

Bridging Theory and Practice: Navigating the Success Pathways of Research Productized Startups

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by

M Srinath Nair

2018111001

srinath.nair@research.iiit.ac.in



International Institute of Information Technology

Hyderabad - 500 032, INDIA

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Hyderabad, India

CERTIFICATE

It is certified that the work contained in this thesis, titled “**Bridging Theory and Practice: Navigating the Success Pathways of Research Productized Startups**” by M Srinath Nair, has been carried out under my supervision and is not submitted elsewhere for a degree.

Date

Adviser: Prof. Ramesh Loganathan

To failure, my good friend and my best teacher

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Abstract

This thesis explores the journey to success of research-productized startups, with a particular focus on those supported by IIT Hyderabad. Through a comprehensive analysis that combines detailed case study interviews with founders of research-productised startups themselves, and surveys with experienced stakeholders from the Hyderabad startup ecosystem, this work identifies key success factors and phases in the productization process. It highlights the crucial role of academic institutions, technology transfer offices, market validation processes, and the founders' backgrounds. Drawing upon insights from Prof. Ramesh Loganathan, Prof. Nimmi Rangaswamy, and my direct involvement in the ecosystem, the thesis bridges theoretical frameworks with practical observations. The findings aim to contribute to a deeper understanding of how research-driven innovations can successfully transition into market-ready products, offering valuable recommendations for startups, academia, and policymakers.

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Chapter 1

Introduction

The intersection of academic research and entrepreneurship presents a fertile ground for innovation, particularly in the realm of research-productized startups. These enterprises, which transform academic research outputs into marketable products, embody a unique blend of scientific rigor and business acumen. However, navigating the path from research to commercial success is fraught with challenges, from securing funding to understanding market needs.

This thesis investigates the journey to success of research-productized startups, with a special emphasis on those supported by the International Institute of Information Technology, Hyderabad (IIIT Hyderabad). The study is motivated by the critical need to understand how these startups overcome inherent challenges and identify the factors that contribute to their success. Drawing upon extensive literature, a detailed case study of startups associated with IIIT Hyderabad, and the author's firsthand experiences as an enabler in the startup ecosystem, this research aims to bridge the gap between theory and practice.

By examining the roles of academic institutions, technology transfer offices, and the ecosystem's enablers, this thesis seeks to provide a comprehensive overview of the ecosystem supporting research-productized startups. It aims to offer insights and recommendations for researchers, entrepreneurs, policy-makers, and academic institutions on fostering an environment conducive to the successful commercialization of research.

1.1 Scope of the Problem

The journey from academic research to a successful startup is fraught with obstacles. One primary challenge lies in the gap between academic research objectives and market requirements. Researchers often focus on scientific discovery and advancement without a clear path to commercial application.

Moreover, the lack of entrepreneurial skills among researchers and the scarcity of structured support from academic institutions further complicate the commercialization process.

Another significant challenge is the identification of success factors for research-productized startups. Traditional indicators may not fully capture the unique trajectories and milestones of startups born from academic research. This gap in understanding what constitutes success for these ventures makes it difficult for stakeholders to evaluate progress and make informed decisions.

1.2 Motivation

Addressing the challenges of research productization is crucial for several reasons. Firstly, it has the potential to significantly accelerate the rate of innovation, bringing transformative solutions to market more rapidly. Secondly, successfully commercialized research can contribute to economic development, creating new industries, job opportunities, and enhancing competitiveness. Lastly, understanding and overcoming these challenges can help streamline the process for future entrepreneurs and researchers, making it easier for more research findings to find practical applications and societal benefits.

There are over 104 million people in India who call themselves as entrepreneurs [8]. Now given that the global average rate of success of startups is 10%, this means that around 93.6 million entrepreneurs are bound to fail. A lack of support system for these entrepreneurs and an unplanned promotion of entrepreneurship would have destructive effects. A strong and supportive ecosystem is key to nurture this talent pool and an increased success rate would mean that more and more businesses thrive and also lead to an explosive amount of jobs in the market. However, a system has to be put in place to accommodate the failures, especially in a country like India where the overall number of entrepreneurs are excruciatingly high.

Another key motivation behind this thesis arises from the critical intersection of academic research and its potential for real-world application through startups. The process of transforming innovative research into viable commercial products is pivotal for economic development and technological advancement. However, navigating this transition presents numerous challenges, including the need for market validation, strategic partnerships, and effective business modeling. This thesis aims to uncover the factors that contribute to the success of research-productized startups, drawing on case studies, academic literature, and personal experiences within the startup ecosystem. By doing so, it seeks to provide

actionable insights for researchers, entrepreneurs, and policymakers, contributing to the broader goal of fostering innovation and entrepreneurship.

Understanding the journey of research productization is essential for several reasons. First, it sheds light on the mechanisms and challenges involved in translating research into viable products, offering insights into how academic findings can be effectively commercialized. This knowledge is vital for researchers, entrepreneurs, and policymakers alike, as it guides the development of strategies and policies that support innovation ecosystems.

Second, identifying success metrics for research-productized startups is critical for evaluating their performance and sustainability. Success metrics provide a framework for assessing the impact of these startups, allowing stakeholders to measure progress, identify areas for improvement, and allocate resources more efficiently. By understanding what factors contribute to the success of research-productized startups, enablers such as universities, investors, and government agencies can better support these ventures, fostering an environment where innovation can thrive.

Moreover, studying research productization and factors that contribute to their success addresses the need for a more systematic approach to innovation. It highlights the importance of collaboration between academia and industry, encouraging the exchange of knowledge and resources that can accelerate the commercialization process. This collaborative approach not only enhances the potential for success of research-productized startups but also contributes to building a more robust and dynamic innovation ecosystem.

Productization of research has led to several successful startups across the world who have contributed immensely to their home country's economy. India being a developing nation, finds startup ecosystem development crucial to the prolonged growth of its economy. While academia needs to step up to not restricting themselves to just research and taking them one step ahead, a well thought out framework around successful research productisation would make it easier to navigate these ventures towards success.

1.3 Scope of Thesis

This thesis focuses on the journey to success of research-productized startups, with a particular emphasis on those supported by IIT Hyderabad. The scope encompasses the identification and analysis

of key success factors, including the role of academic institutions, technology transfer offices, market validation processes, and the founders' backgrounds.

The work centers on the process of research productization — the journey of transforming academic research into market-ready products or services. Despite the potential of academic research to fuel innovation and drive economic growth, numerous challenges hinder the efficient and effective transition of research findings into successful commercial ventures. These challenges include, but are not limited to, identifying viable pathways for commercialization, securing funding and resources, navigating regulatory landscapes, and understanding market demands.

1.3.1 Objectives of the Thesis

The objectives of this thesis can be summarised into the following:

- Investigate the barriers and enablers in the process of research productization. Develop a comprehensive understanding of the ecosystem that supports or hinders the commercialization of academic research.
- Identify and validate factors that are indicative of the growth and sustainability of research-productized startups.

By delineating the scope of the problem, this thesis seeks to contribute to a deeper understanding of how academic research can be more effectively translated into commercial success. It aims to provide actionable insights and recommendations that can be leveraged by researchers, entrepreneurs, and policymakers to foster a more conducive environment for innovation and entrepreneurship.

1.3.2 Specific Areas Covered

- **Academic Support:** The support provided by academic institutions, especially IIT Hyderabad, in nurturing these startups.
- **Technology Transfer:** The role of technology transfer offices in facilitating the commercialization process.
- **Market Validation:** Strategies employed by startups to validate their market and adapt their products accordingly.

- **Founder's Background:** The impact of the founder's educational background and network on startup success.

1.3.3 Approach

This thesis adopts a multifaceted approach to explore the complex process of research productization and to identify the factors that signal success in startups emerging from academic research. The aim is to bridge the theoretical and practical aspects of bringing innovative research to the marketplace, focusing on strategies that can foster sustainable growth and impact. The approach is divided into several distinct but interconnected stages:

1.3.3.1 Literature Review

To lay the groundwork for this study, a comprehensive literature review was conducted. This review encompasses existing theories and empirical studies related to research productization, startup ecosystems, and success metrics and success factors. The purpose is to identify gaps in current knowledge and to understand the broader context within which research-based startups operate. This stage also involves analyzing the factors that have historically contributed to both the success and failure of such ventures.

1.3.3.2 Methodological Framework

Given the exploratory nature of this thesis, a mixed-methods research framework was chosen to provide a holistic understanding of the subject matter. This includes:

- **Qualitative Analysis:** In-depth interviews and case studies of selected research-productized startups, focusing on their journey from concept to market. This method allows for capturing the nuanced experiences of founders and key stakeholders, providing insights into the challenges and strategies of successful productization.
- **Quantitative Analysis:** Survey data and performance metrics from a broader sample of startups to identify common patterns and success factors. This analysis helps in quantifying the impact of various factors on startup success and in validating the findings from qualitative research.

1.3.3.3 Stakeholder Engagement

Recognizing the importance of real-world perspectives, this study involves engaging with a diverse range of stakeholders within the startup ecosystem, including entrepreneurs, investors, mentors, and representatives from technology transfer offices (TTOs). This engagement aims to gather firsthand accounts of the productization process and to understand the roles different stakeholders play in supporting startup success.

1.3.3.4 Data Analysis and Synthesis

Data collected through both qualitative and quantitative methods are meticulously analyzed to identify key themes, patterns, and correlations. This analysis involves the use of statistical tools for quantitative data and thematic analysis for qualitative insights. The findings are then synthesized to formulate a set of success metrics and factors that contribute to the success of startups that are both evidence-based and practically relevant for research-productized startups.

1.3.3.5 Recommendations and Implications

Based on the analysis, this thesis concludes with strategic recommendations for startups, enablers, and policymakers on how to support the productization of research effectively. It also discusses the implications of the findings for future research and for the development of innovation ecosystems.

1.3.4 Limitations

The study is limited to startups associated with IIT Hyderabad, which may not represent the broader landscape of research-productized startups. The findings are based on case studies and personal experiences, which may introduce subjectivity. Contribution:

By bridging the gap between theoretical insights and practical experiences, this thesis aims to provide actionable recommendations for fostering successful research-productized startups.

1.3.5 Thesis Layout

The thesis is organized as follows:

- **Chapter 2: Theoretical Framework and Literature Review** This chapter talks about the theoretical underpinnings of research productization, startup success, and the startup ecosystem's

dynamics. The objective is to define and explore concepts such as research productization, technology transfer, and startup ecosystems.

- **Chapter 3: Case Study of Research Productized Startups Supported by IIT Hyderabad** This chapter will discuss the rationale for selecting IIT Hyderabad as a focal point to discuss research productisation. The discussion results will also be discussed in this chapter.
- **Chapter 4: Survey with Larger Groups** This chapter discusses the validation of success factors identified through discussions with startups and enablers at IIT Hyderabad with other ecosystem stakeholders. Interviews and surveys were done to understand how the ecosystem perceives these factors and which of them would be deemed as important.
- **Chapter 5: Discussions and Learnings** This chapter discusses the findings from the study and tries to correlate the findings from each of the previous chapters. The chapter ends with a reference to the final set of factors that contribute to the success of research productized startups as identified from the activities undertaken as part of this research.
- **Chapter 6: Conclusion** The concluding chapter summarises the activities that were done as part of this research and comments on the activities that can be undertaken to expand on this research.

Chapter 2

Theoretical Framework and Literature Review

2.1 Introduction

This chapter lays the foundational stones for understanding the complex landscape of research-productized startups. It begins by delving into the significance of transforming research outputs into viable commercial products, an endeavor that not only fuels innovation but also bridges the gap between academic findings and market needs. This transition, however, is fraught with challenges, necessitating a deep dive into the theoretical frameworks that underpin successful productization processes.

The literature review systematically explores existing research on startup ecosystems, the role of technology transfer, and the critical success factors for startups transitioning from research to market. By dissecting studies across disciplines, this chapter aims to uncover the multifaceted nature of startup success and the pivotal role played by institutional support, market validation strategies, and the founders' backgrounds.

In synthesizing this body of work, the chapter identifies existing gaps in the literature, particularly the need for more empirical evidence on the efficacy of support systems for research productized startups. It sets the stage for the subsequent chapters, which will explore these themes through a detailed case study of startups supported by IIT Hyderabad and insights from the author's personal experiences as an enabler in the ecosystem.

2.2 Introduction to Research Productisation

The goal of research productisation is to bridge the gap between research and commercialization, by taking an innovative idea or technology from the lab and turning it into a viable product or service that

can be released and use in the real world [6]. Google, one of the most successful companies to ever exist is an example of a very successful research productisation. The co-founders Sergey Brin and Larry Page met at Stanford University where they worked on a search algorithm that eventually went on to become Google [3]. The work done by OpenAI including the Generative Pretrained Transformers (GPTs) [15] and image generation tools like DALLE [17] that have been driving the excitement around Artificial Intelligence (AI) in present times are testaments of why research productisation is important and exciting.

Research productisation is both a technical and a social capital fostering innovation, promoting entrepreneurship, and enabling knowledge transfer from academia to industry. In this study we attempt to trace and understand the journey of four productisations from laboratories initiating the beginnings of research to the launch of a product . A company is formed around product research once there is product validation from customers deeming the product to hit the market and generate revenue. Once formed, our study identifies factors that contribute to the success of these commercial entities.

2.3 Background Study and Literature Review

There has been considerable attention on the commercialisation of science since the Bayh-Dole Act of 1980 in the United States. The act allowed contractors to take ownership in inventions that arise out of Federal Government funded institutions [7] [19]. Research productisation falls under the same concept of commercialisation of science. While there have been works on technology transfer process and academic entrepreneurship from a developing country's perspective [16], our research is targetted particularly at the state of research productisation in India.

2.3.1 Role of Entrepreneurship in Research

The role of entrepreneurship in the realm of research is integral to the transformation of theoretical knowledge and scientific discoveries into practical, market-ready solutions. Entrepreneurship serves as the conduit through which research transcends the confines of academic journals and laboratories to become innovations that address real-world problems [10]. This transition is critical for the development of new technologies, products, and services that can have a profound impact on society and the economy. Entrepreneurs with a vision for applying research findings creatively and practically take on the challenge of navigating the path from concept to commercialization. They are the ones who recognize the potential

of research to spawn new industries or revolutionize existing ones, thereby playing a pivotal role in driving technological advancement and economic growth.

Entrepreneurship in research necessitates a unique blend of scientific understanding, business acumen, and innovative thinking. Researchers-turned-entrepreneurs must not only possess deep knowledge in their field of study but also the ability to identify market needs and opportunities that their research can fulfill. Besides, there is a considerable amount of the taxpayers money that the government infuses into the development of entrepreneurship from research. This makes it vital to study the same and understand what could contribute to the success of these ventures [5]. It is imperative that the founders of these startups also become one with the challenges that this career path puts forth as opposed to a career trajectory involving pure research. This requires a mindset shift from pure research to a more application-oriented approach, where the value of scientific discoveries is measured not just by their contribution to academic knowledge but also by their commercial viability and societal impact. By fostering a culture of entrepreneurship within the research community, institutions and policymakers can encourage more scientists and academics to consider the commercial potential of their work, thereby increasing the likelihood of groundbreaking innovations reaching the market. Studies made on similar grounds in the South African startup ecosystem suggests that there is a need to incorporate entrepreneurship into the curricula of these educational institutions [13].

Besides, the integration of entrepreneurship into research brings about a symbiotic relationship that benefits both realms. On one hand, research provides entrepreneurs with a solid foundation of knowledge and innovative technologies that can be transformed into successful business ventures. On the other hand, entrepreneurship injects dynamism into the research process, as the feedback loop from market experiences back to the research phase encourages continuous improvement and adaptation of technologies to better meet user needs. This relationship enhances the relevance of research activities, ensuring that scientific efforts are aligned with market demands and societal challenges. Consequently, fostering entrepreneurship in research not only accelerates the commercialization of innovations but also amplifies the impact of research on society, driving progress and prosperity.

2.3.2 Key Learnings from Literature Study

Indian universities have not traditionally worked on research with an aim of commercialisation. The approach was with a mindset focused on solving a problem that looks interesting. There is minimal research on this subject as well. But given the government's push in the field of technology transfer

from academia to the industry, there has been some focus on trying to understand the process. The focus has been on understanding the awareness of patenting practices and technology productisation in the academic community of India, comprehending productisation strategies and understanding the barriers in academia-industry technology transfer [18]. It goes without saying although that technology transfer through formation of commercial ventures is something that still remains unprecedentedly unexplored, especially given the Indian government's policies pointing towards their ambitions in developing the startup ecosystem of the country.

The structures and institutions that support startups and productisation efforts remain the same across countries. That is, enablers including Technology Transfer Office (TTOs) and educational institutions, incubators, accelerators, funding firms like VCs, angel investment groups, etc are essential and contribute to the success of entrepreneurial ventures [4]. A quick look was done into understanding how the bodies within the startup ecosystem that constitute as enablers, with a special focus on TTOs, measure their own success. The internal structures and the business models adopted by these bodies inadvertently impact the success of these bodies and the success that these bodies create in startups or products that they support. The offices that run for profit turned out to be better in terms of output when compared to not for profit TTOs [11].

Some effort has been put into understanding the journey of a scientific innovation being commercialised, right from the research to the formation of the product [20][12][1]. An example that is seen is that of a neuromodular device, the market demand and size, licensing, spin offs and funding opportunities made available to the original technology and spin offs that have later taken off [1]. These works provide a first person look into how managing a venture feels like in actual.

From the TTO's perspective, entrepreneurial success is defined in a completely different way. The structure and competency of the TTOs in educational institutions are vital for influencing success of startups that come out of productising research in these institutions [14]. The funds directed from the institution or government bodies help these enablers tackle problems for startups in a much efficient way by letting them serve startups with a backing of good infrastructure and mentorship support.

One thing to be noted here is that this work describes what happens in a start-up ecosystem of a developed country with good financial resources to back start-ups. The case with developing countries like India might be entirely different and worth exploring and documenting. From the work that has been done, what we see is that there are a few studies done on the role of TTOs in start-up success and so forth. But there is a lack of effort made to understand what defines success for research productized start-ups.

Most research fail to talk about how success can be measured and what contribute to the success of startups that come out of research productisation. Also, there are non-physical parameters like leadership style, network of the founders and professional support that these founders have sought which aren't being discussed here but contribute effectively to startup success. Besides these, the research that is currently done does not differentiate research productization from regular entrepreneurship. There is a need to study and publish a methodology of research productization that would increase the probability of success while productizing research. That is basically creating a scientific framework for research productization.

2.3.3 Background Work with IIIT Hyderabad

IIIT Hyderabad has had several years of efforts to actively create products from research. At the Product Labs in the Technology Transfer Office and the DeepTech Incubator that comes under the Centre for Innovation and Entrepreneurship, IIIT Hyderabad (CIE or CIE-IIITH). CIE is the largest and one of the oldest academic incubators in India with an experience of incubating and supporting startups from 2008. CIE is lead by Prof. Ramesh Loganathan, a veteran in the Hyderabad startup ecosystem having guided startups for more than 20 years. Prof. Prakash Yalla on the other hand, leads the Technology Transfer Office (TTO) at IIIT Hyderabad. A detailed discussion was done with both of them to identify what are the factors that potentially contribute to the success of these startups.

2.3.3.1 Success Factors arrived at from discussions with IIIT Hyderabad

From its 14 years of experience guiding and supporting startups, CIE and IIIT Hyderabad have come up with a "Three-way-cocreation model", where they have identified three pillars of innovation - Startups, Industry and Academia. The Industry determines the use cases, Academia does the research to build solutions and Startups innovate and make products out of the research to serve the use cases defined by the industry. Picking on their experience, the following are the factors that IIIT Hyderabad has identified which contributes to the success of research-based startups:

- **The team must have people from different backgrounds.** As a whole, it is essential to have 3 important figures, one person who can take care of the core technology, one who can engineer the product, and one who can handle the business.

- **Having a tech differentiator is very important in a research lead startup.** There needs to be a core technology that can't be replicated and has a strong quality to attract customers to it.
- **The support received from TTOs and other bodies within the academic institution is key to a research productised startup's success.** It is important that startups, in their nascent stage get sufficient support from the TTO, incubator in the form of availability of grants and seed fundings, Infrastructural support, office space, etc. Other support like CA, Legal, Finance, Banking, are also equally important.
- **Market and domain exposure for the founders helps build a good product that solves an important problem in that market.** It is important to understand the technology for startups. But if the founders are unaware of the problems faced by the domain where their customers lie then it is of no use. Founders must know how to apply their solution to the domain that they are targeting and understand how to ease the pain points for them.
- **Access to customers and access to end-users even before productisation to validate the product helps in building a very good product based on feedback.** Support in terms of routing startups to customers. It is also important for these customers to stick with the startups.
- **Continuous innovation post building the startup is important particularly in a research lead startup.** Startups coming out of a laboratory initially had several brains working and thinking over how to make the product better. Once it gets converted to a product and moves out of the laboratory setting, it is difficult to apply the same level of upgradations to the product. This makes innovation important just so that the product remains relevant.
- **Culture within the team must be built in such a way that it improves productivity.** Most of the founders are first-time founders who do not know much about handling people. It is important to build a good culture within the team to ensure success.
- **Ethical aspects need to be kept in mind especially in a regulation heavy country like India.** Inexperience comes with a tendency to take risks. Unawareness of rules and regulations surrounding money, technology proves to be factors that kill startups right before they take off.

2.4 Conclusion: Factors to be studied in this thesis

In conclusion, this chapter has laid the groundwork for understanding the intricate landscape of research-productized startups, highlighting the critical transition from academic research to market-ready products. Through a comprehensive literature review and insights from IIT Hyderabad's experience, we have uncovered the multifaceted nature of startup success, emphasizing the importance of institutional support, market validation strategies, and the founders' backgrounds. The journey from research to commercialization is fraught with challenges, yet it is pivotal for fostering innovation, entrepreneurship, and bridging the gap between academia and industry.

The analysis reveals a significant need for more empirical evidence on the efficacy of support systems and a deeper understanding of the factors contributing to the success of research-productized startups. The unique challenges faced by startups in developing countries like India, compared to their counterparts in developed nations, underscore the importance of adapting support mechanisms and strategies to local contexts.

IIT Hyderabad's "Three-way-cocreation model" serves as a testament to the potential of structured collaboration between startups, industry, and academia in driving innovation. The identified success factors, including team composition, tech differentiator, support received, market and domain exposure, continuous innovation, and ethical considerations, provide valuable insights for future research-productized ventures.

As we move forward, we will discuss which of these factors are actually validated as contributors of success for these unique startups. Interviews and surveys were done to understand the journey of research productised startup. By doing so, we can pave the way for more effective transitions from research to market, ultimately contributing to the growth of the innovation ecosystem and fulfilling the promise of research productization in addressing real-world challenges.

Success Factors	Comments
<p>Continuous innovation post building the startup is important particularly in a research lead startup.</p>	<ul style="list-style-type: none"> Startups coming out of a laboratory initially had several brains working and thinking over how to make the product better. Once it gets converted to a product and moves out of the laboratory setting, it is difficult to apply the same level of upgradations to the product. This makes innovation important just so that the product remains relevant.
<p>The support received from TTOs and other bodies within the academic institution is key to a research productised startup's success.</p>	<ul style="list-style-type: none"> It is important that startups, in their nascent stage get sufficient support from the TTO, incubator in the form of availability of grants and seed fundings, Infrastructural support, office space, etc. Other support like CA, Legal, Finance, Banking, are also equally important.
<p>Market and domain exposure for the founders helps build a good product that solves an important problem in that market.</p>	<ul style="list-style-type: none"> It is important to understand the technology for startups. But if the founders are unaware of the problems faced by the domain where their customers lie then it is of no use. Founders must know how to apply their solution to the domain that they are targeting and understand how to ease the pain points for them.

Success Factors	Comments
The team must have people from different backgrounds.	<ul style="list-style-type: none"> • It is essential to have 3 important figures, one person who can take care of the core technology, one who can engineer the product, and one who can handle the business.
Having a tech differentiator is very important in a research lead startup.	<ul style="list-style-type: none"> • There needs to be a core technology that can't be replicated and has a strong quality to attract customers to it.
Access to customers and access to end-users even before production to validate the product helps in building a very good product based on feedback.	<ul style="list-style-type: none"> • Support in terms of routing startups to customers. It is also important for these customers to stick with the startups.
Culture within the team must be built in such a way that it improves productivity.	<ul style="list-style-type: none"> • Most of the founders are first-time founders who do not know much about handling people. It is important to build a good culture within the team to ensure success.
Ethical aspects need to be kept in mind especially in a regulation heavy country like India.	<ul style="list-style-type: none"> • Inexperience comes with a tendency to take risks. Unawareness of rules and regulations surrounding money, technology proves to be factors that kill startups right before they take off.

Table 2.1: List of initial success factors from discussions with IIIT Hyderabad

Chapter 3

Case Study of Research Productized Startups

3.1 Introduction

Diving into the empirical examination of startups transforming academic research into commercial successes, this section focuses on those fostered by the nurturing environment of IIIT Hyderabad. It presents a detailed analysis of how these enterprises have navigated the path from ideation to market presence, highlighting the critical success factors and the indispensable support provided by the institution. Through this exploration, insights are gleaned on the symbiotic relationship between academic research and entrepreneurial success, offering a nuanced understanding of the ecosystem's role in facilitating the journey of research-productized startups.

3.1.1 Analysing the Factors identified from the Literature Survey as Referred to in section 2.3.3.1

From the literature survey, we had come across the following set of Success Factors:

- **Team Composition**
- **Tech Differentiator**
- **Support Received**
- **Market and domain exposure**
- **Access to customers and access to end-users**
- **Continuous innovation post building the startup**

- **Culture within the team**
- **Other ethical aspects**

In this chapter, we are going to take a look at the startups that have come out of research productisation. The idea is to interview them to validate these factors identified previously, and also put across a few other important aspects that were perhaps not considered in the initial set of factors identified through literature survey.

3.2 Experimentation: Interviews as Case Study for Understanding the Journey of Research Productisation

The research methodology involved documenting case studies of startups. The mode of doing this was through first hand interviews. Interviews were chosen as the preferred method of investigation because they allow in-depth exploration while allowing the flexibility to extract contextual information since the interviewees are answering questions based on their real life experiences. The journey was traced and specific observations were made on the stages of the journey and the actions that entrepreneurs take in order to drive the startups to success.

3.2.1 Interviews

The candidates for the interview were selected based on their profile and how they have contributed to the creation and development of the startups. The candidates were selected across several stakeholders including startup founders, researchers and Technology Transfer Offices. The startups chosen to be tracked were identified in such a way that these had started as a research project, and later on someone had built a product on top of that research and this product was taken to the market. It was also taken into account whether or not these have made any sort of revenue or have paying customers.

Dr. Manish Srivastava - Subtle AI Dr. Manish is the co-founder of Subtle AI, a startup focused on retrieving information from documents with a chatbot interface. He is also a professor and a researcher with an interest in Natural Language Processing (NLP). The CEO of the company, Mr. Vishnu Ramesh was an intern working on the project that eventually became Subtle AI's product. The commercial viability of the product had become apparent after Dr. Manish's discussion with the CTO of an important pharmaceutical company in helping them speed up the process of filtering complaints about their products

from the internet. The solution was able to reduce the human efforts by 80% which led to the CTO calling it a solution they would pay for to use. The current CEO started talking to customers to understand further requirements of potential clients and the product was rolled out.

Prof. Prakash Yalla - Technology Transfer Office, IIIT Hyderabad Prof. Prakash Yalla heads the Technology Transfer Office (TTO) at IIIT Hyderabad. He has overseen multiple research productisation. The importance of TTO in the research productisation process comes from the fact that TTOs are means of educating the students about scientific entrepreneurship. With the success of these offices being directly attributed to the outcome of entrepreneurial ventures from these, this could prove to be an effective mechanism to invoke interest in this domain among the student community of an institution [2].

At IIIT Hyderabad, the TTO has a catalog that lists research happening at IIIT Hyderabad for the industry to take an interest in. Other than doing matchmaking between academia and the industry, the TTO is also responsible for doing market research on whether or not the research is worth productization and possible use cases of research. One of the productizations he oversaw, Matchday AI was the core subject of this discussion. The company works on sports analytics with Star Sports, a television channel headquartered in India and owned by the Walt Disney Company. The company gained a lot of attention through news articles and eventually, Mr. Pallela Gopichand, the Chief National Coach for the Indian national badminton team, joined as a co-founder of the company.

Pawan Reddy - NeuralSync NeuralSync is home to the product Wav2Lip, a technology that helps make lip-synced videos for several languages. The technology gained traction through connections and licensing requests they received through LinkedIn. Between August 2021 and January 2022, the co-founders of NeuralSync spoke to 100 customers and made close to \$75,000 in revenue. The validation for the technology eventually led to the birth of the company NeuralSync.

Rajat Aggarwal - DreamVu Rajat Jain is the founder of DreamVu, a startup that makes products in the domain of omnidirectional 3D vision systems. The first product of the company was a portable 360-degree camera. The research was published at the Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2016. They used the camera for XR use cases which made them incorporate the company in the United States where the market seemed more ready for XR technologies. Eventually, as they realized that the solution that they had taken up did not have a market to cater to, which made them pivot to a different use case. They moved on to building depth perceiving eyes for robots which sowed the seeds to the company that they are presently.

3.3 Findings of the Study

The case studies were analyzed to understand what contributes to a successful startup where the core product came out of the research. An attempt was made to understand what are the key activities undertaken by these founders and stakeholders to drive their startup towards growth. These findings have been grouped under 4 categories including Technology and Product, Market Validation, and the Founder's Background. In the previous chapter we have seen on a broad level what contributes to the success of these research productised startups. Now post the case study interviews, we have validated some of these and have arrived at the further discussions on why these remain important. We expand on those points and also discuss a few additional points that have come up from the interviews in the following sections.

3.3.1 Success Factors of Research-Based Startups as Identified from Case Study Interviews

We had initially come up with 8 points on what contributes to the success of research-productised startups purely from literature study that was done. Now, in the interviews that were done, we were able to discuss with founders in particular, all these factors and unearth some that were not taken into consideration previously. Before beginning with the same, let us revisit the 8 factors that were identified previously.

Let us discuss these findings here and understand deeper into what contributes to the success of research productised startups.

3.3.2 Continuous Innovation post building the startup is important for success of research productised startups

It has been noticed that there are factors outside tech differentiator that falls under innovation that contributes to the success of research productised startups. though these fall under continuous innovation, we can broadly put them under tech differentiator since innovation is being done on the technology that is under consideration.

Note: Research & IP (Innovation) indicate innovation, thereby becoming key indicators of success in research productised startups

Research & IP (Innovation) stands as a crucial pillar in the foundation of research-productized startups for several compelling reasons, central to both their strategic advantage and sustainable growth in the competitive market landscape. The following factor comes under this broader section.

Number of Patents indicate the startup's innovation potential Patents are a direct indicator of a startup's innovative capacity. They not only protect intellectual property but also serve as a testament to the novelty and utility of the startup's technology. A higher number of patents can enhance a startup's valuation and its attractiveness to investors.

Number of Research Papers show constant innovation The publication of research papers in reputable journals and conferences is a reflection of the depth and rigor of the startup's underlying technology. It signals the startup's commitment to advancing knowledge in its field and contributes to its credibility and recognition.

Growth of R&D Team shows the continued focus of these startups into innovation The expansion of the Research and Development (R&D) team is indicative of a startup's growth and its continued investment in innovation. A growing R&D team suggests that the startup is scaling its capabilities to explore new ideas and improve existing products.

This section highlights the need to have an innovation first mindset among these startups which essentially becomes the factor that contributes towards success of these startups.

3.3.3 The support received from the academic institution is important to drive research productisation towards success

The TTO plays a vital role in the success of research productisation in an academic institution. The success depends on how proactive they are at creating opportunities for research productisation, their relationship with the industry, and how well they track productisable research within their institute. The following activities matter:

The right stakeholders need to identify productizable research The TTO and those enabling research productization need to identify specific subdomain use cases in broad research fields and do a matchmaking with the industry.

The enablers must help find the right market use cases for research subdomains Enablers of research productization need to understand what the industry needs and map it back to academia.

There is a need for support from the TTO or Incubator to build a quick demoable prototype

There must be active support to build a prototype of the product that can be used by the startup team to demo in front of prospective customers.

3.3.4 Tech Differentiator: Important for any startup, having a defensible core technology becomes even more important for a research productised startup

Product and how useable it is to the end consumer is key to success of these startups. The technology is most likely cutting-edge in these research-driven startups. But at the same time, it is vital that the use case is validated by the consumers as well.

Startups that come out of research need to have a core technology that is difficult to replicate

Startups that come out of research are supposed to be known for their cutting edge technology. There needs to be a technology that is difficult to replicate which could be the basis for the startup's success.

The ability of the system to reduce human efforts is important while thinking about building a product Subtl AI's product was able to reduce human effort by 85% which attracted the customer that they first spoke with. This was the pivotal moment when they realized that the research could make a good product.

Publication in reputed conferences/journals gives a validation that the tech is interesting and powerful Reputed conferences show that the technology is strong or unique enough. It does not guarantee that it would make a product that would be loved by customers though.

3.3.5 There must be a co-founder who has a core experience or background in the market or domain of the startup

As mentioned in the previous section, this subsection primarily talks about the validation and usability aspect of the research under question. Market validation is often considered key to building any venture and it is no different in research productised startups as well.

Validation from industry experts or individuals who are renowned in the domain that your product lies goes a long way Matchday AI for instance got Pullela Gopichand as a co-founder. Gopichand's reputation would go a long way in adding credibility to the startup.

Lack of a clear leader in the market the product is placed in gives an advantage The lack of a clear leader in the market makes it easier to capture the market and fewer resources to climb up the ladder.

3.3.6 The startup must be able to communicate value easily to customers and end-Users by identifying the right use case

Every startup needs to have access to the people who they are selling their product or service to. Now it is even more important for the startup to be able to communicate the value addition from their end to the customers. It is often the responsibility of TTOs or other enablers including incubators to provide support to the startups in connecting with these potential clients and helping them communicate. Let us discuss how customers and end-users actively contribute to the success:

Customer validation and iterating over the product based on the feedback received while talking to customers lead to success It is important to understand what the customer needs and how the product can be designed to satisfy that.

Building a relation with the customer is important to understand what the customers genuinely need Having a relationship with customers prior to productization would help in piloting the product and acquiring paid customers.

Having users who pay for the technology is the most important form of validation Neuralsync had people paying for the product even before they formed the company. That shows that the technology is worth making a product out of.

Getting people to talk about the technology through proper channels shows that users are liking the product It is important to make sure that people know about the technology and create excitement about the same. It is easier to talk to customers who are familiar with your tech already. The visibility should ideally happen from the research stage.

3.3.7 Additional Factors Identified through the Case Study which are important to note while building a research productised startup

Now besides validating what was identified as part of the literature study, the interviews also gave rise to a set of additional factors that were unearthed. It is to be noted that the interviews were done with

people who are on the ground level running startups or helping startups run. So their point of view was to be considered crucial to arriving at a conclusion on what contributes to the success of companies.

3.3.7.1 Background of the founders matter

While the product and research matters for sure, it is also important to build a team and have co-founders who are capable enough to sell the product and make money. Having a strong team in place is often regarded as more important than the product itself to a lot of people within the startup community.

Having Co-Founders with good domain expertise and complementary skills is important Domain expertise makes it easier to navigate through the product-making process and to deal with customers. If there is an absence of such a person in the team, it is important to gain this experience as soon as possible.

Serial entrepreneurs add value to the team Serial entrepreneurs who have worked with stakeholders add credibility when they return to the same people/organizations which makes it important to have such people in the co-founding team.

The above discussions were made through the interview process. These are made from observations made in the interviews and also by observing the change in status of each of these startups post these critical moments. What is to be noted is that discussions covered only **Tech Differentiator, Support Received, Market and Domain Exposure, Access to Customers and End-Users**. The discussions done by founders pointed to the fact that factors like, **”Culture within the team”** and **”Ethical Aspects”** are important for all startups and are not worth mentioning in a study that is done specifically on research productisation.

3.4 Other Considerations that Influence Success

The previous section identifies the factors that contribute to why a startup that arises out of research would become successful. Here, we discuss certain variables outside these that enable startups. Careful observations have also been made on the startup journey which have been discussed in this section.

3.4.1 What are the roles of different stakeholders in research productisation?

There are some key problems that are faced by the research community while trying to productise the research that they are doing. For instance, the current support received by research-productized startups

is the same as that of a regular startup. This is not ideal for these startups that may not have a traditional market. There is a need to communicate their work better to the intended audience.

The institutions that work towards supporting research productization are also limited. There are Government-supported institutes including the Indian Institute of Technology (IITs), the Indian Institute of Information Technology, or privately funded International Institute of Information Technology (IIITs) that support research productization efforts in India. Let us look at the role of the stakeholders in detail.

3.4.1.1 Researchers produce core technology which becomes the heart of the startup

The role of researchers is primarily to produce core technology for people to consume. It is the efforts made by these individuals that eventually become products through research productization. A collaboration with the industry is necessary to understand what part of the research can help ease the pain points of potential customers.

3.4.1.2 Technology Transfer Offices (TTOs) help convert research to a product, thereby playing a crucial role in setting up the business

The TTOs are responsible for identifying use cases from the industry and doing matchmaking between industry and research. The lack of experience of researchers in understanding markets can be filled by these bodies. Cold calls to understand what problems technology can solve for the industry can go a long way. The ideas or use cases that they receive from these calls need to be documented to understand what kind of technology is shown value by the market.

TTOs are responsible for cataloging of technology based on the domain of research that happens at the research institute. This public document becomes a handbook for entrepreneurs who wish to take up interesting use cases to productize. TTOs can also support in creation of demoable prototypes for these entrepreneurs. TTOs also play a key role in helping get IP protection support for the technology that these startups end up productizing.

3.4.1.3 Incubators pair up with TTOs to support startups in the early stage to get the business running

The incubators are regular enabler bodies whose activities are independent of whether or not the startup is from research to a large extent. Incubators are supposed to help set up these commercial

entities with support ranging from registration of the company to getting them mentorship support for go-to-market (GTM) strategies and start making revenue. These organizations are expected to handhold the startups in their initial phases.

3.4.1.4 Entrepreneurs and their skill sets are vital to driving a company to success

Entrepreneurs play a key role in research productization by taking action. They identify interesting technologies and make successful businesses out of them. Once the startups are formed, they are supposed to play the key role of connecting the dots to bring in revenue and raise funding and investments when necessary.

3.4.2 Framework – Phases in the Journey of Research Productisation

Every research-productized startup is seen to have gone through most of the phases that have been listed in the following subsection.

What are the Phases?

- Identifying pain points in the industry that can be addressed by the broad research problem.
- Identifying the specific solution within a broad research problem that can be applied to solve the pain point.
- Verbal validation from potential customers. This could be through an increase in the number of unpaid users for the technology as well.
- Identifying the right product and getting a demoable product built.
- On-boarding entrepreneurs who can run the company
- Paid customers start getting on-boarded
- Company is formed with a proper structure

Why are the Phases not Serial in Nature? Every startup has its own journey and is unique in how they achieve milestones. For instance, some have had paid users before the formation of the company, and some have verbal validation and look for paid users post-formation of the company.

3.4.3 Phases of Product in “Land” in Research Productisation

There are two such phases as follows:

- Product is made and there are users for the product. Could be paid or unpaid.
- Company is formed and users now become customers.

Why are these phases different? As mentioned earlier, research is mostly not done to productize it. Researchers usually look at interesting problems and try to solve them from an academic point of view. When solutions exist, people use them either by paying the researchers or without paying when the technology is made available for open use. Now, when the company gets incorporated, these individuals become users or customers of the company based on whether or not they are paying. When startups are formed, they define a revenue model for the use of the technology, and payment is sought from customers accordingly.

3.5 Success Factors from section 2.3.3.1 that were excluded by founders

It was interesting to note that some factors that were identified through the literature survey including, “Culture within the team” and “Other ethical aspects” were not discussed by the founders. While initial thoughts deem these factors as unimportant due to lack of significance provided by the founders to the same, we do not disregard these at this point since there is further discussion and study that is to be done with a larger group of startup ecosystem stakeholders.

3.6 Discussions

In chapter 2 we tried to understand the factors that contribute to the success of research productised startups from literature that currently exists. Now we took these to startups that have actually come out of research at IIIT Hyderabad to understand how the founders perceive these. Interviews showed that “Support Received”, “Tech Differentiator”, “Market and Domain Exposure”, “Access to Customers and End-Users” and “Continuous Innovation post building the Startup” were validated well by the founders with proper reasoning on why they are important.

The interviews of startups have given a compelling narrative of innovation and sustenance of startups. Through detailed case studies and interviews, this study has illuminated the critical success factors that

underpin the journey of research productization, from ideation to market presence. The indispensable role of institutional support, particularly from Technology Transfer Offices (TTOs) and incubators, emerges as an important insight in bridging the gap between academic research and entrepreneurial achievement.

The findings underscore the importance of strong technology and product development, rigorous market validation, and the founders' backgrounds in steering startups towards success. Moreover, the study highlights the unique challenges and opportunities faced by research-productized startups, distinguishing them from more traditional entrepreneurial ventures.

While understanding dynamics remains important, it should not divert our attention away from what these interviews were initially done for. The interviews opened a gateway into understanding what contributes to the success of these research productised startups and how IIT Hyderabad and the startups there have been thriving while the need for such a system is still neglected by a large chunk of the ecosystem. It calls for a continuous exploration of best practices, success factors, and the development of frameworks that can enhance the probability of success for startups navigating the complex journey from research to market.

Ultimately, the successful transformation of academic research into commercial ventures is not just about individual startup success but it's also about contributing to a larger narrative of innovation, economic growth, and societal progress. The case studies from IIT Hyderabad show the potential that lies at the intersection of research and entrepreneurship, offering valuable lessons and inspiration for the wider ecosystem from a developing country's standpoint where the startup ecosystem is still in its relative nascent stage.

Success Factors	Subfactors based on case study interviews
<p>Continuous Innovation post building the startup is important in a research productised startup</p>	<ul style="list-style-type: none"> • Secure more patents even post building the startup • Publishing more papers is seen as a positive sign • Get the builder of the technology in your core team.
<p>Team Composition - Make sure that the expertise of the team is diverse</p>	<ul style="list-style-type: none"> • The creator of the technology must be a part of the core founding team • Maintain an optimal number of co-founders of 2-3 • The team must grow over time
<p>Support Received from TTOs and Incubators within academic institutions is very important</p>	<ul style="list-style-type: none"> • The right stakeholder needs to identify productizable research • TTO must help find the right market use cases for research subdomains • TTO needs to support to build a quick demoable prototype
<p>Tech Differentiator becomes important for research productised startups</p>	<ul style="list-style-type: none"> • Startups that come out of research need to have a core technology that is difficult to replicate • The system must be able to reduce human efforts • Publication in reputed conferences/journals validates that the technology is unique and groundbreaking in nature

Success Factors	Subfactors based on case study interviews
Market and Domain Exposure for the startup founder is a plus	<ul style="list-style-type: none"> • Take validations from industry experts on the idea and the technology • A lack of clear leader in the market helps the startups with a first-mover advantage
The startup must be able to communicate value easily to customers and end-Users by identifying the right use case	<ul style="list-style-type: none"> • Iterate the product based on customer feedback • Get users to pay as early as possible • Get existing users to refer more users • Keep a track of the number of active users

Table 3.1: Subfactors under each success factor as identified in the case study

Chapter 4

Survey with a Larger Group from the Startup Ecosystem

4.1 Introduction

So far we have seen that the journey of research productisation is not a single person's effort. There is an adequate need to foster a rich and well-networked ecosystem for this process in order for more startups to come out of research in India. The last chapter gave us a comprehensive understanding of how these startups and founders themselves view success and their journeys. We now take this research to the next level by discussing these findings with the ecosystem stakeholders including head of incubators, investors, and mentors to understand how they view the idea of research translation. What makes this study powerful is the focus group that we are creating, which encompasses of people who are rich in experience dealing with startups and some of who have enabled research productised startups in their career as well.

The transition of academic research into commercially viable products is a multifaceted journey, encompassing various stages of development, from ideation to market penetration. What we have seen is that, evaluating the success of research-productized startups requires a nuanced understanding of the factors that reflect their progress and sustainability. This chapter delves into the key indicators of success, drawing from insights gained through interviews with founders and stakeholders at IIIT Hyderabad, as well as an extensive review of the literature on startup ecosystems and innovation management.

Let us now look at the survey and experimentation that took place.

4.2 Experimentation

Based on the discussions done with IIIT Hyderabad's startups, Incubation Center and the TTO, certain factors have been identified that could potentially contribute to the success of startups. The next step was to validate this with a few startups as case studies who have come from research. Based on that, a set of factors were arrived at with proper explanation on why they exist in the same. Now the final step was to validate this with a larger set of ecosystem stakeholders.

A discussion was done with several such individuals to validate the same. The factors identified as contributing to success have been listed here:

4.2.1 Participants of the Survey

The following were the participants of the survey that was conducted:

- **M Srinivasa Rao (MSR):** MSR, the CEO of T-Hub Hyderabad, is a seasoned entrepreneur with over three decades of experience in the information technology industry, having co-founded Aujas and Network Solutions, which were acquired by NSEIT in 2019 and IBM in 2005, respectively. As a Partner at Social Venture Partners and a Charter Member of TiE, MSR is dedicated to mentoring startups and fostering a culture of innovation and entrepreneurship in India and beyond.
- **Anish Anthony:** Anish Anthony is a dynamic entrepreneur who has co-founded and helped build two multi-million dollar companies, currently leading Operations at the world's largest innovation campus and startup incubator, THub. His transition from an instructor and project director to the entrepreneurial world showcases his versatile leadership and commitment to innovation. He was a founding member of MyGate.
- **Anupam Pandey:** Anupam is a seasoned professional leading the foodtech vertical at Anthill Ventures, where he oversees the identification and development of investment opportunities, working closely with family funds to foster innovative and sustainable food solutions. With a rich background that includes managing investments at CIE-IIIT Hyderabad's deeptech incubator and leading the social impact community 'Misfits,' Anupam is deeply committed to community building and leveraging his expertise to support growth and innovation in the foodtech sector.
- **Abdul Mujeeb Shaik:** Abdul has been nurturing community growth as a Community Manager at AIC IIITH Foundation since May 2019, and he is also the founder of Alilka, where since February

2015, he has been dedicated to crafting handwoven products from Water Hyacinth, fostering sustainable livelihoods and entrepreneurship among women.

- **Rohit Gupta:** Rohit Gupta is a Founding Partner at Seedin Ventures with over 12 years of diverse experience, recently pivotal in scaling over 150 startups at Freeflow Ventures since 2019, and currently spearheading the Headstart West Bengal chapter, demonstrating a profound commitment to driving innovation and growth in the startup ecosystem. His expertise encompasses strategic business planning, market access, and orchestrating successful fundraising from various investment sources.
- **Amit Singh:** Amit Singh is the entrepreneurial force behind Wow Labz, one of India's premier product engineering firms known for rapidly turning ideas into market-ready consumer and enterprise products, alongside investing in a robust portfolio of startups. Additionally, Amit co-leads Headstart Network, India's most extensive early-stage startup community, with a vision that harnesses the transformative power of entrepreneurship, technology, and design.

4.2.2 Success Factors Identified through the Survey

The identification of the factors that contribute to the success for research-productized startups is a result of an in-depth analysis and synthesis of insights garnered from interviews with founders and stakeholders at IIT Hyderabad, coupled with an extensive review of existing literature on startup ecosystems and the innovation process. These factors serve as a comprehensive framework for assessing the performance and potential of startups transitioning from academic research to commercial viability. They are categorized under key areas such as Research & IP (Innovation), Funding, Customer/Usage, Revenue/Profits, Value/Customer Satisfaction, and People (Founders' Background), each reflecting critical aspects of startup success. The factors listed below are instrumental in understanding and measuring the multifaceted nature of startup growth and sustainability, providing a structured approach to evaluate the progress and impact of research-productized ventures in the competitive marketplace.

4.2.3 Funding is a validation of other success factors

Promise of funds and fundraising helps startups validate their growth potential. An investment is directly linked to potentially more returns to those who are investing, thereby validating a good future for the startup.

Note: Funding shows validation from external sources based on the business done or the business potential

Funding is a pivotal factor for research-productized startups, underpinning nearly every aspect of their journey from conceptualization to market penetration and scale. Its importance is multifaceted, impacting the startup's ability to innovate, grow, and compete in several critical ways.

Capital raised along with the source shows who has validated the idea The amount of capital raised and the diversity of funding sources (e.g., angel investors, venture capital, grants) are critical points. They not only reflect the startup's ability to convince stakeholders of its value proposition but also its capacity to navigate through different stages of growth.

Number of fundraising rounds - the more the up rounds, the better the startup is doing The number of rounds of fundraising successfully completed is a measure of the startup's progress and the confidence investors have in its potential. Each round typically corresponds to a milestone achieved, paving the way for further development and scaling.

Timeline of the startup funding journey shows how quick was the growth story was, a key indicator of success The timeline from ideation to prototyping to early revenue generation provides insights into the startup's pace of development and its ability to execute its business plan effectively.

While funding is important on its own, the timeline of the funding journey and the source of the fundraisings show that the startups is being validated as building a useful technology, becoming another factor of success.

4.2.4 Market is the best validation of many of these factors

There must be a demand for a product that is being built from the customers. When there is demand, it means that people are finding the product useful. If there is some sort of friction in this demand rising that means that there is some issue with the product that is preventing people from adopting the solution. A proper relation with the customer ensures that the product evolves into exactly what the market needs.

Note: Customers and users validates how important the product is to the users Customers and usage are fundamental to the success and sustainability of research-productized startups for several compelling reasons. They not only represent the direct market validation of the startup's products or services but also play a critical role in shaping the startup's trajectory and strategic decisions.

Number of users are vital and if they pay, that is validation beyond anything. A startup that knows the customer inside out is a startup that would build great products. Get customers to refer more customers. In conclusion, customers, users and low onboarding friction contributes towards success.

Number of Customers/Users shows how well the product is being received in the market The total number of customers or users serves as a direct measure of the startup's market acceptance and the demand for its products or services.

Strong customer relations and having a product with features validated by users There was a strong validation on this factor which was previously identified through the interviews with startups at IIT Hyderabad. The survey clearly told us that a user validated feature addition to the system essentially means a sellable feature, more revenue, greater customer satisfaction. It is important to build a relation with the customer, identify a few who are important to shape the journey and take constant feedback.

Get existing users to refer more people People refer more people when they themselves love the product that you have built. Once you get them to talk about your product, then you are seeing success. Organic growth through customer referrals is a great way to grow. There is no better champion of your product than your own customer.

Active user number shows the frequency with which people use this solution The number of active users, especially for tech startups, highlights user engagement and the utility of the product or service.

4.2.5 Revenue and profits shows the money making potential of the solution

Revenue and profits are critical indicators of a startup's financial health, sustainability, and potential for long-term success. For research-productized startups, which often begin their journey within the academic or research sphere and transition into the commercial market, understanding the importance of revenue and profits is fundamental for several reasons:

Lifetime Value (LTV) shows an estimated idea about how long a customer is going to stay engaged and the value generated LTV measures the total revenue a business can expect from a single customer account. It reflects the long-term value of customers and helps in strategizing customer relationship management.

Monthly Recurring Revenue (MRR) is an indicator of repeated revenue generation MRR is a vital metric for businesses with a subscription model, providing a predictable revenue stream and reflecting the stability of the business.

Revenue and a larger LTV shows that users are finding significant value in the product offered. A visible reduction of human efforts would be a key indicator that the product is exciting. This contributes towards success as well.

Note: Customer satisfaction and judgement of the value created is important to track how well the startup understands the user Value and customer satisfaction are paramount for research-productized startups for several reasons, fundamentally influencing their success, growth, and longevity in the market. These aspects are crucial because they directly impact the startup's ability to attract, retain, and foster loyalty among its customer base.

Customer Retention Rate shows that the consumers find the product useful as against other competitors A high retention rate indicates that the startup is successfully meeting customer needs and building loyalty, which is crucial for long-term success.

Churn Rate is an indicator of friction to keep the users/customer as part of the system The churn rate, or the rate at which customers discontinue their subscriptions or stop using the product, is a critical measure of customer satisfaction and product fit.

Customer Grievance Redressal Stats shows how well the team is in resolving customer issues and keeping them happy The ratio of complaints to resolutions is an important indicator of the effectiveness of a startup's customer service and its commitment to customer satisfaction.

Customer retention and satisfaction means that more and more revenue is being generated on a recurring basis and loyalty is established towards the product and the brand, becoming a key indicator of success.

4.2.6 Team and Culture is a critical aspect

Team building is a very difficult process for any startup or founder. It is not only important to find the right talent, but it is also important to find the people who would gel well with the culture put in place at the organization and who would protect and propagate that culture further.

Note: The people in the team, including their backgrounds is a key indicator on how capable the team is in executing the idea. It addresses the much important question of "Why you?" The People factor, particularly the founders' background, plays a pivotal role in the success and trajectory of research-productized startups. Founders' expertise, experience, and networks set the foundation for the startup's strategic direction, culture, and resilience.

Number of Co-Founders: An ideal number is 2-3 The composition of the founding team, including the number of co-founders and their complementary skill sets, can significantly influence a startup's direction and resilience.

Founders' Experience in running the startup and the domain of the startup goes a long way The founders' prior experience in running startups and their domain expertise are crucial factors that can accelerate the startup's growth and help navigate challenges.

Team Size and Growth indicates how well the startup is growing The growth of the team reflects the startup's scaling efforts and its ability to attract talent, which is essential for innovation and execution.

This section discusses how important it is to have a strong co-founding team with founders having sufficient domain expertise and knowledge. This is a key point that contributes towards success.

The experiment was done in such a way that the stakeholders were questioned on their perception on the importance of the above factors. They could choose 3 options - Validated, Unsure or Invalidated. Each validation added 2 points against the factor concerned, an invalidation deducted 1 point and unsure added 1 point again. Certain stakeholders did not opine on certain factors and those were given a 0 point. The reason for selecting the above point system was to ensure that all 4 scenarios added to the validation or invalidation of a factor concerned. Anything with less than 4 points were removed from the list of factors contributing to success.

4.3 Discussions

In conclusion, this comprehensive analysis, grounded in discussions with stakeholders from IIT Hyderabad's vibrant startup ecosystem and reinforced by a broad review of literature, has successfully identified a diverse array of factors contributing to the success of research-productized startups. These success factors come from a three level refinement process where the initial set was arrived at from the literature that currently exists, followed by discussions with one of the oldest academic incubators with a plethora of knowledge on research productisation. This was then pushed through another filter that is the ecosystem itself. The factors identified through this particular part of the study are being considered as additional factors that are important for most other startups as well to succeed. It is to be noted that while the research productised startups stand out in some respect and need to be given the additional privilege

Subfactors that are important

- Track the number of customers/users to understand how well the product is being received in the market
- It is important to have strong customer relations and build a product with features validated by users
- Get existing users to refer more people
- Active user number shows the frequency with which people use this solution
- Track the LTV to understand the value generated from the user
- Monthly Recurring Revenue (MRR) is an indicator of repeated revenue generation
- Iterate the product based on customer feedback
- Get users to pay as early as possible
- Get existing users to refer more users
- Keep a track of the number of active users
- Secure more patents even post building the startup
- Publishing more papers is seen as a positive sign
- Maintain an optimal number of co-founders of 2-3
- The team must grow over time

based on their needs, they are finally a startup. In most cases, any factor that applies to a regular startup also applies here.

Subfactors that are important
<ul style="list-style-type: none"> • The startup needs to take care of ethical and regulatory aspects • The team needs to have a culture that is more innovative and conducive to research • The capital raised along with source becomes important • The number of fundraising rounds and the timeline of the startup funding journey is important to track • Track and grow revenue and profits constantly • Keep track of the Lifetime Value of customers

Table 4.1: Additional factors to be considered while building a startup as identified through the survey done with startup ecosystem stakeholders

The idea behind understanding the success factors of research productised startups is that, these startups, while being critical to utilisation of research outputs, also have unique journeys. Hence there is an effort that is put into the work to understand them better by talking to startups who have been there and done that. Although the work is biased towards the experiences of the Hyderabad and the IIT Hyderabad ecosystems, these set of success factors are a good starting point to further research in this domain.

Chapter 5

Findings and Learnings

5.1 Introduction

So far, this work explores the intermingling of academic research and entrepreneurship, particularly focusing on startups that convert academic research into marketable products. The thesis emphasizes the unique challenges these startups face, such as securing funding and understanding market needs, and aims to understand how these challenges are overcome and what factors contribute to the success of such startups. The study is specifically interested in startups supported by the International Institute of Information Technology, Hyderabad (IIIT Hyderabad), and uses a mix of literature review, detailed case studies of startups associated with IIIT Hyderabad, and the author's experiences as an enabler in the startup ecosystem to offer insights.

The introduction sets the stage for a comprehensive examination of the ecosystem supporting research-productized startups, aiming to provide actionable insights for various stakeholders, including researchers, entrepreneurs, policymakers, and academic institutions, on fostering an environment conducive to the successful commercialization of research.

Key issues addressed include the inherent gap between academic research objectives and market requirements, the need for entrepreneurial skills among researchers, and the identification of success factors for research-productized startups. The motivation behind the thesis is rooted in the potential of research productization to accelerate innovation, contribute to economic development, and streamline the process for future entrepreneurs and researchers.

The thesis outlines its scope, objectives, specific areas covered, the approach for investigation, limitations, and the overall layout of the document, preparing the reader for a detailed exploration of research productization, the challenges involved, and strategies for success.

5.2 Getting Initial Success Factors from Literature Review

The foundation laid by the literature review establishes a theoretical basis for identifying factors that contribute to the success of startups. This initial set focuses on innovation and research productivity, such as the number of patents and publications, signaling the startup's contribution to scientific knowledge and technological advancement. However, while these factors offer insight into the intellectual property and research capabilities, they do not fully capture the startup's ability to translate this innovation into market success.

The initial factors identified from the literature review serve as a beacon, guiding the subsequent empirical investigation into the success factors of research-productised startups. These factors are rooted in academic research and intellectual property (IP), reflecting the unique characteristics and challenges of startups that originate from a research environment. Their significance lies in highlighting the importance of innovation output and the creation of knowledge as foundational elements of startup success in this context.

5.2.1 Selection of Initial set of Success Factors

The selection process for these indicators involved a thorough examination of academic literature on technology transfer, entrepreneurship, and innovation management. Success factors identified include:

- **Number of Patents:** Serving as a proxy for technological innovation and the startup's ability to protect its inventions. Patents are critical for defending a startup's competitive advantage and attracting investment by demonstrating a tangible output of their research efforts.
- **Number of Research Publications:** Indicating the depth and rigor of the startup's research foundations. Publications in peer-reviewed journals and conferences not only validate the scientific merit of the research but also contribute to the startup's reputation and credibility in the academic and business communities.
- **Patent Filings:** Reflecting the startup's commitment to innovation and its strategy for safeguarding its intellectual assets. The act of filing for patents demonstrates an intention to commercialize research findings, marking a critical step in the transition from research to market.

- **Feature Addition:** Highlighting the startup's ability to iterate and enhance its product offerings based on research outcomes and market feedback. This metric underscores the startup's agility and responsiveness to evolving market demands and technological advancements.
- **Collaboration with Research Institutions:** Emphasizing the importance of maintaining strong ties with academia to access cutting-edge research, expertise, and resources. Collaborations can accelerate the development process, enhance the startup's innovation capacity, and provide credibility.
- **Fund Allocation to R&D:** Demonstrating the startup's commitment to ongoing research and development efforts. This metric indicates the startup's prioritization of innovation and its willingness to invest in long-term growth and competitive differentiation.

5.2.2 Implications and Applications of these Success Factors

The initial factors form a comprehensive framework that reflects the multifaceted nature of startup success within the context of research productization. They emphasize the critical role of research output and IP management in establishing a firm foundation for startup growth. By incorporating these indicators into their evaluation criteria, startups, investors, and ecosystem enablers can better understand the strengths and areas for development within research-productized startups.

Moreover, these factors underscore the necessity for startups to balance their research-oriented objectives with market-driven strategies. They highlight the transition challenges from an academic setting to a competitive marketplace, pointing towards the need for strategic alignment, market validation, and the development of business acumen among research-focused entrepreneurs.

In essence, the initial set of success factors from the literature review provide a lens through which the unique journey of research-productized startups can be examined and understood. They lay the groundwork for a nuanced exploration of success factors, guiding subsequent phases of the study towards a more holistic understanding of how academic research can be effectively transformed into successful commercial ventures.

5.3 Insights from IIIT Hyderabad - Refinement of the Success Factors

The engagement with IIIT Hyderabad's ecosystem introduces a pivotal shift towards incorporating practical, market-oriented indicators. This phase acknowledges that while technological innovation forms the core of research-productized startups, their success also heavily relies on market validation, customer relationships, and strategic partnerships. For instance, indicators related to market exposure and customer validation emphasize the importance of aligning product development with market needs and customer feedback, moving beyond the confines of research excellence to embrace market dynamics and consumer demand.

5.3.1 Understanding market needs and strategic partnerships is important to developing a good product

One of the paramount insights from IIIT Hyderabad centers around the critical importance of understanding market needs and forging strategic partnerships. Startups emerging from research environments often possess strong technological foundations but may lack insight into market demands and customer needs. IIIT Hyderabad's ecosystem emphasizes the necessity for startups to engage closely with potential customers and industry partners early in their development process. This engagement facilitates a better alignment of product features with market requirements, enhancing the potential for commercial success.

5.3.2 Role of Technology Transfer Offices (TTOs) and Incubators and their support in setting up the initial company is key to helping these startups succeed

Another vital insight pertains to the role of Technology Transfer Offices (TTOs) and incubators in bridging the gap between research and market. TTOs at institutions like IIIT Hyderabad are instrumental in identifying commercially viable research, securing intellectual property rights, and facilitating technology transfer processes. Incubators provide startups with the essential infrastructure, mentorship, and resources needed to navigate the early stages of business development. This support system is critical for research-productized startups as it not only provides a platform for growth but also instills a business-oriented mindset among academically inclined founders.

5.3.3 Importance of a strong technology and product that reduces human effort will capture the attention of the customers quickly

The discussions at IIIT Hyderabad also highlight the importance of having a strong technology and product as the cornerstone of startup success. The case studies underscore the need for products not just to embody technological innovation but also to offer tangible benefits that address specific pain points in the market. This insight stresses the importance of continuous product development and iteration based on feedback from early adopters and customers. Such an approach ensures that the product remains relevant and competitive, addressing the evolving needs of the market.

5.3.4 Market validation and customer engagement helps startups grow and scale without a lot of friction

Market validation emerges as a key insight, emphasizing the need for startups to validate their business model and product offerings through customer engagement. This process involves acquiring early customers, gathering feedback, and iterating on the product to better meet customer expectations. Validation from paying customers and industry experts serves as a powerful testament to the product's value proposition and market fit. It also plays a crucial role in attracting further investment and scaling the business.

5.3.5 The founders' background and team dynamics, the stronger they are, the better

Insights from IIIT Hyderabad further stress the significance of the founders' backgrounds and the composition of the startup team. The synergy between co-founders with complementary skills—combining technical expertise, business acumen, and industry knowledge—is critical for navigating the multifaceted challenges of transforming research into a successful enterprise. The presence of serial entrepreneurs or founders with prior startup experience can also be invaluable, providing practical insights into scaling businesses and navigating the startup ecosystem.

The insights from IIIT Hyderabad serve to expand upon the initial set of factors, adding layers of practicality and market orientation to the theoretical foundation. They emphasize the critical transition from a research-focused mindset to a market-driven approach, underscoring the importance of adaptability, customer-centric product development, and strategic networking in achieving startup success. This phase of the study not only enriches the thesis with real-world applicability but also bridges the gap between

academic research and commercial viability, highlighting a pathway for research-productized startups to thrive in competitive markets.

5.4 Engagement with Broader Stakeholder Ecosystem: Validating and Expanding the List of Success Factors

Surveying a wider array of stakeholders further refines the factors by incorporating diverse perspectives on startup success. This expansion introduces factors that assess customer engagement and financial viability, such as customer acquisition cost, revenue metrics, and customer satisfaction indicators. These indicators reflect a deeper understanding of the market's role in startup success, acknowledging that sustainable growth and profitability are essential components of a successful transition from research to market. They underscore the necessity for startups to not only develop innovative technologies but also to effectively engage with the market and build a viable business model.

Discussions were done with stakeholders of varying backgrounds to validate these factors and add more to the list. A scoring mechanism was put in place to evaluate the factors based on survey responses. The participants were selected in such a way that they vary in their learnings and experiences so that an overlap of learnings does not take place.

5.4.1 Development of a Scoring System

The culmination of these insights into a scoring system for final metric selection represents a methodical approach to distilling the essence of startup success into quantifiable and actionable indicators. This system allows for the weighting of indicators based on their relevance and impact, informed by empirical data and stakeholder feedback. It addresses the complexity of measuring startup success by providing a balanced view that encompasses innovation, market validation, customer engagement, and financial health. The scoring system offers a data-driven methodology for prioritizing such factors, ensuring that the most significant indicators of success are highlighted.

5.5 The Final set of Success Factors

The final set of success factors that contribute to the success of research productised startups have been mentioned in table 5.2. This table has the final set of factors that were identified through three

processes, that is, (i) literature survey and background work with IIIT Hyderabad, and (ii) interviews with research productised startups at IIIT Hyderabad. The final step, that is, the (iii) survey done with a larger group of ecosystem enablers in Hyderabad yielded us some additional factors that contributed to the success of startups. These have also been listed below. Certain factors like the need for the importance of "Ethical aspects" and "Culture within the team" that are said to have been redundant, have been moved to the additional factors that contribute to startup success.

The sections and subsections mentioned in table 5.2 are the ones that were arrived at from inputs through the literature study and background work that was done with IIIT Hyderabad. The interviews helped us find out some other subfactors and also determine what was important and what was not.

5.6 Conclusion and Implications

The research concludes some of the important factors that contribute towards the success of research productised startups. The literature review lead us to some factors that were further expanded through the disussions with IIIT Hyderabad, an educational institute that specialises in technology and technology translations from research labs to land. The factors were grilled further through an extensive interview process that gave us some idea about the legitimacy of the factors identified, while helping us do a deeper dive into certain subfactors within these.

The final step of the process was a survey that was done with ecosystem stakeholders to understand certain factors that also add to the success of startups. These are more generic in nature and are applicable to other startups as much as it is to research productised startups.

Success Factors	Subfactors identified through interviews	Comments
Support Received from TTOs and Incubators within academic institutions is very important	<ul style="list-style-type: none"> • The right stakeholder needs to identify productizable research within an academic institute • TTO must help find the right market use cases for research subdomains • Product teams within TTOs needs to support to build a quick demoable prototype 	<ul style="list-style-type: none"> • TTOs play a crucial role in this task and creating a catalogue of productisable research. • Most startups fail due to their failure in identifying this use case for their product. Now given that research lead startups are founded by researchers who are assumed to have minimal exposure to understanding customers and markets, it becomes important for the TTOs to develop an expertise in this field and support the startups accordingly. • TTO needs to support to build a quick demoable prototype.
Tech Differentiator becomes important for research productised startups	<ul style="list-style-type: none"> • Startups that come out of research need to have a core technology that is difficult to replicate • The system must be able to reduce human efforts • Publication in reputed conferences/journals validates that the technology is unique and groundbreaking in nature 	<ul style="list-style-type: none"> • Defensibility becomes very important in research productised startups. Having a core technology that is difficult to replicate becomes key to determining the value of the startup. • As seen in the case with Subtl.AI, a technology that reduces human efforts is a tool that improves productivity and reduces cost. There will be takers for such a product in the market. • Most of the startups we have interviewed have had publications in reputed conferences. DreamVu started off with a technology that was published in CVPR, one of the most important conferences in computer vision.
There must be at least one co-founder with domain and market exposure	<ul style="list-style-type: none"> • Take validations from industry experts on the idea and the technology • A lack of clear leader in the market helps the startups with a first-mover advantage 	<ul style="list-style-type: none"> • A strong validation for Matchday.AI came in the form of the national badminton coach Pullela Gopichand joining their team as a co-founder. This helped them secure avenues with a reputed figure in the industry they are targetting, being part of the team. • Like any other startup, it stands good to know the competition in the market. And if this startup is opening up a new market as discussed at the start of this thesis, it gives them a first mover advantage. This however comes with the downside that they become pioneers, making them alone in an untested market or industry.
The startup must be able to communicate value easily to customers and end-Users	<ul style="list-style-type: none"> • Iterate the product based on customer feedback • Get users to pay as early as possible • Get existing users to refer more users 	<ul style="list-style-type: none"> • Build a relationship with the customers while building the product. Understand their journey while using your product. • Paying customers means that the use case identified is good and the productisation is now taking off. • Get your current users to be your ambassador. Make them talk about the product.

Success Factors	Actions to be taken	Comments
<p>Continuous Innovation post building the startup is important in a research productised startup</p>	<ul style="list-style-type: none"> • Secure more patents even post building the startup • Publishing more papers is seen as a positive sign • Get the builder of the technology in your core team. 	<ul style="list-style-type: none"> • Constant innovation is key in research productised startups and securing more patents is a measure of the innovation that is being done. • This activity is key to maintain an innovative mindset within the team of the startup. • Almost all the research productised startups who we have seen through the length of this thesis had the builder of the technology actively taking part in the startup's product evolution.
<p>Team Composition - Make sure that the expertise of the team is diverse</p>	<ul style="list-style-type: none"> • The creator of the technology needs to be a part of the core founding team • Maintain an optimal number of co-founders of 2-3 • The team must grow over time 	<ul style="list-style-type: none"> • It has been observed that the active involvement of these individuals has helped the startups to grow and thrive • The research shows that the optimal number of co-founders is 2-3. • A growing team shows that the company is able to get more resources, thereby getting more productive. It is important to track the value brought in by a new addition to the team.

Table 5.1: Success Factors and Actions to be Taken

Subfactors that are important

- Track the number of customers/users to understand how well the product is being received in the market
- It is important to have strong customer relations and build a product with features validated by users
- Get existing users to refer more people
- Active user number shows the frequency with which people use this solution
- Track the LTV to understand the value generated from the user
- Monthly Recurring Revenue (MRR) is an indicator of repeated revenue generation
- Iterate the product based on customer feedback
- Get users to pay as early as possible
- Get existing users to refer more users
- Keep a track of the number of active users
- Secure more patents even post building the startup
- Publishing more papers is seen as a positive sign
- Maintain an optimal number of co-founders of 2-3
- The team must grow over time

Subfactors that are important
<ul style="list-style-type: none"> • The startup needs to take care of ethical and regulatory aspects • The team needs to have a culture that is more innovative and conducive to research • The capital raised along with source becomes important • The number of fundraising rounds and the timeline of the startup funding journey is important to track • Track and grow revenue and profits constantly • Keep track of the Lifetime Value of customers

Table 5.2: Additional factors to be considered while building a startup as identified through the survey done with startup ecosystem stakeholders

Chapter 6

Conclusion

In concluding this comprehensive exploration into the world of research-productized startups, it becomes evident that the journey from academic research to commercial success is a nuanced and multifaceted process, underpinned by a complex ecosystem of stakeholders, from technology transfer offices (TTOs) and incubators to entrepreneurs themselves. The empirical examination of startups associated with IIT Hyderabad has provided invaluable insights into the mechanisms and strategies that facilitate this transition, offering a roadmap for future ventures embarking on a similar path. This becomes key particularly when we consider the rate of growth of the Indian startup ecosystem. It is interesting to note that in 2021 alone, startups in India have raised more than \$23 billion, spread over 1000+ deals, with 33 startups entering the unicorn club [9]. The government's push to build in India, coupled with Indians' desire to become a part of the "India Story" makes this the right time to understand how the ecosystem can be built better, coupled with high-quality research and entrepreneurs.

The critical success factors identified through this study—spanning TTO and enabler support, technology and product innovation, market validation, and the founders' background—highlight the essential ingredients for a research-based startup's journey towards sustainability and impact. These factors, rooted in rigorous academic inquiry and practical engagements with the startup ecosystem, underscore the importance of a supportive infrastructure that bridges the gap between academic research and market demands.

One of the key takeaways from this study is the pivotal role of TTOs and similar enabler organizations in guiding research-based startups from inception to market realization. These entities not only facilitate the identification and nurturing of promising research but also provide the critical support structures needed for startups to navigate the early and often tumultuous stages of product development and market entry. Furthermore, the study sheds light on the importance of founders' backgrounds, particularly their

educational and professional experiences, in equipping them with the requisite skills and insights to lead their ventures to success.

Moreover, the research emphasizes the significance of market validation and the development of a strong technology or product as foundational elements of a startup's potential for success. It is through the iterative process of market feedback and product refinement that startups can fine-tune their offerings to meet the needs and expectations of their target audience, thereby enhancing their chances of achieving sustainable growth and profitability.

As we reflect on the findings and narratives presented in this study, it becomes clear that fostering a thriving ecosystem for research-productized startups requires concerted efforts from all stakeholders involved. This includes creating more opportunities for academia-industry collaboration, enhancing the support and resources available to startups, and fostering a culture that values innovation, resilience, and continuous learning.

6.1 Summarising the work done

Summarising what has happened in the thesis, we started off by creating an initial list of factors that could contribute to the success of startups from literature review. Now using this, we went on to do an interview with some of the research productised startups from IIIT Hyderabad.

Why did we take IIIT Hyderabad in particular to do this analysis, IIIT Hyderabad has a rich culture of productising research. The institute is widely regarded for its research culture and have unique programs on taking research from lab to land. There is a fully functional TTO that is established at IIIT Hyderabad whose experience combined with the experience of CIE - IIIT Hyderabad, the institute's startup incubator which is also one of the oldest academic incubators in the country. Combined with their expertise and interviews done with the startups who did research productisation there, we expanded the list of success factors and also validated a few.

This list was then taken to some of the enablers including individuals working with VCs and the head of THub, the largest incubator in the world backed by the government of Telangana, to get more validation and expand further on the same. The final list was then presented as factors which would contribute to the success of research productised startups.

6.2 Summarising the final set of factors

The final set of factors that were identified from all the activities undertaken, all of which that have been summarised in the section above, lead to shortlisting of 10 different success factors with 30 subfactors within them. These have been well organised in table ??.

The initial set of factors were identified from the literature study that was done. These were then taken to the startups at IIIT which came from research productisation. While they verified some of these factors, not all were discussed by the founders. This lead us to do another larger survey with some of the stakeholders of the Hyderabad startup ecosystem consisting of investors, incubator heads, and mentors. This then lead us to the final set of success factors.

6.3 Future works

There are several ways in which this study can be extrapolated to understand more about the startup ecosystem and what contributes to their betterment. It is widely acknowledged that 10% is the success rate of startups across the world. In India however, the rate seems to be much lower. The understanding on what is missing is not very much understood. The overall picture is also low with respect to numbers and any contribution on helping these numbers increase would be labelled a success.

The following are the top 3 ways in which this study can be expanded:

6.3.1 Replication of the research done in Hyderabad - IIIT Hyderabad pair in Silicon Valley - Stanford University

The investigations done at the startup ecosystem of Hyderabad with IIIT Hyderabad as a case study can be replicated at the Silicon Valley with Stanford as a case study. The learnings can be compared back to that of those from Hyderabad. A comparative study can be done on how they are similar.

6.3.2 A deep dive study into the effectiveness of the Indian startup ecosystem

A study can be done to understand the effectiveness of the Indian startup ecosystem. It is interesting to notice that each region of the Indian ecosystem have different culture and requirements associated with it making them very different from each other. A detailed understanding of the same gives us a know how on what could potentially work and not work while guiding startups.

6.3.3 Addressing the limitations of this study

The limitations of this study, such as geography and institutional limit can be rectified. Although it could be difficult to generalise what contributes to success without understanding the culture of the startup ecosystem of the geographical region under consideration.

Looking ahead, the insights garnered from this study can serve as a beacon for policymakers, educators, entrepreneurs, and enablers alike, guiding them in their efforts to cultivate a more vibrant and sustainable startup ecosystem. By embracing the lessons learned and strategies identified, there is a tremendous opportunity to not only accelerate the commercialization of academic research but also to contribute to the broader narrative of innovation, economic growth, and societal progress.

In conclusion, the journey of transforming academic research into successful commercial ventures is both challenging and rewarding. It requires a deep understanding of the unique dynamics at play within the startup ecosystem, a commitment to supporting and nurturing entrepreneurial talent, and a willingness to learn from both successes and failures. As this study has shown, by focusing on the key factors that contribute to startup success and by fostering a collaborative and supportive ecosystem, we can pave the way for more research-based innovations to make a meaningful impact in the market and society at large.

- Identify the right use case to apply your research
- Get a team ready for rapid market prototyping
- Make sure that you have a core, defensible technology
- Prove to your users that the product reduces human efforts
- Publication in major research conference/journal
- Get a co-founder who has experience in the startup's domain
- Get the creator of the technology in the core founding team

Table 6.1: Checklist for startup founders before getting into research productisation

- Get people to use the product
- Get these users to bring in more users
- Convert users to paying users
- Recurring Revenue (MRR and ARR)
- Lifetime Value of a user
- Number of publications/patents post productisation

Table 6.2: Optional items on the checklist

- Number of users
- Number of active users
- Number of paying customers
- Recurring Revenue (MRR and ARR)
- Lifetime Value of a user
- Number of publications/patents post productisation

Table 6.3: Some key metrics to track while running the startup

Related Publications

Thesis Publications

- Nair, M. Srinath, Loganathan, Ramesh, and Rangaswamy, Nimmi, 2024. "Discovering the Journey to Success of Research Productised Startups." In Transfer, Diffusion and Adoption of Next-Generation Digital Technologies, edited by Sharma, Sujeet K., Dwivedi, Yogesh K., Metri, Bhimaraya, Lal, Banita, and Elbanna, Amany, pp. 301-312, Cham: Springer Nature Switzerland. Available at: https://doi.org/10.1007/978-3-031-50204-0_26

Other Publications

- Nair, Srinath and Fernandes, Dolton, 2021. "professionals@DravidianLangTech-EACL2021: Malayalam Offensive Language Identification - A Minimalistic Approach." In Proceedings of the First Workshop on Speech and Language Technologies for Dravidian Languages, edited by Chakravarthi, Bharathi Raja et al., pp. 175-179, Kyiv: Association for Computational Linguistics, April. Available at: <https://aclanthology.org/2021.dravidianlangtech-1.23>.
- Bajaj, Vaibhav, Pant, Kartikey, Upadhyay, Ishan, Nair, Srinath, and Mamidi, Radhika, 2021. "TEASER: Towards Efficient Aspect-based Sentiment Analysis and Recognition." In Proceedings of the International Conference on Recent Advances in Natural Language Processing (RANLP 2021), edited by Mitkov, Ruslan and Angelova, Galia, pp. 102-110, Held Online: INCOMA Ltd., September. Available at: <https://aclanthology.org/2021.ranlp-1.13>.

Bibliography

- [1] S. Assaf and J. Kerr. Chapter 17 - A Brief Guide to the Scientific Entrepreneur. *ScienceDirect*, 2014. [Accessed 12 Jul. 2023].
- [2] D. Bolzani, F. Munari, E. Rasmussen, and L. Toschi. Technology transfer offices as providers of science and technology entrepreneurship education. *The Journal of Technology Transfer*, 2020.
- [3] S. Brin and L. Page. The anatomy of a large-scale hypertextual Web search engine. *Computer Networks and ISDN Systems*, 30(1):107–117, 1998.
- [4] P. Clayton, M. Feldman, and N. Lowe. Behind the Scenes: Intermediary Organizations that Facilitate Science Commercialization Through Entrepreneurship. *Academy of Management Perspectives*, 32(1):104–124, 2018.
- [5] C. Guindalini, M.-L. Verreynne, and T. Kastelle. Taking scientific inventions to market: Mapping the academic entrepreneurship ecosystem. *Technological Forecasting and Social Change*, 173:121144, 2021.
- [6] J. Harkonen, H. Haapasalo, and K. Hanninen. Productisation: A review and research agenda. *International Journal of Production Economics*, 164:65–82, 2015.
- [7] M. Kenney and D. Patton. Reconsidering the Bayh-Dole Act and the Current University Invention Ownership Model. *Research Policy*, 38(9):1407–1422, 2009.
- [8] M. Kiniulis. Entrepreneur Statistics: Industry Insights, 2023. Markin Blog.
- [9] M. Maradi. Growth of indian start-up: A critical analysis. 17:180–186, 03 2023.
- [10] G. Markman. Research and technology commercialization. *Journal of Management Studies*, 45(8):1413–1423, 2008.
- [11] G. Markman, P. Phan, D. Balkin, and P. Gianiodis. Entrepreneurship and university-based technology transfer. *Journal of Business Venturing*, 20(2):241–263, 2005.
- [12] N. Myhrvold. The big idea: funding eureka! *Harvard Business Review*, 88(3):1200–1210, 2010.
- [13] T. Ncanywa and N. Dyantyi. Can enabling entrepreneurship ecosystem improve commercialization of research in South African Higher Education Institutions? *International Journal of Research in Business and Social Science (2147-4478)*, 11(8):304–311, 2022.
- [14] C. O’Kane, J. Cunningham, M. Menter, and S. Walton. The brokering role of technology transfer offices within entrepreneurial ecosystems: an investigation of macro–meso–micro factors. *The Journal of Technology Transfer*, 2020.

- [15] A. Radford and K. Narasimhan. Improving Language Understanding by Generative Pre-Training. *Improving Language Understanding by Generative Pre-Training*, 2018.
- [16] N. A. Rahim, Z. B. Mohamed, and A. Amrin. From Lab to Market: Challenges Faced By Academic Entrepreneur in Technology Transfer Pursuit. *International Journal of Business and Society*, 22(3):1256–1268, 2021.
- [17] A. Ramesh, S. Gray, G. Goh, and M. Pavlov. Dall·E: Creating images from text. *DALL·E: Creating images from text*, n.d.
- [18] R. Ravi and M. Janodia. Factors Affecting Technology Transfer and Commercialization of University Research in India: a Cross-sectional Study. *Journal of the Knowledge Economy*, 2021.
- [19] D. Siegel and M. Wright. Academic Entrepreneurship: Time for a Rethink? *British Journal of Management*, 26(4):582–595, 2015.
- [20] J. Youtie, D. Hicks, P. Shapira, and T. Horsely. Pathways from Discovery to Commercialization: Using Web Sources to Track Small and Medium-sized Enterprise Strategies in Emerging Nanotechnologies. *Technology and Strategic Management*, 2012. [online] 24(10). Available at: https://works.bepress.com/diana_hicks/26/[Accessed12Jul.2023].