

CITY UNIVERSITY OF HONG KONG
香港城市大學

**Understanding Inter-organizational System,
Supply Chain Collaboration and Performance
under Environmental Uncertainty**
環境不確定下基於跨組織資訊系統的供應
鏈協同和績效研究

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Chiao Yu Chi
焦佑麒

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摘要

隨著全球經濟環境的變化及產業環境不確定性的加劇，企業正面臨著外部環境不確定性所帶來的挑戰。在此競爭情況下，企業需要與供應鏈夥伴進行協同合作以提高自身的供應鏈競爭優勢、促進企業績效。現有供應鏈研究將供應鏈協同視為企業重要的資源之一，並已證實供應鏈協同會促進供應鏈績效。然而在高度環境不確定性下，供應鏈協同是否有助於供應鏈績效的提昇並未達成一致的結論。同時，供應鏈協同影響供應鏈績效的潛在機制也並未得到闡明。因此，本研究將對環境不確定性下供應鏈協同影響供應鏈績效的潛在機制進行深入分析。本研究第一部分探討在環境不確定性下，供應鏈協同如何對供應鏈績效產生影響。

此外，跨組織資訊系統作為企業間交換資訊的 IT 平臺技術之應用，能夠促進供應鏈夥伴間的知識共用與合作。本研究第二部分探討在環境不確定性下，企業如何設計以跨組織資訊系統作為促進供應鏈協同運營與執行的平臺。目前光電科技電子產業企業供應鏈績效的競爭多以 IT 技術平臺為資訊交流的基礎。而以往供應鏈協同的相關研究主要從「供應鏈協同形成」的角度來探索其影響因素（如信任、策略等），尚未有研究探討如何通過跨組織資訊系統的設計在運營與執行中提升供應鏈協同的水準，以及在外界環境不確定性對上述關係變化的影響。因此，跨組織資訊系統如何才能更好地促進供應鏈協同的運營與執行是本研究的另一重要議題。

本研究通過整合資源基礎、動態能力及疆界物件三個理論以解決以上的問題。具體地，以資源基礎理論和動態能力理論為依據，引入供應鏈敏捷的概念，從而探討供應鏈協同如何通過供應鏈敏捷性的中介效應對供應鏈績效產生影響，以及外部環境對該中介效應的調節作用。以疆界物件理論為依據，把跨組織資訊系統理解為企業間連接的疆界物件，從疆界物件特點的角度（即標準化和適應性）探討跨組織資訊系統的特點對供應鏈協同運營與執行的影響，以及外部環境的調節作用。

本研究以光電電子產業供應鏈中的廠商為研究對象，以問卷調研的方式

進行資料收集。並對每家企業的熟知供應鏈的商業主管和資訊主管進行配對調研，最終共獲得 172 份有效配對樣本。研究以實證的方式進行假設檢驗，實證結果表明：在供應鏈協同效果方面，供應鏈協同、供應鏈敏捷與供應鏈績效三者之間呈現顯著正相關關係，環境不確定性顯著正向調節供應鏈敏捷在供應鏈協同和供應鏈績效之間的中介作用。在供應鏈協同運營與執行方面，跨組織資訊系統標準化和適應性均與供應鏈協同呈現顯著正相關關係，環境不確定性顯著負向調節跨組織資訊系統標準化與供應鏈協同間的關係，顯著正向調節跨組織資訊系統適應性與供應鏈協同間的關係。因此，企業必須建立敏捷、並與供應鏈上下游夥伴聯結的供應鏈協同才能提升供應鏈績效，尤其是在環境不確定的情況下。此外，企業還需要根據環境不確定性的程度，設計不同特點的跨組織資訊系統以促進供應鏈協同的運營與執行。最後，本研究在實證結果的基礎上，針對其理論意義和實證啓示進行深入探討。

關鍵字：供應鏈協同、供應鏈敏捷、供應鏈績效、IOS 標準化、IOS 適應性、環境不確定性

Abstract

With the rapid changes in the global economic environment and the increasing uncertainty of the industrial environment, there are great challenges posed by the uncertainty of the external environment in the global optoelectronics industry. In this competitive situation, enterprises need to cooperate with supply chain partners to improve their supply chain competitiveness and promote business performance. Existing supply chain research considers supply chain collaboration as one of the most important resources of enterprises, confirming that supply chain collaboration can promote supply chain performance. However, there is no consensus on whether supply chain coordination can facilitate supply chain performance under high environmental uncertainty. In addition, the underlying mechanism of the relationship between supply chain collaboration and supply chain performance has not been clarified. Therefore, this study will provide an in-depth analysis of the underlying mechanisms between supply chain collaboration and supply chain performance under environmental uncertainty. The first part of this study aims to explore how supply chain collaboration affects supply chain performance under environmental uncertainty.

The competition in the optoelectronic technology industry is heavily reliant on information technologies (IT) for information exchange between supply chain partners. As an IT platform for information exchange between enterprises, inter-organizational system (IOS) can promote knowledge sharing and cooperation between supply chain partners. The second part of this study explores how to design an IOS to promote supply chain collaboration under environmental uncertainty. Previous research on supply chain collaboration mainly discovers the drivers of the formation of supply chain collaboration (such as trust and strategic orientation). Yet there has been no study to discuss how to improve supply chain collaboration at the operation stage after formation, especially through the IOS design and under the influence of environmental uncertainty. Therefore, how to design an IOS to better promote supply chain collaboration at the operation stage is another important research objective of this study.

To meet the aforementioned research objectives, this study develops and empirically tests a research model by integrating three theories: resource-based

theory, dynamic capability theory and boundary object theory. Based on the resource-based theory and dynamic capability theory, I introduce the concept of supply chain agility and examine its mediation effect on the relationship between supply chain collaboration and performance. I also propose a moderating effect of environmental uncertainty on this mediation relationship. Based on the boundary object theory, I conceptualize IOS as a boundary object between supply chain partners, and examine the effects of two IOS characteristics (i.e., standardization and adaptability) on supply chain collaboration as well as the moderating effect of environmental uncertainty.

To test the research model, I collected data through survey on firms in the optoelectronic industry, where firms are keen on competing through supply chain collaboration. I conducted a pair-match survey on the business executives and IT executives familiar with supply chain operations of their respective firms and obtained 172 valid matching samples. The empirical results through structural equation modeling generally confirm our hypotheses. Specifically, in terms of the effects of supply chain collaboration, positive relationships were found among supply chain collaboration, agility and performance. It was found that environmental uncertainty positively moderates the mediation effect of agility between supply chain collaboration and performance. Furthermore, IOS standardization and adaptability both were found positively associated with supply chain collaboration. Environmental uncertainty negatively moderates the relationship between IOS standardization and supply chain collaboration and positively moderates the relationship between IOS adaptability and supply chain collaboration. Based on the empirical findings, I suggest that enterprises must establish agile supply chain collaboration with the upstream and downstream partners in the supply chain to improve supply chain performance, especially in the uncertain environment. In addition, enterprises also need to design IOS with different characteristics to promote supply chain collaboration at the operation stage based on the level of environmental uncertainty. I conclude by further discussing the theoretical significances and practical implications from this study.

Key words: Supply Chain Collaboration, Supply Chain Agility, Supply Chain Performance, IOS Standardization, IOS Adaptability, Environmental Uncertainty

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