A Novel Application of a Hybrid Delphi-Analytic Hierarchy Process (AHP) Technique: Identifying Key Success Factors in the Strategic Alignment of Collaborative Heterarchical Transportation Networks for Supply Chains

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ABSTRACT

This research studies heterarchical collaboration in logistical transport. Specifically, it utilizes a hybrid Delphi-Analytic Hierarchy Process (AHP) approach to explore the relevant criteria for the formation and maintenance of a strategic alignment for heterarchical transport collaboration. The importance of this work is that it applies a novel hybrid approach for identifying criteria for success to a little-studied form of supply chain collaboration: heterarchical collaborative transport. The criteria for this form of collaboration identified by the application of Delphi-AHP include ones from the technical, risk, financial, organizational, and operational categories. This novel application of the hybrid approach leveraged the expertise of transportation collaboration experts from the U.K., France, Canada, Sweden, the Netherlands, and Italy to identify key criteria for a strategic alignment between heterarchical collaboration partners. Such collaborative initiatives are important in industry as an environmentally conscious, yet efficient and effective strategy for the transport of raw materials and finished products in the supply chain.

Keywords: Delphi-Analytic Hierarchy Process (AHP), Heterarchical Transport Collaboration, Strategic Alignment, Supply Chain, Transport Management

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1. INTRODUCTION

As the business world begins to focus on “green” initiatives and ways to reduce greenhouse gases through innovative approaches to traditional business processes, collaboration in the supply chain has shown great potential for such endeavors. Different terms are sometimes used to refer to collaboration among the various entities with respect to transport and logistics activities. The ultimate goal with respect to collaboration in transport and logistics is to save on the amount of trucks used and distance traveled in order to fulfill supply chain activities thereby saving time, fuel energy, costs and ultimately, the environment.

A complete definition for transport collaboration is: “an innovative holistic approach with socio-technical systems encompassing platform-based, automated, adaptive technologies, supporting business processes and proactive human collaboration. With this approach, transport decisions and strategies are enhanced through cooperation between and among transport users and transport service providers. The goals are to eliminate inefficiencies from the transport chain and to facilitate cost reduction through effective utilization of available resources, cooperative planning and new business models implementation”. A discussion of traditional forms of collaboration is included in order to better distinguish an emerging form known as “heterarchical” which is the focus for the application of the Delphi-AHP hybrid technique.

Traditionally, three forms of collaboration exist: horizontal, vertical, and lateral (Figure 1). Our work focuses on heterarchical transport collaboration which is an extension of traditional lateral collaborative arrangements. What distinguishes heterarchical transport network collaboration from a lateral one is the nature of control within the coalition.

Heterarchical transport collaboration relies on a collaborative strategy where leadership is shared between the transport users and the transport providers. Such a strategy is not followed in a traditional lateral arrangement where one or the other party leads and therefore dictates membership. Shared leadership and its ramifications for the workings of the collaborative effect are clearly defined in Audy et al. (2007): “The transportation planner (TP) is named by the customers (shippers) and the carriers to plan the customers’ transportation needs using the carriers’ transportation capacity. The TP objective is the minimization of the transportation costs of the customers using the transportation capacities of the carriers. Coordinated by the TP, the customers and the carriers decide together to add and remove participants in the coalition ....”

Much existing research focuses on these three traditional forms of collaboration with each work identifying a single or a few factors that may ultimately lead to success. We specifically focus on heterarchical transport collaborations which is a relatively new form of collaborative network and for which little research exists. Our work is important in that it uses the hybrid Delphi-AHP approach for identifying multiple criteria that impact the development of a successful strategic alignment between coalition partners in heterarchical fashion. We are the first researchers to conduct such a study of this type of collaborative network. A heterarchical transport collaboration, which allows for shared control between different types of partners, gains an advantage through the deployment of a strategic alignment involving the various criteria identified in our work. We sought a methodology to identify factors for a successful strategic alignment since no single partner or partner category is making the decisions for the entire coalition in this type of collaborative network. It should be noted that the receiver layer of such collaborative networks was not the focus of our work; and that the collaborative efforts analyzed later deal strictly with the business-to-business interaction between suppliers and carriers. Our results of the application of the novel methodology, which are presented in greater detail in Section 6 with detailed explanations of each criterion, are shown in Table 1. This lists the ten most critical criteria across the five categories identified generated by the Delphi-AHP procedure. The
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