OPPORTUNITIES AND CHALLENGES OF TECH- STARTUPS: A STUDY IN THE CONTEXT OF DELHI- NCR.

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in

Economics

by

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DECLARATION

I Diksha Arora hereby, declare that the thesis work entitled "Opportunities and Challenges of Tech- Startups: A Study in the Context of Delhi- NCR" my original work carried out under the supervision of Prof. Seema Singh. This thesis has been prepared in conformity with the rules and regulations of Delhi Technological University, Delhi, India. The research work presented and reported in the thesis has not been submitted either in part or full to any other University or institute for the award of any other degree, diploma, or other qualifications.

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CERTIFICATE

This is to certify that the thesis titled, entitled **"Opportunities and Challenges of Tech- Startups: A Study in the Context of Delhi- NCR"**, submitted to the Delhi Technological University, Delhi, in fulfilment of the requirements for the award of degree of Doctor of Philosophy in Economics is an original research work carried out by **Miss Diksha Arora,** with Roll Number 2K21/PHDHUECO/02 under my supervision. The matter presented in the thesis has not been submitted elsewhere in part or fully to any University or Institute for the award of any degree to the best of my knowledge.

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ABSTRACT

The rapid growth and emergence of technology startups, or *tech-startups*, have become pivotal in shaping the global economy, with the Delhi NCR region in India playing a significant role in this transformation. However, the growth and success of these ventures are influenced by a multitude of factors, ranging from the characteristics of the founders to the internal dynamics of the startups themselves, and the external market environment. This research, titled *"Opportunities and Challenges of Tech Startups: A Study in the Context of Delhi NCR,"* aims to provide a comprehensive understanding of these factors and their interactions. By focusing on four key objectives, the study explores the opportunities that fuel the growth of tech-startups and the challenges they face in their pursuit of success.

The first objective of this study is to examine how both founder-specific and firm-specific factors impact the financial performance of tech-startups in the Delhi NCR region. The findings indicate that founder characteristics—such as prior experience, skills, and gender—play a crucial role in determining the startup's success. Startups led by experienced founders, particularly those with a background in managing other startups, tend to perform better financially. Moreover, gender diversity in founding teams, particularly those with female founders, was found to positively influence financial outcomes. Additionally, the firm’s internal capabilities, such as innovation, technology development, and organizational culture, are significant contributors to financial performance. The research highlights that startups developing their own technologies outperform those that rely on purchased technologies, indicating the importance of innovation in sustaining growth. Contrary to some existing literature, the study found that the size of the startup does not have a direct impact on revenue growth, challenging traditional assumptions about the scaling of startups.

The second objective investigates the factors influencing the export propensity and export intensity of tech-startups. In a world increasingly shaped by globalization, understanding the international expansion potential of startups is crucial. The study employs both Logit Regression and OLS regression models to identify the key determinants influencing export behavior. The results reveal that technology adoption and commercial ability are among the most significant factors determining the likelihood of a startup entering international markets (export propensity) and the intensity of their export activities (export intensity). Startups that embrace innovative technologies and demonstrate strong commercial capabilities are more inclined to engage in international markets, and once they do, they generate a higher proportion of revenue from exports. Furthermore, achieving financial breakeven status was found to enhance the probability of engaging in export activities, underlining the importance of financial stability and market credibility. However, the research also uncovers a significant challenge: startups with female founders are less likely to engage in exports, reflecting potential gender-based biases in access to global markets. This finding calls for targeted interventions to support female entrepreneurs, including promoting STEM education and providing access to international networks. The third objective of the study explores the determinants of initial funding sources among tech-startups. The early-stage financing decisions of startups are critical to their survival and growth, and understanding these decisions is essential for fostering a supportive environment for new ventures. The research finds that founder education and prior industry experience are significant factors influencing funding choices. Educated founders tend to seek external financing options, such as incubators and private equity, rather than relying on personal funds (3 F). Interestingly, founders with prior startup experience are more likely to access non-repayable funding sources like subsidies and incubators. The study also highlights that startups with a strong growth orientation are more likely to attract private equity funding, as investors seek high returns, such as through an

IPO. Furthermore, the availability of real estate assets influences the likelihood of obtaining bank loans, with startups owning property being more likely to secure funding from public or private banks. Age is another determinant, with younger founders favoring alternative funding sources and older founders more likely to turn to traditional financing options. Despite these variations, gender was found not to significantly influence funding decisions, suggesting that financial institutions do not discriminate based on the founder's gender. The fourth objective delves into the challenges that tech-startups face, particularly those located in Delhi NCR. The study identifies several key barriers to startup growth, including limited access to capital, regulatory hurdles, difficulties in talent acquisition, and intense competition within the market. These challenges are particularly pronounced for early-stage startups that lack the financial resources and market experience to navigate these obstacles effectively. The study suggests that addressing these challenges requires a multi-stakeholder approach. Policymakers must create more favorable regulatory frameworks and offer incentives that reduce barriers to entry. Investors should consider more flexible funding models tailored to the needs of startups. Moreover, fostering a robust ecosystem that includes mentorship, networking opportunities, and access to resources like office space and technology infrastructure can significantly mitigate some of the challenges startups face. In this context, a supportive environment can enable startups to not only survive but thrive, driving innovation, technological advancement, and contributing to broader economic growth.

In conclusion, this research offers valuable insights into the dynamics of tech-startups in the Delhi NCR region. It provides a nuanced understanding of the factors influencing their financial performance, international expansion, funding strategies, and the challenges they face. By identifying key determinants of success and barriers to growth, this study contributes to the existing body of knowledge and offers actionable recommendations for policymakers, investors, and entrepreneurs. The findings suggest that fostering a supportive ecosystem, particularly one that addresses gender disparities and provides tailored funding options, is essential for nurturing the next generation of successful tech-startups.

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INTRODUCTION

1.1 Overview

Over the last two decades, startup ecosystems have evolved dynamically. Empowered by emerging technologies, startups are emanating as a major source of innovation. Globally, startups have received tremendous response and growing attention in recent years. They are known to governments worldwide for their contribution to economic stability, growth, and job creation (Sulayman et al., 2014). Tech entrepreneurship has become a recognized tool for generating money, jobs, and innovation as countries move toward knowledge economies, ultimately leading to better social conditions. According to World Economic Forum 2024, technology-driven startups are perceived as the drivers of innovation, productivity growth, and employment. Technology entrepreneurship is defined as "an investment in a project that assembles and deploys specialized individuals, heterogeneous scientific and technological knowledge-based assets for the purpose of value creation and capture for a firm (Bailetti, 2012). Since the beginning of the information era and the digital transformation brought about by Industry 4.0, a multitude of technology-driven startups have emerged as global entrepreneurs, striving to translate their concepts into innovative products and services. Entrepreneurial leaders have been the primary drivers of this transformation, leveraging innovative business models to capitalize on changes in the external landscape.

There has been an exponential increase in the rate at which new ideas and technology are becoming widely used. Their capability to introduce new products and services can contribute to the country's competitive advantage (Muller and Rammer, 2012). The nation has a conducive entrepreneurial ecosystem for their emergence, survival and sustenance, and growth over a period of time (Arruda et al., 2015). "A startup ecosystem is formed by people, startups in their various stages and various types of organisations in a location, interacting as a system to create new startup ventures" (Bala Subrahmanya, 2017). The number of startups and the interest of the government in nurturing them is growing exponentially across the globe. The overwhelming growth figures of startups have acquired an important relevance in the world's most dynamic markets as a new model of social and economic growth (Olawale and Garwe, 2010). India is also a part of this global trend. Despite being in its early stages, India has become the world's third-largest start-up ecosystem, following the US and China, according to the Economic Survey of India, 2023. According to Kelley and Nakosteen (2005), startups are important for developing the economy of the countries and especially important in the developing countries. In innovation-driven economies, entrepreneurship is the leading indicator of economic growth and positively affects economic development (Thurik et al., 2016). As more entrepreneurial firms enter the market, they contribute to the expansion of entrepreneurship, the creation of jobs, and overall economic growth. It is observed that the total early-stage entrepreneurial activity has a direct impact on the Global Competitiveness Index of nations (Ferreira et al., 2017).

The economic growth of nations is influenced by entrepreneurial activity, and the level of entrepreneurship is positively related to the level of per capita income (Van Stel et al., 2005). Entrepreneurs use investment opportunities and commercialize them, impacting GDP growth

through startups (Peterson & Valliere, 2008). Although startups have emerged as sources of innovation and economic breakthroughs in the market, the uncertain market conditions and fierce competition pose significant challenges to their survival.

With technological innovation and increased scope of scalability, startups can make effective solutions and, therefore, act as wheels for socio-economic development and change in emerging economies. Emerging economies are defined as "countries that adopt economic liberalization as the main engine for rapid economic growth and have institutional voids that increase the risk of doing business" (Banalieva et al., 2015). Developing countries with rapid growth prospects of joining the developed countries are primarily referred to as emerging economies.

1.2 Global Engagement of Startups

Startups are rapidly venturing beyond the domestic boundaries to tap global opportunities and export engagement has emerged as the critical growth strategy (Monaghan et al., 2020). Export engagement is defined as the strategic entry and expansion into the international markets. It is considered crucial for startups that are seeking growth, sustainability and long-term success (Zahra et al., 2020; Autio et al., 2017). Advancement in technology plays a critical role by reducing barriers in entering foreign markets and allowing startups to expand at a faster pace internationally (Gabrielsson et al., 2008). Moreover, the use of scalable technologies, digital nature of their products and services such as cloud computing and e-commerce platforms, enables tech startups to expand in the international market without the requirement of extensive physical infrastructure. There are significant advantages associated with engaging in exports such as access to broader markets, increased revenue opportunities and diversification of risk.

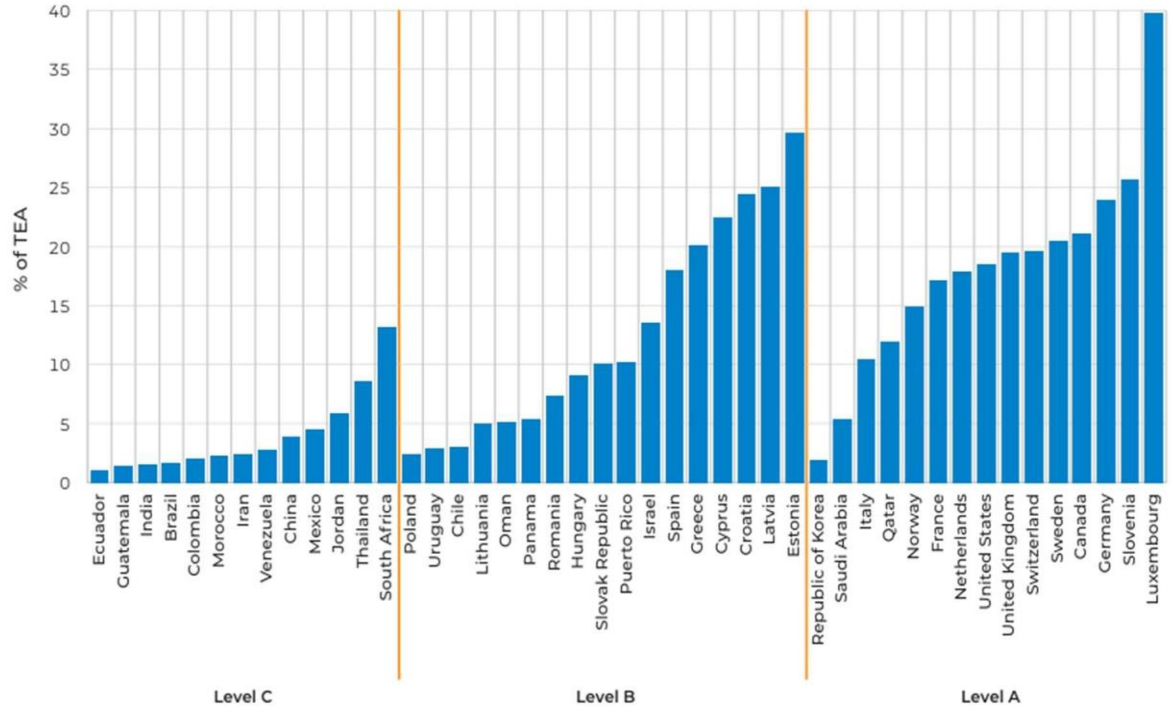
For a new business with export capabilities, the possibilities are vast, and the host economy gains from the influx of foreign revenue. According to GEM, a business is considered export-intensive if its owner expects at least 25% of its revenue to come from international markets.

Figure 1 below illustrates the percentage of individuals starting or running new businesses classified as export-intensive. As expected, there is a positive correlation with income levels. Among Level C economies, only South Africa stands out, with at least one in 10 new businesses being export-intensive. In comparison, this figure rises to nine economies in Level B and 13 in Level A.

Export-propensity was notably low in Ecuador, Guatemala, India, and Brazil, where less than 2% of new businesses fell into this category. Conversely, Luxembourg led with two in five new businesses being export-intensive, followed by Estonia, Slovenia, Latvia, and Croatia, each with at least one in four.

There are exceptions to the income correlation. For instance, in Level A, Saudi Arabia and the Republic of Korea reported only one in 20 or fewer new entrepreneurs as export-intensive. Similarly, Qatar, despite its strategic location near larger economies, just surpassed the threshold of one in 10 new entrepreneurs being export-intensive.

Figure 1: Percentage of Total Entrepreneurial Activity in the category of Export Intensive.



Source: Global Entrepreneurship Monitor Report 2023

1.3 Evolution of Startups in India

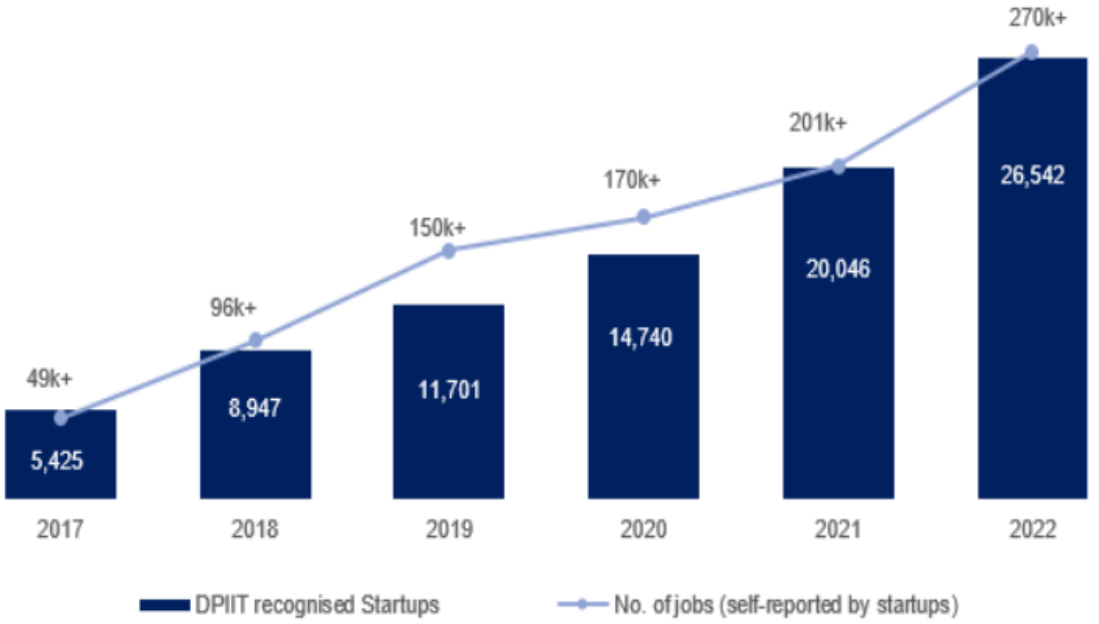
Startups can be defined as entrepreneurial endeavors in their early stages of development that contain the keys to technological growth and market progress. It has been discovered that technological entrepreneurship, which leads to massive technical startups, is gaining relevance globally as a cornerstone of economic and social development. Correspondingly, the rapid emergence of different organizations and entrepreneurship development hubs promoting new enterprise formation in India seems to have the capacity to create productivity expansion, advancement, and industrial progress. It has been recommended that entrepreneurial initiatives shift their focus and funds towards the conception of a more encompassing startup environment (Ali and Jabeen, 2020). Nations that promote startups must continually enhance their entire business climate.

The evolution of startups in India showcases a significant transformation from nascent entrepreneurship to a globally recognized innovation ecosystem. This journey gained momentum with the rise of tech-driven ventures in the early 2000s, primarily in Bengaluru, Hyderabad, and Pune. However, the defining moment came with the launch of the Startup India initiative on January 16, 2016. This flagship program aimed to build a robust framework for nurturing startups, fostering innovation, and creating large-scale employment opportunities. The initiative focused on

three pillars of simplifying regulatory compliance, providing funding and incentives, and promoting industry-academia partnerships (Startup India, Startup Action Plan 2016).

Since its launch, the number of recognized startups has surged from 442 in 2016 to over 99,371 by May 2023, making India the third-largest startup ecosystem globally. Startups are now present across all states and union territories, demonstrating nationwide inclusivity. This growth has also fueled employment, with startups creating an estimated 8.93 lakh jobs as of December 2022. Moreover, India has emerged as a leader in producing unicorns, with over 100 startups valued at $1 billion or more (Press Information Bureau, Startup Landscape Report 2023).

Figure 2: DPIIT Recognized Startups and Employment Generated



Source: RBI, 2023

Figure 2 above depicts DPIIT-recognized startups and the corresponding number of jobs created from 2017 to 2022. It illustrates the growth in the number of recognized startups in India from 2017 to 2022. This data showcases a dramatic increase in the startup ecosystem's size and scope over these years, driven by supportive government policies, increased investor interest, and a favorable entrepreneurial environment. The data highlights India’s transformation into one of the world's largest and fastest-growing startup ecosystems. The sharp rise after 2020, even amidst global economic uncertainties, underscores the resilience and potential of Indian startups. With continued support and innovation, the trajectory suggests further exponential growth in the coming years.

India was ranked 63rd in the Ease of Doing Business rankings globally as per 2020. This position reflects significant reforms and improvements in areas like digitization of land records, streamlining construction permits, and resolving insolvencies through the Insolvency and Bankruptcy Code. Concurrently, the general government apparatus is improving, resulting in fewer administrative barriers for the industry. Startups require a robust, financially solid

ecosystem. Partners, families, angel investors, and venture capital players provide initial capital to startups. Established financial firms and financial participants contribute to the startup ecosystem's development. Different types and structures of commercial organisations also contribute to developing an environment for a startup. Countries are currently creating new types of commercial businesses to stimulate entrepreneurship.

In order to encourage innovation, India, for instance, has recently legalized limited liability partnerships and one-person companies. It is important to create a healthy system in which diverse company structures of different sizes and scales are allowed to thrive (Srivastava et al., 2020). As per the Departments of Promotion of Industry and Internal Trades (2022) reports, several significant factors have been prompted in the context of India. The research indicates that India boasts of being the world's third-largest startup ecosystem, with a year-on-year growth rate of 12-15 per cent predicted.

India is one of the best places globally to start a business currently and placed second among 49 countries, according to the Global Entrepreneurship Monitor (GEM), 2023-24. India's position in the Global Innovation Index has been rising during the last few years. India has been ranked 39th in 2024 as compared to 81st in 2015 in terms of the competitiveness and innovation index. India's advancement is credited to its rich pool of knowledge capital and a flourishing startup ecosystem, bolstered by commendable initiatives from both public and private research institutions.

1.4 Indian Startup Ecosystem

India's startup ecosystem has emerged as one of the most dynamic and expansive in the world, cementing its position as the third largest globally with over 127,000 registered startups as of 2024. This ecosystem is characterized by vibrant startup hubs such as Bengaluru, Delhi-NCR, and Mumbai, which serve as innovative powerhouses. Bengaluru, often referred to as the "Silicon Valley of India," leads in attracting talent, investments, and global attention, while Delhi-NCR and Mumbai offer robust markets for consumer-driven startups and fintech innovation.

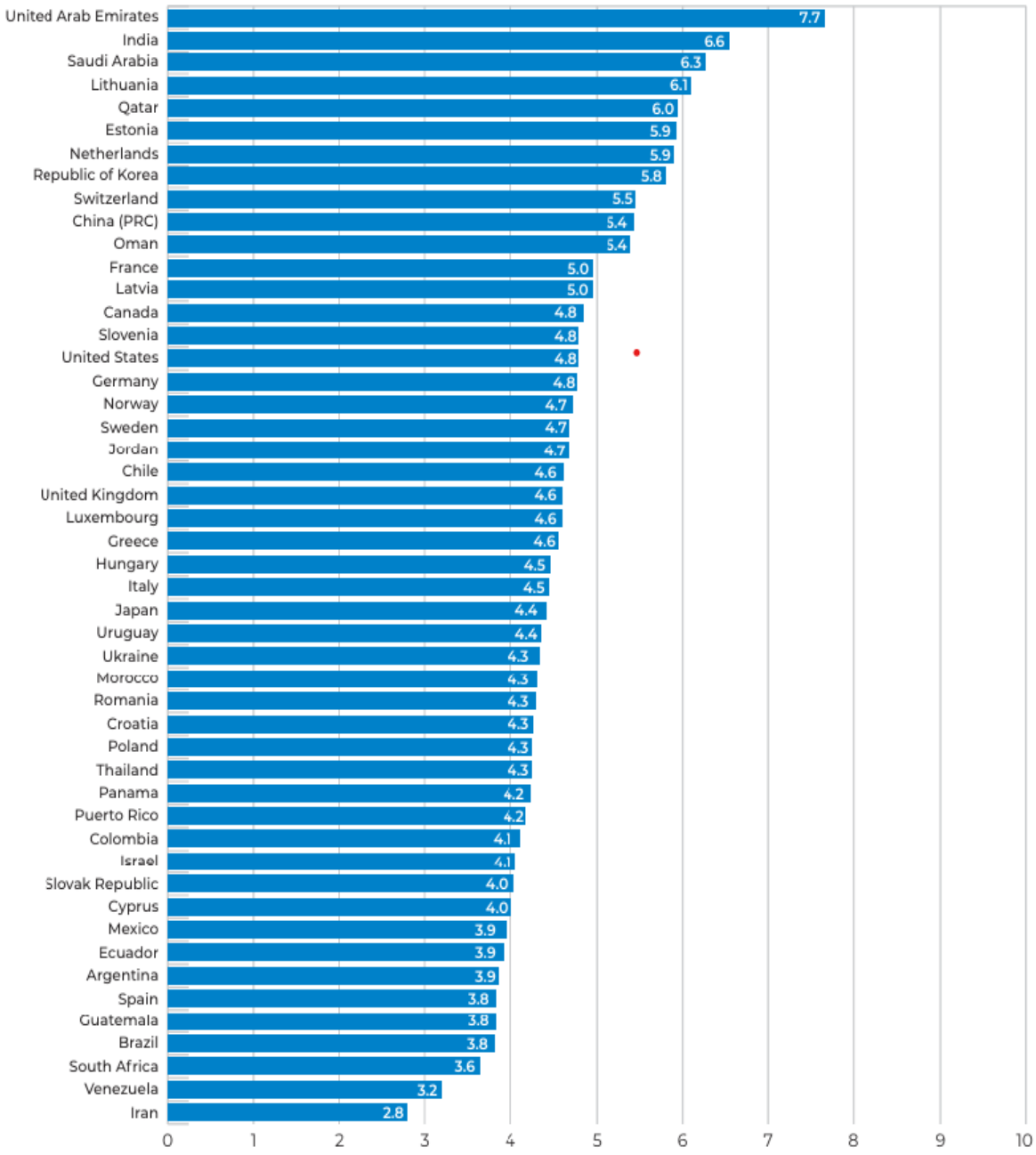
The ecosystem has experienced rapid growth, driven by strong government support through initiatives like Startup India and infrastructure development. These policies have nurtured a culture of entrepreneurship and eased regulatory frameworks for emerging businesses. As of 2024, India is home to 106 unicorns, with a pipeline of "gazelles" and "cheetahs" (startups poised to reach unicorn status in the near future), showcasing the sustained momentum of the ecosystem (Forbes India). In terms of funding, India has cumulatively attracted over $70 billion between 2019 and 2023. Despite a global slowdown in venture capital investments, India remains the fourth highest-funded startup ecosystem globally.

India has reached a significant milestone by ranking 2nd globally in the National Entrepreneurship Context Index (NECI), according to the Global Entrepreneurship Monitor (GEM) 2023 report. This is a significant leap forward from its previous ranking of 4th in 2022, reflecting the country's rapidly evolving entrepreneurial landscape. With a NECI score of 6.6, India has demonstrated a robust and supportive ecosystem for fostering entrepreneurship, overcoming earlier challenges that

had placed it 16th in 2021—a period heavily impacted by the disruptions caused by the COVID-19 pandemic.

Figure 3 below depicts the global rankings in terms of Global Entrepreneurial Context Index based on GEM National Expert Survey 2023.

Figure 3: National Entrepreneurial Context Index , 2023



Source: Global Entrepreneurship Monitor 2023/2024

This progress underscores the effectiveness of several key factors driving India's entrepreneurial success. Notably, government initiatives such as Make in India, aimed at boosting manufacturing and innovation, and the Atal Innovation Mission, which fosters a culture of innovation and entrepreneurship, have played a pivotal role. Additionally, there has been a notable cultural shift towards entrepreneurship, with increasing recognition and support for startups across diverse sectors.

India's rise in the NECI rankings also challenges traditional assumptions about the relationship between a country's income level and its entrepreneurial environment. The findings highlight that high income does not necessarily guarantee a conducive environment for starting a business, while countries with lower income levels, like India, can still cultivate a high-quality ecosystem for entrepreneurship through targeted policies and cultural shifts.

This achievement not only showcases India's potential as a global hub for entrepreneurship but also serves as an inspiration for other nations striving to improve their business environments, irrespective of their economic status.

However, challenges persist. Indian startups face difficulties in securing late-stage funding and navigating regulatory complexities, particularly in highly regulated sectors like fintech and pharmaceuticals. However, in terms of broader business conditions beyond tech, the gender gaps between male and female entrepreneurship are narrowing in India. According to the Global Entrepreneurship Monitor 2023/24 report, in 2001 there was a 3:1 gender ratio of male to female entrepreneurship, but in 2022 there was near gender parity – though that has since regressed slightly in favour of male entrepreneurship. Nonetheless, the ecosystem's resilience is reflected in its ability to adapt and innovate, especially in emerging areas like AI and sustainability (NASSCOM). India’s startup landscape not only contributes to economic growth but also fosters technological advancements and job creation, positioning the nation as a global leader in entrepreneurship.

According to Economic Survey of India 2021-22, Delhi emerged as the startup capital of India, surpassing Bengaluru. This shift was highlighted in the Economic Survey, which noted that between April 2019 and December 2021, Delhi added more than 5,000 recognized startups, whereas Bengaluru added approximately 4,500 in the same period. Delhi's rise was attributed to various factors, including favorable government policies, a robust investor ecosystem, and its strategic position as the nation's capital. At present, Bengaluru continues to lead as the startup capital of India, contributing significantly to this funding landscape with substantial rounds in sectors like fintech, e-commerce, and AI (NASSCOM report 2023).

Delhi has Despite record-breaking funding and an increase in the number of unicorns, the mortality rate of startups remains high. In the industry of technology-driven startups, high birth rates go hand in hand with a high risk of failure; only one in three survive the first three years (Santisteban and Mauricio, 2017). Compared to the number of growing startups, several ventures fail to retain their business operations, creating pessimism among investors (Susilo, 2020).

1.5 Concepts related to Start-up Ecosystem

1.5.1 Startup

According to Blank (2012), startups are temporary organizations designed to explore and establish a repeatable and scalable business model. According to Schumpeter, technological innovation is a source of economic growth, and technology startups have the sheer ability to scale up quickly by solving customer problems innovatively (Roininen & Ylinenpaa, 2009). A startup is a newly established venture with no prior operational history. These age-zero firms operate independently, apart from typical business interactions, and aim to capitalize on a market opportunity, often with an idea that may not necessarily be novel. The startup definition implies that it is not an existing enterprise acquired by a new firm or a new management or by inheritance, not franchises of any form, and not formed through "Spin-offs" from large firms (Bala Subrahmanya, 2015).

The Government of India is striving to foster a thriving startup ecosystem through its flagship initiative, "Startup India," aimed at nurturing innovation and encouraging entrepreneurship. As per the Department for Promotion of Industry and Internal Trade (DPIIT), a startup is defined as follows:

i. Upto a period of ten years from the date of incorporation/ registration, if it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (under the Limited Liability Partnership Act, 2008) in India.

ii. Turnover of the entity for any of the financial years since incorporation/ registration has not exceeded one hundred crore rupees (One billion rupees)

iii. Entity is working towards innovation, development or improvement of products or processes or services, or if it is a scalable business model with a high potential of employment generation or wealth creation.

Provided that an entity formed by splitting up or reconstruction of an existing business shall not be considered a 'Startup'. (DPIIT, 2019)

While startups are defined differently by various organizations, we adopt the Government of India's definition provided by the Ministry of Commerce through the Department for Promotion of Industry and Internal Trade (DPIIT).

1.5.2 Technology-based Startups

A technology-based startup is a company that operates to provide innovative and technologydriven products or services (Santisteban et al., 2021). According to Barnir (2012), technology-based startups are "based on new technologies where the intent is to make technology a core component of the new venture, or in which the entrepreneur substantively incorporates new technologies in the operation or design of the new venture." A technology-based startup is a venture whose primary motive is to bring technology-driven products or services to market either

by creating new products or services or innovatively delivering existing products or services through technology. In the words of Bailetti (2012) technology venture is “an investment in a project that assembles and deploys specialised individuals, heterogeneous scientific and technological knowledge-based assets for the purpose of value creation and capture for a firm." The study by Krejci et al., (2015) indicates that a “technology-based startup is a new and temporary company that has a business model based on innovation and technology and these types of companies have a potential for rapid growth and scalability." Kirchberger et al., (2020) defined technology-based startups as the firms that aim for innovation and significantly differ from the current offerings and suppliers in the market. To sum up, a technology-based startup is a firm based on technology that has the potential to develop multiple market offerings, including products, services, or a process, and its final offering is a product of multiple developments and customer cooperation.

Unlike the traditional businesses, tech- startups are often considered as ‘born global’ emphasizing that they participate in international market from incorporation or in very early stages of their lifecycle (Hennart et al.,2021). Advancement in technology plays a critical role by reducing barriers in entering foreign markets and allowing startups to expand at a faster pace internationally (Gabrielsson et al., 2008). Moreover, the use of scalable technologies, digital nature of their products and services such as cloud computing and e-commerce platforms, enable tech startups to expand in the international market without the requirement of extensive physical infrastructure.

Technology startups revolutionize customer experiences and enhance economic productivity. Entrepreneurs identify business opportunities and address them with innovative solutions. They continue to learn from the market and customer behavior and evolve consistently to the extent that human and machine interaction is becoming symbiotic (Infosys, 2019). They exhibit bricolage behavior and deliver innovative products/services to markets (Stenholm & Renko, 2016) and convert them into business opportunities by establishing startups.

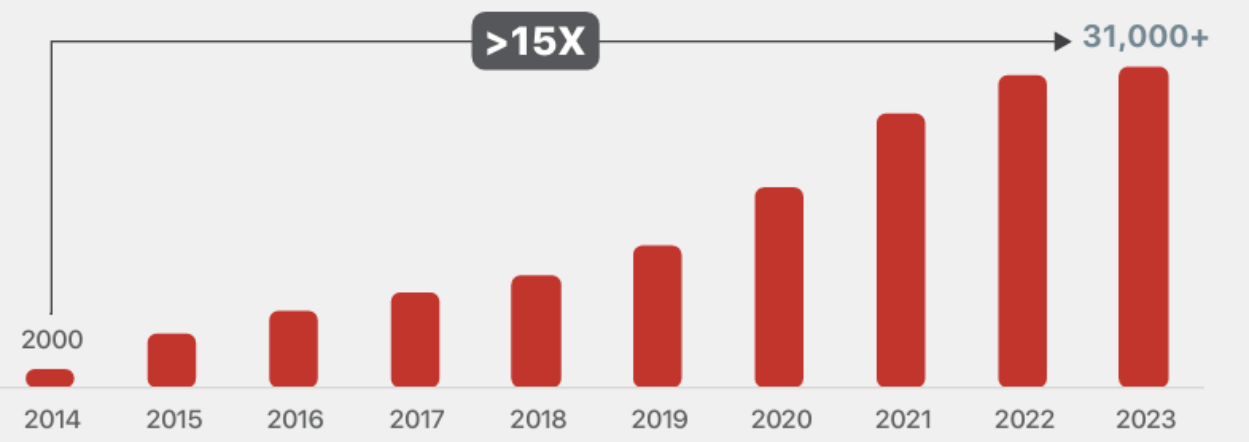
Delivering the solution consistently to customers at a scale requires that startups establish simplified, reliable, and repeatable processes (Barringer & Ireland, 2012). To facilitate consistent delivery, entrepreneurs establish startups as an organization. Startups prioritize enhancing customer experience and place significant emphasis on closed-loop customer feedback as they advance through different stages of their lifecycle.

1.6 Panorama of Technology Startups in India

The Indian tech startup ecosystem remains one of the largest and most dynamic in the world, ranking as the third-fastest growing hub globally in 2024. India is home to over 31000 tech startups, with Bengaluru and Delhi-NCR leading as the primary startup cities (NSTEDB, 2023).

Figure 4 below depicts the Cumulative Number of Tech Start-ups founded over the period 2014-2023

Figure 4: Cumulative Number of Tech Start-ups founded over the period 2014-2023



Source: NSTEDB, 2023

The Indian startup ecosystem is growing every year at 12-15%, most of which are technology based startups. This is expected to grow at a greater rate as the 'digital maturity has leaped India from 34% in 2018 to 55% in 2020 (Kulkarni, 2021). India is at the cusp of making a significant and extensive shift from offline to online transactions. With record-breaking funding and an increase in the number of unicorns, the whole startup ecosystem's future looks brighter. Technology-infused sectors like Ed-tech, Agri-tech, Health-tech, etc., have gained momentum and are witnessing a steady increase in their growth. 2019-2022 has witnessed a maximum number of unicorns in addition to the technology-driven startup ecosystem of India and presently has around 88 unicorns. Out of these, 44 unicorns were added in the year 2021 alone. The domestic market provides ample growth opportunities to the startups but internationalization, particularly ability to export products and services is crucial for long term sustainability and global competitiveness.

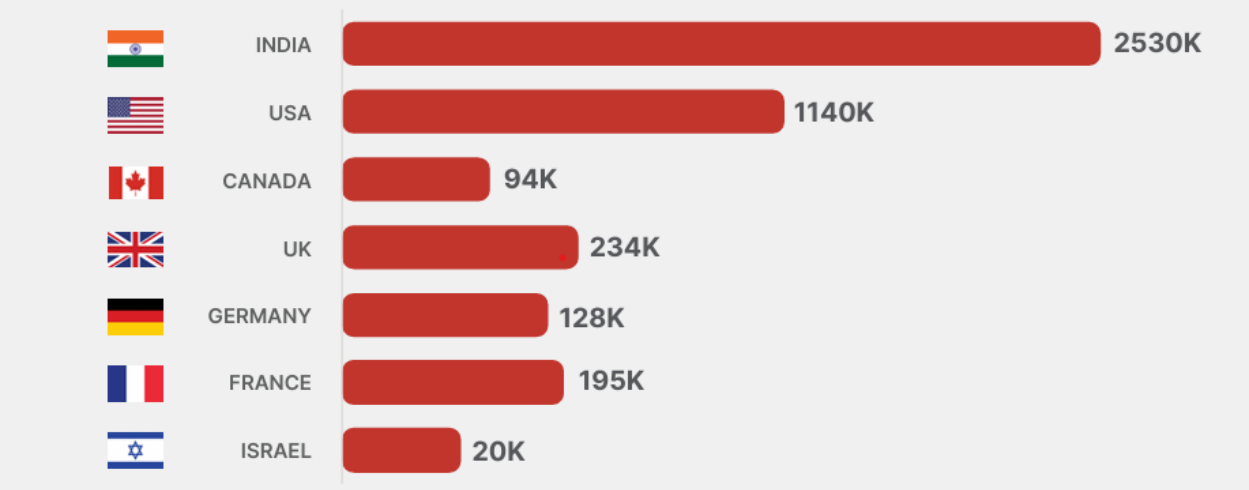
Technology-driven startups have emerged as a major disruptive force transforming human behaviour through innovation in terms of personal communication, social interaction, media consumption, information search, and the exploration and execution of professional work (Zaheer, 2015). Technology startups create new employment opportunities, provide avenues for entrepreneurs to creatively apply their skills, and bring cutting-edge technology to the forefront. For instance, OYO has disrupted the hotel industry. MakeMyTrip has transformed travel and tourism. Ola and Uber have transfigured the mobility sector by replacing traditional taxis and autos. Paytm has revolutionized the payment sector, and BYJU's has disrupted the education industry by elevating the traditional coaching model along with many other innovative business models. These companies, which were once ideas, have metamorphosed into large companies and every household name. Technology startups are rapidly transforming the industries and human behaviour either through disruption or by acting as change agents. A heap of Indian youth is getting attracted by the success of these startups worldwide and exploring the opportunity in technology entrepreneurship. A few areas of India have emerged as the startup hub producing maximum numbers of startups facilitated by a well-developed entrepreneurial ecosystem. These areas include Bangalore, Mumbai, Hyderabad, and Delhi-NCR. Apart from these, several ecosystems are emerging in other parts of the country and are at their nascent stage.

The Indian Tech Start-up Ecosystem has two strong pillars which are as following:

- Highest Number of STEM Graduates
- Second highest Number of Incubators and Accelerators

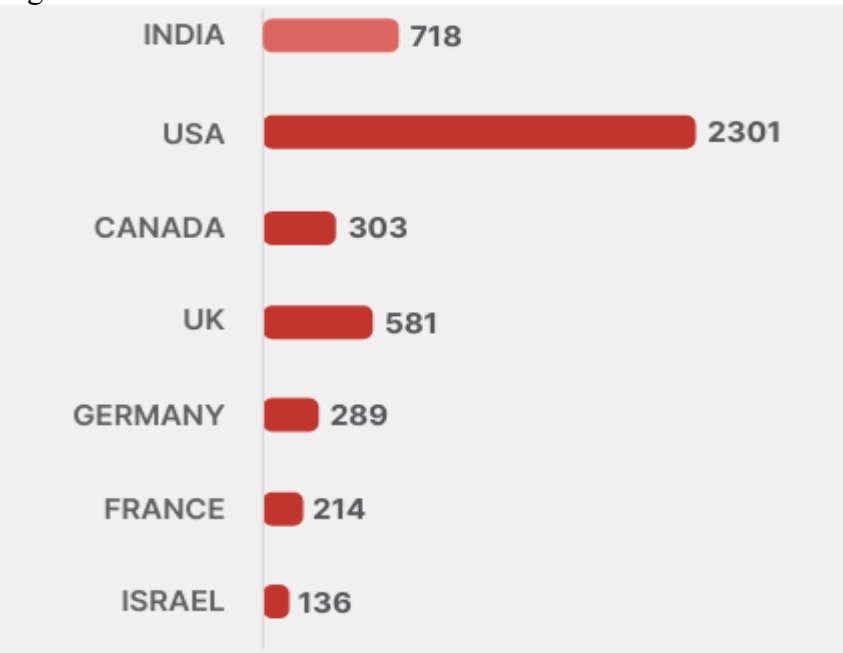
Figure 5 and Figure 6 below depicts the position of India based on Zinnov- NASSCOM Startup Report 2023.

Figure 5: STEM Graduates across leading tech start-up ecosystems in 2022



Source: NASSCOM, 2023

Figure 6: Total Number of Incubators and Accelerators across tech start-up ecosystems



Source: NASSCOM, 2023

While developments in technology-based entrepreneurship present promising opportunities at a macro-level, it's crucial to acknowledge the high failure rate among such startups. Many technology-based ventures fail to sustain beyond the initial years of operation (Certo, 2003). Sustaining high performance levels is essential to startups' survival and success. Some common characteristics of technology startups include their technological foundation, independent character (i.e., ownership primarily by the founder or founders), novelty (i.e., the technology used, and the product or final service provided), size (usually medium or small), and pursuit of a scalable and replicable business model (Ethan et. Al, 2021). These digital firms also aim to raise capital to show that they can transition from the conceptualization stage to the commercialization stage (Mary et.al, 2019). Understanding the factors impacting performance of tech startups is crucial for informed decision-making, resource optimization, competitive advantage, risk management, innovation, and investor confidence.

Starting a business comes with numerous challenges, beginning with idea generation and progressing through steps like creating a proof of concept, identifying initial customers, achieving product-market fit, hiring the right talent, attracting investors, commercializing the product, ensuring sustained revenue, exploring new markets, and scaling operations for both regional and global growth. A startup's inability to navigate these challenges can lead to failure and the cessation of operations. Generally, the survival rate of startups founded by entrepreneurs is low, leaving many exposed to the difficulties of failure.

About "90% of startups fail due to the lack of innovation," as observed in the US context (Forbes, 2017). The phenomenon is the same in the Indian context, as "90% of startups fail in the first five years," due to lack of innovation, nonavailability of skilled workforce, and insufficient funding (Business line, 2017). The situation may not be widely different in other economies.

Compared to other countries, India performs well in terms of the size of its startup landscape, its ability to create unicorns, and employment growth. However, it lags behind when it comes to attracting early-stage funding. Tech- startups require substantial initial capital because of the factors linked with testing new technologies or business models. The sources of funding are often limited for startup firms and as there is no generation of cash flow from ongoing business activities founders are required to raise funds on their own, including friends and family (Honjo et al.,2014). However, these internal sources are generally able to account for a limited amount of funding only unless the founders are very wealthy. These innovative startups are thus required to seek funding from external sources like banks and private equity. These are often unavailable due to high costs associated with the gap of information between suppliers of funds and the startup (Bernile et al., 2007).

1.7 Terminologies used for Startups

The term "Startup" and its synonyms have evolved over time. It was first introduced by *Forbes* magazine in 1976 (startup-book.cm, n.d.), followed by *Business Week* in 1977, which included the phrase, "An incubator for Startup companies, especially in the fast-growth, high technology fields." A review of relevant academic literature reveals that terms like "Tech-Startups," "New

Technology-Based Firms (NTBFs)," "Technology Startups," "Technology Entrepreneurship," "High-Tech Startups," "Innovative Young Firms," "Innovation-Based Ventures," "High-Tech and Low-Tech Startups," and "Technology-Based Startups" have been used interchangeably to describe entrepreneurial ventures driven by technology and intellectual property. Table 1.1 presents a non-exhaustive list of these terms as found in the surveyed literature.

Table 1: Occurrences of Various Synonyms for Tech- Startups in the Literature Surveyed

Occurrence	Terminology
McLeod, John Stanford (2000), Kim, Yunhee; Heshmati, Almas (2010), Khetrapal, S. (2016, July 3), NSTEDB (National Science & Technology Entrepreneurship Development Board). (n.d.). DST Guidelines, Govt. of India, Cantner, Uwe; Kosters, Sarah (2012), Papadimitriou, Stratos; Mourdoukoutas, Panos (2002), Marika Miettinen, M. N. (2015), Startupindia, http://startupindia.gov.in, Govt. of India	Startup
Hutchinson, Harry (2006)	Tech-Startups
Kousari Ali (2011), Bailetti, T. (2012)	Technology - Startups
Giaccone, S. C., & Longo, Maria Cristina. (2014)	Technology based Startups
Cannone, G., & Ughetto, E. (2014), Colombo, M. G., & Grilli, L. (2007), Festel, Gunter; Wuermseher, Martin; Cattaneo, Giacomo (2013), Krishna, H. S., & Subrahmanya, M. H. B. (n.d.), Murray, Reginald J., Pepperdine University, California, United States, Proquest Dissertations Publishing (2009), Su, D., Ali, M., & Sohn, D. (2011)	High-Tech Startups
Popovic, Dragana (2006), Okamuro, Hiroyuki(2008)	High-tech and LowTech Startups
Zane, L. J., & DeCarolis, D. M. (2016).	Technology based New Ventures
Andreas Pinkwart, Michael Schefczyk, Dorian Proksch, Thorsten Fiegler and Cornelia Ernst(2015)	New Technology based Firms(NTBFs)
Colombo, Massimo G; Vismara Cumming, Douglas J, Silvio(2016)	Innovative Young Firms
Marco Talaia, A. P. (2016)	Innovative New ventures

1.8 Policies adopted by the Government of India

India has seen a significant surge in tech startups over the past decade, largely driven by supportive government policies that foster innovation, entrepreneurship, and growth. The Indian government has rolled out various initiatives, regulatory frameworks, and financial incentives specifically designed to nurture the startup ecosystem, enabling young tech companies to scale and thrive in a competitive market.

One of the cornerstone programs for startups in India is the Startup India initiative, launched in 2016. This comprehensive program aims to provide an enabling environment for startups to flourish. Under the initiative, startups are offered a range of benefits, including tax exemptions for the first three years, which significantly reduce the financial burden on fledgling companies. In addition, the government provides startups with simplified regulations, making it easier for them to comply with various legal requirements. These regulatory reforms have reduced the complexity of starting and operating a business, allowing tech entrepreneurs to focus on innovation rather than red tape.

Access to funding is another critical area where the government has played a vital role. The Fund of Funds for Startups (FFS) was launched with a corpus of INR 10,000 crore to help startups gain access to funding by leveraging investments from venture capitalists and other private investors. This fund acts as a facilitator to boost venture capital financing for startups, particularly in the tech sector. In 2021, the Startup India Seed Fund Scheme (SISFS) was introduced, which aims to provide financial assistance to startups at their early stages, ensuring they can develop prototypes, conduct market entry activities, and build products without facing immediate cash flow issues. These funding programs help in addressing one of the primary challenges for startups – securing capital.

Beyond funding, the government has actively promoted innovation and entrepreneurship through the Atal Innovation Mission (AIM), a flagship initiative under the NITI Aayog. AIM focuses on fostering a culture of innovation by establishing Atal Incubation Centers (AICs) across the country. These centers serve as hubs where startups can access infrastructure, mentoring, and networking opportunities to accelerate their growth. In addition, AIM has promoted the creation of Atal Tinkering Labs in schools, aiming to foster a spirit of innovation among young minds by exposing them to cutting-edge technology like 3D printing, robotics, and IoT (Internet of Things).

India's Digital India program has also been a significant enabler for tech startups. By improving digital infrastructure across the country and promoting digital literacy, Digital India has created a fertile ground for startups to develop technology-driven solutions that cater to both rural and urban markets. The government's focus on expanding internet access and promoting digital payment systems has opened up new avenues for fintech, e-commerce, and IT-based startups. This program has helped startups capitalize on India’s growing digital economy and consumer base.

Additionally, the government has introduced several measures to streamline the protection of intellectual property rights (IPR). Recognizing that innovation is key to the success of tech

startups, the government has accelerated the patent registration process and reduced fees for startups seeking patents. Through initiatives like the SIPP (Scheme for Facilitating Startups Intellectual Property Protection), startups receive assistance in filing patents, trademarks, and designs, ensuring their innovations are protected in a competitive market.

Furthermore, the Make in India campaign, which encourages companies to manufacture products within India, has also contributed to the growth of hardware and product-based tech startups. It has encouraged domestic production of electronic goods, thereby boosting the manufacturing capabilities of tech startups and reducing reliance on imports.

In summary, India's government policies are aimed at creating an ecosystem that supports tech startups from the ground up. Whether through financial aid, easing regulatory hurdles, improving digital infrastructure, or fostering a culture of innovation, these efforts have helped transform India into one of the fastest-growing startup ecosystems in the world. The strategic alignment of these policies with India's broader economic goals has not only empowered startups but also positioned India as a global hub for innovation and technology-driven solutions.

1.9 Significance of the Study

Technology-based startups are pivotal engines of economic growth, driving innovation, job creation, and competitiveness. In recent years, tech startups have played a significant role in driving innovation, creating new industries, and reshaping global economies. A comprehensive understanding of the factors that boost tech startup performance is essential for charting their growth path. These startups, known for their agility, innovative approaches, and use of cutting-edge technologies, have the potential to disrupt established industries and introduce groundbreaking solutions. However, despite their potential for success, tech startups face numerous challenges that can impede their growth. This research aims to shed light on both the opportunities tech startups can capitalize on, such as access to venture capital, market demand, and technological advancements, as well as the challenges they must overcome to achieve long-term sustainability.

By examining the opportunities available to these startups, the study can provide insights for policymakers, investors, and entrepreneurs to support and foster the growth of the tech startup ecosystem. Additionally, tech startups are a vital part of the entrepreneurial landscape, and this study can guide new entrepreneurs in avoiding common pitfalls and making informed decisions to increase their chances of success.

Overall, the significance of this study lies in its ability to provide stakeholders—entrepreneurs, investors, policymakers, and academics—with actionable insights to enhance the success and sustainability of tech startups in a highly competitive and dynamic environment.

1.10 Organization of the Study

This study has been organized into five chapters. The description is as given below:

Chapter 1- Introduction: This chapter introduces the study area and establishes the foundation for research. It begins by providing a general overview of the topic, highlighting its significance and relevance in the broader academic and practical contexts. The introduction explains the key concepts, theories, and trends that shape the research area, offering the necessary background for understanding the study's focus.

Chapter 2- Review of Literature: The literature review critically examines existing research related to the study topic, summarizing key findings, methodologies, and theoretical frameworks. It highlights the strengths and limitations of previous work, identifying areas that have not been sufficiently explored or require further investigation. It concludes with the research gap found from the review of literature.

Chapter 3- Objectives and Research Methodology: This chapter elaborates upon the formulation of hypothesis, variables, and statistical tools used for analysis. It also focuses on sampling design and data collection methods.

Chapter 4 - Data analysis and Findings: This chapter discusses the results and findings for each objective. It depicts statistical representations of the analysis along with relevant discussion based on the results.

Chapter 5- Conclusion and Recommendations: This chapter summarizes the results from each objective and concludes the research findings. It also gives suggestions and recommendations to various stakeholders along with limitations and suggestions of the study.

CHAPTER 2
REVIEW OF LITERATURE

2.1 Background

A comprehensive review of literature has been done during the process of research. This chapter provides an overview of opportunities and challenges of tech startups. It explores the current state of research with respect to performance, internationalization, financing and challenges of tech startups. The literature has been accessed from popular electronic databases such as Web of Science, Google Scholar, Scopus, Emerald, Wiley, Sage and Science Direct. Various keywords were utilized to access literature from books and peer-reviewed journals in the field. These keywords were identified and organized into a search string. A preliminary search using these keywords was conducted to uncover additional terms for the main search.

The list of keywords related to Technological Entrepreneurship includes "Tech-startups", "Technology Entrepreneur*", "New Ventures", "High tech Startups". The list of related keywords includes "Tech Startups AND performance OR growth", "Tech Startups AND Internationalization OR Exports", "Tech Startups AND funding OR financing" "Tech Startups AND Challenges OR Issues OR Problems". The literature was filtered by first analyzing the titles of the articles, followed by a review of the abstracts. The chapter concludes by identifying research gaps based on the literature examined.

2.2 Review of Literature – Discussion

The review of literature has been categorized in the following sections:

2.2.1 Tech-Startups

2.2.2 Women in Tech- Startups

2.2.3 Performance of Tech- Startups

2.2.4 Internationalization of Tech- Startups

2..2.5 Sources of Finance for Tech- Startups

2.2.6 Challenges faced by Tech- Startups

2.2.1 Tech- Startups

Tech startups are innovative business ventures that leverage technology to create products or services. These startups are characterized by their initial stages of operation and their focus on utilizing science and technology to bring new and original ideas to the market (Chua, 2023). In recent years, there has been a significant rise in tech startups globally, particularly in sectors like e-commerce, healthcare, fintech, AI, and customer services (Nagarajan, 2019). Governments, such as in India, have been actively supporting the growth of tech startups through various schemes and initiatives to encourage entrepreneurship and innovation (Kevin, 2018). Academic models like the Tech Startup approach combine Agile software development with Lean Startup

practices to foster collaboration among students in creating real technology-based businesses, providing practical experience and preparing them for careers in software development and entrepreneurship.

Tech entrepreneurship is defined as an "investment in a project that assembles and deploys specialized individuals and heterogeneous assets that are intricately related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a firm" (Bailetti, 2012). Establishment of new technology ventures is at the heart of technology entrepreneurship. Individual technology entrepreneurs are often categorized as researchers, producers, users and opportunists according to their educational background and technical orientation. However, technology entrepreneurial teams are often a mix of all these attributes. Technology entrepreneurs differ in terms of the way of drawing on resources and structures so as to exploit technological opportunities. Tech- entrepreneurs associate major focus on self-dependency along with right network and alliances. The process of technology entrepreneurship is about recognizing, creating, and exploiting opportunities, and assembling resources around a technological solution, irrespective of the organizational context (Spiegel & Marxt, 2011). The technological solution opens up new possibilities, it allows the reduction of transactional costs (Williamson, 2005), and it has the ability to use new a technology product paradigm to provide a solution to a market gap (Ratinho et al., 2015).

Technology entrepreneurship differs from general entrepreneurship in that it focuses on technological opportunities that require deep technological as well as managerial capabilities (Walsh & Linton, 2011). In other words, it requires a higher level of technical capabilities and management of a risky environment (Harms & Walsh, 2015). Alternatively, it involves the same opportunity identification, organization, and execution found in any other form of entrepreneurship but around a focused technology and a business model that makes it unique. Table 2 below categorizes the review based on themes.

Table 2: Review on Tech-Startups

Chua (2023); Nagarajan (2019)	Tech Startups & Global Growth: Tech startups, innovation, technology-driven products, early-stage businesses, rise of global tech startups, sectors: e-commerce, healthcare, fintech, AI, customer service, global expansion, government support for entrepreneurship initiatives
Kevin (2018); Spiegel & Marxt (2011)	Government Support & Entrepreneurial Process: Government support for tech startups, entrepreneurship initiatives, schemes, innovation, process of recognizing and exploiting opportunities, assembling resources around technological solutions
Bailetti (2012); Walsh & Linton (2011); Harms & Walsh (2015)	Tech Entrepreneurship: Investment in technological ventures, specialized individuals and assets, technology knowledge, team composition (researchers, producers, users, opportunists), tech entrepreneurship vs general entrepreneurship, risk management, managerial capabilities
Williamson (2005); Ratinho et al. (2015)	Technology Solutions & Market Gaps: Transaction cost reduction, technology as a solution to market gaps, technological product paradigms, market efficiency through new technology, innovation addressing market needs

2.2.2 Women in Tech- Startups

Women in technology startups are reshaping gender norms and contributing significantly to the economy and culture (Mona, 2023). Studies show that women entrepreneurs are high users of emerging technologies, which positively impacts their business idea generation and formation (Gupta,2021). In India, despite traditional gender dynamics, women-led high-tech startups are on the rise, with academic incubators playing a crucial role in supporting women innovators and enhancing entrepreneurial culture (Marek, 2021). Technology provides opportunities for women in business, especially in developing countries, where it helps overcome entrepreneurial barriers and expand social networks (William, 2020). Additionally, the feminine style of management in technology startups has been identified as beneficial, with women showcasing better problemsolving abilities in such organizations (Tracy, 2018).

Women entrepreneurs continue to face the multitasking whirlpool, along with the lack of financial resources, marketing skills and support services, including poor access to business networks, technology and digital markets (Irene, 2020). Entrepreneurship in STEM areas requires high amounts of investment, and male entrepreneurs are known to raise higher levels of funding than their female counterparts (Alsos et al. 2006). A study on gender differences of business owners in technology-based firms examines firm characteristics and firm success variables in light of gender (Kirsti, 2012). It found that firm characteristics such as firm size, number of employees, and revenues are correlated to gender, while firm success appeared to be independent of these (Malik ,2017) also found that women digital entrepreneurs experience “contradictory pulls” due to societal messages or social expectations concerning multiple roles across public and private spaces. Her study shows how gendered processes are constantly shaping digital entrepreneurship outcomes.

An Empirical paper (Cristina et al.,2020) attempted to find if the genderedness of entrepreneurial normative frames serve as a chance or challenge for women STEMpreneurs in the context of accomplishing entrepreneurial belonging. The research majorly found that Women in STEM can strategically choose to “belong or not” to the given masculine normative frame. Low number of women in STEM entrepreneurship can be attributed to institutional, organizational and individual factors majorly comprising of Change in career aspirations, leaky pipeline and inability of women to raise as much funds as compared to men (Katherina, 2020). Traditionally, women have been underrepresented in STEM educational programs as well as in STEM employment and leadership positions (Mavriplis et al. 2010). This may be one reason why few women entrepreneurs are so far present in STEM industries (Coleman and Robb 2016). Two barriers also commonly studied for women entrepreneurs in other fields are networks and funding. With regard to networks, it seems that lower numbers of women in a field lead the women members of that field to develop mixed gender networks (Hampton et al. 2009) and to use ICTs to engage in networking (Martin and Wright 2005). Additionally, gender bias in incubators (Marlow and McAdam 2012), technology transfer offices (Giuri et al. 2018), and venture capital and entrepreneurial financing (Brush et al. 2018; Alsos and Ljunggren 2017) may make it harder for female entrepreneurs to develop and utilize network contacts.

Table 3 below categorizes the review based on themes.

Table 3: Review on Women in tech- startups

Mona (2023); Gupta (2021); Marek (2021); William (2020); Tracy (2018)	Women in Technology Startups: Gender norms, women entrepreneurs, impact on economy and culture, women using emerging technologies, business idea generation, rise of women-led startups, academic incubators, overcoming entrepreneurial barriers, social networks, feminine management style, problem-solving abilities
Irene (2020); Alsos et al. (2006); Kirsti (2012); Malik (2017)	Challenges Faced by Women Entrepreneurs: Multitasking, lack of financial resources, marketing skills, support services, access to networks, gendered barriers, gender differences in firm characteristics, firm success, societal pressures, gendered processes in digital entrepreneurship
Cristina et al. (2020); Katherina (2020)	Gendered Entrepreneurship Norms: Gendered normative frames, belonging in STEM, institutional, organizational, and individual factors, career aspirations, leaky pipeline, inability to raise funds compared to men
Mavriplis et al. (2010); Coleman and Robb (2016); Hampton et al. (2009); Martin and Wright (2005); Marlow and McAdam (2012); Giuri et al. (2018); Brush et al. (2018); Alsos and Ljunggren (2017)	Barriers in STEM and Networks: Underrepresentation of women in STEM, networks, funding, mixed-gender networks, ICTs for networking, gender bias in incubators, technology transfer offices, venture capital, entrepreneurial financing, challenges for women in STEM industries

2.2.3 Performance of Tech- startups

Tech- startups' performance is complex and can be gauged by several factors, including making a sizable profit, getting funding, and successfully navigating uncertainty (Eric, 2018). The location of the firm, the commitment of the promoting partners, the age of the business, and the existence of non-promoting partners are all factors that impact startup success (Jinze, 2020). Furthermore, examining reports of unsuccessful businesses demonstrates that one of the main causes of company failures is frequently the absence of a well-defined business development strategy (Marco, 2018). The performance of tech startups hinges greatly on the profiles and attributes of their entrepreneurs. Researchers have delved into the traits, skills, and driving forces behind these individuals to unravel their impact on startup trajectory. A business startup is the first step in the lifecycle of any company. It represents a phase when an individual or entrepreneur starts a business activity for profit. Technology based startup is a technology intensive company that creates new markets on the basis of innovative technology. Entrepreneurship research in its early years focused heavily on using the behavioral aspects and characteristics of the entrepreneur for studying any kind of output measures of firms, such as performance, competitiveness among others (Seungku, 2019). Over the years, education background and credentials of the lead entrepreneur, the general and industry-specific work experience of the founders of technology-based start-ups were considered to greatly enhance the survival of the start-ups. In the context of

technology-based start-ups, the firm-level competitiveness is influenced by entrepreneurial or founder-specific, firm-specific and external entrepreneurial environment (ecosystem) related factors (Wiklund et al., 2009; Cader and Leatherman, 2011).

The entrepreneur's age (Furdas and Kohn, 2011) has been discussed as another key factor influencing the competitiveness of technology-based start-ups. Successful tech startups are often founded by middle-aged entrepreneurs rather than younger ones. A study (Kerstin, 2020) demonstrates that new ventures led by co-founders with increasingly dissimilar ages, particularly when one founder is younger and the other older, are more likely to exhibit innovation. This effect is tempered when there are gender dissimilarities among these co-founders or when they identify as dissimilar genders. Moreover, prior experience in the specific industry is a strong predictor of entrepreneurial success (Chandler, 2022). However, there is ongoing debate regarding the relative importance of age and experience in high-tech entrepreneurship, with some studies suggesting that the average age of entrepreneurs is around forty years old. It's important to recognize that age influences entrepreneurs' decisions to become employers and employers' decisions regarding the number of employees, but these relationships are influenced by other factors such as risk-taking propensity and perception of entrepreneurial skills (Eric, 2018). Overall, while age may play a role in the performance of tech startups, it is not the sole determinant, as factors like prior experience and industry knowledge also contribute significantly to entrepreneurial success.
A recent study analysed the role played by entrepreneurial, firm specific and external environment related parameters in impacting the competitiveness of Indian high-tech startups and found that sales and R & D capabilities along with SDP growth in the region are very important in impacting the competitiveness (Krishna et. al. 2020). Another study from Korea (Juii Kim 2019), examined the effect of managerial characteristics of tech-based startup firms on firm performance and found that gender has no impact on firm performance while there exists a negative relationship between age of entrepreneur and firm performance.

Research indicates that having gender diversity on the boards of tech startups positively correlates with their performance (Tade, 2023). It explores the impact of female representation on startup boards, revealing that gender diversity is associated with efficient asset utilization, as measured by Return on Assets. Additionally, the study indicates that higher numbers of female shareholders and board members are linked to a more effective deployment of capital, reflected in Return on Equity. Female-led startups demonstrate comparable financial performance to male-led ones in terms of size, profitability, efficiency, and financial management. The article's findings suggest that venture capital (VC)-financed startups led by women exhibit poorer performance compared to those led by men, particularly concerning the gender gap in performance. This discrepancy is explained by differences in VCs' ability to fairly assess female-led firms (Matz, 2023). According to a different study (Roman, 2019), creative firms run by women outperform those run by men in terms of scale, profitability, efficiency, and money management. Despite this, companies led by women tend to obtain fewer financial resources than those led by men. If syndicates with solely male lead general partners finance their startups, women-led businesses typically do worse at first (Sofia, 2022). Furthermore, the social networks of female tech entrepreneurs positively influence new venture performance, with this effect being moderated by entrepreneurial awareness and gender bias (Xie, 2017). These findings underscore the significance of gender diversity in startup boards and the necessity of addressing gender-related challenges within the entrepreneurial ecosystem.

Research indicates that academic background, particularly technical education, exerts a positive influence on the performance of tech startups across various industries, including those with uncertain profitability (Gupta, 2017). Furthermore, individuals motivated by opportunity tend to excel in innovation and business expansion endeavors, whereas those driven by career ambitions demonstrate higher survival rates, income levels, and likelihood of hiring employees (Kim, 2018). Entrepreneurial experience plays a significant role in entrepreneurial performance, especially in the high-tech sector and during the early stages of business development, as well as for individuals with prior startup involvement Startups led by founders with a STEM (Science, Technology, Engineering, and Mathematics) background often enjoy advantages in terms of innovation and overall performance. Scientists play a pivotal role in fostering innovation within startups by promoting open collaboration and bringing valuable career experiences that can be leveraged within the startup environment.

Research highlights the influence of the startup age on tech startup performance. Specifically, studies reveal that the correlation between entrepreneurial experience and performance is more pronounced in the early stages of a business compared to later stages (James, 2019). Furthermore, the radicalness of technological innovations positively impacts sales growth in young technologybased ventures, especially when faced with high competition in the technology sector (Singh, 2020). Additionally, the effective allocation of resources, particularly intellectual capital, emerges as a critical factor driving entrepreneurial performance in early-stage ventures focused on new knowledge development and technological innovation. Previous startup founder experience significantly influences tech startup performance. Founders with prior startup experience in the same industry or who have launched multiple businesses before tend to experience a decline in performance, particularly in high-tech sectors (Kelly, 2019). It has been noted that startups headed by individuals who have collaborated in well-established organizations in the past tend to do better than others. Additionally, there is a strong correlation between the total amount of previous work experience—which includes exposure to both industry and startups—and the early success of new technological enterprises.

Table 4 below categorizes the review based on themes.

Table 4: Review on Performance of Tech- Startups

Eric (2018); Jinze (2020); Marco (2018); Seungku (2019)	Tech Startup Performance & Factors Influencing Success: Profitability, funding, navigating uncertainty, firm location, promoting partners' commitment, business age, non-promoting partners, business development strategy, entrepreneur attributes, entrepreneurial traits, skills, and driving forces, competitiveness of tech startups
Furdas and Kohn (2011); Kerstin (2020); Chandler (2022); Eric (2018)	Entrepreneur Characteristics & Age: Age and experience of entrepreneurs, middle-aged entrepreneurs leading successful startups, age and industry experience correlation, risk-taking propensity,

	perception of entrepreneurial skills, impact of co-founder age diversity on innovation
Krishna et al. (2020); Juii Kim (2019); Wiklund et al. (2009); Cader and Leatherman (2011)	Entrepreneurial Environment & Competitiveness: Role of entrepreneurial, firm-specific, and external environment factors, sales and R&D capabilities, regional SDP growth, gender impact on performance, managerial characteristics of entrepreneurs
Krishna et al. (2020); Juii Kim (2019); Wiklund et al. (2009); Cader and Leatherman (2011)	Gender Diversity in Startups: Gender diversity on boards, female representation and performance, efficient asset utilization, gender gap in performance, gender bias in VC assessment, social networks of female tech entrepreneurs, gender-related challenges
Gupta (2017); Kim (2018); James (2019); Singh (2020); Kelly (2019)	Academic Background & Entrepreneurial Experience: Impact of academic background (technical education) on performance, opportunity vs career-driven motivations, STEM backgrounds, entrepreneurial experience in high-tech sectors, innovation, business expansion, and resource allocation in early-stage ventures
Matz (2023); Roman (2019); Xie (2017); Sofia (2022)	Financial Resources & Gender: Gender disparity in funding, performance differences in VC-financed startups led by men vs women, impact of gender on financial management and resources availability, role of social networks in new venture performance

2.2.4 Internationalization of Tech- Startups

Tech- startups are rapidly venturing beyond the domestic boundaries to tap global opportunities and export engagement has emerged as the critical growth strategy (Monaghan et al., 2020). Export engagement is defined as the strategic entry and expansion into the international markets. It is considered crucial for startups that are seeking growth, sustainability and long-term success (Zahra et al., 2020; Autio et al., 2017). Unlike the traditional businesses, tech- startups are often considered as 'born global' emphasizing that they participate in international market from incorporation or in very early stages of their lifecycle (Hennart et al.,2021). Advancement in technology plays a critical role by reducing barriers in entering foreign markets and allowing startups to expand at a faster pace internationally (Gabrielsson et al., 2008).

The Uppsala model says that internationalization is a gradual process as firms aims to strengthen their domestic operations before venturing abroad (Johanson et al., 1977). However, the process can be faster in the case of tech-startups due to the scalability of digital technologies, which allows for more rapid global market access (Knight & Cavusgil, 2004).

Diffusion of Innovations theory supports the idea that innovation acts as a catalyst and startups that develop their own technology are more likely to succeed in the international market (Rogers, 2003). Schumpeter's theory of Entrepreneurship (1934) also emphasizes the role of innovation.

The entrepreneurs that create and commercialize new products or processes better meet the needs of foreign market by differentiating them from competitors (Block et al., 2017).

The Resource based view (RBV) provides another useful lens to analyze export engagement of tech- startups (Barney, 1991). Firms with unique and difficult to imitate resources are more likely to succeed in competitive international markets. Further, gender role theories suggest that female entrepreneurs face more challenges than male counterparts because of societal norms and expectations around gender (Brush et al., 2009).

The export engagement by tech startups is influenced by various organizational and technological factors. It is crucial to understand these factors for fostering international trade and economic growth. Literature offers contributions in this regard. The organizational structure significantly impacts the propensity to export. Strategic orientation and management capability determines the export behavior of the firms (Jolanda et al., 2007). Success in exports is also impacted by entrepreneurial orientation of the firms like proactive behavior and risk taking. The export decisions are greatly influenced by the managerial attitudes towards risk. Founders pursuing high risk and high reward strategies perform better in international markets which seem unpredictable (Opkara, 2009). Those who can take calculated risks and are able to anticipate changes in the market are in a better position to take advantage of opportunities in the international market (Lumpkin & Dess, 1996; Hossain & Azmi, 2021).

Skilled workforce enhances a startup's ability to engage in high-tech exports significantly. Studies indicate that higher levels of expertise and education are correlated with increased export activities (Drapkin et al., 2023; Tebaldi, 2011). Moreover, startups that possess strong technological foundations are more likely to reach international markets. This is particularly found in academic startups, where having affiliations with reputable universities strengthen export orientation (Suzuki & Okamuro, 2016). Investment in innovation i.e. developing new products or enhancing processes serves very beneficial for startups to succeed in the international markets. This could be attributed to their ability to offer competitive and unique products. Innovative firms usually have an edge in the global markets as they are better able to overcome challenges related to market competition and adapt to foreign market (Gupta & Chauhan, 2021; Ringo et al., 2023).

Export performance is also enhanced by digital transformation as it reduces the transaction costs, improves market intelligence and the product quality. This allows the firms to respond to the global demand in a rapid manner (Kraus et al., 2021; Qian et al., 2023). Supportive institutional frameworks and access to public funding can also facilitate export engagement. Sufficient financial support allows startups to grow, create new products and compete better in the international markets. It is found that proportion of exporting women owned enterprises have increased drastically between 2011 and 2017 which has almost closed the export participation gap (Baur, 2019). However, numerous studies suggest that women ownership negatively impacts the likelihood of firms to enter international market as exporting experience for woman is difficult than that for a man (Bardasi et al., 2011).

The early studies in this context found neutral or negative impact of having women owners on the export propensity of firms (Grondin & Grondin, 1994; Reavley et al, 2005). The studies provided a snapshot of export orientation of businesses owned by women. Empirical literature suggests that women owned businesses don’t have the readiness and are less likely to export (Grondin & Schaefer, 1995). It is reported that women owned firms are smaller, do not produce competitive products and lack relevant information. Moreover, female entrepreneurs are found to be satisfied

with the domestic demand for their products and have less motivation to compete internationally maybe due to sex role socialization. Another study on the dataset of manufacturing firms in Ghana found that reduced access to finance restricts the females to export (Ackah et al., 2020). On the contrary, recent studies in developed economies suggest that women owned businesses are more likely to export and they do not consider gender as a challenge (Shepherd and Stone, 2017).

The startups that are capable of effective and extensive marketing strategies own a stronger competitive advantage in the foreign market in comparison to the others who lack such capabilities. According to the resource- based view of firms (Barney, 1991; Wernerfelt, 1984), possessing unique and difficult to imitate marketing and commercial resources allows the firms to identify, leverage and exploit distinctive business opportunities from international markets.

Possession of substantial resources working towards diverse marketing and commercial activities like advertising, promotion, customization, distribution and customer services enables the new ventures to have improved export performance. It can be done by enhancement of brand recognition or changing the perception of local customers in foreign markets towards distinct characteristics of existing or new products (Bresnahan et al., 1997). There have been various empirical studies in the marketing literature that found a positive relationship between marketing capability and firm performance (Helsen et al., 1993; Holm and Sharma, 2006; Srivastava et al., 1998).

The firms that innovate and develop their own technology have an ability adopt differentiation strategies with respect to their newly developed products in the international market. It allows the firms to enjoy first- mover advantages in the global competitive market having rival firms (Palich et al., 2000). Production efficiency can be enhanced by developing innovation capability which lowers the manufacturing costs. This could be because of the technological economies of scale and scope in innovation that utilizes the learning effects available from experience (Acs and Audretsch, 1991). It also helps the firms to create a diversified portfolio of products that may be helpful in spreading the risk across multiple product categories and multiple foreign countries (Rugman, 1976). Numerous studies in the existing literature on innovation confirms a positive relationship between innovation and firm performance (Belderbos et al., 2004; Pakes, 1985; Qian and Li, 2003; Zachariadis, 2003).

Venture capital funding significantly impacts the export engagement of tech startups by enhancing their financial capabilities and the reach in market. Research indicates that firms backed by venture capital are more likely to indulge in export activities. The likelihood of becoming exporters is increased by 9 % for venture capital backed firms as compared to firms which are not backed by venture capital (Rossi et al., 2018). Furthermore, venture capital funding not only helps in boosting high-tech exports but also correlates positively with the number of patents granted, indicating a link between innovation and export performance (Margaryan & Terzyan, 2022).

However, while venture capital funding can enhance export capabilities, it may also lead to a loss of authenticity in entrepreneurs' digital identities, which could in turn impact stakeholder engagement negatively (Block et al., 2023). This duality highlights the complex nature of venture capital's influence on tech startup export strategies. Better financial stability significantly influences the export decisions as it allows for financing of sunk costs involved with entry in foreign markets (David, 2005).

Table 5 below categorizes the review based on themes.

Table 5: Review on Internationalization of Tech- Startups

Monaghan et al. (2020); Zahra et al. (2020); Autio et al. (2017); Hennart et al. (2021)	Export Engagement as Growth Strategy: International market entry, "born global" startups, reduced barriers due to technology, faster global expansion.
Johanson et al. (1977); Knight & Cavusgil (2004)	Internationalization Models: Uppsala model for gradual internationalization, scalability of digital technologies enabling faster global access for tech startups.
Rogers (2003); Block et al. (2017); Schumpeter (1934)	Innovation and Export Success: Role of innovation as a catalyst, differentiation strategies, and commercializing new products/processes for international markets.
Barney (1991); Wernerfelt (1984); Brush et al. (2009)	Resource-Based View (RBV) & Gender Challenges: Unique resources for competitive advantage, societal norms affecting female entrepreneurs' export potential.
Jolanda et al. (2007); Opkara (2009); Lumpkin & Dess (1996); Hossain & Azmi (2021)	Organizational and Entrepreneurial Orientation: Strategic orientation, management capability, risk-taking behavior, proactive strategies influencing export success.
Drapkin et al. (2023); Tebaldi (2011); Suzuki & Okamuro (2016)	Role of Skilled Workforce and Education: Strong technological foundations, academic affiliations, higher education levels correlated with increased export activities.
Gupta & Chauhan (2021); Ringo et al. (2023); Kraus et al. (2021)	Innovation & Digital Transformation: Investment in innovation, product/process enhancement, reduced transaction costs, improved market intelligence, rapid global response.
Baur (2019); Bardasi et al. (2011); Shepherd & Stone (2017)	Gender and Exporting: Increasing export participation among women entrepreneurs, gender biases in export activities, challenges in developing economies vs opportunities in developed economies.
Bresnahan et al. (1997); Palich et al. (2000); Acs & Audretsch (1991); Rugman (1976)	Marketing Capabilities & Differentiation: Competitive advantage through marketing, product differentiation, first-mover advantage, spreading risk through product diversification.
Rossi et al. (2018); Margaryan & Terzyan (2022); David (2005); Block et al. (2023)	Venture Capital and Export Engagement: Enhanced export potential, increased patents, financial stability, dual impact of VC on authenticity and stakeholder engagement.

2.2.5 Sources of Finance for Tech – Startups

In the early stages of a startup, the available external sources of finance are often restricted to informal investors. This is because none of the formal external investors would be willing to invest its resources in an informationally opaque organization that lacks credibility and formalization in its operations (Cassar, 2004; Denis, 2004). The demand for external informal capital is typically fulfilled by Business Angels (BAs). A BA is a high-net-worth individual who may have previous entrepreneurial experience and who invests informally in a startup using debt or equity or both, without being intermediate (Denis, 2004; Kerret al., 2014). Business Angels (BAs) generally invest in high-risk, high-growth startups that are still in their early stages of development.

Previous research has shown that Bas often make investments on the basis of personal relationships with the entrepreneurs or personal knowledge about a startup and which are usually in close geographical proximity (Denis, 2004; Nofsinger and Wang, 2011; Sudek, 2006). Although there is a contention that the financial instruments used by the BAs involve only equity (Cassar, 2004; Hellmann and Puri, 2002), a few researchers argue that BAs employ a wide range of instruments from pure debt to pure equity, including convertible debt to make investments in the new ventures (Shane, 2012). Apart from making an investment, BAs influence strategies and decision making of the investee startups with their skills, expertise, business contacts and considerable experience in the field of entrepreneurship (Calopa et al., 2014; Shane, 2012).

In addition, investments from the BAs are perceived as a positive signal or rather a prerequisite for further rounds of financing from external informal or formal investors (Maxwell et al., 2011). Further, capital infusion from BAs in a startup's early stages is positively related to performance (Croce et al., 2018). Since BAs usually do not go for follow-up rounds of funding due to insufficient funds for further rounds, the entrepreneurs have to approach other external formal financial sources for achieving further growth and stability (Kim and Wagman, 2016). As a startup matures and subsequently enters into growth stage in its lifecycle, it experiences different kinds of financial requirements, and the quantum of finance required to meet those requirements increases (Calopa et al., 2014). This growing need for funding is addressed by formal external investors, who provide capital on a significantly larger scale than Business Angels. Among these, Venture Capitalists (VCs) stand out as the most prominent category (Calopa et al., 2014). VCs are institutional investors, often referred to as general partners, who serve as financial intermediaries between limited partners (investors) and startups. Their specialization lies in funding high-risk, high-growth new ventures while managing a diverse portfolio of such investments (De Bettignies, 2007).

Extant literature shows mixed evidence that VCs invest at a later stage after BAs (Calopa et al., 2014), or that VCs can invest in a startup's seed stage and could also play the role of BAs (Kim and Wagman, 2016). Furthermore, VCs acquire a part of the ownership as equity in the company, apart from capital infusion (De Bettignies and Brander, 2007). Based on their level of ownership, VCs may choose to join a startup's board of directors, which is a notable difference from Business Angels. Additionally, if the venture faces difficulties, VCs often take decisive actions such as replacing the founder with a professional CEO and/or opting to sell or liquidate the company.

VCs make much larger investments than BAs and they can also plan for sequential or follow-up investments, unlike BAs (Bertoni et al., 2011; Calopa et al., 2014). If VCs make sequential investments in a startup, it sends out positive signals to other investors, leading to increased valuations by the investors and hence increased likelihood of success (Kim and Wagman, 2016).

The shares acquired by VCs are typically highly illiquid. In the initial years, startups often fail to generate positive cash flows and may even incur negative cash flows, which contributes to a lower company valuation and reduces the liquidity of the shares. Additionally, startups generally do not distribute dividends to VCs during the early stages of their lifecycle. This is the reason why VCs invest in startups having high growth potential but usually in its later stages, to get maximum returns on their investments (Denis, 2004; Nofsinger and Wang, 2011). In addition to venture capitalists, startups can also secure financing from another category of institutional investors known as corporate venture capitalists (CVCs). Unlike VCs, the primary goal of CVCs is not solely to generate financial returns but also to explore innovative opportunities by collaborating with technology-driven startups (Kim and Park, 2017).

At later stages of its lifecycle, a startup may gain access to external debt financing, particularly from banks. By this stage, if the startup has survived, it likely has a proven track record, allowing debt investors to assess future cash flows and determine its valuation. Additionally, the startup may have accumulated tangible assets that can serve as collateral, which debt investors typically require to mitigate the risks of information asymmetry and potential default (Gartner et al., 2012). Debt financing offers a significant advantage to entrepreneurs: it allows them to retain full ownership of their business, as it does not involve share dilution. The only obligations are timely interest payments and adherence to the conditions set by the debt holders, who otherwise have no influence over the venture's decision-making process (De Bettignies and Brander, 2007). Furthermore, research has shown that debt financing is positively correlated with the performance and quality of startups (Cole and Sokolyk, 2017).

Following a phase of expansion or scaling up, the next milestone for a startup is often going public through an initial public offering (IPO). This transition is widely regarded as the pinnacle of success for startups and their founders (Croce et al., 2018). At this stage, VCs typically exit their investments, making way for a new group of investors specializing in larger, well-established businesses, most notably, private equity (PE) firms.

Similar to VCs, PE firms are institutional investors that act as intermediaries between investors and the businesses they finance. Managed by general partners (GPs) on behalf of limited partners (LPs), PE firms provide substantial funding to startups for further expansion (Kaplan and Schoar, 2005). After obtaining PE financing, a startup can accelerate its growth and eventually raise funds through an IPO, at which point it transitions from being a startup to becoming a fully established company. Table 6 below categorizes the review based on themes.

Table 6: Review on Funding Sources of Tech startups

Cassar (2004), Denis (2004)	Early-stage startups typically rely on informal investors like Business Angels (BAs) who provide initial funding, often based on personal relationships and geographical proximity.
Denis (2004), Nofsinger & Wang (2011), Sudek (2006)	BAs invest in high-risk, high-growth startups and typically use a range of financial instruments, including equity, debt, or convertible debt.

Calopa et al. (2014), Shane (2012)	BAs provide not just capital but also strategic influence, guidance, and networks, which can significantly affect the startup's decision-making and future trajectory.
Maxwell et al. (2011), Croce et al. (2018)	BAs act as a positive signal for future funding rounds. Their early investments are often viewed favorably by subsequent investors, which can lead to enhanced startup performance.
Kim & Wagman (2016), Calopa et al. (2014)	Venture Capitalists (VCs) invest in the later stages of startups, providing large-scale funding and strategic support, often joining the board of directors. They play an active role in the management and decision-making processes of startups.
Bertoni et al. (2011), Kim & Wagman (2016)	VCs can make sequential investments, which send positive signals to other investors, boosting the startup's valuation and likelihood of success.
Denis (2004), Nofsinger & Wang (2011)	VCs make larger investments than BAs, often in later stages, and typically exit when startups become established, providing an opportunity for entrepreneurs to scale.
De Bettignies & Brander (2007), Calopa et al. (2014)	VCs acquire equity and typically have substantial control, often requiring seats on the startup's board.
Kim & Park (2017)	Corporate Venture Capitalists (CVCs) focus on strategic, innovation-driven investments in technology startups, offering both financial backing and access to new technologies, unlike traditional VCs whose primary goal is financial return.
Gartner et al. (2012)	Startups in later stages may turn to debt financing, especially if they have a proven track record and tangible assets, allowing entrepreneurs to retain ownership without equity dilution.
De Bettignies & Brander (2007)	Debt financing offers startups a way to maintain full ownership while still obtaining the capital needed for expansion, with no direct influence from the debt holders on the startup's decisions.
Cole & Sokolyk (2017)	Debt financing is positively correlated with startup performance and quality, especially when startups have accumulated tangible assets and can show future cash flows.
Croce et al. (2018)	The transition from a startup to a fully established company often involves going public via an IPO, marking a milestone in the lifecycle of the startup.
Kaplan & Schoar (2005)	Private Equity (PE) firms provide funding for the expansion of mature startups, accelerating their growth and preparing them for IPOs, marking the transition from a startup to a well-established company.

2.2.6 Challenges Faced by Tech- Startups

"The startup environment is characterised by the dynamism over time, complexities of interconnected variables, and the hostility of the competition, which in the literature of environment and firm has been identified as 'uncertainty" (Ghosh and Bhowmick, 2017). Entrepreneurs are faced with several challenges and uncertainties in their entrepreneurial journey. These challenges begin right from the generation of ideas to develop the proof of concept, identification of the first customer, establishing product-market fit, acquisition of human capital, seeking potential investors, product commercialization, revenue realization, exploring a new market, and scaling up operations for regional and global growth (Kalyanasundaram et al., 2021). Prior research has observed that technology-based startups need to deal with a lot of uncertainty across many dimensions in their early days (Ghosh et al., 2016). Entrepreneurs try to mitigate the challenges and uncertainties posed by the external environment (Pardo and Alfonso, 2017) through the internal resources available to them (e.g., human resources, products, marketing, finance, etc.) (Amankwah-amoah, 2016). Entrepreneurship is characterised by identifying opportunities in uncertainty and undertaking several sets of decisions and actions under constantly dynamic situations to overcome these challenges. It is not the environment that is certain or uncertain but the perception of the firms about the certainty or uncertainty in the environment for them; it is not the same for all the firms (Pfeffer and Salancik, 2003). According to literature, uncertainty can be defined as "an individual's perceived inability to predict accurately" or "Lack of Knowledge" (Milliken, 1987). Many startups fail in the initial stages and less than one-third of them transform into companies- a "high rate of failure" (Vesper, 1990). Failure of a venture should not be seen as a failure of an entrepreneur as "Failure is a dynamic and evolutionary experiential learning process, which entrepreneurs endure, recover from, and ultimately benefit from (Cope and Cave, 2008)." However, given the scarce nature of available resources, it is necessary to understand their high mortality as the number of startups closure is more than the number of surviving startups. Hence, this raises the question and a matter of investigation of how the failure of startups can be avoided and made sustainable (Triebel et al., 2018).

Failure occurs because of several reasons such as lack of finance, lack of sufficient business knowledge, technology lag, team management problem, etc.- "startup problems." With the mushrooming of startups and many of them ready to come out of the incubators to be planted by their founders so often each day, there is yet another one that has already completed its journey in its infancy. According to Stefano Columbu(2017) "Failure is the rule, rather than the exception" and stated five reasons for thefailure of startups in India: not enough scale, not enough funds, weak business model, incompatibility among founders/between founders and investors, and external factors. Most of the new ventures capable of surviving might turn into successful organisations that play a significant role in the economy- "success stories" (Martinsons, 2002). A black box, known as the "valley of death," is more a metaphor than a well-defined stage (Hudson and Khazragui, 2013). This is the most critical stage to be dealt with due care. Benchmarks should be identified, and efforts are made to fulfill them, which will result in a better ecosystem. Managing the startup and a corporate venture has been interpreted as either chaotic- to be excelled by only transcendent forces such as entrepreneurial spirit or as an engineering science that can be taught (Reis, 2011).

Since the proposition offered by startups is entirely new with no prior precedence, a significant degree of uncertainty is attached to the future of the venture. Furthermore, their ability to

withstand sustained losses is quite limited as the origin of startups is on a small scale with limited resources, often faced by large competitors in the open market (Joshi and Satyanarayana, 2014). Habeebuddin and Saakriya (2017) state that the challenges and issues faced by startups in India can be classified as cultural issues, lack of mentorship, regulatory issues, lack of skilled workforce, access to funding, and social issues, lack of infrastructure, sustainability issues and taxation issues. Whereas Bednár and Tarišková (2017) identified the critical factors contributing to startups failure among the European startup and concluded the five most affecting reasons as lack of money for further development which was not attributed to the lack of financing available, but poor financial planning and investment timing which resulted in the incapability of the venture to reach the sales stage. The second most cited reason was poor market analysis where there was no need for the product or service in the market; third was no investors; fourth related to cost issues, and fifth was team-related issues.

According to Salamzadeh and Kesim (2015), though the challenges faced by startups are unique, some common challenges include; financial challenges, human challenges, support mechanisms, and environmental elements. Picken (2017) puts forth that the eight hurdles in the transition of a startup from its nascent stage to the scalable stage that hinders its survival are setting the right direction, maintaining the focus, product/service positioning, maintaining customers, building an organisation and skilled team, developing effective management, process and infrastructure, building financial capability, developing an appropriate organisational culture, and managing risks and uncertainties.

Cantamessa et al., (2018) proposed that the most important contributors to startup failure are the business model and enterprise-related factors. Their findings further suggest that only 44% of the startups were able to manage their operations for 2-3 years, 28% between 35 years, 14 % of startups failed within the first year, and 14% survived more than five years. Hayward et al., (2006) developed the Hubris theory of entrepreneurship, stating that the startup failure is an outcome of the entrepreneur's overconfidence that tends to deprive their ventures of resources and resourcefulness and affect their decisions to allocate, procure, and utilise these resources. However, Seshadri (2007) linked the startup failure to the dissonance between the founder's personal and corporate goals.

Cardon et al., (2011) proposed that failure is often analysed from an entrepreneur's standpoint. Though the emotional impact of the failure is enormous, one can learn from their past mistakes and avoid those mistakes while creating a new venture. Kalyanasundaram et al., (2021) examined the failure of technology-based startups in India over their lifecycle and identified the causal attributes that differentiate a successful startup from an unsuccessful one. Based on their study, they concluded that stages in the lifecycle of a startup play a crucial role in prioritizing and allocating resources for maximum returns and the significant causal attributes are revenue, product-market fit, product roadmap, market promotion, conflict with investors, level of confidence at execution, the extent of focus on current startup and experience level of the entrepreneur. Table 7 below categorizes the review based on themes.

Table 7: Challenges faced by startups

Ghosh & Bhowmick (2017), Ghosh et al. (2016), Pardo & Alfonso (2017), Amankwah-Amoah (2016), Pfeffer & Salancik (2003), Milliken (1987)	The startup environment is characterized by uncertainty, dynamism, and complexity. Entrepreneurs face numerous challenges across various stages of their venture. Uncertainty varies between firms and is often subjective based on how each firm perceives the environment.
Vesper (1990), Stefano Columbu (2017), Bednár & Tarišková (2017), Hayward et al. (2006), Seshadri (2007)	Common causes of startup failure include high failure rates, insufficient scale, lack of funds, weak business models, incompatibility among founders/investors, poor financial planning, lack of market need, cost issues, team problems, misalignment of founder and company goals.
Kalyanasundaram et al. (2021), Habeebuddin & Saakriya (2017), Salamzadeh & Kesim (2015), Picken (2017), Joshi & Satyanarayana (2014)	Entrepreneurs face challenges like product-market fit, human capital, funding, scaling, regulatory issues, mentorship shortages, market competition, and environmental factors. Key hurdles in transitioning to scalable stages include setting direction, managing risks, building teams, and maintaining financial capability.
Cope & Cave (2008), Cardon et al. (2011), Kalyanasundaram et al. (2021)	Failure is a part of the entrepreneurial journey, offering valuable learning opportunities. Entrepreneurs learn from past mistakes and adapt in future ventures. Factors such as revenue, product-market fit, execution confidence, and investor relations influence startup success.
Martinsons (2002), Hudson & Khazragui (2013), Cantamessa et al. (2018), Reis (2011)	Successful startups play a key role in the economy, and with proper management, they can avoid failure and achieve sustainability. The “valley of death” is a critical stage, but effective management strategies and business models can help ventures survive and thrive long-term.

2.3 Research Gap

The review of literature done in the previous section highlights that extensive literature exists on startups but there are relatively very few studies in the case of tech- startups specially in case of India. Tech startups play a vital role in driving economic growth, fostering innovation, and

addressing societal challenges. It becomes important to understand the opportunities and challenges of tech startups in the Indian startup ecosystem. To the best of our knowledge, the following issues are found unanswered in the literature review:

i. The existing studies have not incorporated the aspect of gender composition of founding team and type of technology adoption in the context of tech startups.

ii. Few studies have been conducted to examine the success factors of startups and their competitiveness but there is dearth of comprehensive study analyzing the factors that impact the financial performance of tech- startup and its internationalization.

iii. Academic research has primarily concentrated on specific sources of funding, such as banks or venture capital, with limited focus on the simultaneous use of multiple funding sources. There is a lack of empirical studies examining how founders' human capital and entrepreneurial orientation influence the use of diverse initial funding sources for small businesses and startups.

iv. Theoretical studies have been conducted to bring out the challenges faced by startups but there is a dearth of empirical literature in terms of challenges specially in context of Tech- Startups.

CHAPTER 3
OBJECTIVES AND RESEARCH METHODOLOGY

3.1 Background

On the basis of the research gap discussed in section 2.8, the objectives of the thesis have been developed in this chapter. The chapter discusses the hypothesis and variables of the study. The statistical tools are also discussed in this chapter along with model specification. Moreover, it also emphasizes on the population, reason for selecting sample areas, data collection and the research instruments.

3.2 Objectives of the Study, Hypotheses, Variables and Tools

The objectives, hypothesis, variables and tools are discussed in a sequential manner below.

3.2.1 Objective 1

To analyze the impact of firm and founder specific factors on financial performance of tech startups.

3.2.1.1 Hypothesis for Objective 1

$H1_{0:}$ Gender composition of the founding team does not have any significant impact on the performance of tech-startups.

$H1_{1:}$ Gender composition of the founding team has a significant impact on the performance of tech- startups.

$H2_0$: Prior - Startup Experience of the founders does not have any significant impact on the performance of tech-startups.
$H2_1$: Prior - Startup Experience of the founders has a significant impact on the performance of tech-startups.

$H3_0$: Startup size does not have any significant impact on the performance of tech - startups.

$H3_1$: Startup size has a significant impact on the performance of tech-startups.

$H4_0$: Type of technology adoption does not have any significant impact on the performance of tech startups.
$H4_1$: Type of technology adoption has a significant impact on the performance of tech-startups.

$H5_0$: Startup Age does not have any significant impact on the performance of tech- startups.

$H5_1$: Startup Age has a significant impact on the performance of tech startups.

3.2.1.2 Variables and Tools for Objective 1

Table 8: Description of Variables and Tools for Objective 1

S.No	Variable	Variable Name	Type of Data	Description
Dependent Variable				
1.	Financial Performance	Fin_Perf	Ratio Data	Revenue in financial year 2021-22
Independent Variables				
1.	Gender Composition of the founding team.	Gen	Binary Data	More than 50% Female Founders = 1 ; 0= otherwise
4.	Prior- Startup Experience	Start_exp	Discrete Data	Years of experience working in startup previously
5.	Startup Size	SSize	Discrete Data	Number of employees in the startup
6.	Startup Age	Sage	Discrete Data	Number of years since incorporation
7.	Technology	Tech	Categorical Data	Innovated = 1; 0= purchased
Research Tool: OLS Regression				

Source: Made by the Researchers

3.2.2 Objective 2

To identify the factors impacting export propensity and export intensity of tech- startups.

3.2.2.1 Hypothesis for Objective 2

$H6_0$: There is no significant relationship between gender composition of founding team and a) Export Propensity b) Export Intensity of Tech- Startups.

$H6_1$: There is a significant relationship between gender composition of founding team and a) Export Propensity b) Export Intensity of Tech- Startups.

H7 $_0$: There is no significant relationship between breakeven status and a) Export Propensity b) Export Intensity of Tech- Startups.
H7$_1$: There is a significant relationship between breakeven status and a) Export Propensity b) Export Intensity of Tech- Startups.

H8 $_0$: There is no significant relationship between commercial ability of the founding team and a) Export Propensity b) Export Intensity of Tech- Startups.
H8 $_1$: There is a significant relationship between commercial ability of the founding team and a) Export Propensity b) Export Intensity of Tech- Startups.

H9 $_0$: There is no significant relationship between type of technology adoption and a) Export Propensity b) Export Intensity of Tech- Startups.
H9 $_1$: There is a significant relationship between type of technology adoption technology and a) Export Propensity b) Export Intensity of Tech- Startups.

H10 $_0$: There is no significant relationship between venture capital funding and a) Export Propensity b) Export Intensity of Tech- Startups.
H10 $_1$: There is a significant relationship between venture capital funding and a) Export Propensity b) Export Intensity of Tech- Startups.

3.2.2.2 Variables and Tools for Objective 2

Table 9: Description of Variables and Tools for Objective 2

S.No	Variable	Variable Name	Type of Data	Description
Dependent Variables				
1.	Export Propensity	EXP	Binary	1 = if the startup exports 0 = otherwise
2.	Export Intensity	EXI	Ratio	Proportion of revenue coming from exports
Independent Variables				
1.	Breakeven Status	BkE	Binary	1 = attained breakeven 0 = otherwise
2.	Type of technology adoption	TadP	Binary	1= innovated; 0= purchased
3.	Commercial Ability	CoM	Ordinal	Average level of commercial and marketing skill (0=None, 1= Basic, 2 = Intermediate, 3= Advanced, 4= Expert)

4.	Funding	FunD	Binary	1= backed by venture capital , 0 = otherwise.
5.	Gender	GeN	Binary	1= more than 50% founders are female 0= otherwise
Research Tool: Logistic and OLS Regression				

Source: Made by the Researchers

3.2.3 Objective 3

To investigate the determinants of initial funding sources among tech- startups.

3.2.3.1 Hypothesis for Objective 3

H11 $_0$: There are no significant differences in the source of initial funding based on gender composition of founding team.
H11 $_1$: There are significant differences in the source of initial funding based on gender composition of founding team.

H12 $_0$: There are no significant differences in the source of initial funding based on Education level of the startup founders.
H12 $_1$: There are significant differences in source of initial funding based on Education level of the startup founders.

H13 $_0$: There are no significant differences in source of initial funding based on industry-specific work/ startup experience of the startup founders.
H13 $_1$: There are significant differences in source of initial funding based on industry-specific work/ startup experience of the startup founders.

H14 $_0$: There are no significant differences in the source of initial funding based on growth intention of startup founders.
H14 $_1$: There are significant differences in the source of initial funding based on growth intention of startup founders.

H15 $_0$: There are no significant differences in source of initial funding based on the type of technology adoption.
H15 $_1$: There are significant differences in source of initial funding based on the type of technology adoption.

H16 $_0$: There are no significant differences in the source of initial funding based on the physical capital held by the startup.
H16 $_1$: There are significant differences in the source of initial funding based on physical capital held by the startup.

H17 $_0$: There are no significant differences in the source of initial funding based on the age group of founders.
H17 $_1$: There are significant differences in the source of initial funding based on age group of founders.

3.2.3.2 Variables and Tools for Objective 3

Table 10: Description of Variables and Tools for Objective 3

S.No	Variable	Variable Name	Type of Data	Description
Dependent Variable				
1.	Source of Initial Funding	INI_FUN	Dichotomous	3 F (Friends, Family, Founder) ; Subsidies; Incubators; Private Bank; Public Bank; Private Equity (Business Angels , Venture Capital)
Independent Variables				
1.	Gender Composition of the founding team.	FEMALE	Dichotomous	Dummy for having more than 50% female founders
2.	Education	UNIV	Dichotomous	Dummy for founder having technical master's degree or above
3.	Age of the founder	AGE 20_30 AGE40 AGE50	Dichotomous	Dummy for the founder in 30s. Dummy for the founder in 40s. Dummy for the founder in 50s.
4.	Experience	WRK_EX STP_EX	Dichotomous	Dummy for the founder having prior work experience in the same or related industries. Dummy for the founder having prior startup experience.
5.	Growth Orientation	IPO_INT	Dichotomous	Dummy for the startup that has an intention to conduct initial public offering in the future.
6.	Type of Technology Adoption	INNOV	Dichotomous	Dummy for the startup that has novelty characteristics in terms of products or service.

7.	Physical capital (Real Estate)	BUY_EST NO_EST	Dichotomous	Dummy for the startup that bought land or building (real estate) when starting the business. Dummy for the firm that did not require land or building (real estate) when starting the business
Research Tool: Multivariate Probit Model				

3.2.4 Objective 4

To evaluate the challenges faced by tech startups.

3.2.4.1 Variables and Tools for Objective 4

Table 5: Description of statements used to evaluate challenges

Poor cash flow Management
Difficult to convince the investor
Difficult to secure Initial Funding
Lack of sufficient financial knowledge
Market study inadequate/ Unable to assess market potential
Technology is not flexible to adapt to new changes
Difficult to decide the right price of the product/service.
Lack of brand awareness/ brand trust
Difficult to acquire and retain Customers
Lack of access to professional networks
Difficult to attain product market fit.
Issues in Social media selection and development of marketing strategy
Lack of access to incubators, science and technology parks, business development center, etc.

High cost of office space and facilities.
Competing for skilled talent
Difficult to recruit/ retain employees
Compensationissues
Roles and Responsibility not defined
Conflict between founders
Conflict between investors and founders
Conflict between employees and founders
Difficult to ensure cyber security
Corruption/ Bureaucratic inefficiencies
The regulatory environment is complex
Economic and Political Instability
Forex variance impacting input cost/output realization
Competition is very high

Research Tool: Principal Component Analysis

3.3 Research Design

This thesis aims to examine the opportunities and challenges of Tech Startups in terms of factors impacting financial performance, export propensity, export intensity, choice of source of finance and problems faced by them. This study is empirical in nature, with appropriate strategies employed to collect relevant data to meet the research objectives. The researcher reviewed existing literature to gain insights into the research question. Given the limited information available on tech startups, a pre-test was conducted through interviews with startup founders to obtain a deeper understanding of the issue. The insights gained from the literature and interviews were then used to design an initial questionnaire for a pilot study. The pilot study, conducted with 31 startup founders, assessed the feasibility of the questionnaire. The results from this pilot study informed the development of the final questionnaire. Ultimately, the data was collected from founders of tech startups located in the Delhi-NCR region.

3.3.1 Period of Study

The data collection for this study was spread over one year i.e. from November 2022 to October 2023. The interviews were conducted during the first month of data collection and the questionnaire was formed accordingly. On the basis of pilot study, relevant changes were incorporated in questionnaire and questionnaire was finalized.

3.3.2 Population

The study is based out of Delhi- NCR. As there is no solitary repository or database of technology-based startups, the population for this study is considered to be unknown.

3.4 Sampling Design

The initial step in sampling design is to define the target population from which the sample is to be drawn. To decide the number of responses to be collected for the survey, the following steps are followed:

3.4.1 Sampling Method

As there is a lack of a centralized repository or database containing information on technologybased startups within the selected study areas, technology-based startups were contacted on the basis of data from various credible sources like Department of Science and Technology, National Science and Technology Entrepreneurship Development Board, National Association for Software and Services Companies (NASSCOM), Start-up India website. A list of 1683 startups was created after eliminating the repeated entries. All the startups were contacted in several rounds to get research data.

3.4.2 Sample Size

Sample Size = Z^2 x pq / e^2

e is the desired level of precision (i.e. the margin of error). p is the (estimated) proportion of the population which has the attribute in question, q is 1-p.

The z value found in Z table is 1.96.

At 95% confidence level, 0.5 standard deviation and margin of error +/- 5%

Sample Size = $(1.96)^2$ x 0.5(0.5)/ $(0.05)^2$

= 3.8416 x 0.25 / 0.0025

= 0.9604/ 0.0025

= 384.16

= 384

3.4.3 Data Collection

Startups were contacted through data from Department of Science and Technology, Startup India and NASSCOM Websites. List of 1683 startups created after eliminating the repeated entries. A total of 1683 startup founders were contacted through email/ LinkedIn. The questionnaires were shared in several rounds. Initially, questionnaires were sent to 220 startup founders in first round out of which only 32 responses were received. In the second round the questionnaire was shared with 500 more startup founders which led to responses from 108 founders. In the third round, the questionnaire was shared with rest of the startups and 150 responses were received. In the fourth and fifth rounds, the reminder mails were sent to the startup founders. This further led to the responses from 130 founders.

3.5 Model Specification

3.5.1 Objective 1

In order to analyse the factors that impact performance of tech startups, OLS regression model has been used. Multiple regression analysis is a statistical technique used to understand the relationship between one dependent variable and two or more independent variables. This method helps in predicting the value of the dependent variable based on the values of the independent variables.
The general form of a multiple regression model is:

$$Y=\beta 0+\beta 1X1+\beta 2X2+\cdots+\beta kXk+\epsilon$$

where:

Y	is the dependent variable.
$\beta 0$	is the intercept.
$\beta 1, \beta 2\ldots,\beta k$	are the coefficients of the independent variables.
$X1, X2\ldots,X\ k$	are the independent variables.
ϵ	is the error term.

Multiple linear regression relies on several key assumptions to ensure the validity and reliability of its results. First, the relationship between the independent variables and the dependent variable must be linear. Second, the residuals (errors) should be normally distributed and have constant variance (homoscedasticity). Third, there should be no perfect multicollinearity among the independent variables, meaning that the predictors should not be too highly correlated with each other. Fourth, the observations should be independent of each other, ensuring that the error terms are not correlated across observations. Additionally, the model assumes that there is no significant measurement error in independent variables. Violation of these assumptions can lead to biased, inefficient, or inconsistent parameter estimates, potentially compromising the interpretability and predictive power of the regression model. The model for the first objective is as stated below:

$$Fin\_perf_i = \beta 0 + \beta 1\ Gen_i + \beta 2\ Start\_exp_i + \beta 3\ \ SSize_i + \beta 4\ SAge_i + \beta 5\ Tech_i + u_i$$

3.5.2 Objective 2

The logistic model, also known as the logit model, is a statistical model used to predict the log-odds of an event as a linear function of one or more independent variables. In regression analysis, logistic regression (or logit regression) is the process of estimating the parameters of this logistic model, which corresponds to determining the coefficients in the linear combination.

In binary logistic regression, the dependent variable is binary, represented by an indicator variable with values "0" and "1". The independent variables can be either binary (coded as indicator

variables for two classes) or continuous (real-valued variables). The model estimates the probability of the dependent variable being labeled as "1", which can range between 0 (certainly "0") and 1 (certainly "1"). This conversion from log-odds to probability is achieved through the logistic function, which gives the model its name. The log-odds scale is measured in logits, or logistic units, giving rise to the alternative term "logit regression."

$$P_i = E(Y = 1 \mid xi) = \frac{1}{1+e^{-(\alpha+\sum\beta_i X_i)}}$$

The parameters of logistic regression are typically estimated using maximum-likelihood estimation (MLE). Unlike linear regression, which has a closed-form solution through ordinary least squares (OLS), MLE for logistic regression does not provide a closed-form expression and requires iterative methods to compute the estimates. Logistic regression, using MLE, serves a fundamental role in modeling binary or categorical responses, much like linear regression with ordinary least squares (OLS) does for scalar responses. It is considered a simple, well-established baseline model for such types of analysis.

The determinants of export engagement are examined using two models. The two empirical equations are presented below in this section. In equation (1), Export Propensity is the dependent variable. It is a binary response variable measured as 1 if the startup exports and 0, otherwise. This equation is estimated using the Logit model. In equation (2), Export Intensity is the dependent variable. It is a ratio variable which is measured as a proportion of revenue coming from exports. This model is estimated using OLS Regression. The equations are presented as below:

$$EXP\ i = \alpha + \beta 1 + \beta 2\ BkE + \beta 3\ TadP + \beta 4\ CoM + \beta 5\ FunD + \beta 6\ GeN + ui \quad \ldots\ldots\ldots(1)$$

$$EXI\ i = \alpha + \beta 1 + \beta 2\ BkE + \beta 3\ TadP + \beta 4\ CoM + \beta 5\ FunD + \beta 6\ GeN + ui \quad \ldots\ldots\ldots(2)$$

3.5.3 Objective 3

In statistics and econometrics, the multivariate probit model is an extension of the probit model designed to estimate multiple correlated binary outcomes simultaneously. This approach allows for the modeling of interdependence between different binary variables, providing a more comprehensive analysis when outcomes are not independent of one another.

The concept of the multivariate probit model was initially proposed by J.R. Ashford and R.R. Sowden. Later, Siddhartha Chib and Edward Greenberg further developed this model by introducing simulation-based inference methods. These methods simplified and generalized the estimation of parameters, making it easier to handle the complexity of multivariate probit models.

For the general case, $\mathbf{y_i} = (y_1, \ldots, y_j),\ (i = 1, \ldots, N)$ where we can take j as choices and i as individuals or observations, the probability of observing choice $\mathbf{y_i}$ is

$$\Pr(\mathbf{y_i}|\mathbf{X_i}\beta, \Sigma) = \int_{A_J} \cdots \int_{A_1} f_N(\mathbf{y}_i^*|\mathbf{X_i}\beta, \Sigma) dy_1^* \ldots dy_J^*$$

$$\Pr(\mathbf{y_i}|\mathbf{X_i}\beta, \Sigma) = \int 1_{y^* \in A} f_N(\mathbf{y}_i^*|\mathbf{X_i}\beta, \Sigma) d\mathbf{y}_i^*$$

Where $A = A_1 \times \cdots \times A_J$ and,

$$A_j = \begin{cases} (-\infty, 0] & y_j = 0 \\ (0, \infty) & y_j = 1 \end{cases}$$

The log-likelihood function in this case would be $\sum_{i=1}^{N} \log \Pr(\mathbf{y_i}|\mathbf{X_i}\beta, \Sigma)$

With respect to the objective, the decision to take initial funding from one source and that of taking initial funding from another source are correlated (both the decisions are binary). In such a scenario, multivariate probit model would be appropriate for jointly predicting the choices on an individual- specific basis.

3.5.4 Objective 4

The challenges faced by tech startups can be effectively evaluated using Principal Component Analysis (PCA), a statistical technique that simplifies complex, high-dimensional datasets while retaining their variation. PCA works by transforming the original variables into a new set of uncorrelated variables called principal components, which are ordered in such a way that the first few components capture most of the variation in the data. The first principal component accounts for the largest possible variance, while each subsequent component captures the maximum variance possible, constrained by orthogonality to the previous components.

The process of PCA involves several key steps. First, the data is standardized to ensure that each variable contributes equally to the analysis, particularly when variables are measured on different scales. Then, the covariance matrix is computed to examine how the variables in the dataset vary with respect to each other. Next, the eigenvalues and eigenvectors of the covariance matrix are calculated. The eigenvalues represent the amount of variance each principal component explains, while the eigenvectors indicate the direction of these components in the data space. Finally, based on the eigenvalues, the principal components are selected, and the data is transformed into this new component space. By reducing the dimensionality of the data, PCA makes it easier to identify and interpret the key factors contributing to the challenges faced by tech startups, allowing for a more manageable and insightful analysis of complex data. The main applications of PCA include dimensionality

reduction, data visualization, noise reduction, and feature extraction. By reducing the number of dimensions, PCA helps to simplify models, making them easier to interpret and reducing computational costs. It is widely used in fields such as finance for risk management, in image compression, and in genomics for identifying patterns in genetic data. Overall, PCA is a powerful tool for uncovering the underlying structure in data and facilitating more effective data analysis.

3.6 Profile of the Respondents

The table 12 below depicts the profile of the respondents in terms of frequency and percentage based on primary survey conducted by the researchers.

Table 12: Profile of the respondents

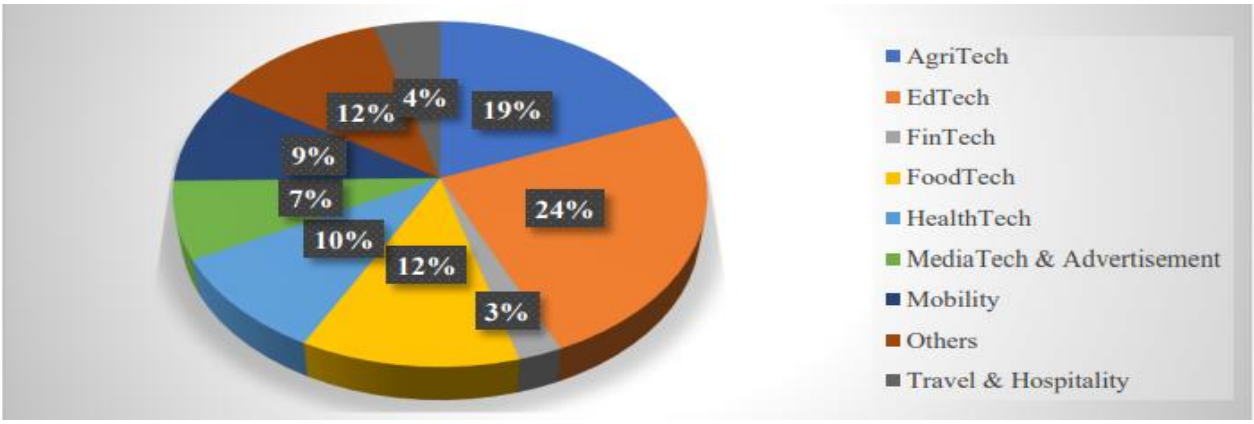
Variable	**Frequency**	**Percentage**
Startups with no female founder	242	63
Startups with atleast one female founder	143	37
Startups that have innovated technology	231	60
Startups that have purchased technology	154	40
No prior Managerial Experience	141	36.6
1-5 years of Managerial Experience	113	29.3
No prior Startup Experience	194	50.3
1-5 Years of Startup Experience	235	61
Less than 10 employees in the startup	178	46.2
Revenue upto Rs. 25 lakh	105	27.2
Revenue between Rs. 25 lakhs to 50 lakhs	132	34.2
Revenue above Rs. 50 lakhs	148	38.4

Source: Primary Survey

Figure 7 below represents the Industry Vertical Served by the startups. EdTech dominates with 24%, reflecting a significant focus on education technology solutions among startups. This could

indicate a growing demand for innovation in education, especially post-pandemic. HealthTech, with 19%, emerges as another key area, likely driven by increased investments in health solutions and digital healthcare platforms. FoodTech and Others, each accounting for 12%, demonstrate moderate startup activity in food innovation and other diverse sectors. Similarly, MediaTech & Advertisement (10%) and Mobility (9%) show a steady presence, indicating startup engagement in digital media, advertising, and transportation solutions. AgriTech (7%) reflects a focus on technology-driven agricultural solutions, addressing rural and sustainability challenges. Meanwhile, Travel & Hospitality (4%) and FinTech (3%) represent the smallest shares.

Figure 7: Industry Vertical Served by Startups



Source: Primary Survey

3.7 Normality and Reliability

Before discussing the Ordinary Least Squares (OLS) regression output and explaining the factors influencing enterprise growth, diagnostic tests for the assumptions of the classical linear regression model were conducted. The first assumption, normality of the residuals, was tested to ensure the validity of single or joint hypothesis tests about the model parameters. The Shapiro-Wilk test was used to assess the normality of the error terms, with the null hypothesis being that the residuals are normally distributed. The result of the test, with a p-value (Prob > z) of 0.20039, was statistically insignificant, supporting the null hypothesis that the residuals follow a normal distribution.

Next, a multicollinearity test was performed to verify that the explanatory variables are not highly correlated with one another. Multicollinearity can distort the results of the regression model, so the variance inflation factor (VIF) was calculated. According to Gujarati (2003), variables with a VIF exceeding 10 indicate severe multicollinearity. In this study, the VIF for each explanatory variable was found to be very low (less than 3), suggesting that there is no severe multicollinearity problem in the model.

Another assumption checked was whether the regression model was correctly specified, as incorrect model specification can lead to model specification errors or biases. To test for this, Ramsey's RESET test was applied, which checks for the omission of variables or incorrect

functional form. The null hypothesis for this test is that the model has no omitted variables. The test result was statistically insignificant (p-value of 0.2528), supporting the null hypothesis that the model is correctly specified.
Further, the assumption of constant variance of error terms (homoscedasticity) was tested using the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. The null hypothesis for this test is that the variance of the error terms is constant. The test result was statistically significant (p-value of 0.0005), indicating the presence of heteroscedasticity. Since assuming homoscedasticity when heteroscedasticity is present can lead to biased results, the problem of heteroscedasticity was addressed by using robust standard errors.

Lastly, for Principal Component Analysis (PCA), the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were conducted. The significance level for these tests was 0.000, indicating that the data was appropriate for PCA. Additionally, various diagnostic tests, including the Hosmer-Lemeshow goodness of fit test, were performed to ensure the unbiasedness of the estimated coefficients. These tests collectively ensure the reliability and validity of the regression model and its results.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

This chapter discusses the research analysis of all four objectives. It elaborates upon the results based on analysis of data collected through questionnaire. The tools used for analysis have been discussed under model specification in section 3.5. It includes introduction, findings and discussion sequentially for each of them.

4.1 Objective 1

4.1.1 Introduction

Tech startups, act as global innovators and aim to transform their ideas into groundbreaking products and services, contributing significantly to economic and technological advancement. While developments in technology-based entrepreneurship present promising opportunities at a macro-level, it's crucial to acknowledge the high failure rate among such startups. Many technology-based ventures fail to sustain beyond the initial years of operation (Certo, 2003). Sustaining high performance levels is essential to startups' survival and success. Some common characteristics of technology startups include their technological foundation, independent character (i.e., ownership primarily by the founder or founders), novelty (i.e., the technology used, and the product or final service provided), size (usually medium or small), and pursuit of a scalable and replicable business model (Ethan et. al, 2021). These digital firms also aim to raise capital to show that they can transition from the conceptualization stage to the commercialization stage (Mary et.al, 2019). Understanding the factors impacting performance of tech startups is crucial for informed decision-making, resource optimization, competitive advantage, risk management, innovation, and investor confidence. Additionally, understanding these factors assists investors in making better investment choices, thereby channeling resources into the most promising ventures. Ultimately, this knowledge contributes to the overall economic development by promoting the sustainability and scalability of tech startups, which are vital engines of technological advancement and job creation.

The objective aims to analyze the factors impacting financial performance of startups, where the dependent variable is financial performance of the startup. It is measured by annual revenue. The independent variables include gender composition of the founding team, the prior experience of the startup’s founders, the size of the startup, the age of the startup, and the type of adoption i.e. whether innovated or purchased technology. It explores how these factors influence the financial success of startups. By understanding the impact of gender, experience, size, age, and type of technology adoption, this model seeks to provide insights into the key drivers of startup performance and how these variables contribute to long-term sustainability and growth. The objective is to identify and quantify the factors that most significantly affect the financial outcomes of startups, enabling entrepreneurs and policymakers to make informed decisions that foster business success.

4.1.2 Results and Findings

Table 13: Estimates of attaining revenue

Variables	Coefficient	Robust St. Err.	T	Sig. level	Confidence Interval	
					Lower	Upper
Gen	0.1878082***	0.0365764	5.13	0.002	0.1158813	0.259735
SSize	0.1365386	0.0386175	3.54	0.304	0.2124793	0.060598
SAge	0.1318955***	0.0361807	3.65	0.000	0.0607467	0.2030442
Start_Exp	0.1685265**	0.0490086	3.44	0.041	0.0721519	0.2649012
Tech	0.3752453*	0.0406874	9.22	0.091	0.2952342	0.4552564
Cons	2.233827	0.0608458	36.71	0.000	2.114175	2.35348

Number of Observations = 385
R Square= 0.6893

*** 1 %, ** 5 %, *10% significance

Source: Data Estimation based on primary survey

Table 13 above presents the results of a regression analysis with various factors that are hypothesized to influence the financial performance of startups. The coefficient for gender (Gen) is positive and statistically significant at the 1% level. This suggests that startups with a majority of female founders experience a positive impact on financial performance. Specifically, the financial performance increases by approximately 18.78% when female founders dominate. The confidence interval further supports this finding, as it does not cross zero. This confirms that gender diversity in leadership has a positive influence on revenue. The positive coefficient for startup age (SAge) suggests that older startups generate higher revenues. Specifically, for each additional year of age, the startup's revenue increases by 13.19%. This result is highly statistically significant at the 1% level, and the confidence interval indicates a robust relationship, confirming that startup age positively influences financial performance. Startup experience (Start_Exp) is positively associated with financial performance. The coefficient of 0.1685 suggests that each unit increase in startup experience leads to a 16.85% increase in revenue. This result is statistically significant at the 5% level, and the confidence interval supports the positive relationship, reinforcing that experienced founders tend to drive better financial outcomes. The positive coefficient for technology innovation (Tech) suggests that startups which innovate technology experience higher revenue growth. A 37.52% increase in revenue is associated with startups that develop their own technology rather than purchasing it. While this result is statistically significant at the 10% level, the confidence interval supports the finding that technological innovation contributes to improved financial performance. Although the coefficient for startup size (SSize) is positive, the significance level of 0.304 indicates that it is not statistically significant at the 10% level or lower. This means that the size of the startup does not have a meaningful impact on financial performance in this model. The confidence interval also suggests the possibility of a weak effect or no effect at all, as it includes values close to zero.

4.1.3 Discussion

The results of this analysis highlight several important factors that influence the financial performance of tech startups. One of the most striking findings is the positive relationship between the age of a startup and its revenue. As startups mature and gain experience over time, their ability to understand market dynamics and customer needs improves. This maturation process allows the founders to refine their business models, validate their products or technologies, and ultimately scale their operations more effectively. Over time, as these elements come together, startups can leverage their accumulated knowledge to drive increased revenue. This finding aligns with Marvel et al. (2020), who suggest that longer startup survival and maturation contribute to better business performance as founders gain insights that allow them to improve their strategies.

Gender also plays a significant role in shaping financial performance. Startups with a majority of female founders experience higher revenue, which suggests that gender diversity may contribute to improved decision-making and team performance. The results align with existing literature suggesting that gender-diverse teams bring different perspectives, which can enhance problem-solving, creativity, and ultimately, business success. Smith and Zhang (2023) note that gender-diverse teams tend to perform better financially, highlighting the advantages of diverse leadership in fostering innovation and efficient team dynamics. This is a noteworthy finding, as it challenges the conventional gender biases in entrepreneurship and highlights the potential advantages of gender diversity in leadership.

Prior startup experience is another critical factor linked to financial performance. Founders with previous experience in starting businesses appear to have an advantage when it comes to driving revenue. Their past exposure to the challenges of running a startup enables them to better navigate the complex landscape of innovation and operations. These experienced founders are often better equipped to identify growth opportunities, foster innovation, and build resilient businesses. This finding echoes Roberts and Chang (2022), who argue that experienced founders are more adept at fostering innovation, which directly correlates with improved financial performance. Their expertise equips them to overcome common obstacles and leverage growth opportunities, leading to better financial outcomes.

The impact of technology innovation on financial performance is particularly significant. Startups that innovate their technology, rather than simply purchasing it, tend to outperform their competitors in terms of revenue. Innovating technology allows startups to differentiate themselves in the market, offering unique products or services that can generate higher demand. It also positions the startup as a more attractive investment opportunity, as investors are often keen to back businesses that demonstrate technological leadership and innovation. This finding aligns with the work of Davis (2021), who emphasizes that technology innovation can drive growth by providing a competitive edge and enabling differentiation in the marketplace.

Interestingly, the size of the startup did not show a statistically significant relationship with financial performance. This contrasts with some earlier studies, which suggest that larger startups tend to have better financial outcomes due to economies of scale, increased resources, and greater market reach (Lewis, 2019). However, the results here may be attributed to the specific nature of tech startups, where agility, innovation, and adaptability are often more important than sheer size. In this context, smaller or mid-sized startups may be able to compete effectively by leveraging

their flexibility, niche focus, and rapid response to market needs, even without the scale advantages that larger companies might enjoy.

Overall, these findings provide valuable insights into the key factors that drive the financial success of tech startups. They underscore the importance of experience, gender diversity, innovation, and the maturation process in shaping a startup's revenue potential. These insights can inform entrepreneurs, investors, and policymakers looking to foster a thriving startup ecosystem.

4.2 Objective 2

4.2.1 Introduction

The rise of technology- based startups has led to a complete transformation of global commerce with innovation coming up as the key driver of growth in the competitive international markets. Tech- startups are rapidly venturing beyond the domestic boundaries to tap global opportunities and export engagement has emerged as the critical growth strategy (Monaghan et al., 2020). Export engagement is defined as the strategic entry and expansion into the international markets. It is considered crucial for startups that are seeking growth, sustainability and long-term success (Zahra et al., 2020; Autio et al., 2017).

Unlike the traditional businesses, tech- startups are often considered as 'born global' emphasizing that they participate in international market from incorporation or in very early stages of their lifecycle (Hennart et al.,2021). Advancement in technology plays a critical role by reducing barriers in entering foreign markets and allowing startups to expand at a faster pace internationally (Gabrielsson et al., 2008). Moreover, the use of scalable technologies, digital nature of their products and services such as cloud computing and e-commerce platforms, enable tech startups to expand in the international market without the requirement of extensive physical infrastructure. There are significant advantages associated with engaging in exports such as access to broader markets, increased revenue opportunities and diversification of risk. However, the path to successful engagement in international markets comes up with several challenges as well like barriers to market entry, regulatory issues, financial constraints, and difficulty in understanding the market. The presence of export-oriented tech startups contributes significantly to economic growth, suggesting that their international activities enhance competition and innovation within the economy (Hessels et al.,2007). Despite the opportunities in one of the leading tech hubs like Delhi, all the tech startups don't engage in exports due to varied reasons. It is important to have a comprehensive understanding of the determinants of export engagement by tech startups, which can offer valuable insights for the policy makers to enhance global expansion.

This objective aims to analyze the factors impacting export propensity and export intensity of tech- startups. There are two dependent variables. The first one is taken as the export propensity i.e. likelihood of exporting and the second as Export Intensity measured by the proportion of revenue coming from exports. Four out of the five independent variables are binary in nature i.e. breakeven status, type of technology adoption, funding, gender. One of the other independent variables, namely commercial ability is ordinal in nature and is measured on an ordinal scale. Commercial ability is measured through three aspects, i.e. skills in influencing people, social networking and commercializing.

4.2.2 Results and Findings

To understand the determinants of export intensity and export propensity by tech- startups, the results from Logit Regression and OLS regression are represented in the two tables below. Table 9 illustrates the determinants of export propensity i.e. likelihood of the startup to engage in export and Table 10 illustrates the determinants of export intensity i.e. the proportion of revenue coming from exports. In the first model, analysis is conducted for data of 385 tech- startups. In the second model, the analysis is only conducted for those tech- startup firms that engage in exports. Thus, the analysis has been conducted for a data of 142 tech- startups.

Table 14: Determinants of Export Propensity

Variables	Coefficients	Std. Error	Marginal Effect
GeN	- 0.053***	0.012	-0.007
TadP	0.552**	0.226	0.078
FunD	0.444	0.499	0.066
CoM	1.164*	0.637	0.150
BkE	0.636**	0.275	0.094
Constant	-1.159	0.931	
Number of Observations	385		
Pseudo R^2	0.619		
Log- likelihood	-175.87 **		

*, **, *** indicate significant at 10%, 5% and 1%.

Source: Data estimation based on primary survey

Table 14 above presents the results from a Logit regression analyzing the determinants of export propensity. The dependent variable here is export propensity, while the independent variables include gender (Gen), technology adoption (TadP), funding (FunD), commercial ability (CoM), and breakeven status (BkE).

The coefficients represent the effect of each variable on the likelihood of export engagement (or export propensity), controlling other factors. A positive coefficient indicates that an increase in the variable increases the likelihood of export engagement, while a negative coefficient suggests the opposite. The model has a Pseudo R^2 of 0.619, indicating a reasonably good fit, and the log-likelihood is -175.87, with significance at a high level. Among the variables of interest in this study, gender is the only variable which negatively affects the likelihood of exporting by tech startups in the study area (at 1 % level of significance). Estimates of the marginal effect indicate that the probability of exporting reduces by 0.7% for startups having majority of female founders. A positive coefficient (0.552) for technology adoption indicates that adopting new or innovative technology increases the likelihood of export engagement. The marginal effect (0.078) quantifies this impact. The study estimated that the probability of exporting for those startups which are using innovated technology rather than purchased technology is more by 7.8%. The startups that

innovate have a competitive edge in the international market. Moreover, the probability of exporting is higher by15% for the startups with stronger commercial ability. Although the coefficient for funding is positive (0.444), it is not statistically significant, implying that funding may not have a strong impact on export propensity in this sample. The coefficient for commercial ability (1.164) is positive and statistically significant, suggesting that startups with stronger commercial abilities are more likely to engage in export activities. The marginal effect is high (0.150), indicating a considerable impact. The probability of exporting is higher by 15% for the startups with stronger commercial ability. A positive coefficient for breakeven status (0.636) suggests that startups that have reached breakeven are more likely to engage in international markets. The marginal effect (0.094) confirms the importance of financial sustainability for export propensity. Startups that have reached breakeven are more likely to engage in international markets. The marginal effect (0.094) confirms the importance of financial sustainability for export propensity.

Table 15: Determinants of export intensity

Variable	Coefficient	Standard Err.	P value
Gen	0.2432	0.2385	0.3101
TadP	13.5941**	5.5792	0.0165
CoM	17.4846**	7.4815	0.0213
BkE	5.1876**	7.8389	0.0495
Constant	24.9423	17.4849	0.1737
Number of Observations: 142			
R Square: 0.6853			

*, **, *** indicate significant at 10%, 5% and 1%.

Source: Data estimation based on primary survey

Table 15 above presents the results from an Ordinary Least Squares (OLS) regression analyzing the determinants of export intensity (the proportion of a startup's revenue that comes from exports). The dependent variable here is likely export intensity, while the independent variables include gender (Gen), technology adoption (TadP), commercial ability (CoM), and breakeven status (BkE).

R^2 value of 0.6853 indicates that about 68.5% of the variation in export intensity is explained by the independent variables in the model. This is a strong R^2, suggesting that the model has a good fit and that the included variables explain much of the variance in export intensity among tech startups. The coefficient for GeN is positive (0.2432) but not statistically significant ($p = 0.3101$), indicating that gender does not have a meaningful impact on export intensity in this model.

In other words, the proportion of revenue from exports is not significantly influenced by the gender composition of ownership. The coefficient for technology adoption is large and statistically significant (13.5941, $p = 0.0165$), suggesting that startups which innovate their own technology tend to have a significantly higher export intensity compared to those adopting external technology. The magnitude indicates that technology adoption plays a critical role in

boosting export revenue. The coefficient for commercial ability is positive and statistically significant (17.4846, $p = 0.0213$); it highlights the importance of commercial ability in increasing the proportion of revenue derived from exports. Moreover, it suggests that startups with strong commercialization strategies can more effectively translate their offerings of product or service into export revenue. The coefficient for breakeven status is positive (5.1876) and statistically significant ($p = 0.0495$). This implies that startups that have reached financial breakeven have higher export intensity, emphasizing the importance of financial stability in maximizing export revenue.

As the firms with female ownership are found to have a lower likelihood to participate in exports; it reflects upon the stereotypes and perceptions attached to female founders. Female founders often suffer challenges in the form of perceived lack of trust and respect by peer business owners and not being taken seriously by customers which restraints the women from participating in international markets. Gender-specific care roles and responsibilities also lead to severe challenges for women which results in limited efforts for firm expansion and internationalization by female founders.

4.2.3 Discussion

The findings provide a nuanced understanding of the various determinants influencing export propensity and intensity among tech startups. Gender emerged as a critical variable in the analysis, revealing a negative association between the presence of female founders and the likelihood of exporting. This outcome highlights the persisting stereotypes and biases that continue to hinder female entrepreneurial participation in international markets. The findings align with studies such as Grondin (2010), Schaefer (2005), and Ackah et al. (2020), which similarly report adverse effects of female ownership on a firm's export engagement. These studies collectively underscore the challenges faced by women-led enterprises, particularly in navigating perceptions and barriers that limit their participation in global trade.

Interestingly, while gender influences export propensity, its impact diminishes when evaluating export intensity. Once women-led startups enter the export market, the volume of exports remains unaffected by the gender of the founder. This finding suggests that while female founders face initial barriers to market entry, their performance in the international market is comparable to male-led startups once these barriers are overcome. This result challenges earlier assertions made by studies like Shepherd and Stone (2017), Reavley et al. (2005), and Baur (2019), which found no significant gender-related constraints on export participation.

In addition to gender dynamics, the role of innovation emerged as a strong determinant of export propensity. Startups that develop their own innovative technologies, rather than relying on purchased solutions, possess a competitive advantage in international markets. This reinforces the broader understanding that innovation serves as a critical driver of global competitiveness, enabling firms to differentiate their offerings and respond effectively to international demand. The significance of innovation aligns with the findings of Stephan (2023), emphasizing that technological advancements can enhance a startup's ability to access and thrive in export markets.

Another crucial determinant is commercial capability, which positively influences the likelihood of exporting. Startups with robust commercial acumen are better equipped to identify and exploit market opportunities beyond domestic boundaries. This finding underscores the importance of strategic management skills and market awareness in fostering export participation, particularly in competitive global environments.

Financial sustainability, represented by a startup's ability to achieve breakeven, further enhances export propensity. Startups that have stabilized their financial operations are better positioned to allocate resources toward international expansion. This finding highlights the interconnection between financial health and a firm's capacity to engage in higher-risk, resource-intensive activities like exporting.

Overall, the results suggest that while gender continues to present challenges for export entry, innovation, commercial ability, and financial sustainability serve as key enablers of international market participation. The absence of gender-related effects on export intensity signals a promising opportunity for women-led enterprises to demonstrate their competitiveness once they overcome entry barriers. Addressing systemic biases and promoting equal opportunities for female founders could further enhance the participation of women-led startups in global trade.

4.3 Objective 3

4.3.1 Introduction

The availability and choice of initial funding play a pivotal role in shaping a startup's trajectory, influencing not only its ability to launch but also its capacity for scaling and innovation. Startups often face unique constraints due to their limited track records and the inherent riskiness of their ventures, which can deter traditional lenders like banks. As a result, external funding sources such as venture capital, angel investments, and government subsidies become crucial lifelines. However, access to these resources is often mediated by the founders' human capital. Founders with higher education levels or technical expertise may be better positioned to articulate their vision and attract sophisticated investors.

Similarly, industry experience and professional networks can open doors to strategic partnerships and funding opportunities that might otherwise remain inaccessible. Additionally, prior entrepreneurial experience can enhance credibility, helping founders navigate the complexities of funding negotiations. Understanding these dynamics not only highlights the importance of human capital in shaping funding outcomes but also underscores the need for supportive ecosystems. Policymakers and private entities can play a critical role by fostering mentorship programs, facilitating access to investors, and offering targeted grants to bridge funding gaps for startups with high growth potential. This interplay between funding sources and human capital ultimately determines how startups contribute to economic growth, job creation, and technological progress. This objective explores the sources of initial funding and examines how founders’ human capital influences their funding choices.

4.3.2 Results and Findings

Table 16: Determinants of Initial Funding Sources

Variable	3 F	Subsidies	Incubators	Public Banks	Private Banks	Private Equity
AGE20_30	0.172	0.565***	0.330**	0.813***	0.699***	0.634**
	(0.148)	(0.133)	(0.140)	(0.133)	(0.114)	(0.159)
AGE40	–0.155	0.347***	0.304**	0.619***	0.493***	0.109
	(0.132)	(0.134)	(0.131)	(0.131)	(0.112)	(0.164)
AGE50	–0.146	0.069	–0.015	0.434***	0.364***	–0.057
	(0.130)	(0.143)	(0.139)	(0.133)	(0.115)	(0.182)
FEMALE	–0.071	0.176	–0.007	0.082	–0.076	0.0002
	(0.142)	(0.121)	(0.148)	(0.103)	(0.105)	(0.159)
UNIV	–0.196**	0.084	0.252***	–0.082	–0.131**	0.162
	(0.093)	(0.084)	(0.092)	(0.069)	(0.067)	(0.111)
WRK_EX	0.156	0.019	0.039	0.145*	0.206***	–0.049
	(0.097)	(0.096)	(0.104)	(0.081)	(0.076)	(0.113)
MNG_EX	–0.308***	0.172*	0.474***	0.058	0.094	0.711**
IPO_INT	0.026	0.255**	0.328***	0.266***	0.054	0.611**
	(0.136)	(0.109)	(0.126)	(0.095)	(0.094)	(0.125)
INNOV	0.197**	0.289***	0.090	0.103	0.095	0.254**
	(0.097)	(0.090)	(0.098)	(0.077)	(0.074)	(0.113)
BUY_EST	–0.335*	0.347**	–0.007	0.341**	0.639***	0.471**
	(0.173)	(0.147)	(0.172)	(0.135)	(0.129)	(0.190)
NO_EST	–0.196	–0.706***	–0.340**	–0.584***	–0.511***	–0.195
	(0.123)	(0.142)	(0.146)	(0.111)	(0.101)	(0.152)

Source: Data estimation based on primary survey

Education has a statistically significant negative effect on the use of 3 F (family, friends, and fools), suggesting that educated founders are more likely to raise funds from external sources rather than relying on internal funds. However, education has a positive and significant effect on the use of Incubators (c), but it does not significantly affect the use of Subsidies (b), Public banks (d), or Private equity (f). Additionally, education has a negative effect on the use of borrowing from Private banks (e), indicating that educated founders tend to avoid relying on loans from private banks.

Industry-related work experience has a positive and statistically significant effect on the use of Public banks (d) and Private banks (e), suggesting that such experience is beneficial for securing bank loans. In contrast, prior management experience shows a different pattern. Startup experience has a positive and statistically significant effect on the use of Subsidies (b), Incubators (c), and Private equity (f), but is statistically insignificant for Public banks (d) and Private banks (e). Interestingly, startup experience also has a negative and statistically significant effect on the use of 3 F (a), suggesting that founders with startup experience do not primarily rely on personal funds but instead seek external funding sources such as subsidies, incubators, and private equity. Growth orientation has a positive and statistically significant effect on the use of Private equity (f), indicating that private equity investors are more likely to fund startups with a strong growth orientation, expecting substantial returns through an eventual IPO. Additionally, the variable for growth IPO intention positively and significantly affects the use of Subsidies (b), Incubators (c),

and Public banks (d), suggesting that these funding sources play a critical role in supporting growth-oriented businesses. Innovativeness also has a positive and significant effect on the use of 3 F (a) and Subsidies (b). Since innovative startups are typically high-risk ventures, they tend to rely on funding sources that do not require repayment, such as subsidies and funds from family and friends. Furthermore, the presence of real estate (as collateral) positively and significantly influences the use of Public banks (d) and Private banks (e). Conversely, the absence of real estate negatively affects the likelihood of using these bank loans, supporting the idea that the availability of collateral is crucial for securing bank financing.

Regarding founder age, three age dummies were not associated with the use of 3 F. Founders in their 20s and 30s are more likely to use alternative funding sources compared to older founders in their 60s or above. Founders in their 40s are more inclined to use Subsidies (b), Incubators (c), Public banks (d), and Private banks (e), while those in their 50s tend to rely more on Public banks (d) and Private banks (e). Founders in their 60s are less likely to expect loans from public and private banks. Lastly, the analysis found that gender does not have any statistically significant effect on the use of the six sources of initial funding. This suggests that funding providers do not discriminate based on the gender of the founders.

4.3.3 Discussion

The findings of this study provide important insights into how founder characteristics influence the choice of initial funding sources for startups. Education has a mixed impact, as it reduces reliance on personal funding sources such as *3 F* (friends, family, and founders' funds) but encourages the use of incubators, reflecting a preference for structured external funding among educated founders. However, education does not significantly affect access to subsidies, public banks, or private equity. Industry-related work experience positively influences borrowing from public and private banks, highlighting its role in enhancing credibility with traditional lenders. In contrast, founders with startup experience avoid relying on *3 F* and instead secure funding from subsidies, incubators, and private equity, suggesting they are more growth-focused and skilled in leveraging professional funding channels.

Growth orientation further drives access to private equity, as these investors prioritize scalable startups with high return potential, particularly through IPOs. Additionally, growth IPO intention positively influences access to subsidies, incubators, and public banks, emphasizing the role of these funding sources in supporting scalable business models. Innovativeness, on the other hand, leads to increased reliance on *3 F* and subsidies, indicating that high-risk startups often depend on funds with fewer repayment obligations. Collateral availability also plays a critical role, as founders with real estate are more likely to secure loans from public and private banks, reinforcing the importance of assets in debt financing. Age influences funding preferences, with younger founders favoring non-traditional sources, while founders in their 40s and 50s show greater reliance on public and private banks.

Notably, gender has no significant effect on funding decisions, suggesting that providers do not discriminate based on gender when offering financial support. Overall, these findings highlight the interplay between founder characteristics and funding choices, offering valuable implications for both entrepreneurs and policymakers.

4.4 Objective 4

4.4.1 Introduction

Research on the challenges faced by tech startups is a critical area of inquiry that holds significant value for entrepreneurs, policymakers, investors, and the broader economy. Tech startups, often at the forefront of innovation, face unique and multifaceted obstacles that can hinder their growth, sustainability, and impact. A deeper understanding of these challenges enables stakeholders to identify common barriers such as funding constraints, regulatory complexities, difficulties in talent acquisition, and intense market competition. For example, many startups struggle to secure the financial resources necessary for scaling their operations, often due to limited access to venture capital or an over-reliance on personal or informal funding sources. Similarly, navigating regulatory frameworks can be daunting, especially in industries with complex compliance requirements such as fintech, health tech, or artificial intelligence. Talent acquisition is another significant hurdle, as startups often compete with well-established companies for skilled professionals, while simultaneously managing tight budgets and resource limitations. Moreover, market competition can be fierce, with startups needing to differentiate themselves in saturated markets or create entirely new demand in emerging sectors. The findings from this objective would not only contribute to the survival and success of individual startups but also enhances the overall health and dynamism of the entrepreneurial landscape, driving economic growth and technological advancement.

4.4.2 Results and Findings

The accuracy of the measurement elements or indicators included in the study was assessed using a reliability and validity analysis to measure the constraints.

4.4.2.1 Reliability analysis

In the present study, the reliability of the questionnaire was measured using the Cronbach alpha method to confirm the reproducibility of the study, i.e. to check whether a certain number of tests gave the same result. In other words, Cronbach's alpha value represents the durability and continuity of a material, which is achieved in the absence of all types of bias. The current study examined the inter-item reliability of the questionnaire, which demonstrated the level of consistency in the models displayed by the study participants' responses to the study items (Trochim, 2006). The Cronbach's alpha coefficient is the reliability coefficient used in the study to test the reliability of the scales measuring the study constructs. The alpha values can range between 0 and 1, and scales with values above 0.6 are considered as reliable. Table 3.3 shows the Cronbach's alpha values obtained for the study constructs. It can be observed that the alpha values are greater than 0.6 and in many cases are greater than 0.8. Values which are closer to 1 indicate that the items in the scale measuring the construct are highly reliable and measure the same construct.

4.4.2.2 Factor analysis

Because of the extensive number of dependent variables (27 challenges faced by startups) involved in this study, there was the likelihood that some of the variables would lead to the same or similar underlying effects; hence, it was essential to embrace a data reduction technique, namely factor analysis, to refine and reduce these items to form a smaller number of coherent

subscales (Pallant 2010). Factor analysis is used to identify a small number of factor groupings that can be used to represent sets of many interrelated variables (Norusis 1992).

To examine the underlying structure between the 27 challenges identified in this study, the survey response was subjected to this technique. Regarding the appropriateness of factor analysis for this study, Hair et al. (1998) suggested that factor analysis is suitable for 20–50 variables, as the extraction of common factors becomes inaccurate if the studies conducted by number of variables exceeds this range. Suitably for this study, there were 27 challenges.

Similarly, the prior requirements for conducting appropriate statistical tests, such as the correlation matrix, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, and Bartlett's test of sphericity, were met for this study. These tests indicated that the data is suitable for factor analysis, ensuring that the assumptions underlying this method are satisfied. As a result, it can be concluded that factor analysis is an appropriate technique for this study, and therefore, the analysis can proceed with full confidence in its validity and reliability.

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Table 17 below represents the values from KMO and Bartlett's Test.

Table 17: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.837
Bartlett's Test of Sphericity	Approx. Chi-Square	3166.834
	df	351
	Sig.	.000

Source: Estimation based on primary survey

Table 18 below presents both the initial matrix and the rotated matrix of the factors. The first four columns represent the initial matrix, which displays the factor loadings before rotation, while the last three columns present the rotated matrix, which only includes the eigenvalues greater than 1.00. Eigenvalues less than 1.00 are considered to have minimal influence and are thus excluded in the rotated matrix. This rotation process helps to clarify the structure of the factors by making the factor loadings more interpretable and revealing the most significant factors for the study.

Factor analysis is dependent on the correlation matrix of the variables involved, and the correlations usually require a large size sample before they stabilize (DeCoster 1998). The same technique used for a similar analysis by Hardcastle et al. (2005) with a sample size of 61 respondents, and by Osei-Kyei et al. (2014) with a sample size of 45 respondents, had comparatively low responses, but satisfied all the appropriate statistical tests, was accepted and has been considered worthy (Chan et al. 2010).

From Table 17, KMO value is 0.837, which is larger than 0.5. Bartlett's test has high sampling adequacy, and thus the data collected via the survey questionnaire is suitable for factor analysis (Norusis, 1992). With such a high KMO achieved in this instance, there was no need to produce anti-image matrices to further check the adequacy of the sample size.

Each of the variables is therefore loaded heavily on only one of the principal components while the absolute value of the loadings exceeds 0.50.

Table 18 shows the total variance explained by each component, extracted as follows: Component 1 (9.089%), Component 2 (8.681%), Component 3 (8.608%), Component 4 (8.569%) and Component 5 (8.097%), Component 6 (7.559%), Component 7 (5.072 %) and Component 8 (4.831 %). Thus, the final statistics of the PCA and the components extracted cumulatively explained 60.508% of the variation in the data set and fulfil the cumulative proportion of variance criterion which states that the extracted components should together be at least 50%of the variation; it also satisfies the basic requirement of 60% advocated by Malhotra (1996).

Therefore, eight factor groupings can be used to adequately represent the data. The factor grouping based on varimax rotation was adopted, and this is indicated in Table. Mostly, varimax is used in orthogonal rotation. Varimax has been used by numerous researchers (Li et al. 2005; Osei Kyei et al. 2014).

Varimax was used because it simplifies the interpretation of factors as compared to the other rotation methods; with varimax each variable is associated with one of the factors and each factor represents only a small number of variables, which was interpretable (Osei Kyei et al. 2014). Each of the variables is therefore loaded heavily on only one of the principal components while the absolute value of the loadings exceeds 0.50.

The eight components are interpretable as:

i) Component 1 represents Financial Challenges
ii) Component 2 represents Product Development Challenges
iii) Component 3 represents Market Challenges
iv) Component 4 represents Infrastructure Challenges
v) Component 5 represents Human Resource Challenges
vi) Component 6 represents Organizational Challenges
vii) Component 7 represents Regulatory Challenges
viii) Component 8 represents External Challenges

Table 18: Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.737	24.953	24.953	6.737	24.953	24.953	2.454	9.089	9.089
2	2.043	7.566	32.519	2.043	7.566	32.519	2.344	8.681	17.770
3	1.589	5.886	38.405	1.589	5.886	38.405	2.324	8.608	26.378
4	1.471	5.449	43.854	1.471	5.449	43.854	2.314	8.569	34.948
5	1.323	4.900	48.754	1.323	4.900	48.754	2.186	8.097	43.045
6	1.108	4.105	52.859	1.108	4.105	52.859	2.041	7.559	50.604
7	1.045	3.871	56.730	1.045	3.871	56.730	1.369	5.072	55.676
8	1.020	3.778	60.508	1.020	3.778	60.508	1.304	4.831	60.508
9	.979	3.626	64.134						
10	.906	3.355	67.489						
11	.865	3.203	70.693						
12	.805	2.980	73.673						
13	.736	2.725	76.398						
14	.689	2.552	78.950						
15	.659	2.442	81.392						
16	.586	2.169	83.562						
17	.565	2.091	85.652						
18	.500	1.852	87.504						
19	.491	1.820	89.324						
20	.467	1.729	91.053						
21	.448	1.658	92.710						
22	.388	1.436	94.146						
23	.370	1.372	95.518						
24	.340	1.258	96.777						
25	.334	1.236	98.012						
26	.278	1.029	99.041						
27	.259	.959	100.000						

Extraction Method: Principal Component Analysis.

Table 19: Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
COMPONENT 1: FINANCIAL CHALLENGES								
Poor cash flow Management	0.673							
Difficult to convince the investor	0.628							
Difficult to secure Initial Funding	0.744							
Lack of sufficient financial knowledge	0.657							
COMPONENT 2: PRODUCT DEVELOPMENT CHALLENGES								
Market study inadequate/ Unable to assess market potential		0.602						
Technology is not flexible to adapt to new changes		0.841						
Difficult to decide the right price of the product/service.		0.680						
Lack of brand awareness/ brand trust		0.721						
COMPONENT 3: MARKET CHALLENGES								
Difficult to acquire and retain Customers			0.771					
Lack of access to professional networks			0.624					
Difficult to attain product market fit.			0.731					
Issues in Social media selection and development of marketing strategy			0.754					
COMPONENT 4: INFRASTRUCTURE CHALLENGES								
Lack of access to incubators, science and technology parks, business development center, etc.				0.659				
High cost of office space and facilities.				0.786				
COMPONENT 5: HUMAN RESOURCE CHALLENGES								
Competing for skilled talent					0.761			
Difficult to recruit/ retain employees					0.694			
Compensation issues					0.721			
Roles and Responsibility not defined					0.771			
COMPONENT 6: ORGANIZATIONAL CHALLENGES								
Conflict between founders						0.706		
Conflict between investors and founders						0.648		
Conflict between employees and founders						0.577		
COMPONENT 7: REGULATORY CHALLENGES								
Difficult to ensure cyber security							0.626	
Corruption/ Bureaucratic inefficiencies							0.504	
The regulatory environment is complex							0.800	
COMPONENT 8: EXTERNAL CHALLENGES								
Economic and Political Instability								0.529
Forex variance impacting input cost / output realization								0.638
Competition is very high								0.754

Rotation Method: Varimax and Kaiser Normalization

4.4.3 Discussion

Tech startups often face a multitude of challenges as they strive to grow and succeed in a competitive market. One of the primary hurdles is financial challenges (Component 1), where securing sufficient funding can be difficult, especially in the early stages. Startups may struggle to access venture capital, secure loans, or generate steady revenue, which can hinder their ability to scale and invest in necessary resources. Alongside this, product development challenges (Component 2) are critical. Developing a viable product that meets customer needs while being technically feasible is often a complex, time-consuming process. Tech startups must navigate the balance between innovation and practicality, often facing technical hurdles, lack of skilled personnel, or the pressure to deliver quickly.

Market challenges (Component 3) are another significant obstacle. Startups need to identify and understand their target market, create a strong value proposition, and effectively reach and retain customers. The competition is fierce, and without the resources of larger, established companies, startups may struggle with brand recognition, customer acquisition, and pricing strategies. Infrastructure challenges (Component 4) also play a pivotal role in a startup's growth. The need for robust technology, reliable data systems, and scalable operations is crucial. However, building this infrastructure can be costly and resource-intensive, posing a challenge for startups with limited budgets.

In addition to these, human resource challenges (Component 5) are a major consideration. Startups often face difficulties in attracting and retaining top talent, particularly when competing with larger companies that can offer higher salaries, benefits, and job security. The pressure of wearing multiple hats can also lead to burnout among employees. Organizational challenges (Component 6) stem from the need to create a clear structure, effective communication channels, and a strong company culture. As startups grow, maintaining alignment and efficiency while adapting to new roles and responsibilities can be difficult.

Regulatory challenges (Component 7) also present a barrier, as tech startups must comply with ever-evolving regulations related to data privacy, intellectual property, and other industry-specific laws. Failure to navigate these regulations can lead to fines or legal disputes. Finally, external challenges (Component 8) can include factors beyond the startup's control, such as economic downturns, shifts in consumer behavior, or changes in technology trends. These factors can disrupt business plans, reduce market demand, or introduce new competitors, adding another layer of uncertainty for startups to manage.

Overall, the combination of these financial, product development, market, infrastructure, human resource, organizational, regulatory, and external challenges makes navigating the startup journey complex and demanding.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Background

The growth and success of technology startups, or tech-startups, depend on a complex interaction of various factors. This research aimed to provide a comprehensive analysis of these factors by focusing on four key objectives. First, the study analyzed the impact of both founder-specific and firm-specific factors on the performance of tech-startups. It explored how individual characteristics of founders, such as experience, skills, and network, influence the strategic direction and growth prospects of these ventures. Additionally, the internal firm-specific elements, including innovation capabilities, management structures, and organizational culture, were examined for their role in driving startup performance. Second, the research sought to identify the determinants of export propensity and export intensity in tech-startups. As globalization continues to shape market dynamics, understanding the factors that influence the decision of tech-startups to enter international markets and the extent to which they engage in export activities became crucial. Factors like market demand, regulatory environments, and access to international networks were explored to determine their effect on export behavior. The third objective was to investigate the factors that impact the choice of initial funding sources among tech-startups. Early-stage financing is critical for startups, and the study delved into the influence of various factors such as the founders' background, the startup's business model, and available financial instruments. The research aimed to uncover which funding options, be it venture capital, angel investment, crowdfunding, or bootstrapping—were most aligned with the needs and growth trajectories of tech-startups. Finally, the study evaluated the challenges faced by tech-startups, which are often characterized by high uncertainty and risk. From financial constraints to talent acquisition, market competition, and regulatory hurdles, the research aimed to shed light on the key barriers that startups encounter, especially in the early stages of their development.

5.2 Major Findings of the Objectives

The major findings of the study have been discussed in the following sub sections along with the objectives**.**

5.2.1 Objective 1: To analyze the impact of firm and founder specific factors on financial performance of tech startups.

The findings from the first objective highlight several important factors that affect a startup’s revenue. As a startup gets older, its revenue tends to grow because the founders gain a better understanding of the market, customers, and the best business model. Gender diversity in the founding team also plays a role, with startups led by mostly female founders performing better financially. Additionally, founders with previous experience running startups tend to generate higher revenue, as their experience helps them innovate and make better business decisions. Startups that create their own technology also perform better financially compared to those that buy technology. On the other hand, the size of a startup does not seem to have a significant effect on its revenue, which contrasts with some earlier studies.

5.2.2 Objective 2: To identify the factors impacting export propensity and export intensity of tech- startups.

Second objective provides a comprehensive analysis of the determinants of export engagement by tech startups using two models i.e. Logit Regression and OLS regressions. The results indicate that there are several key factors, such as technology adoption, commercial ability, and breakeven status, that play a crucial role in influencing the export propensity i.e. the likelihood of engaging in export activities and the export intensity i.e. the extent of revenue generation from participation in international markets. In the case of export propensity, technology adoption and commercial ability were found to be the most significant determinants. Startups that adopt innovative technologies and demonstrate strong commercial capabilities were found more likely to engage in international markets. Additionally, reaching financial breakeven positively influences the likelihood of export participation. It further emphasizes the importance of financial stability and the goodwill attained in the market over a period of time. However, the results also highlight the negative impact of gender on export propensity, where startups with majority of female ownership are less likely to participate in international markets. This puts light on the potential biases and structural barriers faced by women entrepreneurs. In the second model, while examining export intensity, technology adoption, commercial ability, and breakeven status were found to be key drivers. Startups that innovate their own technology and possess strong commercial ability tend to generate a higher proportion of revenue from exports. The study also reveals that gender does not significantly impact export intensity, indicating that once a startup engages in international markets, the gender of the owner does not affect the firm's export performance. The negative relationship between female ownership and export propensity puts emphasis on the need for targeted interventions to support female entrepreneurs. In a patriarchal society like India, the first and foremost step should be to promote participation of women in STEM education which would lead to more and more women coming up as tech entrepreneurs. Moreover, governments and industry bodies should try to reduce gender-based barriers by developing programs, such as providing mentorship, networking opportunities, and access to international markets. These efforts can help combat the biases and stereotypes that serve as a challenge for female founders from engaging in exports.

5.2.3 Objective 3: To investigate the determinants of initial funding sources among tech- startups.

Third objective finds that education influences the way founders raise funds for their startups. Educated founders are less likely to rely on their own funds (3 F), as they tend to seek outside sources of financing. Education has a positive impact on the use of incubators but has no significant effect on subsidies, public banks, or private equity. However, educated founders are less likely to borrow from private banks. Industry-related work experience is beneficial for using public and private banks, showing that such experience helps with securing bank loans. On the other hand, founders with prior startup experience tend to avoid using their own funds (3 F) and are more likely to rely on subsidies, incubators, and private equity. Growth orientation also plays a role in funding sources. Startups focused on growth are more likely to attract private equity, as these investors expect high returns, such as through an IPO. Growth-oriented businesses are also more likely to use subsidies and public banks. Innovativeness leads startups to seek non-repayable

funding sources like 3 F and subsidies due to the high risks involved in innovation. The availability of real estate as collateral influences the use of bank loans. Startups with real estate assets are more likely to borrow from public and private banks, while those without real estate tend to avoid this option. Age also affects funding choices, with younger founders more likely to use alternative funding sources, while founders in their 40s and 50s are more likely to use subsidies, incubators, and bank loans. Gender, however, does not have a significant effect on funding sources, suggesting that funding providers do not discriminate based on the founder's gender.

5.2.4 Objective 4: To evaluate the challenges faced by tech startups.

The fourth objective that aimed at analyzing the challenges faced by tech startups underscores the multifaceted obstacles that hinder their growth and sustainability. Key issues such as limited access to capital, complex regulatory environments, difficulty in acquiring and retaining talent, and intense market competition are significant barriers that these startups must navigate. Addressing these challenges requires a concerted effort from multiple stakeholders, including policymakers, investors, and the startups themselves. Policymakers need to create more supportive regulatory frameworks and provide targeted incentives, while investors should consider more flexible funding models to meet the unique needs of tech startups. Additionally, fostering a robust ecosystem that includes mentorship, networking opportunities, and access to resources can significantly alleviate some of these challenges. By understanding and addressing these obstacles, we can create a more conducive environment that not only supports the survival of tech startups but also promotes innovation, economic growth, and technological advancement in the broader economy.

5.3 Suggestions and Recommendations

Based on the findings from the objectives, here are suggestions for regulatory bodies, techpreneurs, and researchers:

5.3.1 For Regulatory Bodies

1. Gender-Inclusive Policies: Regulatory bodies should focus on policies that address gender-based barriers faced by female entrepreneurs. This includes creating mentorship programs, offering networking opportunities, and facilitating access to international markets, especially for female-led startups. Developing gender-neutral policies and incentives will help overcome stereotypes and promote inclusivity.

2. Promote Technology Adoption and Innovation: Encourage startups to adopt and innovate technology by providing incentives, tax breaks, or funding programs for those that develop their own technology rather than just purchasing it. This could help increase their revenue and competitiveness, particularly in the international market.

3. Support for Growth-Oriented Startups: Create special schemes and programs that cater to growth-oriented startups, especially in the tech sector. Providing access to private equity, subsidies, and incubators will enable these startups to scale and contribute to economic growth.

4. Improve Access to Capital: Regulatory bodies should establish financial structures that support startups in accessing alternative funding sources, especially for those without real estate assets.

Creating platforms or funds focused on early-stage ventures, innovation, and high-risk sectors can boost the startup ecosystem.

5. Facilitate Simplified Regulatory Processes: Simplify the regulatory landscape and reduce barriers such as complex compliance requirements and bureaucratic hurdles that can hinder startup growth. Encouraging ease of doing business will make it easier for startups to focus on innovation and growth.

6. Fostering a Robust Entrepreneurial Ecosystem: Create conducive environments for mentorship, talent acquisition, and networking. Support for incubators, accelerators, and public-private collaborations can address the challenges that hinder startup growth.

5.3.2 For Techpreneurs

1. Leverage Experience for Innovation: Founders should capitalize on prior experience, both from previous ventures and industry-related roles, to make more informed business decisions. Building on existing market knowledge can help them generate higher revenue and make better choices for scaling their business.

2. Gender Diversity in Leadership: Founders should focus on building diverse teams, as gender-diverse teams have been shown to perform better financially. Encourage inclusive leadership practices and consider the benefits of having a mix of genders in the founding team.

3. Technology as a Competitive Advantage: Techpreneurs should focus on creating proprietary technology or developing innovative solutions rather than relying on purchased technology. This will not only differentiate their startups but also lead to higher revenue and export intensity.

4. Export Opportunities: Startups should prioritize technology adoption and building commercial capabilities to improve their export propensity. Additionally, ensuring financial stability through breakeven status can make them more competitive in international markets.

5. Exploit Educational Background for Fundraising: Founders should utilize their education to better navigate funding options. Those with higher education should seek external financing like incubators or private equity, while avoiding over-reliance on personal funds (3 F).

6. Strategic Use of Capital: Focus on raising funds through channels that align with your startup's growth trajectory. Innovators should target non-repayable sources like subsidies, while growth-oriented startups can engage private equity investors for higher returns.

7. Talent Acquisition and Retention: Address talent challenges by offering competitive incentives, fostering a strong organizational culture, and leveraging networks to attract top talent. This will be key to the long-term success of the startup.

5.3.3 For Researchers

1. Investigating Gender Barriers: Researchers should further explore the negative relationship between female ownership and export propensity, examining the underlying causes of this trend and potential solutions. This could help in designing targeted interventions and support systems for women entrepreneurs in tech.

2. Funding and Capital Access Research: More studies can be conducted on the role of real estate assets in securing loans and the impact of age on funding sources. Research can provide insights into developing new funding models that cater to startups without real estate collateral.

3. Export Propensity and Intensity Studies: Future research can look into how tech startups can overcome the barriers to export participation, particularly for those with limited international exposure. This will help create more detailed strategies to boost global market engagement.

4. Effect of Education on Startup Success: Further research can investigate the link between founders' education levels and their choice of funding sources. Understanding the motivations and preferences of educated founders can help optimize the startup financing process.

5. Longitudinal Studies on Startup Growth: Researchers could track the progress of startups over time, comparing early-stage and mature startups to identify additional factors that influence revenue generation and market engagement.

By acting on these suggestions, stakeholders—whether regulatory bodies, techpreneurs, or researchers—can help improve the startup ecosystem, foster inclusivity, promote innovation, and overcome the challenges that many tech startups face.

5.4 Limitations of the Study

This research acknowledges several limitations that may influence the generalization and scope of its findings. Firstly, the study focused exclusively on startups within the Delhi-NCR region, which limits the ability to apply the results to startups in other geographical contexts. Expanding the study to include a broader range of regions could provide more comprehensive insights.

Secondly, the study examined only a select set of factors that influence startup performance, leaving room for further exploration of additional variables that may play a role.

Moreover, while specific measures of startup performance were assessed, alternative metrics may yield different perspectives and results, suggesting the need for a more diverse set of performance indicators.

Additionally, the study offered a snapshot of startup performance at a single point in time, making it difficult to understand the long-term trends and development of successful startups. A longitudinal study, focusing on the growth phase of startups over an extended period, would offer more valuable insights into how startups evolve and adapt to challenges.

Furthermore, the study did not sufficiently explore the behavior of outside investors, which limits the understanding of how their funding decisions and characteristics might influence startup success. There is a need for more detailed research into the dynamics between startup funding demand and the supply of funding from investors, which would shed light on the broader ecosystem and its impact on startup performance.

5.5. Emerging Issues for Future Research

The findings of this study point to several promising avenues for future research. One potential direction involves extending the research to a wider geographic area, examining startups in various regions to assess whether the findings hold true across different contexts. This would help in establishing broader generalizations and uncovering region-specific trends.

Future studies could also explore additional factors beyond those investigated in this research that may affect startup performance. There is a need to examine a more diverse set of variables that could influence outcomes, such as the impact of team dynamics, market conditions, and industry-specific challenges. Furthermore, considering alternative metrics for measuring startup success could provide a more comprehensive understanding of the factors driving growth.

A particularly valuable area for future research would be conducting a longitudinal study to track the performance and evolution of startups over time, especially during their initial growth phase. Such a study could offer insights into the long-term dynamics of startup success and the factors that influence their ability to sustain growth and overcome early challenges.

Another important area for further investigation is the relationship between startups and outside investors. Future research could delve into the interplay between the demand for funding by startups and the supply of capital from investors, exploring how these two forces interact and shape the startup ecosystem. Understanding this dynamic would provide a clearer picture of the role funding plays in the performance and success of startups.

Lastly, examining the challenges faced by startups at different stages of their development would allow researchers to offer targeted recommendations and interventions tailored to the specific needs of startups. This could enhance the ability of stakeholders to address these challenges effectively and contribute to the overall growth and sustainability of the startup ecosystem.

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PROOF OF PUBLICATIONS

1. JIM QUEST: JOURNAL OF MANAGEMENT AND TECHNOLOGY

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Determinant Factors of Entrepreneurial Performance: An Empirical Study in Context of Delhi- NCR.

*Diksha Arora
**Prof. Seema Singh

Abstract

In contemporary world, women's entrepreneurship is gaining attention from policymakers due to its potential to accelerate technological advancement and economic growth. This study aims to examine the impact of entrepreneurial competency, networking and innovation on women's entrepreneurial performance. The study utilizes empirical data from 161 women entrepreneurs based in Delhi- NCR by employing self-administered questionnaires. The data has been analyzed using Principal Component Analysis and hierarchical multiple regression. The findings show a significant direct link between entrepreneurial skills and networking, impacting the performance of women-owned businesses. Moreover, innovation not only directly impacts performance but also acts as a mediator in the link between competencies, networking and entrepreneurial performance. The study emphasizes the importance of collaboration for enhanced entrepreneurial performance.

Keywords: *Entrepreneurship, Innovation, Networking, Performance JEL*

Introduction

Female businesses are a rapidly growing entrepreneurial segment, poised to contribute significantly to innovation, employment, and wealth creation worldwide (Block et al., entrepreneurs, with 35% aspiring to be entrepreneurs. This contrasts with high- income countries, where only 25% of women view entrepreneurship as a promising path.

2. JHARKHAND JOURNAL OF DEVELOPMENT AND MANAGEMENT STUDIES

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AN ASSESSMENT OF FACTORS IMPACTING PERFORMANCE IN TECHNOLOGY BASED STARTUP

Diksha Arora and Seema Singh

Technology startups serve as pivotal drivers of regional economic growth, yet understanding the factors shaping their performance remains a challenge due to the multidimensional nature of the phenomenon and diverse empirical contexts. This study aims to quantify performance indicators through a comprehensive review of literature and interviews with entrepreneurs. The research identifies profitability and securing financing as key performance indicators; and aims to analyze their determinants across 350 tech- startups in Delhi-NCR. Findings reveal four significant factors influencing performance: target market segment, founders' managerial experience, company age, and patent ownership. Interestingly, female presence in founding teams positively affects profitability but decreases financing probability. Additionally, the adoption of green innovation practices enhances financing prospects but adversely impacts profitability.

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***Keywords**: Technology, Startups, Profitability, Financing, Performance*

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BRIEF PROFILE

Diksha Arora is a dedicated researcher and educator in Economics, currently pursuing a Ph.D. at Delhi Technological University with a focus on tech startups in Delhi-NCR. A NET and JRF qualifier, she has taught at institutions like DTU and the University of Delhi, combining deep subject expertise with innovative teaching methods. Diksha has published on entrepreneurship, gender studies and economic growth earning recognition such as the Best Paper Award. She holds advanced certifications in research methodologies and is adept at modern teaching technologies. Beyond academics, she is trained in classical music and actively engages in community service. She can be reached at dikshaarora2102@gmail.com.

Professor Seema Singh specializes in the intersection of technology and its influence on the labor market, gender dynamics, education, and training. She is an accomplished academic with a strong publication record in leading refereed journals and has successfully completed numerous research projects supported by both national and international organizations. In her role as an educator, she supervises PhD and post-doctoral students and is a frequent reviewer for SCOPUS, Emerging Sources Citation Index, Web of Science, and Science Citation Index Expanded journals. Her ORCID is 0000-0001-5193-1639, and she can be reached at prof.seemasinghdtu@gmail.com.

Questionnaire
on

OPPORTUNITIES AND CHALLENGES OF TECH- STARTUPS: A STUDY IN THE CONTEXT OF DELHI- NCR.

in Partial Fulfillment for the award of Ph.D. Degree

Conducted
by

Diksha Arora
(2K21/PHDHUECO/02)

Under the Supervision of

Prof. Seema Singh
Professor of Economics

Department of Humanities
DELHI TECHNOLOGICAL UNIVERSITY
(Formerly Delhi College of Engineering)
Shahbad Daulatpur, Main Bawana Road, Delhi-110042, India

Opportunities and Challenges of Tech- Startups: A study in the context of Delhi-NCR.

Hello! I am a Research Scholar in the Department of Humanities, Delhi Technological University. I am carrying out research on "Opportunities and Challenges of Tech- Startups: A study in the context of Delhi- NCR." I have developed a questionnaire for the same and it is my humble request to please fill it out so as to help me with the successful completion of my study. The questionnaire would take about five minutes of your time to complete. I would be highly obliged for your cooperation.

Note: The collected information will be used strictly for research purposes. It will be used in an aggregate form for making general inferences. If any of your responses will be quoted to support the findings, due information will be given to you.

Thanks a lot!

Official Letter from Delhi Technological University

दिल्ली प्रौद्योगिकी विश्वविद्यालय

DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

DTU

Prof. Seema Singh
Professor of Economics
Department of Humanities
INWES Board Member (South Asia)
International Network of Women Engineers and Scientists (INWES)
Hon. Joint Secretary Indian Society of Labour Economics
Mob- 9810790475 email- seemasinghdtu@gmail.com

Date: 30-09-2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. Diksha Arora is a **Ph.D** research scholar (Roll no. 2K21/PHDHUECO/02) at the **Department of Humanities, Delhi Technological University, Delhi.** Her research topic is **"Opportunities and Challenges of Tech Startups: A study in the context of Delhi- NCR".** She has developed a questionnaire for the same which you are requested to fill.

We intend to use the information collected strictly for research purpose. It will be used in an aggregate form for making general inferences for the study. If any of your statement will be quoted to support any of the findings, due information will be given to you.

We will be grateful for your cooperation which will help us to complete the study successfully.

Seema Singh
30/9/2022

Prof. Seema Singh
Supervisor

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Opportunities and Challenges of Tech- Startups: A study in the context of Delhi-NCR.

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Not shared

* Indicates required question

Factors impacting the Performance and Export Intensity of Tech- Startups

Name of the startup

Your answer

Year of Incorporation

Your answer

Type of startup

- [ ] Deep Tech
- [ ] High Tech
- [ ] Low Tech

Sector

- [ ] Product
- [ ] Service

Industry Verticals served

- [ ] Health Tech
- [ ] Fin- Tech
- [ ] Ed- Tech
- [ ] Agriculture
- [ ] Food Tech
- [ ] Waste Management
- [ ] Travel and Hospitality
- [ ] Mobility and EV
- [ ] Information Technology
- [ ] Manufacturing, Robotics and Automation
- [ ] Green Technology
- [ ] Prop Tech
- [ ] Others

Market Segment

- [ ] B2B
- [ ] B2C
- [ ] B2B2C
- [ ] B2B, B2C

Number of Male Founders

Your answer

Number of Female Founders

Your answer

Number of Founders with Engineering background (please specify the academic background if other than engineering)

Your answer

Age group of the founders (check multiple, if applicable)

- [ ] less than 30
- [ ] 30 to 45
- [ ] 45 and above

Prior Managerial Experience of the founding team (all founders combined, in years)

- ○ No experience
- ○ 1-5
- ○ 6-10
- ○ 11-15
- ○ 15 and above

Prior startup experience of the founding team (all founders combined, in years)

- ○ No experience
- ○ 1-5
- ○ 6-10
- ○ 11-15
- ○ 15 and above

Total number of employees in the startup

- ○ less than 10
- ○ 10 to 20
- ○ 20 to 30
- ○ more than 30

Proportion of employees with engineering background in the startup

- ○ less than 25%
- ○ 25% to 50%
- ○ 50% to 75%
- ○ 75% and above

Have you hired any external personnel for sales related activities?

- ○ Yes
- ○ No

Have you hired any external personnel for R & D activities?

- ○ Yes
- ○ No

Whether launched or not, how mature do you think is your product/service category ?

- ○ never existed before
- ○ less than 2 years old
- ○ existed for 2 to 9 years
- ○ existed for 10 years or more

Type of technology adoption

- ☐ Innovated
- ☐ Purchased (outsourced)

Whether launched or not, how many direct competitors did you face?

- ○ 0
- ○ 1-3
- ○ more than 4

Did you conduct/Are you conducting rigorous minimum viable product (MVP)* tests?
A rigorous test: 1) proves hypotheses true or false; 2) recruits typical target customers; and 3)
considers the risk of false positive or false negative results.

- ○ We did not conduct any MVP test.
- ○ We conducted one or more MVP tests, but they were not very rigorous.
- ○ We conducted one or more rigorous MVP test.

Customer Base (in thousands)

- ○ Not applicable yet
- ○ 0-10
- ○ 11-20
- ○ 21 to 30
- ○ 31 to 40
- ○ 41 to 50
- ○ more than 50

What is the stage of your product or service development?

- ○ Ideation Stage
- ○ Conception
- ○ Commitment
- ○ Validation
- ○ Scaling
- ○ Establishing

How would you like to rate the performance of your Startup?

- ○ Progressing well
- ○ Yet to take shape
- ○ Led to early failures
- ○ Led to failures and Reviving
- ○ Successful and now expanding to next level.

Profitability *

- ○ Not applicable yet
- ○ loss
- ○ breakeven
- ○ 1-10%
- ○ 11-20%
- ○ 21-30%
- ○ 31-40%
- ○ 41 -50%
- ○ more than 50%

Number of years taken to reach break-even after incorporation of the startup.

Your answer

Startup annual Revenue in Rs. (2022-23) *

- ○ upto 25 lakh
- ○ 25 lakh to 50 lakh
- ○ 50 lakh to 1 crore
- ○ 1 crore to 5 crore
- ○ 5 crore to 10 crore
- ○ 10 crore to 20 crore
- ○ 20 crore to 50 crore
- ○ more than 50 crore
- ○ None

Percentage of Export out of Total Sales. *

- ○ 0-10%
- ○ 11-20%
- ○ 21-30%
- ○ 31-40%
- ○ 41-50%
- ○ 51-60%
- ○ 61-70%
- ○ 71-80%
- ○ 81-90%
- ○ 91-100%
- ○ None

Back Next Clear form

Opportunities and Challenges of Tech- Startups: A study in the context of Delhi-NCR.

Determinants of Initial Funding Sources among Tech- Startups

Type of Legal Entity at the time of incorporation

- ○ Proprietorship
- ○ Private Limited
- ○ Partnership
- ○ Limited Liability Partnership
- ○ OPC
- ○ Others

Total amount of Initial Funding received (approximate)

Your answer

Sources of Initial Funding (Check multiple, if applicable)

	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80
Bootstrapped/self funded/friends,family, relatives	☐	☐	☐	☐	☐	☐	☐	☐
Subsidies and Grants from Government	☐	☐	☐	☐	☐	☐	☐	☐
Borrowing from Government affiliated Financial Institutions	☐	☐	☐	☐	☐	☐	☐	☐
Borrowing from Private Financial Institutions	☐	☐	☐	☐	☐	☐	☐	☐
Incubator/ Accelerator	☐	☐	☐	☐	☐	☐	☐	☐

Number of First Generation Entrepreneurs in the Founding Team

Your answer

Number of patents issued (please mention the year of issue)

Your answer

Technology Readiness Level

1	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○

Number of patents filed (Please mention the year of filing)

Your answer

Ownership of Real Estate (land or building)

- ○ Yes, since the starting of business (own house)
- ○ Yes, since the starting of business (separate work place)
- ○ Not at the starting of business, but own as of now
- ○ Not till date

Intention to go Public (Conduct Initial Public Offering)

- ○ Yes, since beginning
- ○ Not intended in the beginning but planning as of now
- ○ No such plans till date

Number of Investors

Your answer

Product development life cycle time

Your answer

Number of rounds of financing received until 31st March 2023

Your answer

Back Next Clear form

Please rate the below mentioned challenges (on the basis of your experience so far) on a scale of 1 to 5 where
1- strongly disagree, 2 - disagree, 3 - neutral, 4 - agree and 5 - strongly agree.

	1	2	3	4	5
The establishment cost is very high	○	○	○	○	○
Poor cash flow/ lack of liquidity	○	○	○	○	○
Difficult to finding the right funding option	○	○	○	○	○
Difficult to decide the right price of the product/service.	○	○	○	○	○
Difficult to convince the investor	○	○	○	○	○
Difficult to allocate the budget	○	○	○	○	○
Customer acquisition cost is high	○	○	○	○	○
Market study inadequate & Unable to assess market potential	○	○	○	○	○
Lack of brand awareness/ brand trust	○	○	○	○	○

Difficulty in facing existing competition	○	○	○	○	○
Difficult to attain product-market fit	○	○	○	○	○
Issues in Social media selection and development of marketing strategy	○	○	○	○	○
Difficult to retain employees	○	○	○	○	○
Compensation issues	○	○	○	○	○
Cost of upgrading skills/technology is very high	○	○	○	○	○
Lack of suitable infrastructure	○	○	○	○	○
Roles and Responsibility not defined	○	○	○	○	○
Conflict between founders	○	○	○	○	○
Conflict between investors and founders	○	○	○	○	○
Conflict between employees and founders	○	○	○	○	○
Difficult to ensure cyber sercurity					

Corruption/ Bureaucratic inefficiencies	○	○	○	○	○
The regulatory environment is complex	○	○	○	○	○
Economic and Political Instability	○	○	○	○	○
ForEx variance impacting input cost / output realization	○	○	○	○	○
Lack of mentoring and guidance	○	○	○	○	○
Lack of access to professional networks	○	○	○	○	○
professional networks	○	○	○	○	○

Any other challenge/ If you could wind back the clock and do it all over again, what's the single most important thing you'd
do differently in managing and leading your startup?

Your answer

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