

Using a hybrid method for evaluating and improving the service quality of public bike-sharing systems

應用複合方法評估及提升公共自行車系統服務品質之研究

摘要

騎乘自行車除了可以增進個人健康與節省運輸成本之外，還可以在最低環境生態衝擊影響下，顯著地改善城市整體生活品質。因此，許多世界主要城市均陸續建置公共自行車共享系統。然而，如何持續提高服務品質以吸引更多使用者，已成為永續經營公共自行車系統，必須審慎考量的重要問題。本研究有鑑於使用者多處於訊息不充足或不明確的狀況，且傳統研究大多假設服務品質評估準則間為獨立關係，鮮少採用期望水準與目前水準的加權差距進行分析，無法反應真實世界狀況，故提出應用灰色理論（Grey theory），結合決策實驗室分析法（DEMATEL）與網路程序分析法（ANP）的D-ANP法，以及修正VIKOR的系列評估模型。本研究以台北市主要的兩種公共自行車系統，YouBike及oBike系統為研究對象進行實證分析，經由系列分析結果，並結合台北市現有公共自行車政策，提出如何提升個別系統服務品質的管理意涵與建議。

關鍵字：公共自行車系統、服務品質、灰色-DANP、灰色-VIKOR、多評準決策



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A hybrid MCDM and sustainability-balanced scorecard model to establish sustainable performance evaluation for international airports



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ABSTRACT

The SBSC (sustainability-balanced scorecard) is adapted for the evaluation of the performance of airports to ensure sustainable development. The approach aims to integrate this performance evaluation of sustainable development, and use qualitative and quantitative information with the sustainability-balanced scorecard. The multiple criterion decision making model was first used to estimate the key influences of international airport performance in relation to sustainability. We first used the DEMATEL (decision-making trial and evaluation laboratory) to establish a complex system illustrated as an influential-network-relationship-map. We next used the DANP (DEMATEL based on analytical network process) to confirm the influential weights. Then, we used a hybrid modified VIKOR to select and improve the performance gaps between the aspiration values and the current situation for the international airport. To demonstrate the proposed model, we applied it to three international airports in Taiwan as a case study. The outcomes indicate that airport image is the most crucial factor within the performance evaluation and that social perspective has the highest degree of net influence. The largest weighted gap when examining the aspiration value is public transport for the A₂ airports and transparency of finance for the A₁ and A₃ airports. The implications for management are discussed.

1. Introduction

Social responsibility and sustainable development have become important issues in recent years. There are many methods for performance evaluation of strategic control and techniques aimed at estimating the performance results of their implementation in an organization (Ülgen and Mirze, 2004; Dinçer, 2004). One performance approach that empowers systematic and periodic system control is the Balanced Score Card (BSC) structure established by Kaplan and Norton (1996, 1992).

The BSC evaluates an organization in terms of the performance factors enabling expression of its vision, for the formation of the strategic framework required for performance evaluation and the measurement of management systems. There are many kinds of methods that have been established to broadly estimate the performance of an organization. The BSC technique is one of the most widespread performance evaluation approaches, and it considers both non-financial elements and financial elements (Zhao and Li, 2015; Schauß et al., 2014). However, the technique neglects the most significant perspective, the evaluation of sustainable performance. Hence, many

researchers have revised the BSC, offering a hybrid method, the SBSC (sustainability balanced scorecard) approach to investigate sustainable performance. This method takes into account issues of sustainability by including social and environmental issues (Rabbani et al., 2014). Other studies have incorporated SBSCs into strategies for the sustainable performance evaluation management of an enterprise by inserting eco-efficiency factors along with the appropriate main financial and environmental factors (Möller and Schaltegger, 2005; Zhao and Li, 2015; Figge et al., 2002).

There has been little effort applied to the implementation or adaptation of the SBSC technique for the evaluation of sustainable performance related to international airport activities. Actually this application has not been addressed in prior studies. Thus, in this study, the SBSC framework is applied to determine the preliminary estimation indicators for improvement of the sustainable performance of an international airport. This includes many aspects, such as “financial”, “internal business process”, “learning and growth”, “environmental”, and “social” perspectives. Hence, the preliminary criteria followed by the SBSC can be used to measure and improve these international airports’ sustainable performance.

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DEVELOPING A SUCCESSFUL AEROTROPOLIS BY USING A HYBRID MODEL UNDER INFORMATION UNCERTAINTY

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Abstract. Many airports are being expanded from transportation centers to economic hubs. This new type of urban area has been termed the aerotropolis or airport metropolis and is meant to function as an economic center with land-use that link local and global markets. However, to find the optimal means for developing an aerotropolis requires additional research, particularly from the viewpoint of long-term public policy and planning. In this study, a multiple criteria decision making model was applied to explore the key factors for successfully building an aerotropolis. We first applied the Decision-making Trial and Evaluation Laboratory based Analytical Network Process to construct the complex system and influential weights. A modified VIKOR method was then utilized to explore the gaps between the aspiration levels and the current situation. In addition, considering the uncertainty of decision-makers, fuzzy theory was integrated into the model. Data from the Taoyuan Aerotropolis in Taiwan were used to demonstrate this method. The results indicate that internationalization is the most crucial factor within the system, and that administrative efficiency has the highest degree of net influence. The largest weighted gap to the examined aspiration level is adequate regulation. Management implications are provided in the discussion.

Keywords: DEMATEL, DANP, MCDM, VIKOR, aerotropolis.

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Introduction

An aerotropolis is an urban subregion whose infrastructure, land-use, and economy are centered on an airport. Its primary value proposition is that it offers businesses speedy connectivity to their suppliers, customers, and enterprise partners nationally and worldwide,

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A Hybrid Model for Aircraft Type Determination Following Flight Cancellation

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There are several factors that need to be considered in fleet management when it is necessary to resolve disturbances which necessitate aircraft re-assignment due to flight cancellations, making this a multiple-criteria decision-making problem. A change in the type of aircraft assigned can lead to additional alterations as well as directly affecting connecting flights and interconnected schedules serving specific flight segments. Decision-making is crucial and involves the consideration of complex cost effects, with possible disruptive actions evaluated according to the priorities of airline management and the available resources. Airline managers require a practical and flexible tool to help them make appropriate decisions in a rapidly changing and highly competitive environment. Differing from prior studies using mathematical programming, we propose a hybrid model based on the decision-making trial and evaluation laboratory method and the concepts of analytic network process (DANP) to aid in the decision-making process. We also recommend using the VIKOR method to select the most appropriate alternatives, with the corresponding weights obtained using the DANP method. The efficiency and effectiveness of

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Improving transportation service quality based on information fusion



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ABSTRACT

How to improve transportation service quality and thus attract more passengers to use public transportation systems is an important concern for city governments around the world. In this study, we propose a novel information fusion model that addresses the dependent relationships among the various criteria for a method of non-additive weighted gap analysis aimed at evaluating and improving the service quality of transport systems. The hybrid model remedies prior shortcomings and should be more applicable to real-world situations. The proposed model is applied to a real case study of Taipei city bus companies to demonstrate its usefulness. The resulting analysis and the managerial applications for improving the bus service quality are also discussed with regards to the current policies of Taipei city.

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1. Introduction

Service quality has been proven to have a positive effect on passengers' behavioral intentions (Lai and Chen, 2011). The service quality of a transportation system is a key factor that affects the willingness of citizens to choose to use the public transportation system rather than drive their private vehicles. The measurement of service quality in any transportation system has been and will continue to be an important issue when allocating resources between competing transit agencies. The problem of evaluating the service quality of a transportation system has been investigated in several studies and great contributions have been made (Hensher et al., 2003; Yedla and Shrestha, 2003; Iseki and Taylor, 2008; Said, 2002; Lai and Chen, 2011; Awasthi et al., 2011; Hu and Jen, 2006; Joewono and Kubota, 2007; Tripp and Drea, 2002; Paquette et al., 2009; Agarwal, 2008; Stuart et al., 2000; Eboli and Mazzulla, 2007; Nathanail, 2008; Nurul-Habib et al., 2009; Tyrinopoulos and Antoniou, 2008; Yeh and Kuo, 2003). Some researchers have applied statistical hypothesis testing to demonstrate the relationships between service quality and its related constructs. Some have used multiple criteria decision-making (MCDM) methods which assume that the criteria are independent to evaluate transportation service quality, but in the real world, the criteria are not independent. Others have considered the interdependence among criteria, but have still used additive models (i.e., the simple additive weight method (SAW), grey relations, VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), and the Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS)) to obtain an aggregated performance score (Lin et al., 2010; Liou and Chuang, 2010; Yang and Tzeng, 2011). However, these methods are inconsistent with the assumption that the criteria are interdependent. This inconsistency can be avoided by applying an information fusion technique (e.g., non-additive fuzzy integrals) to integrate interdependent performance values.

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