspective of national and public interest. The direction for aviation policy development in the future will be discussed based on the studies conducted so far regarding the rapidly changing air transport industry environment as a result of the COVID-19 pandemic and details of competition that is taking place within the industry. The conclusion, in summary, is that, while expanding the concept of competition, the seed of innovation in Korea's air transport industry must continue to be planted.

Changes in Air Transport Industry Competition System According to the COVID-19 Crisis and Discussions

COVID-19, which broke out in 2020, has driven the global air transport industry to a state of crisis. With movements between countries blocked, the air transport industry as the core of international passenger transport is in imminent peril. Airlines, regardless of their nationalities, are battling for survival in various forms, personnel layoff, bankruptcy, merger and acquisition, and nationalization as a result of their deficit operation. The fact that Southwest Airline of the US, which was introduced in the previous edition as an example of strong resilience, is considering layoff for the first time in 50 years since its foundation¹⁾ indicates the seriousness of this crisis situation.

Korea, too, experienced numerous issues over the course of 2020 due to the COVID-19 pandemic. The merger and acquisition between Eastar Jet and JEJUAIR floundered as a result of rapid deterioration in financial conditions due to COVID-19. At present, Eastar Jet has commenced corporate rehabilitation procedures. The merger and acquisition between Asiana Airlines and Hyundai Development Company (HDC) also floundered due to environmental changes following the COVID-19 outbreak. In November 2020, the merger between Korean Air and Asiana Airlines was announced.



Since the outbreak of COVID-19, much concern has been raised regarding the air transport industry, such as in terms of the issue of market monopolization by ultra large-scale carriers and LLCs and new airlines facing crisis in their survival.

In this brief, the directions to be followed by Korea’s air transport industry in terms of its competitiveness and policies in the post-COVID-19 era will be discussed from the perspective of national interest and competitiveness. For this, changes in Korea’s aviation policy must be examined first from the viewpoint of competition.

Changes in Korea’s Aviation Policy from the Perspective of Competition

As for the history of civil aviation in Korea, Korea National Airlines was established in October 1948, the same year as the foundation of the Republic of Korea government, and then went bankrupt due to deficit operation. In 1962, Korean Air Corporation, a state enterprise, was established. Due to deficit operation, however, it was privatized to Korean Air in 1969.



source: Korea Transport Institute(2016), Transport in Korea with KOTI 30 Years, p.148

<Fig. 1> Establishment of National Airlines in Korea (1962 - 2016)



For approximately 20 years, the single airline structure was maintained. In the 1980s, the deregulation policy, which had been started in the US, was spreading to countries around the world. In Korea, aviation demand rose rapidly as a result of the liberalization of citizens' overseas trips following the 10th Asian Games Seoul 1986 and the Games of the 24th Olympiad Seoul 1988 in addition to the “three lows”— “low oil price, low interest rate, and low dollar value” in the latter part of the 1980s. Accordingly, the second civil aviation company was selected in order to promote improved efficiency through a competitive system and reject market monopolization. The Kumho Group, which acquired a business license, established Seoul Airlines in 1988. It was later renamed “Asiana Airlines.”

After around 20 years, this competitive structure was changed in 2005 when low-cost carriers (LCCs) began entering the market. Watching the success model of LCCs that appeared in the neighboring Asian countries in the 2000s following the US and Europe, the voice demanding market efficiency and additional deregulation was heightened in Korea.³⁾ Hansung Airlines, Korea's first LCC, and JEJUAIR began flight operation in 2005 and 2006, respectively. Since then, a number of airlines have joined the competition.

Not only in Korea but throughout the world, government regulations on the air transport industry have gradually been changing to deregulation for the purpose of maintaining stable service and appropriate fair level to ensure public interest. Korea's air transport policy has been developing through the transition from single-airline to multi-airline and competitive structures in line with the aviation demand increasing over a period of approximately 65 years.

Competition from the Perspective of National Competitiveness

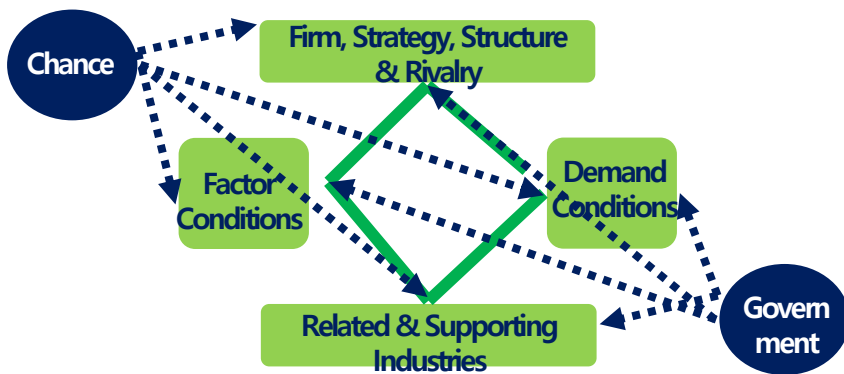
A number of theories have been established, with studies conducted on the necessity of a competitive system. In this brief, the necessity of competitive system is explained from the perspective of national interest based on the concept and theory of “national competitiveness” or “national competitive advantage.”

The “Diamond Model” of M. Porter (1990) is the most representative theory of national competitive advantage. According to Porter, national competitiveness changes depending on the capacity of the country's industry rather than based on the resources, labor power, and value of money as argued by other economic theorists



As the key determinants of national competitive advantage, Porter’s diamond model shows four main attributes (factor conditions, demand conditions, related and supporting industries, and firm strategy and structure). The four determinants, both individually and as single system, create the conditions under which the companies of a country get established and compete against one another. Porter explains that the most important condition of all is the pressure of investment and innovation on companies. The “diamond” can be regarded as a mutually strengthening system, and the effect of any one determinant is based on the state of other determinants. For example, a competitive advantage cannot be achieved even with an advantageous demand condition if the competitive factor is not sufficient.

“Firm strategy and structure,” which are related to the main subject, “competition,” imply the conditions of a country governing how companies are established, organized, and managed and also the characteristics of domestic competition of the companies. In particular, Porter explains in this study that “fierce domestic competition” is significantly related to the “creation and maintenance of competitive advantage in an industry.” National competitive advantage achieved through competition brings about a number of benefits. Fierce domestic competition puts pressure on domestic companies to promote growth and enter and perform in overseas markets. This in turn creates pressure for companies to “upgrade” their innovation continuously. Through competition, which gives rise to fear of failure, the companies overcome inertia. As for the relationship with the government, it changed to straightforward check rather than protection. At the same time, government support took on a more constructive form (support for overseas market development and investment in the creation of professional elements, etc.) for the entire industry. In fact, there are quite a number of reports and data about job creation and scale expansion in Korea’s aviation industry since the establishment of the first LCC in 2005.



Source: M.Porter(2009)

<Fig. 2> Michael Porter’s Diamond Model



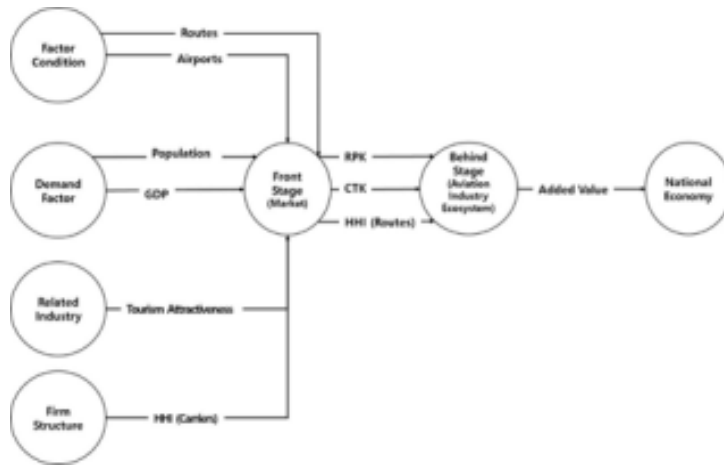
Source: M.Porter(2009)

<Fig. 3> Michael Porter’s Four Stages of National Competitive Development



It indicates that maintaining continuous competition and innovation is important for the air transport industry. With respect to this, Porter (1990) suggests that national competitive advantage develops by stage. The figure below suggests a three-stage development process consisting of factor-driven, investment-driven, and innovation-driven development, based on Porter's four stages of national competitive development. The stage of innovation-driven development in particular is where interaction among the elements of the diamond model takes place powerfully and innovation is pursued for each element.

The Korea Transport Institute and the Ministry of Land, Infrastructure, and Transport conducted a “Study on the Plans for the 3rd Aviation Policy Basic Plan (2020 - 2024) Establishment.” Through analysis on the indicators for each air policy-related field (transport, airport, safety, etc.), a strategic decision was made: the direction of Korea's aviation policy was in the stage of “innovation-driven” beyond “investment-driven,” which is to execute large-scale investments or follow international standards. Accordingly, the first goal of the national aviation policy was decided as “innovation,” and more future-oriented and aggressive tasks were emphasized and announced. Based on the diamond model, Song Ki-han, et al (2020) analyzed the sustainability and competitiveness of Korea's aviation industry from the perspective of efficiency between countries. For the indicator of competition, Herfindahl - Hirschman Index (HHI), which indicates the degree of dispersion by air route, was used. As a result of the analysis, the ranking of Korea's aviation competitiveness was found to be lower than that of the air transport industry (sixth in the world as of 2019).



Source: Song Ki-han, et al (2020)

<Fig. 4> Analysis on National Aviation Industry Competitiveness

The study on the analysis of Korea's aviation policy from the perspective of national competitiveness produced the following implications: While the scale of the aviation industry and each indicator have reached a considerable level, the ranking, in terms of national competitiveness and innovation, is not yet among the highest in the world. Korea's aviation competitiveness is in a significantly high level. To achieve further advancement, however, innovation-driven rather than investment-driven growth must be pursued. This means that the competitive system being pursued so far by the government for the air transport industry must be continually maintained and developed into the future



The Key is to Promote a Competitive Policy with the Changing Environment Reflected

As mentioned above, Korea's aviation policy has been focusing on establishing a competitive system over the last 20 years, and this competitive system is beneficial in promoting national interest. In addition, Korea must pursue innovation and competition-driven growth in order to develop into an advanced aviation country in the future.

In light of this directivity, however, one must not hastily conclude that the establishment of an integrated airline does not bode well for the air transport industry because it will form a monopolistic market. Any theory or policy must reflect the characteristics and environmental changes of the respective industry. In this brief, a more detailed approach was attempted with consideration given to the characteristics of the aviation industry and environmental changes caused by COVID-19.

Korea's aviation policy has also been changed to the competitive system in line with the national economic development and increased aviation demand. Song Ki-han (2021), Director of KOTI's Dept. of Aviation, forecasts that changes in the aviation demand and policy will take place in a short period of time as the aviation demand, which plummeted following the COVID-19 outbreak, recovers.

In fact, countries with advanced aviation industry, such as the US and Europe, have already started implementing policies to protect their national airlines just as they protected the aviation industry in the past. The most extreme case of using government fund to support airlines, as in Korea, is the nationalization of airlines. In May 2020, the German government declared the nationalization of Lufthansa, its national airline. In case of Italy's Alitalia, it had filed for bankruptcy in 2017, which is before the COVID-19 outbreak. Then, the airline promoted re-sale following the government-led receivership. With no applicant for purchase, however, it declared nationalization in March 2020. Based on a decision on October 10, 2020 that rehabilitation would be impossible with the existing organization and operating capacity, Alitalia is scheduled to establish a new company by keeping only the basic elements of an airline, such as employees and aircraft.

Just like the European airline nationalization policy, Korea must also build a line of defense with which to maintain the competitiveness of the air transport industry by reflecting the environmental changes resulting from the COVID-19 crisis. Therefore, a policy to protect Korean Air and Asiana Airlines, the largest airlines of Korea, seems inevitable at least for Korea's air transport industry and national interest. Nevertheless, discussion is needed as to which direction the defense policy must be promoted. As in the case of Germany, the protective measure was a short-term plan to protect the country's air transport industry. The German government emphasized the fact it was a temporary partial nationalization.

The support in accordance with the Korean Air - Asiana Airlines merger must be limited as short-term support until the end of the COVID-19 crisis. Once the crisis is successfully overcome and a new market environment is established, the government policy must be reset in the direction of promoting competition and innovation.



Integrated Airline must Take on the Challenge and Join the Global Competition

If so, it is necessary to think about the competitive system in Korea's air transport industry in the post-COVID-19 era.

The COVID-19 situation clearly revealed the weakness of Korea's air transport industry, i.e., being dependent on international flights.¹³⁾ The demand for international flights has been strongly influenced by the factors of uncertainty, such as politics and economy, in addition to infectious diseases like COVID-19 and MERS-COV. In fact, in countries considered relatively safer, such as the US and China, because of the demand for domestic flights, damages to the air transport industry caused by COVID-19 are being offset to an extent by domestic flight operation. In Korea, the demand for domestic flights has recovered to a level similar to that before the COVID-19 outbreak. However, most domestic flights in Korea are limited to the routes to Jeju Island; as a result, a large-scale demand, such as in the US and China, cannot be created. To reduce the uncertainty while lacking a stable market, Korea must eventually increase overseas markets through the Open Skies Agreement with other countries. An example is the Open Skies Agreement in Europe. Through this agreement, Europe is generating stable demand by operating international flights within Europe as domestic flights.

Of course, the Open Skies Agreement in Europe was promoted concurrently with the political situation to integrate all countries in the region and is consequently not suitable for Korea. Even so, Korea, whose economy is largely driven by exports, needs to promote economic cooperation with other countries strategically. In the past, the stance of the national airlines of Korea about the Open Skies Agreement was selectively conservative in terms of competition with overseas airlines. However, the integrated airline, as an airline representing Korea, must start building competitiveness by expanding the scope of competition to other countries. The government's aviation policy must encourage competition between the integrated airline and overseas airlines.

In the global competition, the role and responsibility of the integrated airline are all the more important. It needs to strive further to improve global competitiveness while strengthening the sense of duty as the representative of Korea's aviation industry. In fact, in line with the implementation of deregulation and the Open Skies Agreement in Europe since the latter part of the 1990s, airlines that had been dependent on national finance or government support eventually became integrated with airlines of other countries through bankruptcy or merger; accordingly, the performance of hub airports representing the respective countries also deteriorated



The Seed of Competition and Innovation must be Planted Continuously in Korea's Air Transport Industry

Recently, the Dept. of Aviation of the Korea Transport Institute has been working on developing plans to support Korea's aviation industry from the perspective of the air transport industry ecosystem. For this, the characteristics of the air transport market in leading countries as well as in Korea were compared.

Countries that are leading the air transport market, such as the US, China, and Europe, characteristically have a single market with high demand (for example, the market for domestic flights), full-service carrier (FSC) - low-cost carrier (LCC) - regional carrier ecosystem, and competition between business models. On the other hand, Korea's air transport market is divided among FSCs, LCCs, and small-scale air transport service providers. Given the low demand for domestic flights, small-scale air transport service providers—which can be referred to as regional carriers—are almost absent. For passenger transport, the competition is mostly between FSCs and LCCs. Overall, compared to the advanced countries abroad, Korea lacks stable market and regional carriers. This insufficient foundation was expressed in an inverted pyramid structure.

Assuming the worst case scenario for 2021 where aviation demand recovery is slow and there is no government support, the aviation industry ecosystem itself, with the exception of the integrated airline, can collapse. Korea's air transport industry ecosystem, which has been maintained to an extent but imbalanced compared to that of advanced aviation countries, faces the risk of fall. Fortunately, on March 3, the government declared policy support customized to airlines through the announcement of “Plans for the Aviation Industry to Overcome the COVID-19 Crisis and to Promote Reform.”

As previously mentioned, Korea secured the diversity and competitiveness of its air transport industry over the last 20 years through a transition from the structure of multiple private airlines following the foundation of Asiana Airlines in 1988 through the establishment of LCCs after 2005. At least for the improved competitiveness of the air transport market, continuous support to maintain the air transport industry ecosystem that has been established so far will be necessary. In addition, through continual support for and license issuance to new airlines in the post-COVID-19 era, the existing airlines will be able to achieve innovation by getting out of the rut.



How Have the Aviation Industry and Aviation Policies been Changing Since the Outbreak of COVID-19? - Centering on Keyword Analysis

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It has been over a year since the occurrence of the first confirmed case of COVID-19 in Korea. Over this period, the aviation industry has undergone a variety of events. In this study, the overall trend of the aviation industry and policies was analyzed according to the passage of time centering on text mining and keyword analysis; thus, an analysis for the “foundation” with which to develop suitable strategies was attempted.

Composition and Background of the text-mining Study

It has been over a year since the occurrence of the first confirmed case of COVID-19 in Korea on January 20, 2020. The number of confirmed COVID-19 cases reached almost 100,000, and the vaccine—a game changer—has become available within one year of the outbreak of the disease. However, the appearance of mutant virus amplifies the uncertainty for the future. Under the circumstances, what must be attempted preemptively is to analyze changes in trend according to the passage of time. By analyzing trend, events and issues for specific time periods can be comprehensively expressed; accordingly, the needs of each member group can be understood. To be able to understand the overall needs means that strategies suitable for each time period can be developed. Therefore, in this aviation and airport policy brief, the general trend of “aviation” was analyzed based on news articles published in Korea.

The subject of this brief study is “What trend has the aviation field been exhibiting since the outbreak of COVID-19?” Accordingly, for the text mining study, three study components must be confirmed. First are the keywords to be used in the study; second is the temporal and spatial scope of the study, and third is the text analysis technique.

The keywords for this study were set as “aviation industry” and “aviation policy.” The original intention had been to set “aviation” itself as the search keyword. However, it had limitations such as too much importance being placed on the “Korean Air” issue and certain themes, such as sports, as well as stop words. Therefore, to overcome the limitations and derive suitable results for a national policy study, the two words “aviation industry” and “aviation policy” were set as the main search keywords.



Detailed Methodology of Text-mining research

The NAVER news portal limits the maximum number of pages for search result display to 400 (4,000 news articles). Therefore, for this study, the data for analysis were collected through crawling on the headlines of up to 4,000 news articles per month from January 2020 when the first confirmed case of COVID-19 occurred to February 2021.

As a result of crawling on news articles, 48,816 and 43,344 keywords were derived for “aviation industry” and “aviation policy,” respectively. This result was produced based on the NAVER news article search results aligned in “order of relevance” with the overlapping news headlines removed.

In case of the Word2Vec model, the data were established by using the Okt module of Python Konlpy Package as the tag module for distinguishing headlines by article in the process of data pre-treatment, as well as by selecting nouns and extracting words consisting of at least two letters for each token to remove stop words. For this model, 300 vector-level embedding words as the module for the Word2Vec model of Python Gensim Package, context window size of 10, minimum word frequency of 50, 6 learning processes, skip-gram method, 20 iterations, and down sampling ratio of 0.001 for word label were set as parameters.22) Additionally, for t-SNE, the TSNE module of Python Sklearn Package was used.23)

Number of Articles Collected by Month (Aviation Industry)

Date (By Month)	No. of Articles
January 2020	3,517
February 2020	3,564
March 2020	3,491
April 2020	3,500
May 2020	3,518
June 2020	3,521
July 2020	3,515
August 2020	3,516
September 2020	3,551
October 2020	3,510
November 2020	3,120
December 2020	3,509
January 2021	3,531
February 2021	3,453

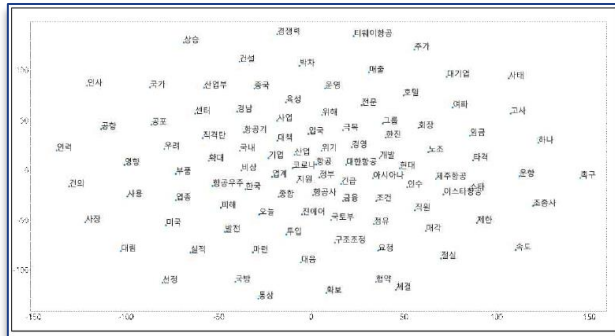
Number of Articles Collected by Month (Aviation Policy)

Date (By Month)	No. of Articles
January 2020	3,058
February 2020	3,553
March 2020	3,602
April 2020	3,624
May 2020	3,038
June 2020	3,618
July 2020	3,254
August 2020	2,390
September 2020	2,832
October 2020	2,554
November 2020	3,528
December 2020	2,981
January 2021	2,758
February 2021	2,554

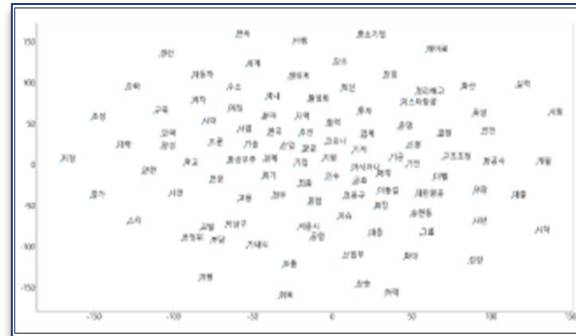


Word2Vec Similarity(t-SNE) Analysis of Text-mining Research

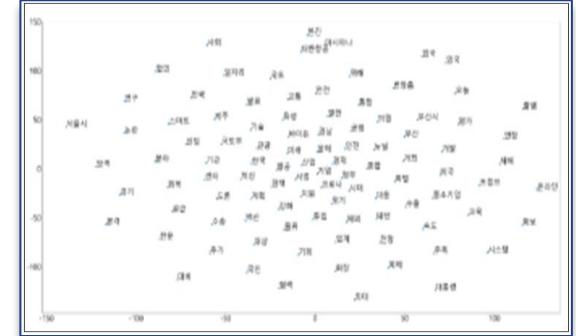
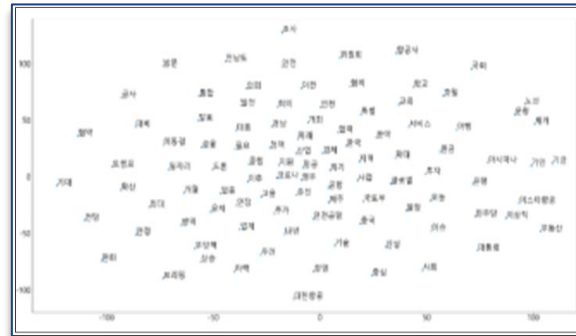
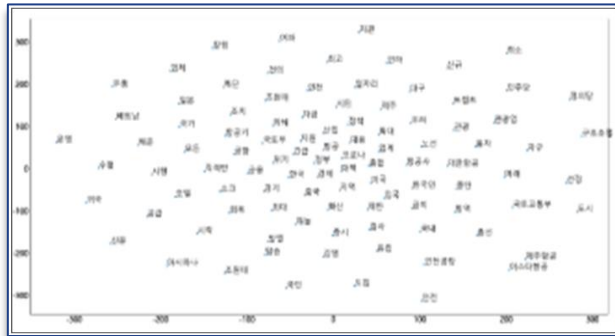
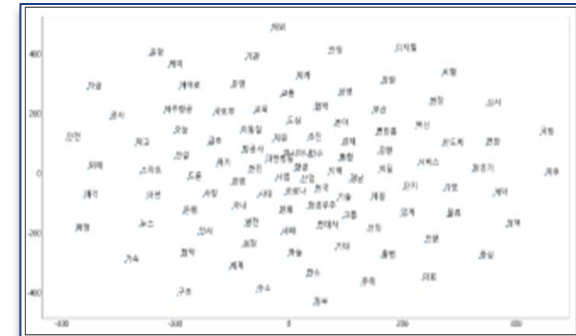
(1) 1st Wave (Feb. - Apr. 2020)



(2) 2nd Wave (Aug. - Oct. 2020)



(3) 3rd Wave (Dec. 2020 - Feb. 2021)



t-SNE Analysis Result in Relation to the 1st ~ 3rd Wave (Aviation Industry & Aviation Policy)



“By promoting further development, the strategies and foundation for the advancement of aviation study will be secured” (Conclusion of Text-mining methodology)

In this study, a total of three keyword analysis techniques were used to understand the characteristics and trend in each time period. There certainly are limitations. First is whether the division of period into the first, second, and third waves is appropriate; second is whether the NAVER news portal, which was used as the search source, is universal and valid in policy study. The last limitation is whether the parameters of the analysis model are appropriate and if the result can successfully represent the respective period. Keyword analysis results can vary widely depending on the interpretations of the persons conducting the analysis. Therefore, these limitations, which lead to the requirement of setting the elements as clearly and feasibly as possible, are a matter of substance in a study that is continuously associated with keyword analysis.

However, this study holds significance as it produced results under the subject “aviation” regarded from two perspectives (aviation industry and aviation policy) by using three analysis techniques based on the continuously researched data tools and study results. In addition, with the results, a foundation for additional studies has been prepared.

In summary, for “aviation industry” and “aviation policy,” keywords indicating urgency were mainly displayed as detailed plans for the crisis posed by COVID-19 had not been developed. As for “aviation industry,” issues concerning M&A in line with the COVID-19 pandemic were displayed over time; in the case of “aviation policy,” subjects related to mid- to long-term policies began to appear from the phase of the second wave of COVID-19. The characteristics of the methodologies applied to this study are also clear. Simple frequency analysis focuses on the unidimensional aspects of a phenomenon itself; Word2Vec similarity analysis examines detailed and composite aspects of a phenomenon, whereas t-SNE analysis—although similar to simple frequency analysis—enables understanding the closeness of detailed words using the two-dimensional visualization results.

In this study, the overall trend was analogized through keyword analysis. As such, by applying detailed methodologies, the data obtained from text mining can be used in developing aviation-related prediction models and establishing them as indicators.

By promoting further development, the strategies and foundation for the advancement of aviation study will be secured. Furthermore, the text-based derivative studies will serve as a compass in the post-COVID-19 era.

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COVID-19: KOTI AVIATION BRIEF



THANK YOU

감사합니다.



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Appendix





Appendix : References

- Burghouwt, G., & Huys, M. (2003). Deregulation and the consequences for airport planning in Europe. *disP-The Planning Review*, 39(154), 37-45.
- Carracedo, P., Puertas, R., Marti, L. (2020). Research lines on the impact of the COVID-19 pandemic on business. A text mining analysis, *Journal of Business Research*
- Jatnika, D., Bijaksana, M. A., & Suryani, A. A. (2019). Word2Vec Model Analysis for Semantic Similarities in English Words. *Procedia Computer Science*, 157, 160-167.
- Korea Transport Institute(2016), *Transport in Korea with KOTI 30 Years*
- Korea Transport Institute(2006), *Transport, 100 Milestones of Progress in Korea*
- Ministry of Land, Infrastructure, and Transport(2019), *The 3rd Aviation Policy Basic Plan (2020 - 2024)*
- Maaten, L. V. D., & Hinton, G. (2008). Visualizing data using t-SNE. *Journal of machine learning research*, 9(Nov), 2579-2605.
- Mikolov, T., Chen, K., Corrado, G., & Dean, J. (2013). Efficient estimation of word representations in vector space. *arXiv preprint arXiv:1301.3781*.
- Mikolov, T., Sutskever, I., Chen, K., Corrado, G. S., & Dean, J. (2013). Distributed representations of words and phrases and their compositionality. In *Advances in neural information processing systems* (pp. 3111-3119).
- Porter, M. E. (1990). The competitive advantage of nations. *Competitive Intelligence Review*, 1(1), 14-14.
- Song, K. H., Choi, S., & Han, I. H. (2020). Competitiveness Evaluation Methodology for Aviation Industry Sustainability Using Network DEA. *Sustainability*, 12(24), 10323.