The International Journal of Business Management and Technology, Volume 3 Issue 4 July–August 2019
ISSN: 2581-3889

Research Article Open Access

Airport enterprises management performance evaluation towards innovation and sustainable development

Maria F. SARTZETAKI
Dr/PhD, Management and Economics on Transport Enterprises
Department of Economics, Democritus University of Thrace, Greece

Abstract: *Airport enterprise innovation performance is a crucial issue that planners, decision makers and managers should focus in order to drive the airport enterprise performance towards sustainable development. The strategic infrastructure needs, and investments need to include improvements across all major factors that affect the innovation dimension of sustainable development. Key objective of the paper is to highlight the challenges in airport enterprise management towards sustainable development in terms of innovation improvement. A performance evaluation towards innovation and sustainable development framework is adopted and a case study application highlights the crucial role of airport enterprise management performance innovation dimension towards sustainable development. Conventional wisdom is to stimulate the interest on topic and promote a framework addressing to evaluate airport enterprise management performance towards innovation and sustainable development.*

Keywords: *Airport enterprise management, Performance management, Innovation, Sustainable development*

I. INTRODUCTION

Sustainable transport infrastructure development is a process that incorporates all the basic principles of sustainable development. These processes should comply with the objectives of environmental, social awareness, and economic growth [1]. Institutions, associations and governmental bodies widely recognize the need for monitoring transport demand and adopting strategies to exploit the total benefits for local society. Dimitriou and Sartzetaki, 2018 [2] estimate the contribution of aviation in regional development providing evidence that this relationship needs to be investigated not only to extrapolate the demand trends, but also to adopt policies, define strategies and support decisions towards transport policies and investments in new infrastructure to accommodate additional demand.

Transport is a major contributor to economic growth that requires operational productive and efficient infrastructures and services.

The related demand and supply variables such as the transport cost, income per capita and social security and education and health and the related supply variables as transport asset portfolio, working force capital and other capitals affect the decision making process in order to develop the transport sector and lead to the equilibrium point between transport sustainability and economic development. The branch of economics, economic geography, indicates that the values assigned to classical variables for the models that forecast tourism demand are unique to each country as illustrated in Fig.1. These variables are self-explanatory and interrelated. For example, although natural and climatic capital may exist in many countries, it is a combination of the existing tourism infrastructure and historical levels of tourism that together with the natural and climatic capital explain why volumes of tourism are higher in certain countries equilibrium [3, 4].

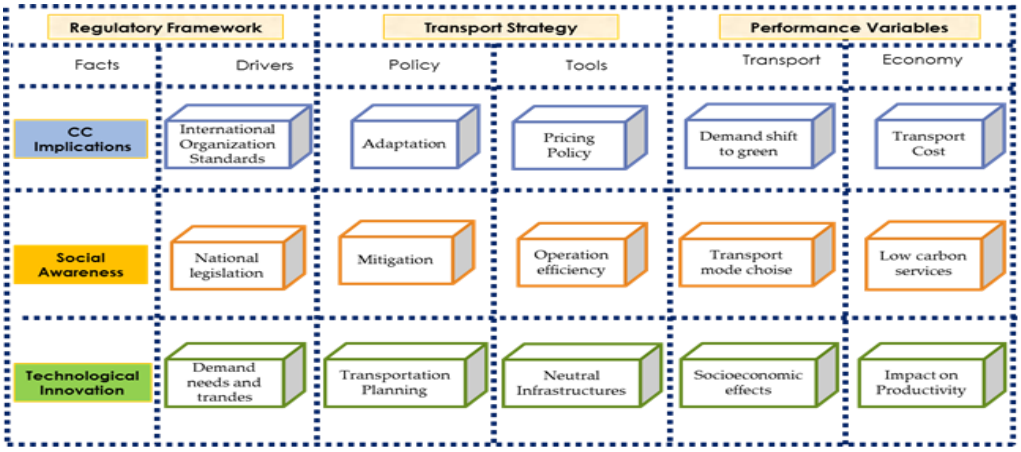

Figure 1

Demand -Supply variables influence the Transport- Regional economy equilibrium (Dimitriou and Sartzetaki, 2016b).

Transport enterprises development is a decision-making process that involves multiple stakeholders, such as Government and governmental authorities, investors, and operators. The highest-level goal of the decision-making process is the delivery of cost effective, reliable, sustainable, efficient, convenient and safe services to the state's population [5].

The external environment of a transport enterprise encapsulates many different influences. The most general layer of the ecosystem environment is often referred as the corporate of the enterprise acting in a sector, that consists of broad factors that impact to a greater or lesser extent on transport infrastructures. The fundamental objective is to develop an analysis framework that identify how short-term trends in the economic, social, technological, environmental aspects might affect the transport enterprise management.

This research paper deals with the challenges in airport enterprise management towards sustainable development in terms of innovation improvement. Key objective is to illustrate the airport enterprise innovation indicators towards sustainable development. By a top-down approach, definitions, assessment methodology and key outputs are highlighted.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The identification of the development directions is based on the understanding of the transport enterprise strategic position. Development directions are the strategic options that transport enterprise face considering the strategic capabilities of the enterprise and the expectations of stakeholders. Transport policy, planning and operation exist with a hierarchy of objectives functionally split into four directions-strategy, planning, competitiveness and innovation [6].

Figure 2

Key dimensions of transport enterprises management actions towards innovation and sustainable development [6]

One of the most important issues of the decision-making process in order to invest in new infrastructures in transports by funding agencies is which projects they should spend their limited resources on [5]. These decisions can be

supported by Decision Support Systems and frameworks which are based on techniques of decision analysis and optimization techniques based on evaluation criteria and indicators [7].

Assessing concrete steps in airport enterprise management can be a way of making it more resilient and ultimately more profitable for all the stakeholders and agents across the value chain. Governments and authorities are responsible for the strategic planning in order to improve the transport enterprise performance with accurate forecasts and assumptions [4].

Each dimension is based on principles that affect the strategic planning process as well as the management of the transport infrastructure project. Strategy and market development are based on regulation and protection, funding and capital leverage and socioeconomic impact. Business Planning is forced by business viability, business development and external variables consideration. The Competitiveness dimension is forced by the regulatory framework, the Exposure to competition in the product market and the improvement in management performance [6].

Innovation dimension is driven by the Artificial Intelligence, new products and services and Intelligent Transport Systems development. Innovation process is aimed at ensuring that transport infrastructure project is given the opportunity to be as creative as possible. Issues concerning innovation include developing practices that stimulate new thinking; demonstrating interest in all aspects of business development; investing in skill information in employees; investigating incentives schemes for new ideas [8].

More investments are needed in market research to analyse and anticipate passenger preferences and reactions to new products and services. These passengers service requirements can be partially addressed by analyzing economic, demographic technological, innovation and social trends. Increasingingly the demand for products which have not been experienced markets and whose demand is difficult to forecast using information on past behavioral responses [6].

In all transport enterprises new technology has either lessened the entry barriers, enhanced, cross-national investment, streamlined the supply chain, integrated logistics functions, enhanced or replaced transportation, improved transit and transaction time, led to new service and product innovations and improved service delivery [6].

There are several innovation dimension aspects of airport enterprises including safety, comfort, reliability, convenience [9]. Passenger expectations for time, place and possession utility, service quality and price quality continue to grow. All enterprises and transport infrastructure projects have been influenced in some ways by immense technological change, principally in the area of information technology systems and telecommunications. This trend means that most businesses are performing quite differently to the way they were some years ago and which many would have thought impossible many more years ago.

Reliability is defined as a measure of the probability of a trip to take place in accordance with the expected trip elements, such as waiting time, riding time, passenger load, vehicle quality, safety travel time, comfort and cost or as the availability and stability of travel attributes at a given point influencing the decision making of passengers and transit operators [10]. Comfort is the standards of living of the majority must be reflected by passenger carriers if they are to continue to attract a demand of their services. The departure times or arrival times must be those which the customer requires. To encourage long term growth the frequency and network design create a network of travel opportunities. This is especially important for the public transport system's attractiveness [6].

Safety is always a concern of passengers, government authorities and most operators, adverse publicity attached to accidents reduces demand for the mode, especially in the short term. According to [11] in that hierarchy of quality determinants, security is defined as the actual degree of safety from crime or accidents and the feeling of security resulting from that and other psychological factors. As public transportation provides a mobility service to the user, as well as producing a wide impact on the system. it should be operated in such a way as to achieve an efficient and effective transportation system with high levels of safety and security [12].

III. RESEARCH FRAMEWORK AND METHODOLOGIES ADOPTED

3.1 Airport enterprise Management Performance towards innovation indicators determination

The fourth dimension towards sustainable development was introduced as innovation. Innovation measures are complex. Quality measures can be specific to each mode and to the types of service provided by the mode in a country [13]. Despite the complexity of the measurements, the level of quality of service is an inherent assumption in decisions about where and how much to invest in transport and it is directly related to management operation as well.

The Innovation targets are measured through an Operational Scorecard and are based on wide range of the key non-financial value drivers of the transport enterprise management. The innovation dimension towards sustainable development is measured through the following four introduced indicators:

- Safety /Security

Transport safety importance is crucial for passengers with safety aspects being usually considered only when accidents occur. However, pertinent regulations and practices ensure the safety of countless passengers on literally thousands of passenger and cargo transportation. In addition, transport enterprise engages all operational stakeholders in the implementation of every preventive measure that minimizes the risk of an accident. The safety/security indicator is defined as the number of serious (high consequence) incidents/accidents per 100,000 movements.

- Service quality

Optimal management of airport enterprises targets to provide quality service and ensure that that its staff is available on a 24 hours basis to assist passengers, visitors or users., receiving personal assistance or information. The service quality indicator is defined as the score from overall satisfaction form passenger survey. The "Passengers Survey" is a quantitative research in the form of personal face-to-face interviews.

- Connectivity /Accessibility improvement

Especially when referring to an airport enterprise, airport connectivity is the sum of both direct and indirect connectivity from the airport in question – thus measuring the overall level to which an airport is connected to the rest of the World, either by direct flights or indirect connections via other airports [14]. Direct connectivity is defined as the air services available from the airport – measured not just in terms of destinations, but also based in the frequency of flights to the same destination [15]. Indirect connectivity measures the number of destinations, through a connecting flight at hub airports from an airport. The Connecitivity ndicator measures the overall level to which an airport is connected to the rest of the World, either by direct flights or indirect connections via other airports.

- System availability

Transport enterprise management targets to create an environment where all passengers may have access to trustworthy sources of technological means and a policy environment that fosters innovation to be able to protect and safeguard their information assets and securely utilize technology. The system availability indicator is defined as the average availability of the entire air transportation system.

3.2 Indicators values estimation in a time period using Balance Scorecard

Performance indicators support the management of transport enterprises. As no single performance indicator can give a full picture regarding transport enterprise performance, each indicator presents a partial view from a specific viewpoint and is therefore not enough to serve as a basis for management decisions. A popular performance measurement scheme suggested by [16] is the Balanced Scorecard (BSC) that developed to measure performance metrics from financial, customer, internal processes and growth perspectives. By combining these different perspectives, BSC helps decision makers to understand the inter-relationships and trade-offs between alternative perfor- mance dimensions, thus leading to improved decision making and problem solving [17]. The base point of BSC would be the identification of the unit's strategic plan. This would involve the development of a goals, strategy, outputs, measures, targets and four different financial perspectives.

After airport development the asset owners and investors or concessionaires are the stakeholders that are related to the operation and maintenance contractor monitoring, while operational and maintenance contractors are responsible for ensuring on-time, on-budget, and on-quality operation and financing, through KPIs efficiencies in order to avoid delays and increased costs [18].

The Performance Ratios of the qualititave- non-financial value drivers of the innovation dimension indicators are measured through an Operational Balance Scorecard. Based on the average Score of the Operational Scorecard (ranging between 1-5, with 3 being "On-Target") the OPR is calculated with values that range from 0.9 (Score = 1, "Poor") and 1 (Score = 5, "Excellent"). If Score = 3 (i.e. "On Target") the operational performance ratio value is 1. The target values for the year in question are based on an objective rule, i.e. "On Target" (score 3) was at least the average actual for the previous 5 years while Outstanding (score 5) was set higher than the best actual value for the previous last years.

3.3 Innovation indicators values adjustment

For the safety security indicator (c1) equation 1 is applied to each of the two sub-components, where the min and max are the relative values between which the targets are determined for the reference year with the Balance Scorecard analysis and then the arithmetic mean of the two sub-indices is created.

$$C1 = SafetySecurity(Incidents) = \frac{\frac{actual\ value}{minimumtargetvalue} + \frac{actualvalue}{maximumtargetvalue}}{2} \quad (1)$$

For service quality indicator (c2) equation 2 is applied to each of the two sub-components, where the min and max are the relative values between which the targets are determined for the reference year with the Balance Scorecard analysis and then the arithmetic mean of the two sub-indices is created.

$$C2 = Servicequality(Overallsatisfaction) = \frac{\frac{actual\ \ value}{minimumtargetvalue} + \frac{actualvalue}{maximumtargetvalue}}{2} \quad (2)$$

For Connectivity (c3) the equation 3 is applied using the actual value observed in the reference year and the minimum values reviewed from benchmarking in similar transport infrastructures with similar characteristics and maximum value the forecasted annual traffic growth according to global estimations.

$$c_3 = Connectivity = \frac{targetvalue\ \ - minimumvalue}{maximum\ \ value - minimumvalue} \quad (3)$$

For system availability indicator (c4) equation 4 is applied to each of the two sub-components, where the min and max are the relative values between which the targets are determined for the reference year with the Balance Scorecard analysis and then the arithmetic mean of the two sub-indices is created.

$$C4 = Systemavialability = \frac{\frac{actualvalue}{minimumtargetvalue} + \frac{actualvalue}{maximumtargetvalue}}{2} \quad (4)$$

Finnaly the total aggregated innovation index is calculated as the geometric mean of each indicator. The index for transport enterprise management towards innovation is the geometric mean of the adjusted indices and is defined as the nth root of the n indices C1, C2, C3, C4 and is computed as:

$$\left(\prod_{i=1}^{n} C\right)^{1/n} = \sqrt[n]{C_i \dots \dots \dots . C_n} (5)$$

Where
C=management enterprise performance indicators towards innovation and sustainable development
n=number of performance indicators towards innovation and sustainable development

IV. Application Case Study, Results and Discussion

4.1 Case study features

The case study transport enterprise is the main airport in Greece. Athens International Airport enterprise was established in 1996 as a public private partnership with a 30-year concession agreement, the Airport Development Agreement (ADA), that grants the enterprise the exclusive right and privilege of the 'Design, Financing, Construction, Maintenance, Operation, Management and Development' of the new airport. With a corporate goal to create sustainable value to all shareholders by offering value-for-money services, the airport enterprise has implemented successful development strategies in both its aeronautical and non-aeronautical sectors. Based on advanced incentives and marketing support schemes, the enterprise ensures the sustainability and development of domestic, regional and international traffic, working closely with home carriers and international carriers, legacy airlines and Low-Cost Carriers (LCC). The air transport market development shows growing trends as analytically depicted in Fig.3. In the non-aeronautical sector, the enterprise undertakes advanced and extensive development initiatives ranging from IT, Telecommunications systems and business activities to high-quality consumer-related products offered at its commercial terminals and business activities related to its real estate assets.

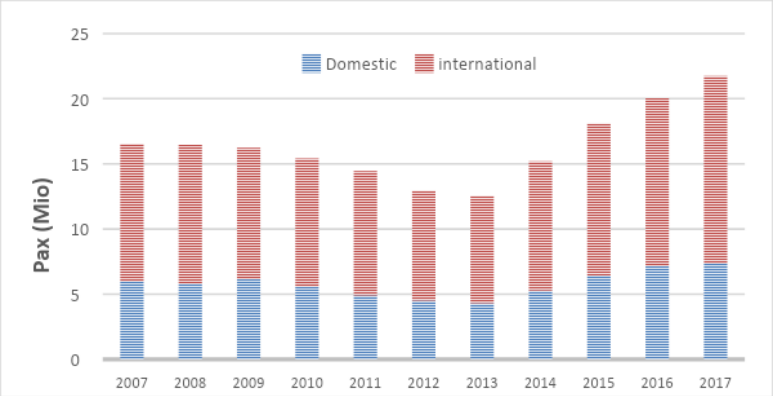

Figure 3
Air transport in term of pax in case study airport (2007-2017) (AIA annual report, 2018)

4.2 Results and Discussion

The implementation of the proposed methodology has enabled the evaluation of the proposed methodology and the reliability of the results it provides. Based on the modelling framework and the index development over a five-time period time, the total innovation performance index has been created in order to give an integrated picture of the airport enterprise towards sustainable development.

The indicator values are computed and then are adjusted through min max calibration in the times series and transformed into indices between 0 and 1. Minimum and maximum values (goalposts) are set in order to transform the indicators into indices between 0 and 1. The justification for placing the minimum and maximum values are either on historical evidence in a specific time series or the ''aspiration goals'', depending on the indicator. Having defined the minimum and maximum values, the indices are calculated as analytically presented in Fig.4.

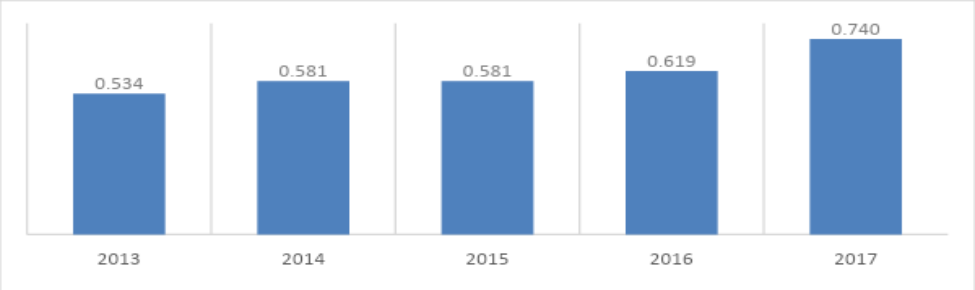

Figure 4
Case study airport enterprise management innovation performance indicators results for 5-year time period

The results highlight that airport enterprise management performance towards innovation and sustainable development has been improved significantly in the 5-year time period. Key of drivers of this positive change are artificial intelligence, robotics, baggage handling technological improvements, security and safety have improvement in airport enterprise.

V. CONCLUSIONS

Airport enterprise management deal with a set of stakeholders which often have different interests. Indeed, airport management interests are often different to those of their stakeholders. Costs, revenue and demand growth opportunities are not always aligned. Therefore, transport focus on balancing the different interests of passengers, identifying the additional value created due to innovation improvements.

Competition between airport enterprises generate need for more comprehensive performance indices development. By doing so transport enterprise management can achieve greater value creation for all stakeholders, encourage collaboration and stimulate innovation and artificial intelligence.

The innovation index of the case study transport enterprise highlighted that despite the gradual ageing of the transport infrastructure and the cost containment efforts in 5-year time period, the overall innovation targets are set at growing levels driving airport enterprise management performance towards innovation and sustainable development.

For airport enterprise management key challenge is to adopt digital transformation in the airport value-based management analysis. All airport operators regardless of size, focus on the need to modernize, attract traffic, improve operational efficiency and enhance the passenger experience. The key component in delivering on each of these is technology and the adoption of innovation and technology, concentrating on value drivers as passenger experience and revenue generation, by prioritizing the value-add of new technology and artificial intelligence provided by advanced IT systems.

REFERENCES

[1] Samberg, S., Bassok, A., & Holman, S. (2012). Method for evaluation of sustainable transportation. *Transportation Research Record: Journal of the Transportation Research Board*, 2242, pp. 1-8

[2] Dimitriou D., Sartzetaki M. (2018). Assessing air transport socioeconomic footprint, *International Journal of Transportation Science and* Technology,7(4), pp. 283-290

[3] Dimitriou D., Mourmouris J., Sartzetaki M., (2017). Quantification of the air transport industry socio-economic impact on regions heavily depended on tourism, *Transportation Research Procedia, 25 (2017),* pp.5242-5254

[4] Dimitriou D., Sartzetaki M., (2018). Social Dimension of Air Transport Sustainable Development, *International Journal of Industrial and Business Engineering, 12(4),* pp. 568-571.

[5] Dimitriou D., Sartzetaki M., (2016). Sustainable Development Variables to Assess Transport Infrastructure in Remote Destinations, *International Journal of Urban and Civil Engineering, Vol.10(10),* pp.1343-1350.

[6] Sartzetaki M.,(2019). Value based management analysis framework towards transport enterprises resilience, *International Journal of Economics, Business and Management Research, 3(6),* pp.82-96

[7] Giffa G., Crompvoets J. (2008). Performance Indicators a tool to Support Spatial Data Infrastructure assessment, *Computers, Environment and Urban Systems, Volume 32, Issue 5,*pp. 365-376

[8] Dimitriou D. and Sartzetaki M. (2017). Decision Framework for developing transport logistics hub, *International Journal of Engineering Sciences &Research Technology (IJERT), Vol 6(1),* pp. 314-322.

[9] Van Hagen, M. & Bron, P. (2014). Enhancing the Experience of the Train Journey: Changing the Focus from Satisfaction to Emotional Experience of Customers. *Transportation Research Procedia, 1(1),* pp.253-263

[10] Arhin, S.A., Noel, E.C. & Dairo, O. (2014). Bus Stop On-Time Arrival Performance and Criteria in a Dense Urban Area. *International Journal of Traffic and Transportation Engineering, 3(6), pp.* 233-238.

[11] Transportation Research Board (2003). A Guidebook for Developing a Transit Performance-Measurement System. *Transit Cooperative Research Program. Report 88*. Washington, D.C. (2003a).

[12] Transportation Research Board (2003). Transit Capacity and Quality of Service. *Transit Cooperative Research Program. Report 100. 2nd edition*. Washington, D.C. (2003b).

[13] OECD (2018), Infrastructure investment (indicator), doi: 10.1787/b06ce3ad-en, (Accessed on 05 September 2018)

[14] DimitriouD., Sartzetaki M., Karagkouni A., (2018). "Rating Framework to Evaluate Connection Flights at Tourist Airports." *International Journal of Modern Research in Engineering &Management (IJMREM),*1(7), pp. 1-6.

[15] ACI (2017). *Airport Industry Connectivity Report 2017*. pp. 3, 9-11. https://www.aci-europe.org/policy/connectivity.html

[16] Kaplan, R. S. and Norton, D. P. (1996). Linking the Balanced Scorecard to Strategy, *California Management Review*, 39(1), pp. 53-79.

[17] Rajesh R., Pugazhendhi S., K.Ganesh, YvesDucq, S.C.LennyKohGeneric balancedscorecard framework for third party logistics service provider, *Int. J.ProductionEconomics*, 140 (2012), pp. 269-282.

[18] Dimitriou D., Sartzetaki M. (2019). "Appraisal of the effects, on regional economy by investments in transportation projects", *Transportation Research Board (TRB) 98th Annual Meeting, January 13-17, Washington, DC, TRB Annual Meeting proceeding online*.

[19] Athens International Airport (AIA) (2019),*Annual and Sustainability Report* https://www.aia.gr/ebooks/annualreport/ar2018 , accessed July 2019.