

國立聯合大學
經營管理學系碩士班

碩士論文

主導性廠商在標準技術轉換中的
技術策略探究—以微影技術為例

**Analyzing Technology
Strategies of Leading
Semiconductor Companies in
Dominant Design Technology
Transition: A Case of
Lithography Technology**

研究生：范宜雯 撰

指導教授：蔡林彤飛 博士

黃俊寧 博士

中華民國 112 年 6 月

摘要

技術更迭是常態，原主流標準轉換至新主流標準是一個間斷性的過程，而主流標準的轉換即是因為不連續科技的產生。雖然在轉換過程中效能可大幅地提升，但是否能順利地轉換主流標準，使整體技術生命週期延續，則要關注技術間斷期間，主導性廠商的創新行為以及該主導性廠商之核心科技、促成科技與互補品的技術成長軌跡，包含主導性廠商是如何佈局核心科技、促成科技與互補品間的互動，使其能夠逐漸轉換至新主流標準。因此本研究以半導體微影製程的極紫外光微影技術(Extreme ultraviolet lithography, EUV)和深紫外光微影技術(Deep Ultraviolet Lithography, DUV)作為案例，以艾司摩爾(ASML)為主導性廠商，探討在不連續科技的間斷期間，主導性廠商進行何種科技策略佈局，以面對主流標準所帶來的挑戰與機會，並使用專利分析及時間序列資料去說明主導性廠商在創新行為的動態過程。研究結果顯示主導性廠商確保了深紫外光微影技術與極紫外光微影技術在核心技術、促成科技及互補品的技術相容性，並在轉換的間斷均衡期中，專注在極紫外光微影技術的開發，使其能夠突破摩爾定律的限制，大幅度提升效能，而其與促成科技及互補品的配合研發使消費者快速接受並採用，影響技術逐漸轉換。因此建議廠商在進行主流標準轉換前，需注意，一、確保新舊技術之間具有相容性，以確保轉換過程互補性資源可以轉移。二、促成科技與互補品的投資，以確保轉換過程中的順利進行。三、盡可能發展下游產品技術，以確保消費者能夠了解新技術的優勢和特點，提高其採用與協同轉換之意願。

關鍵詞：技術生命週期、不連續科技、主流標準轉換、專利分析、微影製程

Abstract

In a continuous technology lifecycle, discontinuous innovation transition is an imperative strategy for leading players to sustain their position in the dominant design. While discontinuous technologies bring better performance, the transition requires leading players to consider developing core, enabling, and complementary technologies simultaneously. The three factors will drive the transition during the punctuated period. Therefore, this study takes Extreme Ultraviolet Lithography (EUV) and Deep Ultraviolet Lithography (DUV) in the semiconductor lithography process as case studies. The aim is to examine the technological strategies adopted by a leading player (ASML) during the punctuated period to address the challenges and opportunities presented by the changing dominant design. Patent analysis and time series data are used to elucidate the dynamic of ASML's innovation behavior. The research results show that ASML ensures the compatibility of DUV and EUV in terms of core, enabling, and complementary technologies. ASML focuses on developing EUV, pushing the limits of Moore's Law, and significantly improving efficiency. The coordinated development efforts with enabling and complementary technologies will allow for rapid adoption by the users. The study suggests that compatibility between old and new technologies, enabling and complementary technologies facilitate a smooth transition process. The adoption by downstream products can promote the benefits and features of the new technology to customers, thereby increasing their willingness to participate in the transition.

Keywords: Technology life cycle, Discontinuous technology, Standard transition, Patent analysis, and Lithography process.