



Chapter XVI

How High-Technology Start-Up Firms May Overcome Direct and Indirect Network Externalities

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ABSTRACT

This chapter presents a conceptual model of strategic choice for high-technology start-up firms in the face of network externalities—the strength of the market's preference for standardized technology. Our model suggests that the commercialization strategies followed by such a firm will depend on the type of network externalities—direct vs. indirect—as well as the degree of appropriability—the firm's ability to retain the value of innovation. We offer a number of propositions generated by the model and discuss their implications.

INTRODUCTION

A particularly vexing barrier for some start-up firms is how to overcome network externalities that may exist in their markets. Similarly, another hurdle for many start-up firms is how to appropriate value from an innovation. The model in this chapter suggests that the distinction between direct and indirect network externalities, and the degree of appropriability, will determine whether the firm's commercialization strategy focuses on internal resources and decision variables or on interactions with its competitive environment.

High-technology start-up firms may be particularly sensitive to network externalities and appropriability since many such firms are introducing products based on technologies for which there are yet no market standards for compatibility (Hill, 1997) and facing particularly uncertain appropriability conditions that affect their ability to grow and survive (Shane, 2001). Not all new technologies, and not all start-up firms, face network externalities or appropriability issues. For those that do, however, overcoming these barriers to commercialization is crucial as these barriers may influence the firm's strategy for commercialization, growth, and survival.

This chapter models strategic choice for start-up high-technology firms in the face of network externalities—the strength of the market's preference for standardized or compatible technology (Farrell & Saloner, 1985; Katz & Shapiro, 1985). It suggests that commercialization strategies will depend on appropriability—the firm's ability to retain the value of an innovation (Arrow, 1962; Teece, 1986)—and the type of network externality—direct vs. indirect. Following prior researchers (Katz & Shapiro, 1985; Kotabe, Sahay & Aulakh, 1996), direct network externalities refers to a direct relationship between the number of users of a product and the product's quality or utility, while indirect network externalities refers to the indirect effects from the price and availability of goods and services that complement a product. The chapter is rooted in streams of research from technology and innovation literature on how technologies become commercialized (Lee, O'Neal, Pruett & Thomas, 1995; Tushman & Rosenkopf, 1992), organization research on technological discontinuities (e.g., Anderson & Tushman, 1990; Tushman & Anderson, 1986; Tushman & Rosenkopf, 1992), and literature from strategy and economics focused on the impact of technological standards (e.g., Farrell & Saloner, 1987; Garud & Kumaraswamy, 1993; Hill, 1992, 1997; Katz & Shapiro, 1986; Majumdar & Venkataraman, 1998; McGrath & McGrath, 2000).

These streams have posed long-standing questions for researchers and for firms. How can standards be established? How can a new entrant compete? What roles do switching costs, first or second mover advantage, regulation, and intra-industry cooperation play? In competitive strategy, how can a firm profitably commercialize its own technology if the technology poses a network externality for customers and there is the potential for competition from other

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