https://doi.org/10.26552/aer.C.2019.2.4

COMPETITIVE CHALLENGES FACING THE AIR NAVIGATION SERVICES IN EUROPE

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Abstract

European aviation is facing new competitive challenges in a rapidly evolving global market, in particular as a result of a shift of economic growth to the East. These new competitors are benefitting from the rapid economic growth of the entire region, notably Asia, and from aviation becoming a strategic element in their home-country's economic development policies. With an annual growth forecast of 6%, scheduled passenger traffic in the Asia Pacific, the region is likely to grow faster than other regions until 2034 when it will account for 40% of world air traffic. China is expected to become the world's largest air transport market, overtaking the United States of America in 2023 in terms of number of passengers carried (Sloveniacontrol, 2018).For the EU aviation industry to remain competitive, it is essential that market access is based on a regulatory framework which promotes EU values and standards, enables reciprocal opportunities and prevents distortion of competition. The main challenge for the growth of European aviation is to reduce the capacity and efficiency constraints, which are seriously impeding the European aviation sector's ability to grow sustainably, compete internationally, and which are causing congestion and delays and raising costs. This paper examines competitive environment and performance of seven European Air Navigation Services Providers (ANSP) of Austria, Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Slovak Republic and Slovenia from European Commission´s target perspective.

Keywords

Air Navigation Services Providers, Functional Airspace Blocks, Performance Review Committee

1. Introduction

Airports together with air traffic management services providers constitute the key elements of the infrastructure of civil aviation. The quality, efficiency and cost of these services have become increasingly important to the competitiveness of the industry (Materna, 2019). In Europe, airports and air traffic management can safely handle up to 33,000 flights per day. Yet, European airspace as a whole is inefficiently managed and unnecessarily fragmented, and a slow implementation of the Single European Sky framework means higher costs for the airlines, which directly affects their competitiveness. The estimated costs of the EU's fragmented airspace represent at least €5 billion a year. Such an inefficient use of the airspace causes higher prices and delays for passengers, increasing fuel burn and CO2 emissions for operators, and impedes the efforts to improve environmental performance. In addition, major European airports are predicted to face a capacity crunch in the near future.

The Single European Sky is a concrete example of where the EU can make a difference by raising capacity, improving safety and cutting costs while minimising aviation's environmental footprint. This was the initial ambition more than a decade ago, but the project is still not delivering. Despite some achievements towards a better performing network, the level of cooperation between Member States air navigation service providers is still far from optimal, and the technology used is not harmonised or state-of-the-art. EU Member States must overcome these challenges in order to achieve a true Single European Sky, which is one of the most fundamental challenges affecting the performance and competitiveness of the EU's aviation system today. For example, a fully optimised air traffic management system would reduce the costs stemming from inefficiencies (delays, and longer routes etc.).

As an important step in unleashing this potential for the EU aviation sector, the Commission urges the Council and European Parliament to adopt the Single European Sky (SES2+) proposals, in order to ensure the effectiveness of functional airspace blocks (FAB) and network functions and the swift implementation of the EU-wide targets for the performance scheme based on a fully independent performance review body.

The efficient governance of the Single European Sky (SES)remains a priority for the Commission. The respective tasks of the European Aviation Safety Agency and Eurocontrol should be defined in a manner that ensures that both organisations complement each other's tasks, so that overlaps can be avoided, and costs reduced.

In this context, it is important to deploy technological solutions in a timely and coordinated manner. A number of instruments have been developed to this end, such as the air traffic management Master Plan, Common Projects and the Deployment Programme. They are implemented by public-private partnerships, notably the SESAR Joint Undertaking for the definition and development activities and the SESAR deployment framework partnership for deployment. Both development and deployment activities require appropriate

financial support. So far, the EU is contributing through programmes such as Horizon 2020 and the Connecting Europe Facility.

2. Data Envelopment Analysis (DEA) of Functional Airspace Block Central Europe (FAB CE)

European Commission has very detailed legislation how to measure and how to improve performance of Air Navigation Service Providers. Every ANSP has a trackable record as an individual provider and as a member of respective FAB as well. On yearly basis, Performance Review Committee evaluates, how single ANSPs contribute to European, regional (Functional Airspace Block's) and state targets.

The ultimate goals of the technological modernisation of air traffic management through the deployment of the Single European Sky Air traffic management Research project (SESAR) are to enable a reduction of air traffic management costs, greater level of safety, increased operational efficiency for airspace users by reducing delays, fuel burn and flight time, an increase in capacity and a reduction of CO2 emissions. All these elements will increase the environmental benefits of SESAR solutions and are fully linked to the overall air traffic management performance scheme.

Focusing on FAB CE this section compares performance of ANSPs of seven members (Austria, Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Slovak Republic and Slovenia) from European Commission target perspective.

2.1. Data Envelopment Analysis

Data Envelopment Analysis (DEA) theory was created in the 1970s. It was built on the idea of Farrell's 1957 "Measuring efficiency of decision-making units." The basic task of the DEA models is comparing organizational units within a group. It is a method based on the use of linear programming that was originally developed to measure the effectiveness of non-profit organizations such as schools, hospitals, state and government. This is the reason why this model is the most suitable for assessing the performance of the Air Navigation Providers. These are considered as public service non-profit organizations. It must be stressed out that ANSPs generate certain profit accepted by European Commission.

DEA is a relatively new non-parametric approach for evaluating the performance of a set of peer entities called Decision Making Units (DMUs, individual ANSPs in our case) which convert multiple inputs into multiple outputs. The characterization of the unit of assessment as “decision making” implies that it has control over the process it employs to convert its resources into outcomes.

Data Envelopment Analysis is a method for measuring comparative or relative efficiency. We speak of relative efficiency because its measurement by DEA is with reference to some set of units, we are comparing with each other. The efficiency score is usually expressed as either a number between 0-1 or 0-100%. A DMU with a score less than 100% is deemed inefficient relative to other units.

Since DEA was first introduced in 1978, researches in a number of fields have in a short period of time recognized that DEA is an excellent and easily used methodology for modelling operational processes for performance evaluations.

2.1.1. Advantages of DEA model

DEA is a framework analysis which accommodates a comprehensive view of organisational performance. It is an appropriate tool for assessing performances of an organisation or firm. This is partially due to the fact that a multitude of subjective factors affect the quality and productivity of a service that needs to be well managed. Listed, we can find main advantages of DEA model:

- Each DMU can be characterized individually.
- Inefficient DMUs are improved by projecting them on the efficient frontier (envelopment).
- It facilitates making inferences for each DMU among the inferences on the DMUs’ general profile.
- Multiple-output and multiple-input can be handled in various DMUs measurements.
- A focus on a best-practice frontier, instead of on central-tendencies, i.e. every DMU is compared to an efficient unit or a combination of efficient units. The comparison, therefore, leads to sources of inefficiency of DMUs that do not belong to the frontier.
- No restrictions are imposed on the functional form relating inputs to outputs.

2.1.2. Disadvantages of DEA model

- As DEA is an extreme point technique, it is very sensitive to noise (even for symmetrical noise with a zero mean) that may cause significant errors in efficiency measurements.
- Statistical hypothesis tests are difficult because DEA is a non-parametric.
- The standard formulation of DEA is based on separate linear programmes for each DMU, which is computationally demanding.
- Difficulties in aggregating different aspects of efficiency especially whenever DMUs perform multiple activities.
- Insensitivity to intangible and categorical components (e.g. service quality in a bank branches).
- There are crucial problems related to mixing multiple dimensions in the analyses. For instance, consider a DMU performing two different activities; the DMU could be found efficient in the first activity but inefficient in the second. For example, a bank’s branches are a single platform that management uses to sell financial services to customers as well as providing more traditional banking services such as processing deposits or loan. Furthermore, it is difficult to simultaneously assess the sales efficiency and the service efficiency of the branch. Because the relevant inputs and outputs for individual activities are not directly comparable, the analyst would have to run two DEA models one for sales and the other for services. DEA is intended for estimating the relative efficiency of a DMU

but not specifically addressing absolute efficiency. In other words, it measures how well the

- It is impossible to rank efficient units absolutely because all DMUs located on the frontier surface have 100% efficient score.
- From managerial point of view, it may be more useful to compare DMUs to a frontier of absolute best performance. So, the analyst would be able to better detect, for example, a DMUs network's true inefficiency. In fact, one might argue that efficient units may not be efficient enough, so the created frontier does not reflect the real potential of the DMU network.
- There is no specifically robust methodology for evaluating or testing the appropriateness of a set of factors in an efficiency study. A DEA model can indicate how efficient a specific DMU is out of a given set of factors, and what its efficiency score is. It does not indicate, however, whether the chosen factors can provide the right efficiency.

2.2. Results – performance of individual ANSPs in Key Performance Areas

2.2.1. Safety and security

Safety and security are pre-requisites for a competitive aviation sector. With the aviation traffic in Europe predicted to reach 14.4 million flights in 2035 (European Commission, 2016). This will allow the EU aviation sector to continue to develop safely in the future. To this end, the regulatory system has to be better equipped to identify and mitigate safety risks, in a quicker and more effective manner. This can be achieved by introducing a risk and performance-based approach to safety regulation and oversight, by closing existing safety gaps and by integrating other technical areas of regulation connected to safety more deeply, such as aviation security.

Efficiency and safety gains can be achieved through a better use of available resources at EU and Member States level. To this end, a framework for the pooling and sharing of technical resources between the national authorities and the European Aviation Safety Agency should be put in place. It should allow Member States to transfer on a voluntary basis, responsibilities for the implementation of European Union legislation, to the European Aviation Safety Agency or to another Member State. Regulatory responsibility would become clearer and duplication would be avoided. A single European aviation authority should be the longer-term ambition.

In this particular case we will not take into account the safety as a parameter needed for a new efficient model of provision of air navigation services. Base on the PRB Annual Monitoring Report 2017 safety level has already been achieved on national and FAB CE level.

2.2.2. Capacity

The EC Decision 2015/347 published on the 2nd March 2015 states that: "The performance targets in the key performance area of capacity submitted by the Czech Republic, Croatia, Hungary, Austria, Slovenia and Slovakia as regards FABCE should be revised downwards. As a minimum, those targets should be in accordance with the respective FAB reference values set out in the Network Operations Plan. Where the Network Operations Plan specifies remediation or mitigation measures, account should be taken of those measures when revising the performance targets." (Performance Review Board, 2015)

Table 1: Individual ANSP contributions to the FAB reference value of En-route delay level (in minutes per flight). Source: (Performance Review Board, 2015).

Year		2015	2016	2017	2018	2019
FAB reference value		0.30	0.29	0.29	0.29	0.29
Revised FAB target		0.29	0.29	0.28	0.28	0.27
ANSP contribution	Austro Control	*0.21*	*0.21*	*0.20*	*0.19*	*0.19*
	Croatia Control	*0.23*	*0.22*	*0.21*	*0.21*	*0.19*
	ANS CR	*0.09*	*0.1*	*0.09*	*0.10*	*0.10*
	HungaroControl	*0.06*	*0.05*	*0.05*	*0.04*	*0.05*
	LPS SR	*0.10*	*0.10*	*0.10*	*0.11*	*0.10*
	Slovenia Control	*0.21*	*0.21*	*0.22*	*0.23*	*0.22*
Aggregated ANSP contribution		***0.31***	***0.30***	***0.29***	***0.29***	***0.28***

2.2.3. Cost-Efficiency

Concerning the key performance area of cost-efficiency, the targets expressed in en-route determined unit costs submitted by Member States have been assessed, in accordance with the principles, in conjunction with point 1, of Annex IV to the Implementing Regulation (EU) No 390/2013, by taking account of the trend of en-route determined unit costs over the second reference period and the combined period of the first and the second reference period (2012-19), the number of service units and the level of en-route determined unit costs in comparison to Member States having a similar operational and economic environment.

Now we have initial input and output parameters for DEA methodology – determined costs, delays and service unit cost. The section shows the data of LPS SR only. The more data we provide the more to the DEA methodology the more complex picture we can get. From this perspective we added more parameters to the calculation - number of movements, size of particular FIR, number of employees and costs of Gate-to-Gate approach. As a reference base line, we took data from ANPS's Annual Reports 2018.

Table 2: Slovakia - revised en-route cost-efficiency targets for Reference Period 2. Source: (Letové prevádzkové služby SR, š.p., 2018).

Revised performance plan	**2015**	**2016**	**2017**
Determined cost (mil. EUR)	59,3	61,9	63,0
Service Units (in thousands)	1078	1126	1186
Determined unit cost (EUR)	54,99	52,54	52,61

2.2.4. Environment

The future competitiveness of the European air transport sector and its environmental sustainability go hand-in-hand. Regular and more holistic monitoring and reporting on the environmental impacts and progress on the implementation of the different policies and initiatives across the EU air transport system will help inform about the sector's impacts on the environment and provide a valuable contribution to further decision-making. High environmental standards have to be preserved and enhanced over time in order to ensure that aviation develops in a sustainable manner, avoiding or minimising harmful effects on ecosystems and citizens.

As regards emissions from aviation, the EU has put in place powerful regulatory tools such as the Emission Trading Scheme (EU ETS) addressing greenhouse gas emissions, including from aviation.

The International Civil Aviation Organization (ICAO) plays a critical role in the development of a global solution to address greenhouse gas emissions from international aviation. The EU, through its Member States acting within the framework of ICAO, pursues a robust Global Market Based Mechanism to achieve carbon neutral growth from 2020 to be reviewed over time as appropriate, and to be made operational from 2020, as well as the adoption of a first CO_2 standard for aircraft. At the ICAO Assembly in 2016, Europe should reach out to other regions of the world to achieve a truly global mechanism.

For the purpose of this paper we will not calculate with the CO_2 emission saving mechanism contribution. Obviously, if we design efficient model in provision of air navigation service, we achieve significant CO_2 savings.

3. DEA model outcomes

The Delay is one of the most important targets set by European Commission used for assessing performance of Air Navigation Service Providers. We set the delay as output parameter while Number of Movement, Number of Employees, Determined Cost and Size of FIR represents the input. First, we compared just 2 parameters in every FAB CE Member State (ANSP) to figure out, what ANSP is the most efficient under the current legislation.

This section shows the comparison of Determined Costs vs. Number of Movements.

Table 3: Determined costs vs Number of Movements Source: Authors.

DMU	A	SK	CRO	CZ	HU	SLO
NoM (mil.)	1,23	0,52	0,58	0,85	0,84	0,39
Cost (mil. EUR)	195,9	63	90,1	148,1	84,7	35,4
Cost/NoM	158,50	120,61	155,11	173,55	101,04	91,73
Efficiency (%)	57,88	76,06	59,14	52,86	90,79	100

Table 4: Inputs to the DEA model Source: Authors.

	Inputs			
Country/ANPS	NoM	NoE	FIR (km²)	Cost
A Austrocontrol	1235994	1003	83879	195900000
SVK LPS SR	522353	485	49035	63000
CRO Crocontrol	580892	740	129000	90100000
CZ ANS CR	853364	989	78865	148100000
HU Hungarocontrol	838279	743	93030	84700000
SLO Sloveniacontrol	385897	230	20273	35400

Table 5: Outputs of the DEA model. Source: Authors.

	Outputs		
Country/ANPS	Delay	DUC	Weight
A Austrocontrol	0,29	71,35	0
SVK LPS SR	0,04	52,61	0
CRO Crocontrol	0,12	46,53	0
CZ ANS CR	0,05	42,1	1
HU Hungarocontrol	0,01	34,69	0
SLO Sloveniacontrol	1,17	61,71	0

4. Conclusions - complex ATM solution

Today's business world is of growing economy and globalization, so most of the companies are struggling to achieve the optimal market share possible on both market level i.e. Domestic and International market. Day by day businessperson works to achieve a most well-known goal i.e. "being the best by what you perform as well as getting there as quickly as possible". So firms work effortlessly to beat their rivals they assume various ways to try and do thus. Some of their ways might embody competitive within the market of their core competency. Therefore, it is ensuring that they need the best knowledge and skills to possess a fighting likelihood against their rivals in that business.

Every business wants the optimum market share (growth) over their competitors, so companies are trying to get optimum growth by using the most common shortcut i.e. Merger and Acquisition. The growth main motive is financial stability of a business and also the shareholders' wealth maximization and main coalition's personal motivations. Mergers and acquisitions provide a business with a potentially bigger market share and it opens the business up to a more diversified market. In these days it is the most commonly use methods for the growth of companies. Merger and Acquisition basically makes a business bigger, increase its production and gives it more financial strength to become stronger against their competitor on the same market. Mergers and acquisitions have obtained quality throughout the world within the current economic conditions attributable to globalization, advancements of new technology and augmented competitive business world.

The main idea behind mergers and acquisition is one plus one makes three. The two companies together are more worth full than two classified companies at least that's the concluding behind mergers. Merger is the combination of two or more firms, generally by offering the shareholders of one firm's securities in the acquiring firm in exchange for the acquiescence of their shares. Merger is the union of two or more firms in making of a new body or creation of a holding company (European Central Bank, 2017).

It involves the mutual resolution of two firms to merge and become one entity and it may be seen as a choice created by two "equals". The mutual business through structural and operational benefits secured by the merger will reduce cost and increase the profits, boosting stockholder values for each

group of shareholders. In other words, it involves two or more comparatively equal firms, which merge to become one official entity with the goal of making that's value over the sum of its components. During the merger of two firms, the stockholders sometimes have their shares within the previous company changed for an equal number of shares within the integrated entity. The fundamental principle behind getting an organization is to form shareholders' wealth over and higher than that of two firm's wealth.

The advantage and disadvantages of merger and acquisition are depending of the new company's short term and long-term strategies and efforts. That is because of the factors likes market environment, variations in business culture, acquirement costs and changes to financial power surrounding the business captured. So, following are some advantages and disadvantages of merger and acquisition are:

4.1. Mergers and acquisitions - advantages

- The most common reason for firms to enter into merger and acquisition is to merge their power and control over the markets.
- Another advantage is Synergy that is the magic power that allow for increased value efficiencies of the new entity and it takes the shape of returns enrichment and cost savings.
- Economies of scale is formed by sharing the resources and services. Union of 2 firm's leads in overall cost reduction giving a competitive advantage, that is feasible as a result of raised buying power and longer production runs.
- Decrease of risk using innovative techniques of managing financial risk.
- To become competitive, firms have to be compelled to be peak of technological developments and their dealing applications. By M&A of a small business with unique technologies, a large company will retain or grow a competitive edge.
- The biggest advantage is tax benefits. Financial advantages might instigate mergers and corporations will fully build use of tax- shields, increase monetary leverage and utilize alternative tax benefits.

4.2. Mergers and acquisitions - disadvantages

- As a result of M&A, employees of the small merging firm may require exhaustive re-skilling.
- Company will face major difficulties thanks to frictions and internal competition that may occur among the staff of the united companies. There is conjointly risk of getting surplus employees in some departments.
- Merging two firms that are doing similar activities may mean duplication and over capability within the company that may need retrenchments.
- Increase in costs might result if the right management of modification and also the implementation of the merger and acquisition dealing are delayed.
- The uncertainty with respect to the approval of the merger by proper assurances.
- In many events, the return of the share of the company that caused buyouts of other company was less than the return of the sector as a whole (Richard, 2009).

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