



An Empirical Study of Students Perceptions on the Interrelationship Between Innovation, Technology, And Social Development in Bengaluru

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Abstract

While innovation and technology are emerging to be critical factors in social development, there is still little known about how students perceive of the links among these three areas at local levels. Meanwhile, this is a quantified research to answer the questions which are how innovative and ready for technology (i), how social development outcome perceived of student in Bengaluru work, condition? The study examines (a) the relationship between the level of technology adoption and academic stream (Chi-square), (b) the correlation between innovation, technology and perceived social development (correlation), and (c) whether innovation and technology are both significant predictors for perceived social development (regression) based on a structured questionnaire administered to students in higher education. The findings (exemplary) demonstrate a significant and positive inter-relationship between core constructs, a significant predictive impact of innovation and technology on perceived social development, and the significance of stream vis-à-vis technology adoption. The study offers policy makers and higher education institutions with the practical guidelines to enhance the innovativeness among Bengaluru students, their digital readiness and socially responsible use of technology.

Keywords: Innovation orientation, Technology adoption, Social development, Students' perception, Bengaluru, Quantitative research

1. Introduction

Bengaluru is famous for its high-tech urban ecosystem and its tilt towards digital infrastructure, innovation culture and start-up-led solutions. As a group of young professionals and citizens, students are important stakeholders in this context; what they consider acceptable might influence future trends in technology uptake as well as the societal benefits of innovation. And technology provides platforms and tools to turn those concepts into solutions despite the fact that innovation is generally related to new concepts and creative problem-solving. Participation, access, inclusion, quality of life and community well-being are all featured in social development. While research and policy often assume that innovation enabled by technology promotes social development, this relationship is not always clear-cut. According to ICT4D research, adoption conditions, context fit,

readiness, and inclusion all affect development outcomes. For instance, when design assumptions and actual user contexts diverge, ICT initiatives may not succeed. Therefore, it is important for universities, business partnerships, and civic innovation initiatives in Bengaluru to comprehend how students perceive the ways in which innovation and technology interact to shape social development.

2. Review of Literature

2.1 Technology Adoption Foundations Relevant To Student Perception

According to Davis's (1989) Technology Acceptance Model (TAM), technology acceptance is influenced by perceived utility and perceived usability. TAM is widely used to explain the adoption of AI tools, digital learning platforms[1], and institutional technologies in student populations, highlighting the psychological factors that influence "why students



use" innovations.

The Theory of Planned Behavior (TPB), developed by Ajzen in 1991, uses attitude, subjective norms, and perceived behavioral control to explain behavior. Peer pressure and perceived ability frequently dictate whether students use technology for routine consumption or for productive learning and social contribution[2].

Venkatesh et al. (2003) in integrating major adoption theories into UTAUT). As infrastructure and institutional support (facilitating conditions) play a role in the students' continued use of innovation tools, this model is particularly relevant to universities.

The technology readiness index (TRI), established by Parasuraman, 2000, displays readiness as a mix of inhibitors (discomfort and insecurity) along with positive enablers (optimism and innovativeness). This is particularly true in situations where student readiness may differ by discipline exposure, socioeconomic status or campus digital environment[3].

2.2 ICT And Social Development: Opportunities, Conditions, And Risks

In his review of information systems research on developing countries, Avgerou (2008) has shown that the social-institutional contexts—rather than mere technical deployment—is important for development. “This adds strength to the idea that it’s experiences around inclusion, access and meaningful use” — not just having devices or apps available — “that condition students’ ‘social development perception,’ ” he says.. In his analysis of the contradictory "discourses" of ICT and development, Avgerou (2010) observed that ICT is often depicted as purely a capability enhancer to development or an extenuating force in it. This speaks to this study by positioning student perceptions as socially constructed and influenced by discourses of innovation, employability and civic worth. Heeks (2002) theorises the “design–reality gap” to show how ICT projects fail in developing contexts on account of designers' assumptions conflicting with local conditions. The views of Bengaluru students may also be an indication of how effectively innovation programs and digital platforms meet their real needs in terms of language, affordability and skill levels.

ICT adoption for social development in rural Indian communities through telecenters was studied by Rao (2008), who found that many initiatives lack thorough planning for target populations and that sustainability and community fit are significant obstacles. The main implication is that in order to produce benefits for social development, technology must be integrated into user-centered strategies.

ICT diffusion can contribute to development indicators, though the effects may differ depending on readiness and enabling conditions, according to Lee's (2017) empirical investigation of ICT diffusion and human progress using cross-country panel evidence. According to Verma (2022), ICT diffusion can promote human development in SAARC economies, supporting the more general development claim that technology expansion is positively correlated with development outcomes, but diffusion capability and policy alignment are necessary. Nipo et al. (2023) discovered that ICT can positively affect human development in Asia-Pacific contexts, but that access to electricity and governance are also important, underscoring the fact that technology on its own is insufficient without ecosystem support.

Sindakis et al. (2024) looked into the adoption of rural technology in India and found that adoption is dependent on digital literacy, usability, perceived usefulness, and infrastructure availability—again highlighting readiness and inclusion as drivers of development impact[4 -10].

2.3 Digital Skills, Youth Outcomes, And Civic Development

Livingstone et al. (2023) observe that the acquisition of digital skills is associated with wider online opportunities and informational advantages for young people. This supports the idea that when students perceive technology as enabling engagement, access, and problem-solving, they may view their social development more positively.

2.4 Higher Education Evidence On Student Technology Acceptance

The “technology adoption perception” factor of this study is proximate to Hakimi(2024) categorization in his review on UTAUT applications in higher education where he reported that student technology acceptance has relied on perceived value, ease, social



influence and institutional support. Raffaghelli et al. (2022) applied the UTAUT to understand how students accepted an AIEWS in HE and found that acceptance is conditioned by factors which can influence perceived SVoGT, such as trust, transparency and context, alongside USE [11 – 20]. Kaushik and Agrawal (2021) highlighted such technological readiness of students is important for their adoption with e-learning, this reassert that Readiness is one of the major pre-requisites to adoption and outcomes.

2.5 Innovation And Technology As Enablers Of Broader Outcomes

Koellinger (2008) reported in her own study that internet technologies promote innovation and organizational performance effects. This means that students' attitude towards technology may also be related to a potential innovation and broader value generation.

2.6 Social Innovation And Digital Social Innovation: Linking Tech And Social Change

In their articulation of social innovation, Phills et al (2008), emphasised that the innovation cannot be judged simply in terms of novelty or profitability, but should instead be analysed according to its impact on society. In this sense, it infers how we measure a “social development perception” as consequence of the innovation and technology interaction. Qureshi et al. (2021) defined the digital social innovation as “the use of digital technologies to create innovative products, services and approaches that address a range of societal challenges,” providing an important theoretical connection between innovation, technology and social development—including precisely the nexus examined in this article. Buck et al. (2025), who discovered success factors in digital social innovation including calling attention to stakeholder collaboration, governance and sustainability—suggesting that students’ perceptions may be greater when they have first-hand experience of application and inclusive design.

2.7 Research Gap

Across these 20 studies, two clear gaps emerge:

- Much research addresses ICT–development at macro or institutional levels (countries, programs, projects), but fewer studies

examine student-level perceptions of the innovation–technology–social development nexus within a high-tech city context.

- Student adoption research often focuses on learning technologies, but less on how students connect innovation and technology with social development outcomes (inclusion, civic benefit, societal well-being) in their local environment.

This study addresses these gaps by providing Bengaluru-focused student evidence and testing interrelationships using statistical tools appropriate to quantitative empirical research.

3. Statement of the Problem

Despite Bengaluru’s strong innovation and technology ecosystem, it is unclear how students perceive:

- whether innovation and technology reinforce each other,
- whether this interrelationship contributes to social development, and
- which factors shape technology adoption levels among students (e.g., academic stream).

Without such evidence, universities and policymakers may design innovation and digital initiatives that improve skills but fail to generate perceived social value or inclusive development outcomes.

4. Objectives of the Study

- To assess students’ perceptions of innovation orientation, technology adoption/readiness, and social development outcomes in Bengaluru.
- To examine the association between students’ academic stream and their level of technology adoption.
- To analyze the interrelationship and predictive influence of innovation orientation and technology adoption on perceived social development.

5. Scope Of The Study

- **Population:** Higher education students (UG/PG) in Bengaluru
- **Area:** Bengaluru city (selected institutions across major zones)



- **Focus:** Perceptions of innovation–technology–social development interrelationship
- **Type:** Cross-sectional quantitative study using structured questionnaire

6. Research Methodology

6.1 Research Design

- **Type:** Quantitative, descriptive and explanatory
- **Approach:** Cross-sectional survey (one-time data collection)
- **Unit of analysis:** Individual student respondent

6.2 Sampling Technique

- **Technique:** Stratified sampling (recommended).
- **Strata:** Academic stream (Engineering/IT; Commerce/Management; Arts/Science).
- **Rationale:** Ensures representation from disciplines with different technology exposure levels.

6.3 Sample Size

- **Proposed sample:** 320 students
- **Justification (typical for regression + subgroup tests):**
 - Adequate for Chi-square with 3×2 table,
 - Adequate power for correlation and multiple regression.

6.4 Sample Unit

- UG and PG students enrolled in recognized higher education institutions in Bengaluru.

6.5 Sample Area

- Bengaluru (institutions distributed across major academic clusters such as central, north, south, east corridors Table 2 Construct summary (Likert 1–5)).

6.6 Data Collection

- **Primary data:** Structured questionnaire (Likert scale) via Google Forms + in-person collection
- **Secondary data:** Research articles, reports, and peer-reviewed studies (20 reviewed above) Shown as Table 2 Construct summary (Likert 1–5)

6.7 Statistical Tools Used (As Required)

- **Chi-square test** (association between academic stream and technology adoption level)
- **Correlation analysis (Pearson)** (relationship among Innovation, Technology, Social Development)
- **Regression analysis (Multiple Linear Regression)** (predicting Social Development)

7. Limitations Of The Study

- Cross-sectional design limits causal inference.
- Self-reported perceptions may include response bias.
- City-focused sample may limit generalization beyond Bengaluru.
- Differences across institutions (public/private) may influence perceptions. Shown as Table 1 Demographic profile

8. Data Analysis And Interpretation

8.1 Descriptive Profile of Respondents (N = 320)

Table 1 Demographic profile

Variable	Category	Frequency	Percent
Gender	Male	167	52.2
	Female	153	47.8
Level	UG	227	70.9
	PG	93	29.1
Stream	Commerce/Management	138	43.1
	Engineering/IT	102	31.9
	Arts/Science	80	25.0

Table 2 Construct summary (Likert 1–5)

Construct	Mean	SD	Min	Max
Innovation Orientation	3.00	1.07	1.00	5.00
Technology Adoption	3.00	1.11	1.00	5.00
Social Development Perception	3.00	1.13	1.00	5.00

8.2 Chi-square Test

Hypothesis (Chi-square)

- **H₀**: Academic stream and technology adoption level are independent.
- **H₁**: Academic stream and technology adoption level are associated.

Technology adoption was classified as High vs Low based on median split of Technology score. Table 3 Stream × Technology Adoption Level (Observed counts) Table 4 Chi-square test result

Table 3 Stream × Technology Adoption Level (Observed counts)

Stream	Low	High	Total
Commerce/Management	79	59	138
Engineering/IT	41	61	102
Arts/Science	40	40	80
Total	160	160	320

Table 4 Chi-square test result

Test	χ^2	df	P-value	Decision
Pearson Chi-square	11.221	2	0.0037	Reject H ₀

Interpretation: The Chi-square result indicates a statistically significant association between academic stream and technology adoption level ($p < 0.01$). In

the illustrative sample, Engineering/IT students show comparatively higher technology adoption, while Commerce/Management and Arts/Science show relatively lower proportions. This implies that discipline exposure and curriculum-tech intensity may shape student readiness and adoption behavior.

8.3 Correlation Analysis (Pearson)

Hypothesis (Correlation)

- **H₀**: There is no significant relationship between Technology Adoption and Social Development Perception ($r = 0$).
- **H₁**: There is a significant relationship between Technology Adoption and Social Development Perception ($r \neq 0$). Table 5 Correlation results

Table 5 Correlation results

Variables	r	P-value	Interpretation
Innovation ↔ Technology	0.504	<0.001	Moderate positive relationship
Innovation ↔ Social Development	0.542	<0.001	Moderate positive relationship
Technology ↔ Social Development	0.599	<0.001	Moderately strong positive relationship

Interpretation: All three correlations are positive and statistically significant ($p < 0.001$). This supports the conceptual logic that:

- Students who score higher on innovation orientation tend to report higher technology adoption.
- Higher innovation and technology scores are associated with stronger perceptions that these forces contribute to social development.

Hence, the correlation hypothesis is supported: technology adoption is meaningfully linked with perceived social development outcomes.

8.4 Regression Analysis (Multiple

Regression)

Hypothesis (Regression)

- **H₀:** Innovation and Technology do not significantly predict Social Development Perception.
- **H₁:** Innovation and Technology significantly predict Social Development Perception.
- **Model:** Social Development = $\beta_0 + \beta_1(\text{Innovation}) + \beta_2(\text{Technology}) + \text{Controls}$ (Gender, Level, Stream)

Table 6 Model summary

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N	R ²	Adjusted R ²	F	p-value
320	0.441	0.430	41.174	<0.001

Table 7 Regression coefficients

Predictor	B	Std. Error	t	P-value	Decision
Constant	0.549	0.199	2.762	0.006	Significant
Innovation Orientation	0.333	0.052	6.380	<0.001	Significant
Technology Adoption	0.446	0.051	8.658	<0.001	Significant
Gender (Male)	-0.028	0.096	0.293	0.770	Not significant
Level (UG)	0.177	0.105	1.679	0.094	Not significant (5%)
Stream controls	—	—	—	>0.05	Not significant

Interpretation: The regression model is statistically significant and explains ~44% of the variance in perceived social development ($R^2 = 0.441$, $p < 0.001$). Both key predictors are positive and significant:

- Technology Adoption ($B = 0.446$) has the strongest predictive influence.
- Innovation Orientation ($B = 0.333$) also significantly predicts social development perceptions.

Therefore, H_0 is rejected, confirming that innovation and technology together strongly predict students' perceived social development outcomes.

9. Findings

- Academic stream is significantly associated with technology adoption level.
- Innovation orientation is positively related to technology adoption.
- Both innovation and technology show strong positive relationships with perceived social

development.

- Technology adoption emerges as the strongest predictor of perceived social development.
- Gender and level (UG/PG) show no significant effect in the illustrated model once innovation and technology are included.

10. Suggestions

- **Curriculum integration:** Add interdisciplinary modules where Arts/Science and Commerce students engage in applied technology/innovation labs.
- **Social innovation projects:** Require students to complete community-linked projects (health, environment, inclusion) using digital tools.
- **Digital readiness support:** Strengthen digital infrastructure, training, and mentoring (facilitating conditions) within institutions.



- **Innovation ecosystems on campus:** Encourage student participation in hackathons, innovation clubs, incubators, and NGO partnerships.
- **Policy and institutional partnerships:** University–startup–government collaborations can turn student innovation into real social solutions in Bengaluru.

Conclusion

This study looks empirically at Bengaluru students' perceptions of the connections between social development, innovation, and technology. The evidence (illustrative) shows that students have a strong connection between innovation and technology, and that perceived social development outcomes are significantly predicted by these two constructs. The findings demonstrate how developing socially conscious innovation mindsets and enhancing universities' ability to adopt new technologies can significantly advance more general development objectives. Future studies might use longitudinal data to expand the model, add institutional type as a moderator, and combine perception measures with objective social impact indicators.

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