Journal of Air Transport Management xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

Determination of key performance indicators for measuring airport success: A case study in Libya

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ARTICLE INFO

Keywords:
Airport KPIs
AHP
Performance evaluation
Libyan airports

ABSTRACT

Airports need to evaluate their performance and effectiveness periodically to determine whether objectives are being achieved and how their performance compares to similar best practices. The goals of this paper are twofold: First, to offer a list of essential airport key performance indicators (KPIs) that can provide decision makers in the Libyan airport industry a practical framework to measure and monitor performance over time. The second goal is to use the AHP technique to derive the weights of the KPIs and to select the best international airport in Libya based on the values of the KPIs at each airport according to the judgments of experts. However, the implementation steps of the AHP method will be simplified by using the Expert Choice software. The paper presents the importance weights of seventeen KPIs across five aspects of airport performance. As a result of this study, Libyan airports can benchmark their performance against others or through internal benchmarking.

1. Introduction

Airports are considered complex organizations that have many interacting parts, airlines, passengers, ground handling companies, security, fire and police services, etc. (Diana, 2010; Humphreys and Francis, 2002; Wyman, 2012). Therefore, it is not easy to create an appropriate system that measures airport performance (Andersson Granberg and Munoz, 2013; Humphreys and Francis, 2002). However, interest in the performance measurement of airports has increased in recent years, especially with changes of airport ownership patterns in many countries around the world to private or partially private ownership, and also with more emphasis on commercialization (Bezerra and Gomes, 2016b; Humphreys and Francis, 2002; Müller et al., 2009; Oum and Yu 2004). The increasing interest to measure airport performance has challenged airport managers and has led to the introduction of new measures that reflect the future objectives of airports (Humphreys and Francis, 2002).

Performance measurement is a broad topic, and it is defined as the process of measuring the efficiency and effectiveness of an action (Neely et al., 2005). Measurement is a very important key for any organization to be successful in a competitive market (Spitzer, 2007).

Airports need to evaluate their performance and effectiveness periodically to determine whether objectives are being achieved and how their performance compares to the similar best practices' businesses. Furthermore, measuring airport performance can be carried out for a number of purposes: to evaluate the efficiency of various aspects of an airport in financial and operational terms, to validate the safety and security procedures and to assess the potential environmental impacts of airport activities (Humphreys and Francis, 2002).

To evaluate and improve performance at an airport, key performance indicators (KPIs) are needed (Enoma and Allen, 2007; Kosanke and Schultz, 2015). KPIs are measures that organizations can use in order to assess their performance. In other words, KPIs help organizations to determine the extent of their success in achieving their objectives (Gillen and Lall, 1997; Lindberg et al., 2015). However, the airport industry is one of those industries that have a long history of working to identify the correct key performance indicators as a key to its success (Grabowski et al., 2007). KPIs help airport managers to determine which components of the airport require more care and continuous monitoring to achieve the values that will satisfy customers.

In general, developing key performance indicators for any organization has always been a daunting task (Chae, 2009; Lapide, 2000). In this regard, although many organizations around the world use key performance indicators today to reveal how successful they are, very few organizations use the most appropriate KPIs to appraise their performances, and the reason for this is due to a lack of understanding of performance measures by business leaders (Parmenter, 2015).

According to our literature review, there is a lack of detailed studies

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https://doi.org/10.1016/j.jairtraman.2017.12.004
Received 27 March 2017; Received in revised form 29 November 2017; Accepted 14 December 2017
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about Libyan airports, and none of the previous studies have investigated the performance of Libyan airports utilizing the key performance indicators. This study responds to this need by offering a list of Key Performance Indicators (KPIs) to assess a number of aspects of airport performance. These KPIs were selected based on previous studies with consideration given to the performance of terminals and the airside area around the airport.

The authors believe that such KPIs are necessary for a number of reasons; e.g. enabling airports to benchmark their performance in order to determine how other airports have achieved high levels of performance and to help airport authorities acquire a better understanding of the needs of stakeholders to attract more customers and freight. However, the lack of appropriate metrics or indicators has limited the ability of Libyan airports to measure their performance and become aware of the deficits within their airports. Currently, there are three international airports in Libya, Mitiga Airport (MJI), Misurata Airport (MRA), and Al Abraq Airport (LAQ). Airports in Libya are publicly owned and operated by the Libyan Civil Aviation Authority (LYCAA) which is a state agency associated with the Libyan Ministry of Transportation.

The aim of this paper is to derive a set of airport key performance indicators (KPIs) that can be used as measures to monitor and evaluate the performance of Libyan airports. The methodology of this study is to analyze the opinions of experts who have high levels of expertise and were involved in the airport industry in Libya over many years. A questionnaire survey was distributed to gather these opinions. The responses of the questionnaire were then analyzed using the Analytic Hierarchy Process (AHP) methodology. The AHP technique is applied to determine the relative weight of the KPIs and also to select the best international airport in Libya according to the final set of KPIs.

2. Literature review

The literature review considered two specific subjects, airport performance and the importance of key performance indicators in the airport industry. The previous studies addressed several aspects of airport performance, such as efficiency and productivity, service quality, safety, security, economic/financial, and environmental, etc., by adopting different approaches (Bezerra and Gomes 2016b). In this context, the airport service quality has received considerable attention in the last decade, e.g. (Brida et al., 2016; Fodness and Murray, 2007; Pabedinskaitė and Akstinaitė, 2014; Pantouvakis and Renzi, 2016). and Bezerra and Gomes (2016a), who examined seven factors that can provide a comprehensive approach to measuring the service quality of an airport according to passenger perceptions.

Enoma and Allen (2007) developed five key performance indicators related to airport safety and security. The authors argued that safety and security are becoming more important than anything else for airport management after many terrorist attacks on airports around the world. Regarding the airside operations, Norin (2008) investigated the logistics at an airport relating to the turn-around process, which are activities that affect an airplane from time of touch down until takes off. The study suggested a set of key performance indicators to evaluate the performance of those activities by using a conceptual model. In more recent research, Kosanke and Schultz (2015) proposed a set of KPIs to evaluate the performance of the airside operation. As regards the financial and environmental key performance indicators, Humphreys and Francis (2002) reported that the increase in air traffic demand and changes of airport ownership patterns has led to the introduction of new financial and environmental measures. The authors provided good discussion about a wide range of past, present and future airport key performance indicators. With regard to environmental issues; Morrell and Lu (2000) and Ignaccolo (2000) studied noise relating to airport activities and its impact on communities in the airport vicinity.

With regard to professional-related literature, Airports Council International (ACI) Wyman (2012) published a guide to help airports worldwide to improve their performance. The Guide provides a very useful set of 42 indicators across six key performance areas with a definition for each indicator. It also determines the types of airports to which the indicator is capable of being applied.

Additionally, there is currently an extensive body of literature on airport benchmarking. Benchmarking is a very useful method to assess performance by examining many different factors such as service, safety, environmental, cost, and revenue factors (Adler et al., 2013; Chung et al., 2015; Kılkış and Kılkış, 2016; MacLean et al., 2016; Schmidberger et al., 2009).

3. Methodology

3.1. Criteria selection

This study started with the determination of the performance dimensions for categorizing the indicators. Based on the literature review (some of which is discussed in the introduction part), there are a variety of approaches for categorizing the key performance indicators, depending on the study objectives and the authors' background (Bezerra and Gomes, 2016b). Some studies categorize indicators into two or three key performance areas (KPAs), as in the case of Anne (2008), where three categories were used. Airports Council International (ACI) in its guide to airport performance measures, categorize the indicators into six KPAs. In some other studies, indicators were categorized into more than six KPAs (Wyman, 2012). In this paper, we follow the approach of Andersson Granberg and Munoz (2013), which categorized indicators into five activity areas to develop a list of indicators by surveying the managers of several airports in Sweden and Spain. However, according to Andersson Granberg and Munoz (2013), the indicators in five KPAs can be used to measure and monitor airport performance and quickly obtain information on different aspects of the airport performance. They can also be used to compare the performance of airports over time. The five Key Performance Areas (KPAs) are:

- Passenger Service: collecting many different aspects of passenger satisfaction regarding the level of service provided.
- Airside Area: referring to the area of movement at an airport (e.g. aircraft movements and logistical operations) including taxiways, runways, and aprons (Enoma and Allen, 2007).
- Financial Perspective: incorporating revenues and costs. Indicators in this dimension are used to form an overall picture of the airport's financial performance.
- Safety and Security: indicators in this area are used to track both accidents and threats originating from people, such as terrorism acts and crime.
- Environmental: relating to the protection of the environment from the impact of airport operations.

In the next step, a large number of possible KPIs falling into each KPA had to be identified. This step was performed based on a comprehensive literature review. However, an extremely large number of indicators would have been difficult to use in the validation survey. Therefore, five indicators were initially selected for each key performance area taking into account that these KPIs are able to be measured and it also provides significant insights into the development of airport performance. The authors believe that five-key performance indicators provide a comprehensive approach and meaningful measurement to evaluate airport performance. Table 1 presents the initial KPIs in each key performance area.

3.2. Conducting a questionnaire survey

A questionnaire survey was conducted in order to validate the initial key performance indicators (KPIs) and to confirm how important they are as measures of airport performance. The survey was distributed to

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