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Analysing the Challenges and Prospects Confronting Edu-Tech Start-Ups: Evidence from Uttar Pradesh, India

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Abstract: *Edu-Tech Start-Ups have become a key player in changing how education is delivered. But their growth in Uttar Pradesh (UP) is conditioned by a unique mix of opportunity and constraint, stemming from the scale of the state, its uneven digital infrastructure, and socio-economic diversity. This paper presents the outcomes of a mixed-methods study on the challenges and opportunities of Edu-Tech Start-Ups in UP. The primary data was collected through a structured 98-item questionnaire from 150 founders, co-founders and senior managers of the Edu-Tech ventures in the state and analysed using descriptive statistics, reliability analysis, Pearson correlation, multiple regression and path analysis based on the Diffusion of Innovation theory, the Technology Acceptance Model and Digital Divide theory. The success and sustainability of Start-Up were tested against seven hypothesised determinants. Determinants were regulatory environment, adequacy of infrastructure, funding and financial access, technological integration, socio-economic factors, market dynamics and socio-cultural and linguistic diversity. The model explained 50.6 per cent of the variance in success (R2 = 0.506, F(7,142) = 20.12, p < 0.001). The strongest predictors were Socio-Economic Factors (β = 0.218) and Infrastructure Adequacy (β = 0.207). Five out of seven hypotheses were fully supported at p < 0.05. The findings suggest that the viability of Edu-Tech in UP is less about any one barrier and more about the harmonious synchronisation of market economics, infrastructure, and adaptive technology design. The paper ends with concrete recommendations for entrepreneurs, investors and policy makers who wish to create an inclusive and scalable Edu-Tech ecosystem in India's most populous state..*

Keywords: *Edu-Tech Start-Ups; Uttar Pradesh; digital divide; regulatory environment; infrastructure adequacy; funding constraints; technology adoption; multiple regression*

I. INTRODUCTION

Education technology (Edu-Tech), defined as the systematic application of digital tools, platforms and data analytics to teaching, learning, assessment and governance, has in much of the world transitioned from a peripheral enrichment activity to core instructional infrastructure. The EdTech market is projected to be worth between \$187 billion and \$280 billion in 2024/2025 and is expected to grow to between \$350 billion and \$900 billion by the early 2030s with compound annual growth rates of 10–16 per cent, propelled by mobile computing, cloud infrastructure and artificial intelligence. Table I-A Comparison of estimates of Market-Size of Leading Research Firms for Global and Indian Markets It demonstrates the diversity of methodology used in projecting the market but a common expectation of double-digit growth.

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Source	Scope	2024/25 Est.	Projection
Grand View Research	Global	USD 187 bn	USD 348–437 bn (2030)
IMARC Group	Global	USD 280 bn	USD 760 bn (2034)
Fortune Bus. Insights	Global	USD 247–277 bn	USD 588–908 bn (2034)
Market Research Future	India	USD 10.5 bn	USD 50 bn (2035)
IBEF	India	USD 7.5–12.75 bn	USD 29–61 bn (2030)

TABLE I-A. Comparative Global and Indian Edu-Tech Market Size Estimates

India's Edu-Tech sector has been on a particularly volatile journey. Venture funding rose from around USD 1.2 billion in 2019 to a peak of USD 4.7 billion in 2021, driven by pandemic-2023 as investors shifted from growth-at-all-costs to sustainable unit economics (Fig. 1). The much-hyped collapse of BYJU'S valuation crystallised the risks of monetisation-later business models and brought the spotlight back to the much larger population of small and medium Edu-Tech ventures operating outside of India's metropolitan technology hubs.

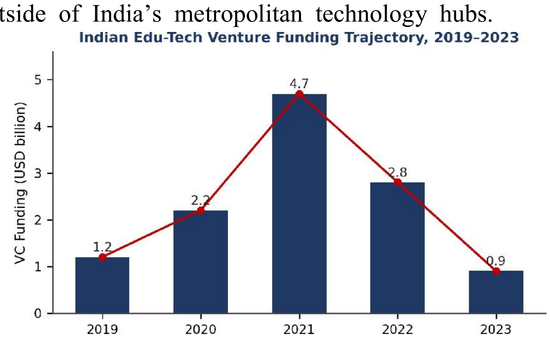

Fig. 1. Indian Edu-Tech venture funding trajectory, 2019–2023 (USD billion), illustrating the post-pandemic funding correction.

Uttar Pradesh (UP) is India's most populous state with an estimated population of 230 million. It has an internet penetration of 46 per cent and a literacy level of 67.7 per cent (lower than the national average of 74 per cent). This creates a challenging but potentially transformational environment for Edu-Tech entrepreneurship. Table I contextualises the state against the national average for key demographic and digital indicators. The 77.7 per cent share of rural population and the gender gap of about twenty percentage points in literacy are particularly relevant for Edu-Tech demand and product design.

Indicator	UP	All-India
Literacy rate (%)	67.7	74.0
Male literacy (%)	79.2	82.1
Female literacy (%)	59.3	65.5
Rural population (%)	77.7	68.8
Internet penetration (%)	46.0	65.0

TABLE I. Key Demographic and Digital Indicators: Uttar Pradesh vs. All-India (Census 2011; IAMAI & Kantar, 2024)

Previous research has focused on well-funded national unicorns, leaving the specific challenges faced by early stage ventures in Tier-2, Tier-3 and rural UP markets comparatively under-explored. This paper fills this gap by empirically testing how regulatory, infrastructural, financial, technological, socio-economic, market and socio-cultural factors jointly shape the success and sustainability of Edu-Tech Start-Ups in Uttar Pradesh and translating the results into actionable guidance for entrepreneurs, investors and policymakers.

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II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

A. Theoretical Foundations

The study is based on three complementary theoretical approaches. Rogers' (2003) Diffusion of Innovation theory explains how the rate of adoption of an innovation within a social system is influenced by its relative advantage, compatibility, complexity, trialability and observability. This gives some insight into why certain Edu-Tech products gain traction in UP's fragmented, multilingual market, while others do not. To understand how technological integration contributes to venture success, we draw on Davis's (1989) Technology Acceptance Model (TAM) that connects perception of usefulness and ease of use with intention to adopt. Van Dijk (2020) states that the theory of the Digital Divide differentiates between a first level divide (access), a second level divide (skills and usage) and a third level divide (outcome). It gives a structural insight into why delivery of Edu-Tech in a state where almost 78 percent of the population is rural, is still tied to infrastructure and socio-economic constraints. The relevance of these constructs for the present model is further supported by the systematic review of 48 studies by Scheerder, van Deursen and van Dijk (2017) which confirms that education, socio-economic status and age remain the most consistent predictors of second-level digital inequality.

B. Determinants of Edu-Tech Success: Empirical Evidence

Research on infrastructure and connectivity shows that unreliable supply of electricity and limited broadband are recurrent major challenges to delivering digital learning in the Uttar Pradesh, with rural areas suffering the most from shortages (Chandra and Kumar, 2023; Kaushik and Kaushik, 2022). The non-metro funding environment for early stage has been brutal. The correction in Indian EdTech venture capital from a peak of USD 4.7 billion in 2021 to sub USD 1 billion in 2023 has seen investors focus on proven companies with positive unit economics. The regulatory and policy landscape for Indian EdTech is still relatively nascent compared to more mature industries. Licensing, data protection and quality assurance requirements are not clear, therefore they impose an undue compliance burden on resource-limited Start-ups.

Beyond traditional venture capital, the literature calls for sector-specific quality assurance standards that can build trust with price-sensitive, first-time digital learners. It also calls for the increasing adoption of alternative funding instruments such as revenue-based financing, impact investment, and government matching grants to fund early-stage EdTech ventures during the funding winter. A common operational constraint for non-metro Start-Ups is talent acquisition and retention – as they have to compete with larger, better resourced platforms for scarce technical and pedagogical expertise. And it lends further weight to the argument that community partnerships and local institutional alliances are a cheaper path to credibility and distribution.

Research on market dynamics suggests a fierce battle between well-funded national platforms (BYJU'S, Unacademy, upGrad) and a much larger population of regional players serving niche segments, examination categories and local languages (Khan et al., 2024). Socio-cultural and linguistic factors of special relevance in Uttar Pradesh which has large populations of speakers of Urdu, Bhojpuri, Awadhi, Braj Bhasha and Bundeli, besides Hindi. Content localisation is frequently mentioned as a contributing factor to learner engagement and retention. Research into AI in education suggests that AI driven personalisation and adaptive learning can provide meaningful differentiation for Edu-Tech products (Holmes, Bialik and Fadel, 2016; Chen, Chen and Lin, 2020). Evidence from meta-analysis shows that online and blended instruction have an average learning outcome advantage of about 0.35 standard deviations over face-to-face instruction alone (Means, Toyama, Murphy and Baki, 2008). The COVID-19 pandemic accelerated a decade's worth of EdTech adoption in just months, affecting the education of over 1.6 billion learners globally (UNESCO, 2020) and permanently increasing institutional and parental acceptance of technology-mediated learning. However, this rapid shift also exposed stark gaps in device access, connectivity and digital-skills among disadvantaged households.

C. Research Gap

Despite this body of work, none of the existing research has attempted to model the regulatory, infrastructural, financial, technological, socio-economic, market and socio-cultural determinants of Edu-Tech Start-Ups success in a single, state-specific analytical framework . Furthermore, the existing research has focused largely on metropolitan unicorns and not on the far larger population of small and medium ventures servicing tier-2, tier-3 and rural markets. The present study fills both the gaps by integrating Diffusion of Innovation theory, TAM and Digital Divide theory into a single unified model of seven-constructs and testing it on primary data from the Edu-Tech entrepreneurial ecosystem of Uttar Pradesh.

III. RESEARCH METHODOLOGY

The research used a mixed methods approach consisting of a quantitative survey and open-ended qualitative items. The research philosophy was pragmatism, which is suitable for applied entrepreneurship research . A structured questionnaire consisting of 98 items divided into eleven sections (five point Likert scale) was administered to the Founders, co-founders and senior managers of Edu-Tech Start-Ups operating in Uttar Pradesh. A total of 280 questionnaires were distributed via online and offline methods over a six-week period and 153 were returned. Three were omitted due to excessive missing data, leaving 150 questionnaires for analysis (effective response rate 53.6 per cent), which is well above the 30 per cent threshold usually recommended for entrepreneurship survey research. Respondents were selected using purposive and snowball sampling. Care was taken to ensure a balance between the organisational development stage (idea/early versus growth/mature) and geographic region (Western, Central and Eastern UP, Bundelkhand and NCR-adjacent areas) to facilitate the subgroup analyses reported in Section IV-F. The obtained sample size of 150 is larger than the minimum sample size recommended by Tabachnick and Fidell (2019) for multiple regression analysis with seven predictor variables ($N > 104 + k = 111$). To develop the instrument, a pilot study ($n = 30$) was conducted and reliability coefficients (.930–.974) were found to be similar to those of the full study, confirming the stability of the instrument.

Convergent validity was evidenced by item-total correlations from 0.71 to 0.88 and Average Variance The values obtained ranged from 0.58 to 0.72, both of which were higher than the conventional cut-off values, and all the standardised factor loadings were higher than 0.70 (range 0.72–0.88). The Fornell–Larcker criterion and the heterotrait–monotrait ratio were used to assess discriminant validity, and all HTMT values were under the conservative limit of 0.85 (range 0.21–0.62). Seven independent constructs (Regulatory Environment (B), Infrastructure Adequacy (C), Funding and Financial Access (D), Technological Integration (E), Socio-Economic Factors (F), Market Dynamics (G), Socio-Cultural and Linguistic Diversity

(H) were hypothesised to predict the dependent construct, Success and Sustainability (K) which was defined as:

$$Y = \beta0 + \beta1X1 + \beta2X2 + \ldots + \beta7X7 + \varepsilon$$

Data was analysed using descriptive statistics, Cronbach's alpha reliability analysis, Kolmogorov-Smirnov/Shapiro-Wilk normality tests, Pearson correlation, ordinary least squares multiple regression and path analysis in SPSS 27.0. All tests were evaluated at $\alpha=0.05$ (two-tailed).

IV. RESULTS

A. Respondent Profile

The demographic and organisational profile of the 150 respondents is shown in Table II. The sample is young (54.7% are under 35 years) and well-educated (65.3% hold postgraduate or doctoral qualifications), and dominated by micro and small enterprises: 56.7% have 1-10 staff and 44.0% are entirely bootstrapped, which highlights the lack of external capital for early-stage, non-metro Edu-Tech ventures.

Variable	Category	n	%
Gender	Male	100	66.7
	Female	50	33.3
Age	Under 35 yrs	82	54.7
	35 yrs and above	68	45.3
Education	Graduate	52	34.7

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	Postgraduate	83	55.3
	Doctorate	15	10.0
Region	Western UP	61	40.7
	Central UP	32	21.3
	Eastern UP /Bundelkhand	38	25.4
	NCR-adjacent	19	12.7
Funding	Bootstrapped	66	44.0
	Angel investment	33	22.0
	Venture capital	18	12.0
	Government grant	22	14.7
	Other	11	7.3

TABLE II. Demographic and Organisational Profile of Respondents (N = 150)

B. Descriptive Statistics and Reliability

Table III shows the mean, standard deviation and Cronbach's alpha for each construct. The ten construct means fall within a narrow range of 3.01 to 3.23 on the five-point scale indicating that the challenges and opportunities were perceived by respondents to be moderate, rather than extreme. Infrastructure Adequacy had the lowest mean score (M = 3.01), consistent with the well-documented infrastructure deficits in UP. The highest mean was observed in Socio-Economic Factors (M = 3.23). Reliability coefficients ranged from 0.929 to 0.969, and all above the acceptable threshold of 0.70 for internal consistency suggesting the instrument measures each construct in accurate manner.

Construct	Mean	SD	α
B: Regulatory Environment	3.12	0.52	0.969
C: Infrastructure Adequacy	3.01	0.54	0.961
D: Funding & Financial Access	3.08	0.53	0.964
E: Technological Integration	3.15	0.51	0.968
F: Socio-Economic Factors	3.23	0.48	0.965
G: Market Dynamics	3.18	0.50	0.959
H: Socio-Cultural Diversity	3.05	0.53	0.953
I: COVID-19 Impact	3.10	0.52	0.929
J: Government Initiatives	3.14	0.51	0.967
K: Success & Sustainability	3.17	0.50	0.969

TABLE III. Descriptive Statistics and Reliability for All Constructs (N = 150)

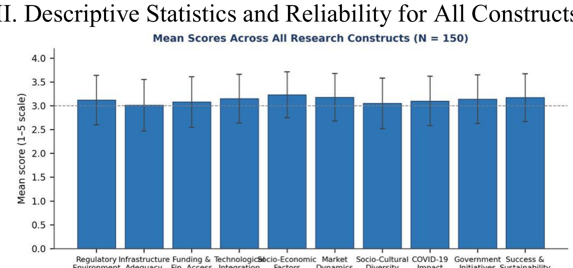

Fig. 2. Mean scores (± SD) across all ten research constructs, showing the narrow clustering around the scale midpoint.

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C. Correlation Analysis

The Pearson correlations (Fig. 3) show that all seven independent constructs are positively and significantly correlated with Success and Sustainability ($p < 0.01$) with r values ranging from 0.36 (Socio-Cultural Diversity) to 0.43 (Infrastructure Adequacy). Correlations between predictors ranged from 0.23 to 0.32, well below the 0.80–0.90 threshold of concern. All subsequent regression variance inflation factors ranged from 1.15 to 1.42, suggesting that multicollinearity does not threaten the regression results reported below.

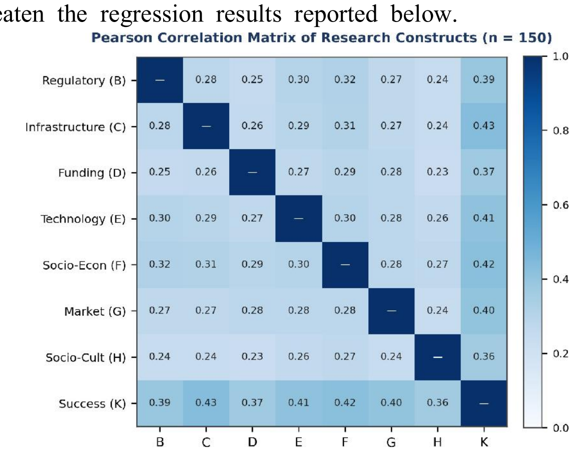

Fig. 3. Pearson Correlation Matrix of All Constructs of the Research (n=150) Darker shading means stronger association.

Before correlation and regression analysis, univariate normality was checked using Kolmogorov–Smirnov and Shapiro–Wilk tests and visual inspection of histograms and Q–Q plots. Three constructs (Infrastructure, Socio-Economic, Market Dynamics) exhibited statistically significant, but practically insignificant deviations from normality (skewness range −0.19 to 0.14; kurtosis range −0.42 to 0.28, within the ±2.0 acceptable band). However, for $n = 150$, OLS regression is robust to such small violations and thus, parametric analysis was performed without transformation as recommended by Tabachnick and Fidell (2019) for samples > 100 cases.

D. Multiple Regression Analysis

The regression model with seven predictors was significant at the .05 level, $F(7,142) = 20.12$, $p < 0.001$, and explained 50.6 per cent of the variance in Start-Up success (adjusted R2 = 0.481). The effect size (f2 = 1.02) is above the threshold for a large effect size as suggested by Cohen (1988). The Durbin-Watson statistic (2.08) indicates no meaningful autocorrelation of residuals. Table IV shows the unstandardised and standardised coefficients of each predictor.

Predictor	B	β	t	Sig.
(Constant)	0.412	—	2.081	.039
H1 Regulatory Env.	0.142	0.145	2.010	.046
H2 Infrastructure	0.198	0.207	2.993	.003
H3 Funding Access	0.122	0.130	1.853	.066
H4 Technology	0.179	0.182	2.589	.011
H5 Socio-Economic	0.221	0.218	3.187	.002
H6 Market Dynamics	0.160	0.161	2.238	.027
H7 Socio-Cultural	0.114	0.121	1.719	.088

TABLE IV. Multiple Regression Predicting Edu-Tech Start-Up Success ($n = 150$); $R^2 = 0.506$, $F = 20.12$, $p < .001$

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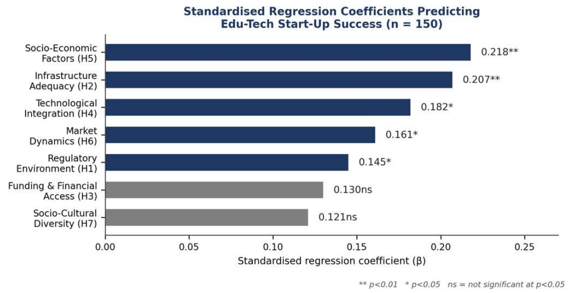

Fig. 4. Standardised regression coefficients (β) for the seven hypothesised predictors, ranked by magnitude.

The strongest predictor was found to be Socio-Economic Factors (β = 0.218, p = 0.002) followed by Infrastructure Adequacy (β = 0.207, p = 0.003) and Technological Integration (β = 0.182, p = 0.011). Market Dynamics (β = 0.161, p = 0.027) and Regulatory Environment (β = 0.145, p = 0.046) were also significant. Funding and Financial Access (β = 0.130, p = 0.066) and Socio-Cultural Diversity (β = 0.121, p = 0.088) were marginally significant with positive signs and p-values just below the usual

0.05 level. Ordinary least square path analysis confirmed the regression results with model fit indices (RMR=0.042; SRMR=0.038) both below the 0.08 cut-off for good fit.

E. Hypothesis Testing Summary

Hyp.	Determinant	β	p	Decision
H1	Regulatory Environment	0.145	.046	Supported
H2	Infrastructure Adequacy	0.207	.003	Supported
H3	Funding & Fin. Access	0.130	.066	Partial
H4	Technological Integration	0.182	.011	Supported
H5	Socio-Economic Factors	0.218	.002	Supported
H6	Market Dynamics	0.161	.027	Supported
H7	Socio-Cultural Diversity	0.121	.088	Partial

TABLE V. Summary of Hypothesis Testing Results

Five hypotheses (H1, H2, H4, H5, H6) are supported fully at p

< 0.05 and the other two (H3, H7) are supported partially at p <

0.10. All seven coefficients are positive, providing strong support for the integrated conceptual model.

F. Subgroup Analysis by Stage and Region

Separate regressions were run for the early stage (n = 68) and growth stage (n = 82) Start-Ups to explore whether determinant importance differs across the enterprise lifecycle and geography. Table VI shows the dominant predictor and its standardised coefficient for each subgroup.

Subgroup	Dominant Predictor	β	p
Early-stage (n=68)	Funding & Fin. Access	0.231	.032
	Regulatory Environment	0.198	.048
Growth-stage (n=82)	Market Dynamics	0.243	.009
	Technological Integration	0.221	.015
Western UP (n=61)	Market Dynamics	0.238	.011
Eastern UP / Bundelkhand (n=38)	Infrastructure Adequacy	0.312	.004

TABLE VI. Dominant Predictors of Success by Development Stage and Region

Funding and regulatory clarity are most critical at the earliest stage when ventures are most constrained for resources. During the growth phase, market positioning and technological capability are the most important. In the more competitive, better-connected Western UP / NCR-adjacent corridor, Market Dynamics is the key driver, whereas

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Infrastructure Adequacy is the binding constraint in the less-developed Eastern UP and Bundelkhand belt. Such patterns suggest that interventions tailored by stage and region are likely to be more effective than uniform, one-size-fits-all policy prescriptions.

V. DISCUSSION

The findings question conventional wisdom about Edu-Tech entrepreneurship that considers technology and funding as the main levers of success. Rather, the prevalence of Socio-Economic Factors confirms that the purchasing power, literacy and digital readiness of the target market acts as a ceiling limiting the return to other strategic choices: enterprises cannot innovate or differentiate their way around fundamental limits on household willingness to pay. The finding is consistent with the capabilities approach to development economics and further strengthens the practical argument for innovative, tiered or outcome-based pricing models suitable for price-sensitive, non-metro markets.

The second-ranked position of Infrastructure Adequacy confirms the importance of first-level (physical) access in the Digital Divide theory as a binding precondition for digital service delivery especially in a state with 77.7 per cent of the population being rural. Most notably, Technological Integration is the only predictor that enterprises can directly control through product design, and its significant positive effect (consistent with TAM's emphasis on perceived usefulness) suggests that offline-capable, low-bandwidth, mobile-first architectures can partially compensate for external infrastructure deficits positioning technology as a strategic enabler rather than a stand-alone solution.

The relatively modest, marginally significant effects of Funding and Financial Access and Socio-Cultural Diversity do not imply that these factors are unimportant but rather that their influence may be indirect, mediated through the technology and infrastructure investments that funding enables, and through the market acceptance that culturally and linguistically localised content facilitates. The stage- and region-specific subgroup patterns (Table VI) further suggest that one-size-fits-all interventions are unlikely to be effective: early-stage ventures require regulatory clarity and seed capital, growth-stage ventures need competitive positioning and technology investment, and Eastern UP / Bundelkhand requires infrastructure investment ahead of market-development support.

These results are generally consistent with the literature, but also extend it. The 50.6 percent explained variance is comparable to or higher than the reported variances in related entrepreneurship-determinant studies. The effect-size advantage attributed to technology-mediated instruction in meta-analytic work (Means, Toyama, Murphy and Baki, 2008) is consistent with the finding that Technological Integration is the only success lever that is directly controllable in the present study. At the same time the pre-eminence of Socio-Economic Factors relative to Regulatory Environment is different to policy discourse that often emphasises deregulation as the principal answer and suggests that demand-side market development merits at least equal policy priority relative to supply-side regulatory reform in the Uttar Pradesh context.

Theoretically, the pattern of results provides some support for an integrated rather than singular application of Diffusion of Innovation theory, TAM and Digital Divide theory: no one framework alone explains the variance observed and each construct's explanatory contribution is consistent with the theoretical mechanism most proximate to it perceived usefulness for Technological Integration (TAM), physical and outcome-level access for Infrastructure Adequacy and Socio-Economic Factors (Digital Divide theory), and relative advantage and compatibility for Market Dynamics and Socio-Cultural Diversity (Diffusion of Innovation theory). This multi-theoretical convergence bolsters calls for integrative frameworks in the literature on studying technology adoption in structurally heterogeneous, resource-constrained settings.

The contrast with BYJU'S well documented trajectory (Section I) is instructive: a growth-at-all-costs strategy built on aggressive customer acquisition and metro-centric monetisation proved unsustainable even with access to world-class technology and capital, precisely because it under-weighted the socio-economic and infrastructural realities that this study identifies as the strongest determinants of sustainable success. For the much larger population of small and medium Edu-Tech ventures in Uttar Pradesh, the evidence points to a more durable competitive advantage arising from disciplined alignment to local market economics and infrastructure conditions than emulating capital-intensive, scale-first national playbooks.

VI. CONCLUSION AND POLICY IMPLICATIONS

The study provides state specific empirical evidence that the success of Edu-Tech Start-Ups in Uttar Pradesh is contingent on the combined interaction of socio-economic, infrastructural, technological, market, regulatory, financial and socio-cultural factors with no single determinant being a magic bullet. The empirical findings are translated into action in the following targeted recommendations for the three main stakeholder groups.

A. For Edu-Tech Entrepreneurs

1. Develop creative tiered pricing models (freemium, instalment, outcome-based, and B2B2C) that are sensitive to the price sensitivity of socio-economically constrained target markets.
2. Build for infrastructure constraints from the start, with offline-first architectures, adaptive-bitrate and low-bandwidth content, rather than slap connectivity-dependent products on later.
3. Focus on regional language content and culturally contextualised pedagogy and not competing directly with well-funded national platforms.

B. For Policymakers

1. Infrastructure Adequacy (BharatNet expansion, subsidised tower density, stable electricity supply) is the second most important predictor of success. Speed up deployment of rural digital infrastructure.
2. Demand-side financial support – EdTech vouchers and outcomes-based funding – to support economically disadvantaged learners and to challenge the dominance of Socio-Economic Factors.
3. Investment in single window compliance sector specific regulatory sandboxes Investment in infrastructure and market development

C. For Investors

1. Add target-market economic analysis (price sensitivity, unit economics, conversion rates) to due diligence, in addition to the regular tech and team review.
2. Match patient, milestone-driven capital with longer investment horizons to the longer development timelines typical of infrastructure- and market-constrained environments.
3. Capital for the portfolio (non-financial) – offline-first product guidance, infrastructure partnerships and regulatory advisory.

D. For Educational Institutions

Develop clear digital learning plans that outline curricular fit, platform selection criteria, and faculty professional development requirements before Edu-Tech tools are deployed.

Find partnership models content licensing, platform adoption and co-development that marry institutional credibility and learner access with enterprise technology and content capability. Invest in faculty digital-pedagogy training and invest in the infrastructure for learner support (device lending, digital learning labs) to close the digital divide for students.

There are significant constraints but Uttar Pradesh has a huge long-term potential for well-placed Edu-Tech ventures owing to its vast scale, rising educational aspirations and growing mobile penetration. Achieving this potential will require concerted effort from entrepreneurs, investors, policymakers and educational institutions rather than any one stakeholder group or intervention.

VII. LIMITATIONS AND FUTURE RESEARCH

There are five limitations to consider when interpreting the findings. First, the sample of 150 respondents was purposive/snowball and may not represent UP's Edu-Tech population. Second, the use of self-reported perceptual data may be subject to social-desirability and common-method bias Third, the design was cross-sectional, meaning that firm causal inference cannot be made. Fourth, the study was restricted to one state which limits generalisability. Fifth, the 2026 data collection window may not capture the fast-moving impact of generative AI on the sector. These limitations highlight five priority directions for future research:

1. Longitudinal studies of the same enterprises over several years to determine causal direction and to identify factors that separate survival from failure.
2. Cross-state comparison studies in other large and diverse Indian states (for example, Bihar, Madhya Pradesh, Rajasthan) and similar international contexts to test generalisability.
3. Qualitative case studies of high performing ventures to explain the strategic and organisational processes that underlie statistical associations.
4. Demand side (learner) research on platform choice, retention and long term outcomes – not just enterprise side.
5. Intervention studies (quasi-experimental or randomised) that investigate the causal effect of specific infrastructure, funding and regulatory reforms, and of generative-AI-enabled tutoring at scale.

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DATA AVAILABILITY STATEMENT

The survey data analysed in this study are available from the corresponding author upon reasonable request, subject to participant confidentiality undertakings given at the time of data collection.

CONFLICT OF INTEREST

The authors declare no conflict of interest with respect to the research, authorship, or publication of this paper.

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