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論文審査の要旨及び審査員

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論文審査の要旨（2000 字程度）

This doctoral thesis entitled ‘Uncertainty Management under Resource Constraints: An Empirical Study of Biotech Startup Firms’ deals with innovation driven by advanced technologies to generate substantial social and economic value by developing novel products and services. In this context, startups play an indispensable role in value creation, particularly in high-risk industries where they serve as engines of industrial progress. Among these, biotech startups have emerged as pivotal innovators in the pharmaceutical sector, contributing to developing breakthrough therapies and revitalizing the industry. Despite their critical importance, biotech startups face significant challenges, including limited managerial flexibility, constrained resources, and the inherent uncertainties of research and development (R&D). The pathway to commercialization is typically protracted and fraught with risk, rendering sustainable growth elusive under resource-constrained conditions.

Chapter 1 introduces this thesis, which explores strategies for managing uncertainty in biotech startups operating within significant resource limitations. The research aims to provide insights that contribute to academic discourse while offering practical applications for the biotech industry. The ultimate objective is to advance understanding of how such startups can navigate complex challenges to foster sustainable growth and drive innovation.

Chapter 2 presents a comprehensive review of the literature on the key success factors (KSFs) for biotech startups. The analysis confirms that achieving an Initial Public Offering (IPO) and initiating clinical trials are primary KSFs, as these milestones validate a firm's potential and secure essential financial resources for continued development. Secondary factors, such as obtaining venture capital (VC) funding and forming strategic alliances with established pharmaceutical firms, are also critical. These alliances not only provide funding but also grant access to expertise and infrastructure necessary for navigating complex regulatory environments and accelerating product development. Furthermore, the study identifies the managerial team's ability to integrate scientific expertise with entrepreneurial acumen as a decisive factor in achieving sustainable growth.

Chapter 3 examines the strategic importance of alliances between biotech startups and pharmaceutical companies. These partnerships provide essential resources, including financial investment, access to advanced R&D infrastructure, and regulatory expertise. Analysis of 73 strategic partnership projects reveals that 56% involved out-licensing, while 32% comprised in-licensing agreements. This highlights the importance of adopting flexible alliance strategies that extend beyond traditional out-licensing models. By engaging in both in-licensing and out-licensing activities, biotech startups can leverage external innovations to enhance their product pipelines and improve their likelihood of success. The chapter also underscores the significance of developing ‘best-in-class’ and ‘first-in-class’ products, alongside technological platform leadership, as foundations for sustained growth under uncertainty.

Chapter 4 focuses on the managerial characteristics required within biotech startups, exploring the processes that drive the mobility of highly skilled talent. The study theoretically examines and quantifies the gaps between established firms and biotech startups, particularly in terms of flexible job attributes, substitutability, and effective resource allocation. Based on a survey and a conjoint analysis, the findings reveal a preference among high-calibre professionals for financial compensation and specialized roles over broader responsibilities, senior

positions, or stock options. The results emphazise the need for biotech startups and their stakeholders to align employment conditions with the financial expectations of skilled professionals as a critical factor in accelerating talent mobility.

Chapter 5 synthesizes the findings from the preceding chapters to present theoretical and practical implications for managing uncertainty in high-tech startups. It highlights how entrepreneurs and management teams can effectively assemble, orchestrate, and deploy limited resources to ensure organizational survival and achieve long-term success. The theoretical framework, established in Chapter 2, incorporates additional insights from studies on strategic alliances and talent mobility. External factors, such as pipeline candidates and value-up strategies through in-licensing, are identified as flexible options for startups to enhance their resource base.

Overall, this thesis advances the academic and industrial understanding of the factors that enable biotech startups to navigate uncertainty and achieve sustainable success. By integrating literature-based insights with empirical evidence, this research provides both theoretical and practical recommendations for overcoming the challenges associated with resource constraints and high-risk innovation. Based on the aforementioned, the present research merits the award of a Doctor of Management of Technology.