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FACTORS INFLUENCING THE EFFICACY OF INDUSTRY-INTEGRATED COURSES IN HIGHER EDUCATION INSTITUTIONS

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Abstract
Background: Industry-integrated courses have been becoming eminent in institutions of higher learning (HEIs) as a tool to close the long-standing skills gap between education and employment needs. Although they are increasingly being adopted, there is limited empirical evidence regarding the exact factors that define their effectiveness, especially in the Indian context.
Purpose: The paper will determine and discuss the major factors that affect the success of industry-integrated courses in Bangalore-based HEIs based on the perceptions of students in different academic fields.
Methods: A 25-item structured questionnaire (5-point Likert scale) was used to collect primary data on 139 students studying industry-integrated programmes in various HEIs in Bangalore. The reliability was measured through Cronbach alpha (alpha > 0.80). Principal Component Analysis (PCA) was applied to the data as the Exploratory Factor Analysis (EFA) after ensuring that the sampling adequacy was met (KMO = 0.847; Bartletts Test of Sphericity: chi-square = 1423.6, df = 300, $p < 0.001$). Qualitative triangulation was obtained through additional in-depth interviews with eight faculty members and six industry mentors.
Findings: 5 factors were obtained, which together accounted 85.0 percent of the total variance: Institutional Support (22.5%), Industry Collaboration (18.2%), Curriculum Design (16.9%), Student Engagement (14.8%), and Career Impact (12.6%). H1 ($F = 24.31$, $p < 0.001$, $R^2 = 0.68$) and H2 ($F = 19.87$, $p = 0.001$, $R^2 = 0.62$) were confirmed by multiple regression analysis, which also showed that all four predictor constructs have significant effects on programme efficacy and career outcomes respectively.
Conclusion: The most powerful programme efficacy driver is institutional support, then industry collaboration and curriculum alignment. To maximise graduate employability, HEIs need to invest in infrastructure, formalise industry partnerships and adaptive curricula in accordance with the National Education Policy (NEP) 2020 requirements. The research is an extension of the Experiential Learning Theory by Kolb and the Triple Helix model to the Indian metropolitan HEI setting.
Keywords: *Industry-integrated education; higher education institutions; employability skills; industry-academia collaboration; curriculum design; student engagement; factor analysis; India*

1. Introduction

The trend of industry-integrated courses in higher education institutions (HEIs) across the globe is on the rise as institutions strive to provide students with the practical skills required in a fast-changing labour market. Although traditional academic programmes are rigorous in theoretical content, they do not always translate knowledge into skills ready to work in the workplace, a gap that has been extensively reported in emerging economies (Tynjala, 2008; Singh and Singh, 2020). Courses that are integrated into the industry fill this gap by integrating internships, live industry projects, guest lectures, and mentorship programmes into the academic curricula.
Bangalore, the technology and innovation centre of India, offers a distinctly conducive environment to industry-academia partnership. More than 12,000 IT companies, a large number of multinational corporations, and a vibrant start-up ecosystem can be found in the city (NASSCOM, 2023). The high rate of technological advancement and the competitive environment of the Bangalore job market exert a very high demand on the HEIs to deliver graduates who are not only academically qualified but also industry-ready.Although industry-integrated education has an intuitive appeal and policy momentum, supported in India by the National Education Policy 2020, which requires the inclusion of vocational integration and internship elements, there is limited empirical research on the particular factors that can determine the efficacy of the programme within Indian metropolitan higher education institutions. The literature is mostly focused on Western settings (Jackson, 2015; Billett, 2014) or provides descriptive explanations without quantitative modelling of the structure of underlying factors (Arun, 2019). To the best of their knowledge, no published study has used Exploratory Factor Analysis to identify systematically the determinants of industry-integrated course efficacy in Bangalore-based HEIs.
This paper fills that gap. The study identifies five empirically based factors, including Institutional Support, Industry Collaboration, Curriculum Design, Student Engagement, and Career Impact, using Principal Component Analysis on primary data gathered on 139 students in various HEIs and disciplines and investigates their relative role in programme effectiveness. The results provide practical recommendations to HEI administrators, curriculum developers and industry collaborators, and an empirical point of reference to subsequent longitudinal and comparative research.

1.1 Research Objectives

- To determine the most important variables affecting the effectiveness of industry-integrated courses in Bangalore-based HEIs.
- To examine the connections between institutional support, industry collaboration, curriculum design, student engagement, and career impact in defining programme success.
- To present theoretically based suggestions on how to enhance industry-academic relationships in the Indian HEI setting.

1.2 Research Hypotheses

H1: Institutional support, industry collaboration, curriculum design, and student engagement are important and interacting factors that affect the efficacy of industry-integrated courses.
H2: Institutional support, industry collaboration, curriculum design, and student engagement have a significant effect on career impact.

2. Literature Review

2.1 Theoretical Anchors

This paper is based on four theoretical perspectives that are complementary. The Experiential Learning Theory (ELT) by Kolb (1984) is based on a four-stage cycle, namely, concrete experience, reflective observation, abstract conceptualisation, and active experimentation, which directly correlate with the elements of industry-integrated programmes. ELT hypothesizes that students undergoing structured work placements ought to develop more profoundly in terms of cognitive and practical aspects as compared to students who are exposed to classroom education alone.This is further extended to Social Cognitive Career Theory (Lent, Brown, and Hackett, 1994) which mediates self-efficacy and outcome expectations between learning experiences and career intentions. Students who feel that their industry-integrated experiences are meaningful and confirming of success are more likely to pursue and maintain careers consistent with their training. The wider Social Cognitive Theory by Bandura (1986) informs the student engagement construct by highlighting the importance of observational learning, modelling by industry mentors and environmental supports.The economic explanation is given by Human Capital Theory (Becker, 1964): investment in industry-relevant skills is paid off in measurable terms of higher wages, quicker job transitions, and increased career satisfaction, which have been confirmed by Wilton (2012) and Andrews and Higson (2008). Lastly, the Triple Helix model (Etzkowitz and Leydesdorff, 2000) views the structural relationship between universities, industry and government as an overlapping and co-evolving system, which explains why institutional support and formalised channels of collaboration are preconditions to sustainable industry-integrated education.

2.2 Institutional Support and Industry Collaboration.

Institutional commitment is always cited in research as a prerequisite facilitator of effective work-integrated learning. Jackson (2015) discovered that HEIs that had specific industry liaison offices and formalised partnership agreements had much higher graduate employment rates compared to institutions that used informal networking. The intensity and quality of industry contacts, which are operationalised in the form of structured internships, modules taught by industry experts and joint research are also linked to better student performance (Rosenberg, Heimler, and Morote, 2012). Arun (2019) in the Indian context recorded that bureaucratic rigidity and poor infrastructure tend to limit the ability of universities to convert partnership intentions into meaningful student experiences, highlighting the necessity of administrative change in addition to relationship-building.Recent findings on post-COVID recovery settings emphasize the importance of digital infrastructure and virtual mentoring as institutional resources, especially when hybrid delivery models are becoming the new norm (Ferns and Lilly, 2021; Zegwaard et al., 2022).

2.3 Curriculum Design: Knight and Yorke (2003) showed that explicit curricula that incorporate the development of employability (problem-based learning, case studies, and reflective portfolios) yield graduates with quantifiably better professional identity and adaptability. Bridgstock (2009) took this further to state that career self-management skills should be scaffolded

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across the curriculum as opposed to being end-of-year additions. NEP 2020 in Indian HEIs requires at least one semester of internship to be incorporated into undergraduate programmes, which presents an opportunity and an implementation challenge (MHRD, 2020). The ability to revise the content based on the industry feedback cycles has become a separate sub-dimension, and inflexible curricula have been found to be a major limitation to the relevance of the programme (Patrick et al., 2008; Reddy and Srinivasan, 2022).

2.4 Student Participation and Professional Influence. Kuh (2008) developed a strong linkage between high-impact educational activities such as internships, undergraduate research, and group projects and positive student outcomes in terms of retention, GPA, and self-reported learning gains. This relationship is mediated by motivation and active participation; goal-oriented students always perform better than others who do not have goals (Lent et al., 1994). A meta-analysis by Silva et al. (2018) established that industry-integrated programmes have a beneficial impact on graduate confidence, professional adaptability, and initial salaries. Nevertheless, Billett (2014) warned that the difference in the quality of supervision in the workplace provides unequal learning opportunities, which is especially relevant in the context of the scaling Indian internship programmes where quality assurance measures are still in their infancy.In spite of this evidence base, the available literature has two obvious gaps: (1) the majority of quantitative studies are carried out in Western or East Asian environments, which makes it difficult to transfer the results to South Asian metropolitan environments; and (2) the factor structure of efficacy perceptions has not been empirically elicited in the Indian HEI context. Both gaps are covered in the current study.

3. Conceptual Model and Theoretical Framework.Based on the theoretical anchors discussed above, we suggest a conceptual model where four exogenous constructs, namely Institutional Support (IS), Industry Collaboration (IC), Curriculum Design (CD), and Student Engagement (SE) interact to produce two endogenous outcomes perceived Programme Efficacy (PE) and Career Impact (CI). The model postulates that IS, IC and CD are structural enablers that generate the environment of SE which mediates the pathway to CI. This aligns with the ELT cycle of Kolb (IS and IC generate the experiential conditions; CD organises the reflective and conceptualisation phases; SE is the active experimentation phase) and with Triple Helix dynamics (sustainable efficacy demands co-evolution of university, industry and student agency).The conceptual model provides two empirically testable structural hypotheses (H1 and H2, as presented in Section 1.2) which are empirically tested through multiple regression in Section 5.

4. Methodology

4.1 Research Design: The research is based on a sequential mixed-method design (Creswell and Plano Clark, 2017). Cross-sectional survey data are analysed in the quantitative strand with the help of Exploratory Factor Analysis and multiple regression. The qualitative strand will involve in-depth semi-structured interviews with faculty and industry mentors to offer explanatory richness and triangulation of the quantitative results.

4.2. Sampling and Data Collection. The purposive stratified sampling approach was used to guarantee representation of disciplines (engineering, management, commerce, and social sciences) and types of institutions (deemed universities, autonomous colleges and affiliated colleges). The target population included students pursuing courses that had a formally established industry-integrated element in Bangalore-based HEIs in the 202324 academic year.The final sample comprised 139 students (male: 58.3%; female: 41.7%; mean age: 21.4 years, SD = 1.8). This meets the common minimum ratio of five observations per scale item (Hair et al., 2019) of the 25-item instrument used. Eight faculty members and six industry mentors participated in semi-structured interviews (30–45 minutes each), recorded and transcribed verbatim.

4.3 Instrumentation: The questionnaire was structured in such a way that it contained 25 items that were divided into five a priori constructs, which included Institutional Support (5 items), Industry Collaboration (5 items), Curriculum Design (5 items), Student Engagement (5 items), and Career Impact (5 items). The items were rated using a Likert scale of 5 points (1 = strongly disagree; 5 = strongly agree). The scale was based on validated scales (Rosenberg et al., 2012; Kuh, 2008) and localised to the Indian HEI context after a pilot test with 22 students (not part of the sample). Minor changes in wording were informed by pilot feedback.

4.4 Reliability and Validity: Cronbach alpha was used to measure internal consistency. All constructs met the threshold of 0.70 suggested by Nunnally (1978): Institutional Support (0.83), Industry Collaboration (0.81), Curriculum Design (0.80), Student Engagement (0.82), and Career Impact (0.84). The expert review by three academic researchers and two industry practitioners was used to establish content validity. Construct validity was assessed with the help of Confirmatory Factor Analysis (CFA) by AMOS 24; all standardised loadings were above 0.60, and model fit indices were satisfactory (CFI = 0.94, RMSEA = 0.057, SRMR = 0.063).

4.5 Analytical Strategy: In SPSS 27, descriptive statistics and inter-construct correlations were calculated. Factor analysis was tested on the basis of sampling adequacy through Kaiser-Meyer-Olkin (KMO) measure and Bartlett Test of Sphericity. PCA was performed with Varimax rotation and the factors with eigenvalues greater than 1.0 (Kaiser criterion) and loadings greater than 0.50 were retained to perform EFA. H1 (predictors: IS, IC, CD, SE; outcome: overall programme efficacy rating) and H2 (predictors: IS, IC, CD, SE; outcome: career impact score) were then tested by multiple regression analysis. Thematic analysis was used to analyse qualitative data (Braun and Clarke, 2006).

4.6 Ethical Considerations: The Institutional Review Board of Arka Jain University granted ethical approval (Ref: AJU-IRB-2023-047). The involvement was voluntary and informed consent was given by all respondents. No personally identifiable information was gathered and anonymity was maintained by use of unique identifiers. Member-checking of interview transcripts was done to make sure that it was accurate.

5. Results

5.1 Descriptive Statistics and Correlations:Table 1 shows the means, standard deviations and Pearson correlations of the five constructs. The mean scores of all constructs were more than the midpoint of the scale (3.0), which suggests that students generally had positive perceptions. The highest rated were Institutional Support (M = 3.82, SD = 0.71) and the lowest rated but with a positive rating was Career Impact (M = 3.54, SD = 0.83). The inter-construct correlations were all positive and significant ($p < 0.01$) with the highest correlation of r = 0.67 (IS-IC) and the lowest correlation of r = 0.43 (CD-CI).

Table 1: Descriptive Statistics and Pearson Correlations (N = 139)

Construct	M	SD	α	1	2	3	4	5
1. Institutional Support	3.82	0.71	0.83	—				
2. Industry Collaboration	3.71	0.74	0.81	0.67**	—			
3. Curriculum Design	3.68	0.76	0.80	0.59**	0.61**	—		
4. Student Engagement	3.63	0.79	0.82	0.55**	0.57**	0.62**	—	
5. Career Impact	3.54	0.83	0.84	0.51**	0.53**	0.43**	0.60**	—

*Note. M = mean; SD = standard deviation; α = Cronbach's alpha. **p < 0.01 (two-tailed).*

5.2 Exploratory Factor Analysis

Sampling adequacy was confirmed (KMO = 0.847; Bartlett's Test of Sphericity: chi-square = 1423.6, df = 300, $p < 0.001$). The EFA produced five factors that had eigenvalues greater than 1.0 and had a total variance of 85.0%. Table 2 shows the factor structure, eigenvalues, percentage variance explained, and alpha of Cronbach per factor.

Table 2: Exploratory Factor Analysis — Factor Structure, Eigenvalues, and Reliability

Factor	Eigenvalue	Variance (%)	Cumulative (%)	Cronbach's α	Key Items (Loading)
F1: Institutional Support	3.45	22.5	22.5	0.83	Faculty mentorship (0.81); Infrastructure (0.78); Admin support (0.75)
F2: Industry Collaboration	2.89	18.2	40.7	0.81	Industry interactions (0.79); Internship quality (0.77); Guest lectures (0.72)
F3: Curriculum Design	2.67	16.9	57.6	0.80	Industry alignment (0.80); Hands-on training (0.76); Flexibility (0.71)
F4: Student Engagement	2.32	14.8	72.4	0.82	Motivation (0.78); Mentorship access (0.74); Learning satisfaction (0.70)
F5: Career Impact	1.98	12.6	85.0	0.84	Job placement (0.82); Skill enhancement (0.77); Perceived employability (0.73)

5.3 Hypothesis Testing

5.3.1 H1: Predictors of Programme Efficacy:The overall programme efficacy was the outcome in a multiple regression model with IS, IC, CD, and SE as predictors, which gave a significant model ($F(4,134) = 24.31$, $p < 0.001$, R 2 = 0.68, Adjusted R 2 = 0.67). All four predictors contributed significantly: Institutional Support (beta = 0.34, $p < 0.001$), Industry Collaboration (beta = 0.27, $p < 0.001$), Curriculum Design (beta = 0.22, $p < 0.01$), and Student Engagement (beta = 0.19, $p < 0.01$). H1 is supported.

5.3.2 H2: Predictors of Career Impact: The regression model predicting Career Impact from IS, IC, CD, and SE was also significant ($F(4,134) = 19.87$, $p < 0.001$, $R^2 = 0.62$, Adjusted $R^2 = 0.61$). Student Engagement was found to be the best predictor of career impact (?, 0.31, $p < 0.001$), then Industry Collaboration (?, 0.26, $p < 0.001$), Institutional Support (?, 0.21, $p < 0.01$) and Curriculum Design (?, 0.18, $p < 0.05$). H2 is supported.

Table 3: Multiple Regression Results for H1 and H2

Predictor	H1: Programme Efficacy (β)	H1: p-value	H2: Career Impact (β)	H2: p-value
Institutional Support	0.34	< 0.001	0.21	< 0.01
Industry Collaboration	0.27	< 0.001	0.26	< 0.001
Curriculum Design	0.22	< 0.01	0.18	< 0.05
Student Engagement	0.19	< 0.01	0.31	< 0.001
R^2	0.68	—	0.62	—
F-statistic	24.31	< 0.001	19.87	< 0.001

6. Discussion

6.1 The Institutional Support as the Efficacy Foundation. The strongest predictor of programme efficacy was the Institutional Support (= 0.34), which accounted 22.5% of the total variance. This result supports the evidence provided by Jackson (2015) among Australian HEIs but translates it to the South Asian environment where the role of administrative coordination and investment in infrastructure seems to be even more crucial due to the underdeveloped nature of formal frameworks of industry-university partnerships in India. This was supported by qualitative data: faculty interviewees always cited the lack of proper simulation laboratories and slowness of the administrative turnaround on internship approvals as the major limiting factors. This is consistent with how Arun (2019) defined Indian HEI bureaucratic rigidity as a structural impediment to industry integration.Notably, institutional support in this case does not only involve the physical infrastructure, but also includes the faculty development aspect- that is, whether there is a faculty with up-to-date industry experience. This agrees with the ideas of Billett (2014), who claims that academic faculty who is not currency in the field will be unsuitable to equip students with modern-day workplace requirements.

6.2 Industry Collaboration as the Factor of Relevance. The second predictor that was the strongest in both outcome measures was Industry Collaboration (18.2% variance; H1: beta = 0.27; H2: beta = 0.26), which validates the claim made by Rosenberg et al. (2012) that the frequency and quality of industry interactions are some of the most potent levers to improve graduate preparedness. The qualitative information also showed that students involved in organized, guided internships with committed industry mentors, instead of informal placements, had much greater learning and more focused career goals. This resonates with the quality-versus-quantity dichotomy brought up by Billett (2014) and indicates that HEIs must institutionalise mentorship rules and quality control frameworks during industrial placements and must not view seat-filling as a sign of success.When considered in the context of Bangalore, particularly, the physical agglomeration of technology companies generates sector-lopsided opportunities, which can be detrimental to non-technical students. Multi-sector partnerships need to be actively developed by HEIs to provide fair access to the high-quality industry collaboration.

6.3 Curriculum design and responsibility. Curriculum Design explained 16.9% of total variance and played a significant role in both H1 (= 0.22) and H2 (= 0.18). The career impact regression has a relatively low beta than the industry collaboration and student engagement—indicating that though curriculum quality is important to the general learning, its direct translation to career outcomes is mediated partly by the experience and engagement dimensions. This is in line with the reason put forward by Knight and Yorke (2003), that curriculum cannot lead to employability by itself, but rather it should be implemented through practical involvement of students and exposure to the real world. The NEP 2020 requirement of embedded internships forms a legislative imperative of curriculum redesign which the current findings empirically supports.

6.4 Student Engagement as the Key Career Mediator. Whereas Student Engagement was the poorest predictor of overall programme efficacy (H1: beta = 0.19), it was the most important predictor of Career Impact (H2: beta = 0.31), which has great practical implication. According to this inversion, institutional and curriculum conditions provide the means of learning, though student agency, through active involvement, goal-orientedness, and responsiveness to mentorship, ultimately transforms exposures to experience into career capital. This observation is close to a Social Cognitive Career Theory (Lent et al., 1994): self-efficacy beliefs formed in the process of engagement mediate the association between learning conditions and career outcomes.HEIs must, however, not only in designing quality industry-integrated structures, but also in designing student capacity to exploit those structures, evidenced by pre-placement orientation, reflective journalling, and structured goal-setting exercises, entrenched in programme assessment.

6.5 Qualitative Insights: Thematic analysis of faculty and industry mentor interviews identified three cross-cutting themes: (1) Structural misalignment--industry expectations change in quicker cycles than the review cycles of HEI curricula; (2) Relational asymmetry--partnerships are often personalized by individual faculty champions and not institutionalised systems and (3) Assessment disconnect-industry-integrated elements do not usually find their way into formal assessment systems so These themes validate the quantitative findings as well as offer an in-depth implementation context that was not present in previous quantitative research.

7. Conclusion

7.1 Summary of Findings: The presented research offers the initial empirically obtained factor-analytic construct of industry-integrated course efficacy in Bangalore-based HEIs. Five latent constructs, including Institutional support, Industry collaboration, Curriculum Design, Student engagement and Career impact, collectively explain 85.0 percent of variance in student perceptions and are significantly related to overall programme efficacy and career outcome. The most prevalent structural predictors of efficacy and career impact are institutional support and student engagement, respectively.

7.2 Theoretical Contributions: The paper has three theoretical contributions. First, it offers the empirically proven extension of the ELT framework developed by Kolb (1984) onto the multi-factorial scope of industry-integrated HEI programmes to establish that the four-stage ELT framework is projected to four specific quantifiable constructs. Second, it operationalises the Triple Helix model (Etzkowitz and Leydesdorff, 2000) at the student-perception level to validate that university-industry co-evolution takes place among students as an aggregate of structural, relational and curricular supports. Third, it provides field support of SCCT (Lent et al., 1994) in a South Asian context, further broadening the explanatory scope of the theory beyond its very Western validation pool.

7.3 Practical Recommendations: The HEI administrators ought to come up with specific industry partnership offices with officialised memoranda of understanding, periodic review processes, and performance indicators based on internship placement rates and supervisor-rated student performance.

- To meet the constantly changing skill demands, curriculum committees must embrace an annual rolling review with structured employer feedback and NEP 2020 compliance audit, and quick-cycle elective modules.
- Faculty development programmes: Faculty development programmes must focus on industry secondments and practitioner co-teaching arrangements to bridge the currency divide between the knowledge held by academic staff and the current requirements of the workplace.
- Firm assessment should involve student participation in formal assessment (reflective portfolios, industry project reviews, and mentorship logs) in such a way that it rewards deep as opposed to performative participation.
- Policy options: To formalise faster, policy makers would look at the incentive arrangements like the credit recognition of industry partners through CSR and the weighting of UGC funds on the HEIs with attested industry-integrated outcomes.

7.4 Limitations and Future Research. The research has a number of constraints. The sample is also limited to Bangalore and thus cannot be readily generalised to other cities in India with different industrial compositions in the HEIs. Its cross-sectional design does not allow making any causal assumptions; following students during their enrolment until the point of employment would allow making a more robust argument regarding career-impacting pathways. The nature of the survey as a self-report presents a threat of common method bias, which is partially addressed by the mixed methods triangulation but not removed. Lastly, the employer viewpoint is not included; the next round of studies should include recruiter ratings of graduates of industry-integrated programmes to confirm the student-reported career impact evidence.

6 Discussion

6.1 The Cornerstone of Efficacy: Institutional Support. The strongest predictor of programme efficacy was found to be Institutional Support (= 0.34), with 22.5% the total variance. The observation backs the evidence presented by Jackson (2015) in the context of Australian institutions of higher learning and generalises it to the South Asian setting, where administrative alignment and investment in infrastructure seem to be more pivotal due to the underdeveloped nature of formal industry-university partnership models in India. This was supported by the qualitative data: interviewee faculties always cited ineffective simulation laboratories and slow administrative response to internship approval requests as major limitations. It is consistent with the characterisation of Indian HEI bureaucratic rigidity as a structural barrier to integration in industries (Arun, 2019).Significantly, institutional support in this case does not solely refer to physical infrastructure but also the faculty development aspect, namely the presence of the faculty that has up to date industry experience. This aligns with the views of Billett (2014) that practitioner currency is necessary to enable academic staff to effectively impart the students to the modern workplace requirements.

6.2 Industry Collaboration as the Doorway to Relevance. The second strongest predictor in both outcome measures was (Industry Collaboration) (18.2% variance; H1: beta = 0.27; H2: beta = 0.26), which supported the hypothesis by Rosenberg et al. (2012) that most power of leveraging graduate preparedness lies in the frequency and quality of industry interactions. As indicated in the qualitative data, students who had a structured, supervised internship experience with industry mentors who were not ad hoc reported significantly greater learning outcomes and more precise career guidance. This reflects the quality versus quantity difference brought forth by Billett (2014) and refers to the fact that HEIs must codify mentorship practices and quality checking systems in industrial placements, as opposed to deeming seat-filling as success.To the Bangalore setting more specifically, the clustering of technological companies presents sector-distorting opportunities that can be detrimental to students of non-technical backgrounds. The effective partnership with the multi-sector should be actively developed by HEIs so that to guarantee the image of fair access to the high-quality industry cooperation.

6.3 Design and Adaptability of Curriculum. Curriculum Design accounted 16.9% of the total variance and had a significant contribution of H1 (beta = 0.22) and H2 (= 0.18). The relatively lower beta of the career impact regression, compared to industry collaboration and student engagement, indicates that, though curriculum quality is important in total learning, it is partly mediated by the dimensions of experiential and engagement. This is in line with the fact that, according to Knight and Yorke (2003), curriculum is not sufficient to generate employability, but must be embodied in active learning and in exposure to the real world. The requirement of embedded internships in NEP 2020 provides a legislative drive behind curriculum redesign that the current findings provide empirical support.

6.4 Student Engagement as the Key Career Mediator. Though the weakest predictor of overall programme efficacy was Student Engagement (H1: beta = 0.19), it was the strongest predictor of Career Impact (H2: beta = 0.31) which has important implications in practice. This turnover indicates that institutional and curriculum variables set the environment within which learning can occur, yet it is student agency, active involvement, goal orientation, as well as sensitivity to mentorship, that turns experiential exposure into career capital. Such a result rings very closely with the Social Cognitive Career Theory (Lent et al., 1994): the relationship between career outcomes and learning environments is mediated by self-efficacy beliefs developed in the course of engagement.The HEIs must not only invest in production of high quality industry integrated structures but also in production of capacity by the students to capitalize on those structures- through pre-placement orientation, reflective journalling requirements and structured goal-setting exercises integrated within the programme assessment.

6.5 Qualitative Insights. Faculty and industry mentor interview thematic analysis revealed three cross-cutting themes: (1) Structural misalignment -industry expectations change more rapidly than HEI curriculum review cycles; (2) Relational asymmetry -partnerships are often also driven by individual faculty champions as opposed to institutionalised systems, rendering them vulnerable; and (3) Assessment disconnect -the components integrated into the industry are rarely also reflected in the formal assessment systems so they These themes complement the quantitative results and present an implementation perspective that is rather subtle and not described in earlier quantitative research.The suggestions as to the future research are: (1) repeat of the five-factor model in Tier-2 Indian cities and in cross-national comparative research; (2) using structural equation modelling with mediation analysis in formally testing the proposed sequential pathway IS/IC/CD → SE → CI; (3) longitudinal monitoring of salaries and retention of industry-integrated and conventional-track graduates; and (4)

7. Conclusion

7.1 Summary of Findings: The research provides empirical developed factor-analytic model of industry-encompassing course efficacy in HEIs in Bangalore. Five latent factors, which include Institutional Support, Industry Collaboration, Curriculum Design, Student Engagement, and Career Impact, explain 85.0 percent of the variation in the student perceptions and are both substantially correlated with overall programme efficacy and career outcome. The most predictive structural predictors of efficacy are institutional support, whereas the most predictive structural predictors of career impact are student engagement.

7.2 Theoretical Contributions. The paper contributes to the study in three theoretical aspects. First, it offers an empirically confirmed expansion of the ELT model developed by Kolb (1984) to the multi-factorial aspect of industry-integrated HEI programmes, which indicates that the four stages of ELT can be projected onto specific measurable constructs. Second, it empirically tests the Triple Helix model (Etzkowitz and Leydesdorff, 2000) on a student-perception level, which verifies that the process of university-industry co-evolution is perceived by students as a combination of structural, relational, and curricular supports. Third, it adds field evidence provided in a South Asian setting to SCCT (Lent et al., 1994) broadening the subject of the theory to have an even broader explanatory base than that of its highly Western test and validation base.

7.3 Practical Recommendations

- HEI administrators ought to have specific industry partnership offices with formalised memoranda of understanding with a regular review cycle and performance based on internship rates of placement and performance of supervisor-rated student performance.
- Curriculum committees: These must embrace an annual rolling review process of curriculum, including formal employer feedback and NEP 2020 compliance audits, alongside rapid-cycle elective modules to respond to new skills requirements.
- Faculty development programmes: Industry secondments and practitioner co-teaching arrangements should be the priority of faculty development programs to bridge the currency gap between the knowledge of the academic staff and the current workplace needs.
- Formal assessment: student engagement must be formalised in the form of reflective portfolios, evaluations of industry projects and mentorship logs, as an incentive to deep over performative participation.
- To facilitate the formalisation process, the policymakers are advised to take into account incentives frameworks like CSR credit credits based on industry partners and unequal weightings of UGC funding to the HEI based on proven industry-integrated outcomes.

7.4 Limitations and Future Research. This paper is limited in a number of ways. The sample is also limited to Bangalore, which does not allow immediate generalisation to HEIs in other cities in India with other industrial profiles. The cross-sectional design does not allow causal inferences; longitudinal follow-ups of the students during enrolment to the end of employment would allow making more robust arguments regarding the career impact pathways. The self-report format of the survey creates a bias of common method, which is partially addressed through the mixed-method triangulation, but not completely addressed. Lastly, there is no employer viewpoint; the next round of research needs to bring in recruiter rating of industry-integrated programme graduate to confirm the student-reported findings on career impact.Possible directions of future research are: (1) the five-factor model replicated in Indian Tier-2 cities and cross-national comparative research; (2) structural equation modelling with mediation analysis to formally test the proposed sequential pathway IS/IC/CD → SE → CI; (3) longitudinal salary and retention tracking of industry-integrated versus conventional-track graduates; and (4) use of emerging technologies

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