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J. Eng. Technol. Manage. 18 (2001) 29–47

Journal of ENGINEERING AND TECHNOLOGY MANAGEMENT JET-M

www.elsevier.com/locate/jengtecman

The role of R&D intensity, technical development and absorptive capacity in creating entrepreneurial wealth in high technology start-ups

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Abstract

This study uses 80 newly public pharmaceutical biotechnology companies to explore the relationship between a high technology venture's R&D intensity, technical capabilities and absorptive capacity and the amount of entrepreneurial wealth created by the venture. A novel measure of absorptive capacity based on co-citation analysis of a firm's scientific publications is developed and several indicators of technical capabilities are used to develop early and late stage measures of a firm's technical capabilities. The results provide strong evidence of a positive relationship between a high technology venture's R&D intensity, late stage technical capabilities and absorptive capacity and the amount of entrepreneurial wealth created by a high technology venture.

Keywords: High technology ventures; Entrepreneurship; Scientific capabilities; Technical capabilities

1. Introduction

Entrepreneurship plays an important role in the development and commercialization of new technologies. Recent examples of new technologies that owe much of their development and commercialization to entrepreneurial high technology ventures include the personal computer, biotechnology, and the Internet. At its core, entrepreneurship is about the creation of new wealth through innovative activities (Dollinger, 1994; Drucker, 1985; Knight, 1921; Ronstadt, 1984). A high technology venture's ability to create entrepreneurial wealth is its reason for existence. If a venture is unable to create new wealth then the funding for the specific venture will dry up. If a population of high technology ventures fail to create significant wealth for investors then an important source of funding for the development

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0923-4748/01/$ – see front matter
PII: S0923-4748(00)00032-1

and commercialization of a new technology will dry up. But, how do research-driven entrepreneurial high technology firms create value for their shareholders? Where should these firms invest their efforts and resources in order to maximize the amount of entrepreneurial wealth they create? These are interesting questions which have significant implications for the management of entrepreneurial high-technology ventures.

The resource-based view of the firm (Penrose, 1959; Barney, 1991) proposes that a firm's ability to create wealth is largely determined by its unique resources/capabilities. Firm success or failure is not entirely dependent upon industry structure, but rather a function of the resources and capabilities controlled by the firm, deployed by managers and developed and extended by the organization (Schendel, 1994). A basic premise in this theory is that those firm capabilities which are rare, inimitable and difficult to trade form the basis for sustainable competitive advantage (Barney, 1991). Subsequent researchers have highlighted the importance of intangible resources such as knowledge and scientific capabilities to competitive advantage (Deeds et al., 1997; Henderson and Cockburn, 1994; Hill and Deeds, 1996; Kogut and Zander, 1992; Petraff, 1993). These capabilities are usually difficult to observe, quantify and measure making the study of organizational capabilities difficult.

However, firms 'going public' provide researchers with a unique opportunity to study the relationship between the performance of the entrepreneurial firm and organizational resources. The implications of the resource-based view are that new venture performance will be dependent upon the ability of the venture to develop resources and capabilities that are rare, inimitable and difficult to trade. Within the context of the biotechnology industry new ventures face a hostile environment in which numerous new firms, as well as a cadre of large well financed pharmaceutical companies, compete to develop new drugs or diagnostics. In most cases these firms are years away from any significant revenue stream, have very few tangible assets, are sustaining significant accounting losses, and are desperate for capital (Burrill and Lee, 1992). Most of these firms have little more then the talent and skills of the individual members of the firms. Thus, their research capabilities are their only valuable assets, as these capabilities represent the potential to develop billion dollar drugs. Several studies have provided empirical support for the proposition that firm specific capabilities may lead to persistent performance differences among firms (Deeds et al., 1997; Henderson and Cockburn, 1994). Recent research also indicates that firm specific differences will also lead to differences in research productivity among firms (Henderson and Cockburn, 1994; Pisano, 1994). There is also evidence that a firm's research and development skills are important to the creation of shareholder value (Kelm et al., 1995). This leads to our basic premise that in the biotechnology industry the quality of the firm's scientific and research capabilities is a critical determinant of the wealth created by the firm.

Given that scientific and technological capabilities are complex asset structures that are built over time, what are the key components of these capabilities? An examination of the existing literature has led us to develop a model of scientific/technological capabilities that has three distinct components. The first is the creation of internal scientific and technological capabilities through investment in R&D. The second component is what we refer to as the firm's technical development capabilities. These are the skills and knowledge that allow the firm to turn basic research into patents and tangible products. Finally, there is the firm's connection to and involvement in the external scientific community. It has long been