

## 摘要

由於人工智慧和物聯網等技術的進步，各國政府和企業爭相投入資金在以提升道路交通安全和運輸效率的車聯網技術，並期望各自支持的技術能夠成為主流標準。然而，在某一技術成為主流標準之前，不同技術標準之間都會歷經標準競爭的過程。為了解析標準競爭的過程與在其過程各項影響標準發展的因素。首先，本研究文獻探討發展主流標準的好處以及影響技術成為主流標準的階段與因素。再者，本研究以車聯網之車間通訊標準 DSRC 和 C-V2X 的技術競爭為個案，以技術專利代表廠商創新行為，蒐集 1998 年到 2021 年含美國、歐洲、日本、中國以及我國共 1,724 筆發明專利。最後，透過專利分析探討雙方技術陣營在不同標準競爭階段的創新參與行為與不同參與者的互動情形。研究結果顯示主流標準競爭的每個階段中會有不同因素去影響到核心技術開發者的策略佈局：第一階段的互補性資產和進入時機；第二階段的促成科技會影響到核心技術開發者的技術優勢與企業選用；第三階段互補品以及第四階段的安裝基礎和網路外部性則會對核心技術的發展產生積極的影響，進而促使核心技術開發者在標準競爭進程中轉而發展另一核心技術及生產該技術之互補品與下游應用。甚者，供應商在標準競爭進程中的加入也會因為其生產核心技術的互補品而提高該技術的價值，進而影響核心技術間的競爭情形。因此，本研究建議核心技術開發者不論身為先行者還是後進者除了要專注於核心技術的研發之外，也應該重視其他技術（例如：促成科技或是互補品）的開發，除了能增加自身技術優勢之外，也能使核心技術成為主流標準的機率最大化。

**關鍵詞：**車聯網、車間通訊、主流標準、標準競爭、專利分析

## Abstract

With the rise of artificial intelligence and the Internet of Things, the government and industrial firms have been heavily engaged in developing vehicle-to-vehicle (V2V) communication technologies to improve traffic safety and transportation efficiency and expect the supported technologies to become the dominant design. However, before that, different technology standards will go through the standard battle. Therefore, this paper aims to analyze the battle process and the factors affecting standards development. First, we discuss the advantages of the occurrence of a dominant design and the stages of the battle and the factors of becoming a dominant design. In addition, this study takes the V2V battle between DSRC and C-V2X as a case study. Through the patent analysis, we have analyzed the innovation behaviors of the two technology teams and the interactions of the different players in the battle. The results show that different factors affect the core developers' strategic deployment at each stage. In the first stage, complementary assets and entry timing affect the timeline of core technology development. In the second stage, enabling technologies affect the core developer's advantage and potential adoption by downstream developers. In the third and fourth stages, complementary goods, installed base, and network externalities positively affect the development of core technologies. In addition, the participation of suppliers in the battle can also increase the value of the core technology by producing complementary goods, which in turn affects competition. Therefore, this study suggests that core developers, whether they are pioneers or latecomers, should not only focus on core technology development but also pay attention to the development of other technologies (e.g., enabling technologies or complementary goods) to enhance their advantages and maximize the chances of becoming the dominant design.

***Keyword: Internet of Vehicles, Vehicle-to-Vehicle Communication, Dominant Design, Standard Battle, Patent Analysis***