



# Influential constructs, mediating effects, and moderating effects on operations performance of high speed rail from passenger perspective



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## ABSTRACT

In a competitive society with diverse consumer needs, service quality, customer satisfaction, customer loyalty, and corporate image determine the sustainability of service-oriented industries. However, management and leadership, employee satisfaction, and employee loyalty also influence company growth and profit. This study applied a theoretical model and findings from related literature to investigate the constructs and observed indices for measuring operations performance in the high-speed railway (HSR) from the passenger perspective. Cause and effect relationships between constructs and operations performance were quantified, and structural equation modeling was used to verify the hypothetical relationships proposed in this study in order to identify constructs, to measure the effects of indices on the constructs, and to measure mediating and moderating effects between constructs. The analytical results showed that leadership and employee cognition have a greater influence on long-term profitability compared to service quality, customer recognition, and corporate image. Notably, employee cognition mediates the effect of leadership on service quality. Further, mediating and moderating effects of corporate image and customer recognition significantly affect operations performance. By using the confirmatory findings of this study as a policy making reference and for clarifying resource use, the HSR can enhance passenger perceptions. Improving the identified evaluation indicators can increase passenger loyalty and improve operating performance in the high-speed rail service.

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## 1. Introduction

The increasing national income of Taiwan and its growing role as an open market for foreign capital have improved quality of life and have increased public awareness of the importance of leisure time, especially after the government implemented regulations regarding a two-day weekend. Thus, service quality requirements of transportation systems and the importance of reducing space value have increased. Competing against time constraints has apparently become the mainstream in various industries.

The number of tourist visits to Taiwan has exceeded 150 million since the Taiwan High Speed Rail (THSR) began operations. However, according to its financial report, the THSR substantially reduced its liability only after the government intervened by lowering loan interest rates in 2009 (<http://www.npf.org.tw/post/2/5668>). Although the THSR continuously increased the number of operating shifts during 2007 and 2011, the costs increased with income, and the average passenger rate

was only slightly higher than 50% of the total capacity. Therefore, the long-term financial status of the THSR has substantial room for improvement.

However, most THSR stations are located in suburban areas far from city centers and downtown areas. Thus, although the THSR enables rapid long-distance southward and northward travel, passengers incur additional time and costs to reach their final destinations. In recent years, the THSR has collaborated with the Taiwan Railway Administration and bus companies to achieve mutual benefits. However, studies suggest that the final overall time and financial costs of using the THSR may actually be greater than that of other transport methods. The THSR sets schedules according to transfer and shuttle services in order to satisfy customer requirements for convenient transportation.

Besides airline industries, numerous empirical studies have attempted to measure service quality, customer satisfaction, and customer loyalty in service industries. However, empirical studies of employee satisfaction and loyalty are rarely performed in operating units of service industries (Anderson and Fornell, 2000; Jia and Ping, 2005; Joo and Sohn, 2008; Lin, 2007). The development of information technologies in the twenty-first century enables technology-, economy-, and service-oriented industries to understand whether service provided by

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management and corporations reaches the standards required by customers. To establish customer trust and loyalty, the services provided must also resolve customer doubts and satisfy their service quality requirements. Increased customer revisit rates, improved corporate image, and positive word of mouth can then increase sustainable operating benefits. Research in this area is critically needed by operation units.

This study explored the perceived feelings regarding contact with first-line employees from the perspective of passengers (*i.e.*, customers). Quantitative methods were used to analyze service quality–customer satisfaction–customer loyalty (QScLc), including leadership–employee satisfaction–employee loyalty (LSeLe). The effects of these two main linkages on operations performance were analyzed to measure the overall perceptions of THSR passengers and to establish a behavioral model. The THSR and the transportation industry can use the empirical data obtained by an index evaluation of each construct in questionnaire surveys to develop effective marketing plans and reference directions for improving quality.

This paper is organized as follows. Section 2 defines and classifies the research constructs, including leadership, employee satisfaction, employee loyalty, operations performance, service quality, corporate image, customer satisfaction, and customer loyalty, based on a literature review. Based on the literature, various research hypotheses are then proposed. Section 3 establishes the research structure and related analysis methods, including the reliability, validity, and SEM test methods. Section 4 describes the questionnaire sampling and statistical analyses. The SPSS software is used for descriptive analysis, and AMOS is used for data analysis to test the research model hypotheses. This section also discusses the modification needed to meet the goodness-of-fit standard. Finally, Section 5 concludes the analysis of results and suggests future research directions.

## 2. Literature review

This section first describes the recent development situation of the survey subject, *i.e.*, the THSR. Constructs related to employees are then reviewed, and information related to customer constructs is collected. The employee and customer constructs are then linked to build the research hypothesis model. Finally, empirical procedure of analyzing the mediating and moderating effects is reviewed.

### 2.1. Overview of the THSR

Since it became operational in 2007, the THSR had run 211,099 trains by December 31, 2011. The average on-time rate during that period was 99.40%. The accumulated passenger number has surpassed 157 million. Fig. 1 shows the operation stations. All THSR stations cooperate with bus companies, taxis, rental cars, temporary parking areas, parking lots, the Taiwan Railways Administration, and travel agencies to facilitate customer transfers. However, undesirable events that have occurred since operations began include a lower than expected use of the automated ticket machines, which has caused customer queues and long ticket purchase times; malfunctioning ticket machines and exit turnstiles at certain stations; and other problems such as inadequate customer safety and inadequate transfer facilities (Chou et al., 2011). Additionally, since several THSR stations in central and southern Taiwan are located in remote or undeveloped locations, the crime rate has increased significantly, which has greatly influenced the corporate operations image of the company.



Fig. 1. THSR stations.

### 2.2. Literature related to employees

#### 2.2.1. Correlation between LSeLe and operations performance

Because of the diverse customer requirements and the intense competition among numerous enterprises in recent years, employees have become the most crucial asset of enterprises. Cultivating supervisors and other employees with leadership potential is essential for improving operations performance. Successful leadership requires a certain personality type such as an inspirational personality. People with leadership skills can inspire a group and are skilled in coordinating and persuading employees and in executing or implementing tasks (Chen and Chen, 2007). Cavazotte et al. (2011) emphasized that effective leadership not only shows the value of an employee to an enterprise, it also inspires other employees to improve organizational performance (Cavazotte et al., 2011).

Additionally, employees who trust the management of an organization attribute positive behavioral intentions to the organization, which generates employee loyalty and is an authentic reflection of employee (Turkyilmaz et al., 2011). Employee satisfaction is the attitudes and emotional reflections of work satisfaction of employees after they compare their expected value with the actual value obtained (Burke et al., 2005). Therefore, we propose the following hypotheses  $H_1$ ,  $H_2$ ,  $H_3$ ,  $H_4$ , and  $H_5$ :

- $H_1$ : Leadership significantly and positively affects employee satisfaction.
- $H_2$ : Leadership significantly and positively affects operations performance.
- $H_3$ : Employee satisfaction significantly and positively affects employee loyalty.
- $H_4$ : Employee satisfaction significantly and positively affects operations performance.
- $H_5$ : Employee loyalty significantly and positively affects operations performance.

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