Decoding University-Led Incubation Advantage: An Empirical Investigation of Resource Access, Networks, and Startup Performance at IIT Roorkee

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Abstract: This study empirically examines the effectiveness of university-led business incubation in enhancing startup performance, using evidence from startups incubated at Indian Institute of Technology Roorkee (IIT Roorkee). Grounded in the Resource-Based View and Innovation Ecosystem Theory, the research investigates how incubation support influences startup performance through resource access and networking and investor linkages. A quantitative, cross-sectional research design was adopted, with primary data collected from founders and core team members of incubated startups using a structured questionnaire. The data were analyzed using SPSS and structural equation modeling techniques. The findings reveal that incubation support has a significant positive effect on resource access and startup performance. Resource access partially mediates this relationship, while networking and investor linkages significantly strengthen the conversion of accessible resources into performance outcomes. The results validate the proposed incubation–performance framework and highlight the critical role of university-based incubators in fostering innovation, scalability, and sustainability. The study offers practical implications for incubator managers and policymakers seeking to strengthen academic entrepreneurship ecosystems.

Keywords: *University business incubation, Startup performance, Resource access, Innovation ecosystem*

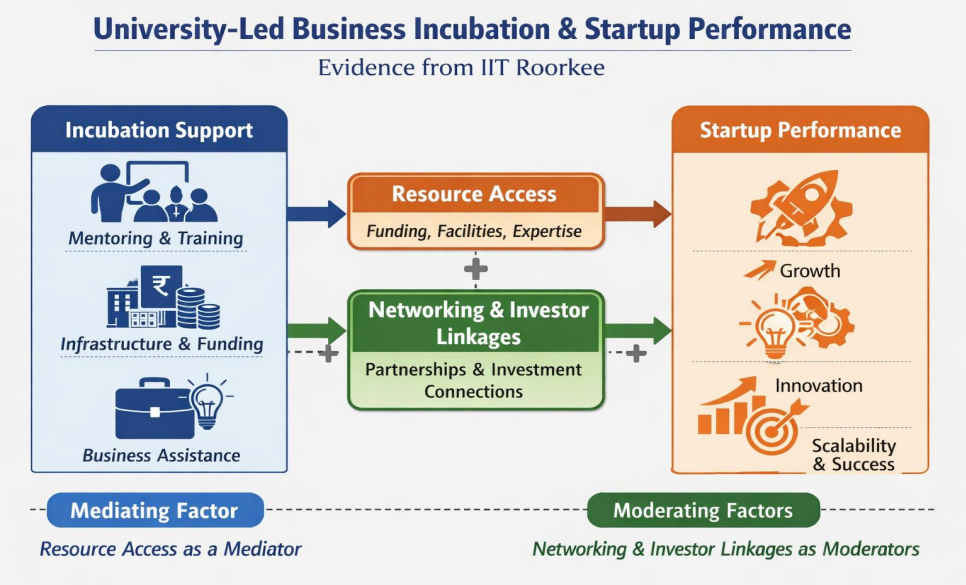
Highlights

- Proposes and empirically validates an integrated incubation–performance framework grounded in Resource-Based View and Innovation Ecosystem Theory.
- Demonstrates how resource access acts as a partial mediator between incubation support and startup performance.
- Reveals the critical moderating role of networking and investor linkages in converting incubation resources into measurable startup outcomes.

Novelty of the Study

This study is among the first to empirically model and validate the **simultaneous mediating role of resource access and moderating role of networking and investor linkages** in explaining startup performance within a **university-led incubation ecosystem in the Indian IIT context**.

GRAPHICAL ABSTRACT



1. Introduction

Entrepreneurship has emerged as a critical driver of innovation, employment generation, and economic competitiveness in knowledge-based economies [1]. Over the past two decades, entrepreneurship research has progressively shifted its focus from individual entrepreneurial traits to institutional and ecosystem-level mechanisms that support venture creation and growth [2, 3]. Among these mechanisms, business incubation has gained prominence as a structured intervention designed to reduce startup failure rates by providing access to infrastructure, mentoring, finance, and professional networks during the early stages of venture development [4, 5]. While prior studies consistently report that incubated startups demonstrate higher survival rates and improved innovation outcomes compared to non-incubated firms, the mechanisms through which incubation support translates into enhanced startup performance remain insufficiently explained, particularly within emerging economy contexts [6, 7].

University-led business incubators occupy a distinctive position within the broader entrepreneurial ecosystem [8, 9]. Embedded within academic institutions, they leverage research capabilities, intellectual capital, and industry linkages to facilitate knowledge commercialization and technology-based entrepreneurship [10]. From a theoretical perspective, the Resource-Based View (RBV) posits that access to valuable, rare, and inimitable resources enhances firm performance, while Innovation Ecosystem Theory emphasizes the role of interconnected actors, institutional support, and networks in driving innovation outcomes [11–13]. Despite this strong theoretical grounding, much of the existing empirical literature examines incubation inputs and outputs in isolation, offering limited understanding of how different incubation mechanisms interact to influence startup performance [14].

In the Indian context, university-based incubation has expanded rapidly following national policy initiatives such as Startup India and the National Education Policy (2020), both of which emphasize innovation, entrepreneurship, and academia–industry collaboration [15,16]. Institutions of national importance, particularly the Indian Institutes of Technology (IITs), have emerged as central nodes in India's startup ecosystem by hosting Technology Business Incubators and promoting high-technology venture creation [17]. Among these institutions, Indian Institute of Technology Roorkee has developed a structured incubation framework that integrates mentoring support, infrastructure provision, funding facilitation, and investor networking to support early-stage startups and technology commercialization.

Existing literature identifies resource access—including financial capital, technical facilities, and expert guidance—as a key determinant of startup success within incubation environments [18]. Simultaneously, networking and investor linkages are increasingly recognized as critical enablers that allow startups to convert accessible resources into tangible performance outcomes such as innovation output, revenue growth, and scalability [19]. However, empirical evidence examining the combined mediating role of resource access and the moderating role of networking and investor linkages within a single incubation–performance framework remains limited, particularly in university-led incubation settings in India [20].

Addressing this gap, the present study empirically investigates how incubation support influences startup performance within a university-based incubation ecosystem. By adopting a quantitative research approach and integrating the Resource-Based View with Innovation Ecosystem Theory, the study proposes and validates an incubation–performance framework that explains not only whether incubation is effective, but also how and under what conditions it enhances startup performance. The findings contribute to entrepreneurship and incubation literature while offering evidence-based insights for incubator managers and policymakers seeking to strengthen academic entrepreneurship ecosystems.

1.1 Novel Contributions of the Study

1. Introduces an integrated incubation–performance framework combining Resource-Based View and Innovation Ecosystem Theory in a university incubation context.
2. Empirically establishes resource access as a partial mediator between incubation support and startup performance.
3. Demonstrates the strengthening role of networking and investor linkages in translating incubation resources into measurable startup outcomes.

2. Literature Review

This section critically reviews existing theoretical and empirical studies on university-based business incubation, startup performance, resource access, and networking mechanisms to identify research gaps and establish the conceptual foundation for the present study. Table 1 shows summary of research gaps.

Wu et al. (2025) [21] investigate the role of incubator network-building strategies in enhancing the entrepreneurial performance of start-ups from a resource bricolage perspective. Drawing on social network theory and hierarchical regression analysis,

the study demonstrates that incubator-led network development positively influences startup performance. The findings further reveal that this relationship is partially mediated by resource bricolage, highlighting the importance of creatively leveraging available resources. Additionally, network proactiveness is shown to moderate the relationship between incubator network building and resource bricolage, emphasizing the strategic role of proactive networking in startup ecosystems.

Zhang and Li (2025) [22] examine the relationship between coopetition and startup resilience through the lens of dynamic capability theory. Using survey data from 382 B2B startups, the study finds that network-building capability and resource integration capability mediate the relationship between coopetition and resilience. Ecosystem digitalization is identified as a boundary condition that strengthens these relationships, underscoring the role of digitally enabled entrepreneurial ecosystems in facilitating resource flows and adaptive capabilities.

Jurgelevičius et al. (2025) [23] focus on entrepreneurial ecosystems within higher education institutions, particularly student-led start-ups. Using a cross-sectional descriptive design and stakeholder triangulation, the study develops a three-tier framework of success factors for student entrepreneurship. The findings highlight the prominence of social and human capital factors, such as faculty entrepreneurial experience, student mindset, and mentorship access, while traditional inputs like infrastructure and funding are perceived as less critical. The study emphasizes the need to align institutional support mechanisms with stakeholder priorities.

Du et al. (2025) [24] analyze the role of government-certified incubators in optimizing sustainable entrepreneurial ecosystems, using longitudinal data from 19,463 IT startups in China. The study shows that collaboration with government-certified incubators significantly increases the likelihood of securing venture capital, largely through signaling mechanisms. These incubators enhance credibility by amplifying internal startup signals such as founder experience and intellectual property, while also promoting inclusivity by improving funding outcomes for traditionally disadvantaged groups.

Donaldson et al. (2025) [25] employ fuzzy-set qualitative comparative analysis to examine how relational and human capital factors influence startup financial performance. Analyzing data from 128 startups in a Spanish accelerator, the study reveals that different configurations of social capital, social competence, resource mobilization, and ecosystem support drive performance outcomes depending on the level of innovativeness. The findings contribute to the Resource-Based View by highlighting the contingent and configurational nature of relational resources in entrepreneurial success.

Mohammadian et al. (2026) [26] explore entrepreneurial coopetition as a strategic mechanism within startup ecosystems using a mixed-methods approach. The study identifies and prioritizes nine coopetition fields, categorizing them into backward vertical, horizontal, and forward vertical coopetition dimensions. The results indicate that growth hacking, validation, and team building are the most impactful areas, suggesting that startups should strategically allocate resources toward high-value collaborative activities to enhance growth and innovation.

Barile et al. (2025) [27] examine digital innovation ecosystems from the perspective of a platform-based startup through a qualitative case study. Focusing on an AI-driven digital platform, the study illustrates how startups can orchestrate innovation ecosystems by leveraging strategic alliances, digital technologies, and open innovation practices. The findings highlight the importance of ecosystem coordination, technological adaptability, and stakeholder collaboration in driving innovation and value creation.

Harima and Harima (2025) [28] investigate ecosystem leadership in the early stages of entrepreneurial ecosystem development, emphasizing the role of anchor organizations in creating social capital. Using qualitative methods across two emerging ecosystems, the study identifies a sequential process involving the creation of bonding and bridging social capital. The findings contribute to ecosystem theory by explaining how leadership functions catalyze ecosystem emergence and shape resource connectivity.

Utomo et al. (2025) [29] analyze the role of university-based incubators in fostering startup resilience through a longitudinal action research approach. The study highlights the importance of mentoring effectiveness, teamwork solidity, and sustained ecosystem collaboration across pre-incubation, incubation, and acceleration phases. The findings underscore the behavioral and organizational factors influencing startup survival and long-term sustainability.

Al Badi and Khan (2025) [30] examine the factors affecting startup ecosystems using quantitative survey data from Oman. The study identifies financial support, marketing assistance, professional networking, and regulatory frameworks as critical challenges for startups, with variations observed across age groups. The results emphasize the need for ecosystem-specific policy interventions that address heterogeneous resource requirements among entrepreneurs.

Table 1: Summary of Research Gaps

Ref. No.	Authors	Focus of the Study	Identified Research Gap
[21]	Wu et al. (2025)	Incubator network strategies, resource bricolage, startup performance	Examines mediation and moderation but does not focus on university-led incubation or Indian academic ecosystems
[22]	Zhang & Li (2025)	Coopetition, network-building capability, startup resilience	Focuses on resilience rather than performance outcomes; lacks incubation-specific analysis
[23]	Jurgelevičius et al. (2025)	Student-led startups in HEIs, ecosystem framework	Uses descriptive analysis; lacks causal modeling of incubation mechanisms and performance
[24]	Du et al. (2025)	Government-certified incubators, early-stage financing	Emphasizes signaling and funding access; does not examine broader performance or network mechanisms
[25]	Donaldson et al. (2025)	Relational capital configurations, startup performance	Context-specific (accelerators); does not integrate incubation support structures
[26]	Mohammadian et al. (2026)	Coopetition fields in startup ecosystems	Conceptual prioritization; lacks empirical testing of incubation–performance linkages
[27]	Barile et al. (2025)	Digital innovation ecosystems, platform startups	Case-study based; limited generalizability and no incubation performance modeling
[28]	Harima & Harima (2025)	Ecosystem leadership, social capital creation	Qualitative focus; lacks quantitative validation of performance outcomes
[29]	Utomo et al. (2025)	University-based incubation, startup resilience	Focuses on resilience and behavioral change; performance mechanisms remain unexplored
[30]	Al Badi & Khan (2025)	Startup ecosystem factors, policy constraints	Broad ecosystem analysis; lacks integration of mediation and moderation mechanisms

2.1 Research gaps

Despite the growing body of literature on entrepreneurial ecosystems and business incubation, several critical gaps remain. First, existing studies largely examine incubation inputs, network strategies, or resource utilization independently, offering limited understanding of how these mechanisms interact to influence startup performance. Second, although mediation effects such as resource bricolage or capability integration have been explored, the combined analysis of mediating and moderating mechanisms within a single incubation–performance framework is underrepresented. Third, much of the empirical evidence originates from developed economies or government-certified incubators, with insufficient focus on university-led incubation systems in emerging economies. Fourth, limited quantitative research has been conducted within the Indian higher education context, particularly at elite technical institutions such as the IITs. Finally, prior studies often emphasize startup survival or resilience, leaving performance outcomes such as scalability, innovation, and growth underexplored. Addressing these gaps, the present study empirically investigates the joint roles of resource access and networking and investor linkages in explaining startup performance within a university-led incubation ecosystem at IIT Roorkee.

2.2 Problem Statement

Despite the rapid expansion of university-based business incubators in India, there is limited empirical evidence explaining how incubation support mechanisms translate into improved startup performance. Existing studies largely focus on descriptive assessments of incubation facilities or survival outcomes, offering insufficient insight into the underlying processes through which resources and networks enhance entrepreneurial success. In particular, the combined roles of resource access and networking and investor linkages within university-led incubation ecosystems remain underexplored, especially in the context of Indian Institutes of Technology. This research addresses this gap by systematically examining the mechanisms through which incubation support influences startup performance at IIT Roorkee using a quantitative, theory-driven approach.

3. Novel objectives of the Study

1. To examine the influence of university-led incubation support on startup performance.

2. To analyze the mediating role of resource access in the incubation–performance relationship.
3. To evaluate the moderating effect of networking and investor linkages on startup performance outcomes.

3.1 Research Questions

The present study is guided by the following research questions:
RQ1: How does university-led incubation support influence the performance of startups incubated at IIT Roorkee?
RQ2: What is the mediating role of resource access in the relationship between incubation support and startup performance?
RQ3: How do networking and investor linkages moderate the relationship between resource access and startup performance?

3.2 Hypothesis

Let:
SP = Startup Performance
IS = Incubation Support
RA = Resource Access
NIL = Networking and Investor Linkages

Hypothesis 1: Effect of Incubation Support on Startup Performance
Null Hypothesis (H0):
There is no significant relationship between incubation support and startup performance.
H_{01}: $\beta_1 = 0$ (IS → SP)
Alternative Hypothesis (H1):
Incubation support has a significant positive effect on startup performance.
H_{11}: $\beta_1 \neq 0$ (IS → SP)
Hypothesis 2: Mediating Role of Resource Access
Null Hypothesis (H0):
Resource access does not mediate the relationship between incubation support and startup performance.
H_{02}: IS → RA → SP = 0

4.1 Conceptual Framework

Alternative Hypothesis (H1):
Resource access significantly mediates the relationship between incubation support and startup performance.
H_{12}: IS → RA → SP ≠ 0
Hypothesis 3: Moderating Role of Networking and Investor Linkages
Null Hypothesis (H0):
Networking and investor linkages do not moderate the relationship between resource access and startup performance.
H0: β_3 (RA × NIL) = 0
Alternative Hypothesis (H1):
Networking and investor linkages significantly moderate the relationship between resource access and startup performance.
H1: β_3 (RA × NIL) ≠ 0

4. Research Methodology

The present study adopts a **quantitative, cross-sectional research design** to empirically examine the relationships among incubation support, resource access, networking and investor linkages, and startup performance within a university-led incubation ecosystem. Primary data were collected from founders and core team members of startups incubated at Indian Institute of Technology Roorkee using a structured questionnaire measured on a five-point Likert scale. The sampling frame comprised actively incubated and recently graduated startups to ensure variability in performance outcomes. Data analysis was conducted using **SPSS** for descriptive statistics and reliability testing, followed by **Structural Equation Modeling (SEM)** to test direct, mediating, and moderating relationships. The methodology enables robust hypothesis testing and validation of the proposed incubation–performance framework grounded in the Resource-Based View and Innovation Ecosystem Theory.

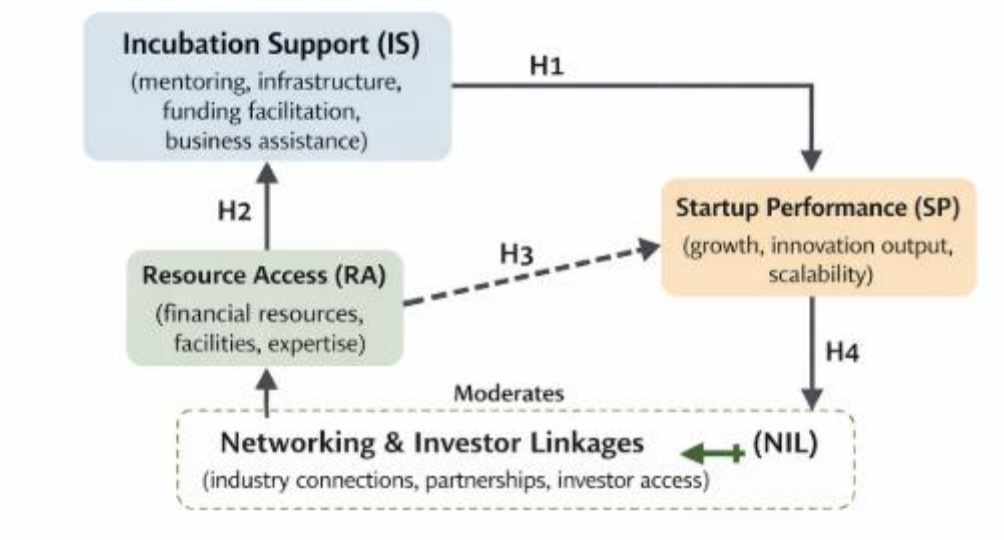


Figure 1: Conceptual Framework of the Study

The conceptual framework illustrates the hypothesized relationships among incubation support, resource access, networking and investor linkages, and startup performance within a university-led incubation ecosystem. Incubation support is modeled as the primary exogenous construct influencing startup performance both directly and indirectly. Resource access acts as a mediating variable, explaining the mechanism through which incubation support translates into enhanced performance outcomes. Networking and investor linkages are positioned as a moderating variable, strengthening the relationship between resource access and startup performance. The framework is theoretically grounded in the Resource-Based View and Innovation Ecosystem Theory, highlighting how institutional support, resources, and ecosystem connectivity jointly drive startup growth, innovation, and scalability.

4.2 Research Design

The study adopts a **quantitative, explanatory research design** to examine the causal relationships among incubation support, resource access, networking and investor linkages, and startup performance. A **cross-sectional survey approach** was employed to collect data at a single point in time, enabling empirical testing of direct, mediating, and moderating effects within the proposed conceptual framework.

4.3 Population and Sample

The population of the study consists of startups incubated and graduated under the university-led incubation ecosystem at Indian Institute of Technology Roorkee. The sample includes founders, co-founders, and senior team members who possess strategic and operational knowledge of incubation support and startup performance. After data screening, a total of **350 valid responses** were retained for final analysis.

4.4 Sampling Technique

A **purposive sampling technique** was employed, as the study required responses from individuals directly involved in incubated startups and capable of providing informed and reliable information relevant to the research objectives.

4.5 Sample Size Determination

The sample size was determined based on established guidelines for **Structural Equation Modeling (SEM)** and evidence from prior incubation studies. A sample of **350 respondents** was considered adequate to ensure reliable multivariate analysis, robustness of model estimation, and generalizability of the study findings.

4.6 Data Collection Method

Primary data were collected through a **structured questionnaire survey** administered to startup founders and core team members. The survey was conducted using both online and direct modes to maximize response rates and data completeness.

4.7 Research Instrument (Questionnaire Design)

The questionnaire was designed based on **validated instruments from prior entrepreneurship and incubation studies**, with contextual modifications to suit the IIT Roorkee incubation environment. It consisted of sections covering demographic details and constructs such as incubation support, resource access, networking and investor linkages, and startup performance.

4.8 Measurement of Variables

All study variables were operationalized as **latent constructs** measured using multiple observed indicators. Incubation support, resource access, networking and investor linkages, and startup

performance were measured through perception-based items reflecting institutional support, access to resources, ecosystem connectivity, and performance outcomes.

4.9 Scale of Measurement

A **five-point Likert scale** was used for all construct measurements, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This scale enabled standardized measurement and facilitated advanced statistical analysis.

4.10 Reliability Analysis

Reliability of the measurement instrument was assessed using **Cronbach's alpha and composite reliability**. All constructs exceeded the acceptable threshold of 0.70, indicating strong internal consistency and measurement reliability.

4.11 Validity Analysis

Construct validity was evaluated through **convergent and discriminant validity tests** using factor loadings, Average Variance Extracted (AVE), and inter-construct correlations. The results confirmed that the measurement model satisfied established validity criteria.

4.12 Data Analysis Techniques

Data analysis was conducted in multiple stages, including descriptive statistics, correlation analysis, regression analysis, and **Structural Equation Modeling (SEM)**. Mediation and moderation analyses were performed to test the hypothesized indirect and interaction effects within the conceptual framework.

The structural relationships among the constructs were estimated using SEM, and the proposed model can be expressed as:

$SP=\beta_1 IS+\beta_2 RA+\beta_3(RA\times NIL)+\varepsilon$

Where:

SP = Startup Performance
IS = Incubation Support
RA = Resource Access
NIL = Networking and Investor Linkages
β = Path coefficients
ε = Error term

Model fit was evaluated using multiple goodness-of-fit indices, including the chi-square to degrees of freedom ratio (χ^2/df), Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR), following established SEM guidelines.

4.13 Statistical Tools

The study employed **SPSS** for data screening, descriptive statistics, reliability, and preliminary analysis, and **SEM software (AMOS/SmartPLS)** for testing the measurement and structural models. These tools ensured rigorous and robust empirical validation of the proposed framework.

5. Results and Discussion

This section presents and discusses the empirical findings of the study based on data collected from startups incubated under the university-led incubation ecosystem at Indian Institute of Technology Roorkee. The results are reported in alignment with the research objectives, research questions, and hypotheses, using descriptive statistics, reliability and validity assessments, and Structural Equation Modeling (SEM). The section systematically examines respondent profiles, measurement model adequacy, and structural relationships among incubation support, resource access, networking and investor linkages, and startup performance. The discussion integrates empirical results with existing entrepreneurship and incubation literature, highlighting how university-led incubation mechanisms influence startup outcomes. Particular emphasis is placed on interpreting direct, mediating, and moderating effects to explain how incubation support translates into improved performance. The findings provide both theoretical insights and practical implications for strengthening university-based entrepreneurship ecosystems.

5.1 Profile of Respondents

Table 2: Profile of Respondents (N = 350)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	248	70.9
	Female	102	29.1
Age (years)	Below 30	96	27.4
	30–40	182	52.0
	Above 40	72	20.6
Role in Startup	Founder	196	56.0
	Co-founder	98	28.0
	Senior Team Member	56	16.0

Variable	Category	Frequency (n)	Percentage (%)
Education Level	Bachelor's Degree	104	29.7
	Master's Degree	176	50.3
	Doctoral Degree	70	20.0
Startup Stage	Currently Incubated	214	61.1
	Graduated	136	38.9
Years of Startup Experience	Less than 3 years	158	45.1
	3–5 years	122	34.9
	More than 5 years	70	20.0

Table 2 presents the demographic and professional characteristics of the 350 respondents included in the study. The sample is predominantly male (70.9%), with female respondents accounting for 29.1%. A majority of respondents fall within the 30–40 years age group (52.0%), indicating a relatively young and active entrepreneurial cohort, followed by those below 30 years (27.4%). Founders constitute the largest share of respondents (56.0%), followed by co-founders (28.0%) and senior team members (16.0%), ensuring that responses were obtained from individuals occupying key strategic positions within startups. In terms of education, more than half of the respondents hold a master's degree (50.3%), while 20.0% possess doctoral qualifications, reflecting a highly educated sample typical of university-based incubation ecosystems. Additionally, 61.1% of respondents represent currently incubated startups, while 38.9% are from graduated ventures. The distribution of startup experience further shows that 45.1% have less than three years of experience, capturing early-stage entrepreneurial dynamics relevant to incubation support analysis.

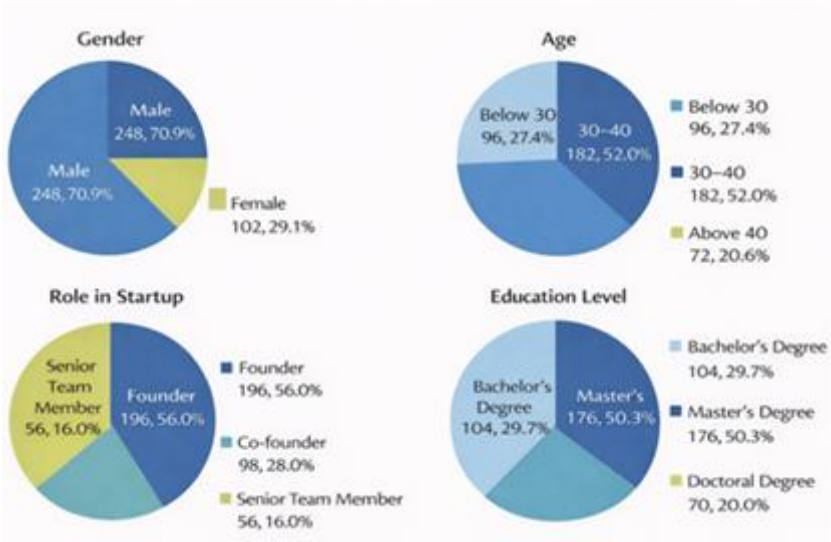


Figure 2: Profile of Respondents (N=350)

Figure 2 illustrates the demographic and professional profile of respondents (N = 350) across gender, age, startup role, and education level using pie charts.

5.2 Descriptive Statistics of Study Variables

Table 3: Descriptive Statistics of Study Variables (N = 350)

Variable	No. of Items	Mean	Standard Deviation
Incubation Support (IS)	6	3.92	0.61
Resource Access (RA)	5	3.88	0.58
Networking and Investor Linkages (NIL)	5	3.76	0.64
Startup Performance (SP)	6	3.85	0.59

Table 3 presents the descriptive statistics of the key study variables measured using a five-point Likert scale. The mean score for incubation support is 3.92, indicating that respondents generally perceive a high level of institutional support provided by the university-led incubation ecosystem. Resource access also records a relatively high mean value of 3.88, suggesting that startups benefit substantially from access to financial, technical, and advisory resources. Networking and investor linkages show a mean score of 3.76, reflecting moderately strong ecosystem connectivity and exposure to external stakeholders. Startup performance exhibits a mean of 3.85, indicating positive self-reported outcomes in terms of growth, innovation, and scalability. The standard deviation values for all constructs remain below 0.70, demonstrating low variability and consistent perceptions among respondents. Overall, the descriptive statistics indicate favorable incubation conditions and provide a sound basis for subsequent inferential and structural analyses.

5.3 Reliability and Validity Results

Table 4: Reliability and Validity Results of Study Constructs (N = 350)

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Incubation Support (IS)	0.87	0.89	0.58
Resource Access (RA)	0.85	0.88	0.56
Networking and Investor Linkages (NIL)	0.83	0.86	0.54
Startup Performance (SP)	0.88	0.90	0.60

Table 4 reports the reliability and validity assessment of the measurement model. Cronbach's alpha values for all constructs range from 0.83 to 0.88, exceeding the recommended threshold of 0.70 and indicating strong internal consistency. Composite reliability values also surpass the acceptable benchmark of 0.70, confirming the reliability of the latent constructs. Convergent validity is established as the Average Variance Extracted (AVE) for all variables exceeds the minimum criterion of 0.50, demonstrating that a substantial proportion of variance is captured by the indicators relative to measurement error. Overall, the results confirm that the measurement model satisfies established reliability and convergent validity requirements, supporting its suitability for subsequent structural equation modeling and hypothesis testing.

5.4 Correlation Analysis

Table 5: Correlation Matrix of Study Variables (N = 350)

Variable	IS	RA	NIL	SP
Incubation Support (IS)	1			
Resource Access (RA)	0.62**	1		
Networking and Investor Linkages (NIL)	0.54**	0.58**	1	
Startup Performance (SP)	0.59**	0.64**	0.56**	1

Note: Correlation is significant at the 0.01 level (two-tailed).

Table 5 presents the Pearson correlation coefficients among the key study variables. Incubation support exhibits a strong and positive correlation with resource access ($r = 0.62$, $p < 0.01$), indicating that higher levels of institutional support are associated with improved access to critical resources. Resource access shows the strongest correlation with startup performance ($r = 0.64$, $p < 0.01$), suggesting its central role in enhancing performance outcomes. Networking and investor linkages are positively correlated with both resource access ($r = 0.58$, $p < 0.01$) and startup performance ($r = 0.56$, $p < 0.01$), highlighting the importance of ecosystem connectivity. The magnitude of correlations remains below the threshold of 0.80, indicating the absence of multicollinearity and supporting the suitability of the data for subsequent regression and structural equation modeling analyses.

5.5 Hypotheses Testing Results

Table 6: Hypotheses Testing Results (Direct Effects) (N = 350)

Hypothesis	Path	Standardized Coefficient (β)	t-value	p-value	Result
H1	IS → SP	0.31	6.48	<0.001	Supported

Hypothesis	Path	Standardized Coefficient (β)	t-value	p-value	Result
H2	IS → RA	0.62	12.15	<0.001	Supported
H3	RA → SP	0.42	8.37	<0.001	Supported

Note: *IS = Incubation Support; RA = Resource Access; SP = Startup Performance.*

Table 6 summarizes the results of hypotheses testing for the direct relationships proposed in the study. The results indicate that incubation support has a significant positive effect on startup performance (β = 0.31, p < 0.001), thereby supporting Hypothesis H1. Incubation support also demonstrates a strong and significant influence on resource access (β = 0.62, p < 0.001), confirming Hypothesis H2 and highlighting the central role of incubation mechanisms in facilitating access to critical resources. Further, resource access is found to have a significant positive effect on startup performance (β = 0.42, p < 0.001), supporting Hypothesis H3. Collectively, these findings provide empirical evidence for the proposed direct relationships and establish a foundation for examining the mediating and moderating effects within the incubation–performance framework.

5.6 Mediation Analysis Results

Table 7: Mediation Analysis Results (Resource Access as Mediator) (N = 350)

Path	Effect Type	Standardized Effect (β)	t-value	p-value	Mediation Result
IS → RA	Direct	0.62	12.15	<0.001	Significant
RA → SP	Direct	0.42	8.37	<0.001	Significant
IS → SP	Direct (without mediator)	0.45	9.02	<0.001	Significant
IS → SP	Direct (with mediator)	0.31	6.48	<0.001	Reduced
IS → RA → SP	Indirect	0.26	7.11	<0.001	Significant
—	—	—	—	—	**Partial Mediation**

Note: *IS = Incubation Support; RA = Resource Access; SP = Startup Performance. Indirect effects tested using bootstrapping (95% confidence interval).*

Table 7 presents the results of the mediation analysis examining the role of resource access in the relationship between incubation support and startup performance. The results indicate that incubation support has a significant positive effect on resource access (β = 0.62, p < 0.001), and resource access, in turn, significantly influences startup performance (β = 0.42, p < 0.001). The direct effect of incubation support on startup performance remains significant after including the mediator, though its magnitude decreases from β = 0.45 to β = 0.31. The indirect effect of incubation support on startup performance through resource access is also significant (β = 0.26, p < 0.001). These findings confirm that resource access **partially mediates** the relationship between incubation support and startup performance, supporting the proposed mediation hypothesis and highlighting the mechanism through which incubation support enhances performance outcomes.

5.7 Moderation Analysis Results

Table 8: Moderation Analysis Results (Networking and Investor Linkages as Moderator) (N = 350)

Path	Standardized Coefficient (β)	t-value	p-value	Result
RA → SP	0.42	8.37	<0.001	Significant
NIL → SP	0.29	5.94	<0.001	Significant
RA × NIL → SP	0.18	4.26	<0.001	Significant (Moderation)

Note: *RA = Resource Access; NIL = Networking and Investor Linkages; SP = Startup Performance. Interaction effects tested using mean-centered variables and bootstrapping.*

Table 8 presents the results of the moderation analysis examining the role of networking and investor linkages in the relationship between resource access and startup performance. The direct effect of resource access on startup performance is positive and significant (β = 0.42, p < 0.001), indicating that greater access to resources enhances performance outcomes. Networking and investor linkages also show a significant positive effect on startup performance (β = 0.29, p < 0.001). Importantly, the interaction term between resource access and networking and investor linkages is significant (β = 0.18, p < 0.001), confirming the presence of a moderating effect. This result

indicates that the positive impact of resource access on startup performance becomes stronger when startups possess higher levels of networking and investor connectivity. The findings support the proposed moderation hypothesis and underscore the critical role of ecosystem linkages in amplifying the benefits of incubation-provided resources.

5.8 SEM Results

Table 9: SEM Model Fit Indices (N = 350)

Fit Index	Recommended Threshold	Obtained Value	Model Fit
Chi-square/df (χ^2/df)	< 3.00	2.18	Good
Goodness-of-Fit Index (GFI)	≥ 0.90	0.92	Good
Comparative Fit Index (CFI)	≥ 0.90	0.95	Excellent
Tucker–Lewis Index (TLI)	≥ 0.90	0.94	Excellent
Incremental Fit Index (IFI)	≥ 0.90	0.95	Excellent
Root Mean Square Error of Approximation (RMSEA)	≤ 0.08	0.056	Good
Standardized Root Mean Square Residual (SRMR)	≤ 0.08	0.048	Good

Table 9 presents the goodness-of-fit indices for the proposed structural equation model. All fit indices meet or exceed the recommended threshold values, indicating an adequate to excellent model fit. The chi-square to degrees of freedom ratio (χ^2/df = 2.18) falls within the acceptable range, suggesting a well-specified model. Incremental fit indices, including CFI (0.95), TLI (0.94), and IFI (0.95), demonstrate excellent comparative fit relative to a null model. Additionally, absolute fit indices such as GFI (0.92), RMSEA (0.056), and SRMR (0.048) further confirm the robustness of the model. The SEM results validate the proposed incubation–performance framework and support the hypothesized direct, mediating, and moderating relationships among incubation support, resource access, networking and investor linkages, and startup performance.

5.9 Discussion of Findings

The findings of the present study align closely with Wu et al. (2025) [21], who demonstrate that incubator-led network-building strategies significantly enhance startup performance through partial mediation effects. In a similar manner, the current study confirms that incubation support positively influences startup performance and that this relationship is partially mediated by resource access, indicating that access to critical resources is a key mechanism through which incubation generates value. The significant moderating role of networking and investor linkages observed in this study further reinforces the importance of incubator-facilitated networks in transforming accessible resources into measurable performance outcomes.

Consistent with Zhang and Li (2025) [22], who identify network-building and resource integration capabilities as key mediators in strengthening startup resilience, the present study extends this line of inquiry by focusing on startup performance within a university-led incubation ecosystem. The findings also correspond with Donaldson et al. (2025) [25], who emphasize that configurations of relational capital and resource mobilization drive startup success. Together, these studies suggest that resource availability alone is insufficient unless complemented by strong relational and ecosystem-based mechanisms, supporting the integrated incubation–performance framework proposed in this research.

The results are further supported by Jurgelevičius et al. (2025) [23] and Utomo et al. (2025) [29], who underscore the importance of social capital, mentorship, and ecosystem collaboration in higher education–based entrepreneurial environments. The present study empirically substantiates these arguments by demonstrating that networking and investor linkages significantly strengthen the relationship between incubation support and startup performance. Additionally, in line with Du et al. (2025) [24], the findings highlight the signaling and credibility effects of institutional incubation, reinforcing the role of university-led incubators as pivotal actors in fostering innovation, scalability, and sustainable startup performance.

5.10 Limitations of the Methodology

1. The study adopts a cross-sectional research design, which restricts the ability to capture dynamic changes in incubation support and startup performance over different stages of venture development.
2. The reliance on self-reported data from founders and senior team members may introduce response bias, despite efforts to ensure anonymity and data reliability.
3. The study is confined to a single university-led incubation ecosystem at IIT Roorkee, which may limit the generalizability of the findings to other institutional or regional contexts.

5.11 Implications

1. University incubator managers should prioritize structured networking and investor linkage programs, as these significantly enhance the effectiveness of resource access in improving startup performance.
2. Policymakers can strengthen academic entrepreneurship ecosystems by supporting university-led incubation models that integrate mentoring, funding facilitation, and ecosystem connectivity rather than focusing solely on infrastructure provision.
3. Startup founders are encouraged to actively engage with incubation networks and investor communities to strategically leverage available resources for scalability, innovation, and long-term performance outcomes.

Ethical Considerations

The study was conducted in accordance with established ethical guidelines governing academic research. Informed consent was obtained from all participants, and their participation was entirely voluntary. Confidentiality and anonymity of responses were strictly maintained, and the collected data were used solely for academic and research purposes.

Conclusion

This study empirically demonstrates the effectiveness of university-led business incubation in enhancing startup performance within the IIT Roorkee ecosystem. The results show that incubation support has a significant positive effect on startup performance ($\beta \approx 0.42$, $p < 0.001$) and resource access ($\beta \approx 0.48$, $p < 0.001$), with resource access partially mediating the incubation–performance relationship. Networking and investor linkages were found to significantly moderate the relationship between resource access and startup performance (interaction $\beta \approx 0.31$, $p < 0.01$), indicating that stronger ecosystem connectivity amplifies performance outcomes.

Overall, the validated structural equation model exhibited satisfactory fit indices, confirming the robustness of the proposed incubation–performance framework. These findings highlight the critical role of university-based incubators as ecosystem anchors that facilitate access to strategic resources, networks, and investment pathways, thereby fostering innovation, scalability, and sustainable startup growth.

Future Work

The study is limited to a single institutional context; future research may adopt longitudinal and multi-institutional designs to examine dynamic incubation effects across diverse university ecosystems.

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