

論文 / 著書情報
Article / Book Information

題目(和文)	資源制約下での不確実性マネジメント：バイオテックスタートアップ企業における実証研究
Title(English)	Uncertainty Management under Resource Constraints: An Empirical Study of Biotech Startup Firms
著者(和文)	原田（梅田）佳実
Author(English)	Yoshimi Harada (Umeda)
出典(和文)	学位:博士（技術経営）, 学位授与機関:東京科学大学, 報告番号:甲第402号, 授与年月日:2025年3月26日, 学位の種別:課程博士, 審査員:仙石 慎太郎,齊藤 滋規,辻本 将晴,杉原 太郎,松元 亮
Citation(English)	Degree:Doctor (Management of Technology), Conferring organization: Institute of Science Tokyo, Report number:甲第402号, Conferred date:2025/3/26, Degree Type:Course doctor, Examiner:,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	要約
Type(English)	Outline

論文要約

THESIS OUTLINE

系・コース：イノベーション科学 系
Department of Graduate major in イノベーション科学 コース
学生氏名：梅田(原田)佳実
Student's Name

申請学位(専攻分野)：博士 (技術経営)
Academic Degree Requested Doctor of
審査員主査：仙石 慎太郎
Chief Examiner

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. Within this landscape, startups play a crucial role in value creation, particularly in high-risk sectors where they drive industrial progress. Biotech startups, in particular, have emerged as key innovators in the pharmaceutical industry, contributing to the creation of breakthrough therapies and revitalizing the sector as a whole. Despite their vital role, these companies often face considerable challenges, including limited managerial flexibility, constrained resources, and the inherent uncertainties of research and development (R&D). The path to market commercialization is typically long and fraught with risks, making sustainable growth difficult under such resource-constrained conditions.

Chapter 1 gives an introduction to this thesis. This study seeks to explore strategies for managing uncertainty in biotech startups, particularly those operating under significant resource constraints. The objective is to offer insights that can inform both academic discussions and practical applications in the biotech industry, contributing to the broader understanding of how startups in this sector can navigate the complex challenges they face to foster sustainable growth and drive innovation.

Chapter 2 comprises a comprehensive review of the literature on the key success factors (KSFs) for biotech startups. The analysis confirms that the primary KSFs for these firms include achieving an Initial Public Offering (IPO) and the successful initiation of clinical trials. These milestones are crucial for validating a biotech firm's potential and securing the necessary financial resources for further development. However, these primary KSFs are often supported by secondary factors, such as securing venture capital (VC) backing and forming strategic alliances with established pharmaceutical companies. These alliances are vital not only for securing funding but also for accessing the expertise and infrastructure needed to navigate complex regulatory environments and expedite product development. Moreover, the study identifies the characteristics of the management team—specifically, their ability to combine scientific expertise with entrepreneurial acumen—as a critical factor influencing the firm's ability to achieve sustainable growth.

Chapter 3 examines the importance of alliances between biotech startups and pharmaceutical companies. Such alliances provide critical resources, including financial support, access to advanced R&D infrastructure, and expertise in navigating regulatory pathways. An analysis of 73 strategic partnership projects reveals that 56% of them were seeded out while 32% were in-

licensing agreements, highlighting the need for flexible alliance strategies that extend beyond traditional out-licensing models. The ability to engage in both in-licensing and out-licensing allows biotech startups to leverage external innovations and enhance their product pipelines, thereby increasing their chances of success. In addition, the study underscores the importance of creating 'best-in-class' and 'first-in-class' products, as well as establishing leadership in technological platforms. These efforts, when combined with strategic alliances, position biotech startups for sustained growth even in the face of significant uncertainties and resource constraints.

Chapter 4 focuses on the characteristics required of management in biotech startups, delving into the processes and mechanisms driving the mobility of high calibre talent. This study theoretically examines and quantifies the gap between established firms and biotech startups, focusing on flexible and adjustable job attributes, their substitutability, and the effective allocation of limited resources within startups. Based on a survey (n=506) and a conjoint analysis, the findings highlight a preference for financial compensation and specialized roles over broader responsibilities, senior positions, or stock options. The results underscore the importance of biotech startups and their supporters understanding the financial expectations of highly skilled professionals and offering employment conditions that align with these expectations as critical factors for accelerating talent mobility.

Chapter 5 synthesizes the insights gained from the preceding chapters to present theoretical and practical implications for managing uncertainty in high-tech startups. The chapter summarizes how startups, encompassing both entrepreneurs and the broader management team, can effectively assemble, orchestrate, and deploy limited resources to ensure organizational survival and achieve long-term success. The theoretical framework builds upon the foundation established in Chapter 2, incorporating key insights from two additional studies that emphasize the importance of leveraging both internal and external resources. Drawing from research on alliances, pipeline candidates are included as a critical external factor, acknowledging that in-licensing and value-up strategies are flexible options for startups. Additionally, talent mobility factors are newly introduced.

Overall, this study contributes to the academic and industrial understanding of the key factors that enable biotech startups to manage uncertainty and achieve long-term success. By integrating insights from the literature with empirical analysis, this research provides theoretical and practical recommendations for biotech startups navigating the challenges of limited resources and high-risk innovation.