

A Decision-Support Framework for Supplier Evaluation in the Automotive Industry: Integrating Traceability Compliance Using AHP

Rifka Beby Dwiayuni

Industrial Engineering Study Program
University of Indonesia (UI)
Jakarta, Indonesia
rifka.beby@ui.ac.id

Akhmad Hidayatno

Industrial Engineering Department
University of Indonesia (UI)
Jakarta, Indonesia
akhmad.hidayatno@ui.ac.id

Abstract

The increasing complexity of automotive supply chains in the Industry 4.0 era necessitates more structured and data-driven approaches to supplier evaluation. While traditional evaluation models emphasize cost, quality, and delivery, the role of traceability compliance as a strategic enabler of transparency and operational reliability remains insufficiently integrated into supplier evaluation decision-support frameworks. This study contributes by developing an automotive-specific AHP-based supplier evaluation framework that systematically incorporates traceability compliance as a quantifiable decision criterion aligned with IATF 16949 requirements, bridging the gap between traditional supplier evaluation models and digital supply chain requirements. A quantitative AHP-based approach was employed using pairwise comparison judgments collected from four industry experts. The results indicate that quality remains the most dominant criterion (0.54), followed by delivery (0.25), traceability compliance (0.13), and cost (0.08). The model achieves a consistency ratio ($CR = 0.07$), indicating reliable expert judgments. The proposed framework enhances supplier evaluation by incorporating transparency and traceability dimensions, providing a structured and practical decision-support tool aligned with Industry 4.0 systems.

Keywords

Supplier Evaluation, Traceability Compliance, AHP, Decision Support System, Automotive Supply Chain

Biographies

Rifka Beby Dwiayuni is a master's student in Industrial Engineering at Universitas Indonesia, specializing in Design Management Systems, and currently works as a System Engineer in industrial automation for automotive manufacturing and warehouse systems. Her professional experience spans system development, integration, and implementation in complex industrial environments. Her research focuses on supply chain decision-support systems, traceability integration, and Industry 4.0-driven operational optimization.

Prof. Dr. Ir. Akhmad Hidayatno, S.T., M.B.T., IPU is currently active as Head of SEMS Lab - Systems Engineering, Management and Simulation Laboratory at Industrial Engineering Department, University of Indonesia. Graduated from Industrial Engineering from University of Indonesia in 1996 and obtained Master of Business and Technology

(MBT) in just less than one year from Australian School of Business (ASB) - University of New South Wales (UNSW), Australia, has given him a unique perspective on how the business and the industry is interrelated in a systemic way. His systems obsession also drives him to tackle the incredible complex systemic relationships between renewable energy and national sustainable development or green economy, as his Doctorate topic. He graduated Cum Laude from Universitas Indonesia. His current research interest is sustainable systems engineering in the area of Industrial Sustainability, a new and exciting field which involves designing and managing complex systems in a sustainable way concurrently from the economy, environment and social perspectives. He is currently member of Institute of Industrial and Systems Engineers (IISE), System Dynamics Society (SDS) and INCOSE (International Council on Systems Engineering). In his class, He like to involved the students using experienced based learning concepts, including the use of business simulation, learning games and case study. Akhmad even copyrighted a "hands-on" game, titled "the kontainer game" which teaches about optimization of container layout in ships, Operations Management Game (OMG), Franchise Management Game, and many other various Serious Simulation Games (SSG). He also published a book on Systems Thinking in Bahasa Indonesia to further push the use of systems approach in problem solving. He writes regularly about Industrial Engineering, Systems Thinking and Systems Engineering in his personal blog (<http://hidayatno.wordpress.com>)