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FACTORS INFLUENCING THE EFFECTIVENESS OF INDUSTRIAL TRAINING OF CIVIL ENGINEERING UNDERGRADUATES- KDU

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ABSTRACT

Industrial training is a core component in civil engineering education, aiming to bridge the gap between theoretical knowledge and real-world practice. This study evaluates the factors influencing the effectiveness of the 24-week industrial training module undertaken by Intake 39 civil engineering undergraduates at General Sir John Kotelawala Defence University (KDU). Using a structured Likert-scale questionnaire, feedback was gathered from 31 undergraduates. The analysis employed a combination of descriptive statistics and inferential methods, including correlation and multiple linear regression. Results show that undergraduate interest, the organizational training environment, and KDU support all have a positive influence on perceived training effectiveness, with undergraduate interest emerging as the strongest predictor. The findings emphasize the importance of motivation, structured training environments, and ongoing academic support in maximizing the value of industrial training. ***Based on these insights, the study recommends strengthening KDU's pre-training orientation and academic follow-ups, promoting consistent supervision and mentoring by host organizations, and encouraging undergraduates to view industrial training as a proactive opportunity for career development.***

KEYWORDS: *Industrial training, Civil engineering education, Student motivation, Training effectiveness, Organizational environment*

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1. INTRODUCTION

Industrial training plays a critical role in developing competent civil engineers, allowing undergraduates to apply theoretical knowledge in real-world contexts. Across engineering education worldwide, internship and industrial placement modules are now seen as essential bridges between academic instruction and workplace expectations (Kolmos & Holgaard, 2019; Jackson, 2015). The demands of modern infrastructure development require graduates to be equipped not only with theoretical and analytical skills but also with practical experience in project planning, team coordination, health and safety awareness, and client interactions.

In Sri Lanka, General Sir John Kotelawala Defence University (KDU) has institutionalized industrial training as a mandatory component of the BSc Eng (Hons) Civil Engineering programme. Undergraduates are placed in both government and private sector organizations, representing roles such as client bodies, consulting firms, and contracting companies. The 24-week programme offers opportunities to work on live engineering projects as trainees in technical, supervisory, and administrative capacities, helping them analyse engineering organizations, understand the societal and ethical role of engineers, identify construction-related risks, and develop key competencies in technical practice, project management, and teamwork (IESL, 2018; KDU, 2024).

Preliminary observations and prior studies indicate that the effectiveness of industrial training is shaped by three main factors:

1. **Undergraduate interest and motivation**, which drive initiative and self-directed learning (Chan, 2012);
2. **The organizational training environment**, including supervision, mentoring, and exposure to real projects (Bilsland et al., 2014); and
3. **University support**, such as pre-training orientation and academic follow-up (Smith et al., 2019).

Understanding how these factors interact in the Sri Lankan context is essential for improving training outcomes. Therefore, this study evaluates the industrial training experience of civil engineering undergraduates in Intake 39 at KDU, aiming to identify the extent to which university support, organizational environment, and individual undergraduate attributes contribute to perceived training effectiveness. Through this investigation, the study provides evidence-based recommendations to enhance the structure and delivery of future training programmes.

2. LITERATURE REVIEW

Extensive literature highlights the importance of industrial training in engineering curricula as a way to integrate academic knowledge with professional competencies. According to Kolmos and Holgaard (2019), problem-based and practice-oriented training contributes significantly to undergraduate readiness for industry roles. Internships and cooperative education programmes are shown to improve undergraduate employability, confidence, and communication skills (Dressler & Keeling, 2011). Similarly, studies in the context of engineering education emphasize that well-supervised industrial experiences foster critical thinking, decision-making, and adaptability in unfamiliar environments (Jackson, 2015).

In the Sri Lankan context, Suraweera and Wijesinghe (2016) highlight that structured industrial placements enhance graduate outcomes, especially when clear guidance and performance assessments are in place. Their findings also stress the need for alignment between academic expectations and organizational training goals.

The role of institutional support is consistently recognized in global studies. For instance, workplace readiness increases when students receive pre-training briefings, learning outcome documentation, and access to academic mentors during the training period (Smith et al., 2019). This institutional coordination ensures continuity between classroom learning and workplace application. Furthermore, training organizations play a pivotal role through task allocation, supervision, and

feedback, all of which contribute to an engaged and effective training environment (Bilsland et al., 2014).

A growing body of literature also recognizes the significance of individual undergraduate motivation. Self-directed learning, punctuality, and a willingness to take on responsibility are strongly associated with effective industrial learning outcomes (Chan, 2012). These intrinsic qualities, in turn, are shaped by personal interest, long-term career orientation, and early awareness of training expectations.

The regulatory framework also reinforces the importance of industrial training. The Institution of Engineers, Sri Lanka (IESL), in its 2018 Recognition Manual, mandates structured practical training as a prerequisite for professional recognition. These expectations guide both academic institutions and training providers in defining meaningful industrial engagement. The KDU *Industrial Training Manual* (2024) expands on the IESL guidelines by detailing the module's learning outcomes, assessment methods, and required documentation. These two documents served as the primary institutional references when designing the questionnaire items for this study.

Based on this foundation, the conceptual framework of this study includes three primary independent variables: university support (as the academic institution's role in guiding and assessing the training process), organizational environment (the support, supervision, and exposure provided by the training host), and student interest (including initiative, preparation, and engagement). These are evaluated against the dependent variable: perceived effectiveness of industrial training as shown in the Figure-1

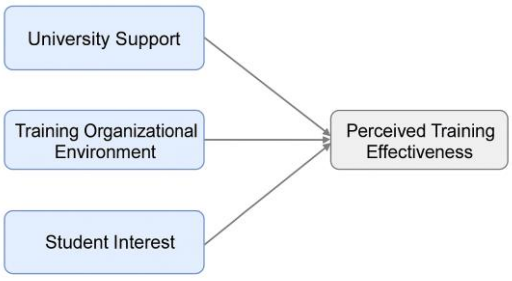

Figure-1- Conceptual framework

Building on the foregoing discussion, the key variables examined in this study—University Support, Organizational Environment, Student Interest, and Training Effectiveness—were operationalised into a set of observable indicators. These indicators were adapted from prior internship and industrial-training literature (e.g., Chan, 2012; Smith et al., 2019; Bilsland et al., 2014) and refined to reflect the KDU Industrial Training Manual (2024) and expert input.

In this study, training effectiveness refers to the extent to which the industrial training experience enables students to achieve the intended learning outcomes of the KDU Industrial Training module and to apply civil-engineering knowledge and skills in a professional setting. Prior research describes training effectiveness as the measurable impact of work-integrated learning on undergraduates professional competence, employability, and readiness for industry (Dressler & Keeling, 2011; Jackson, 2015; Smith et al., 2019). Consistent with these perspectives and the learning outcomes specified in the KDU Industrial Training Manual (2024), training effectiveness was operationalised through ten observable indicators: application of classroom knowledge to real projects, improvement of civil-engineering skills, teamwork experience, increased confidence and professional interest, understanding of organizational functioning and project execution, awareness of professional role distinctions (engineer/technologist/technician), appreciation of workplace safety, overall satisfaction with the training, and willingness to recommend the programme to others.

Despite the growing body of international and Sri Lankan literature, no published study within the Faculty of Engineering, Department of Civil Engineering at General Sir John Kotelawala Defence University has applied a quantitative model that simultaneously examines student motivation, the organizational training environment, and university support as predictors of industrial-training effectiveness. Accordingly, this study was designed to address the following objectives:

1. **Evaluate** the perceived effectiveness of industrial training among KDU civil-engineering undergraduates.
2. **Examine** the influence of three key factors—university support, organizational environment, and student interest—on perceived training effectiveness.
3. **Identify** which of these factors is the strongest predictor of training effectiveness.

3. METHODOLOGY

This research adopted a quantitative design combining descriptive and inferential statistical analysis. A structured questionnaire with 5-point Likert-scale items was developed around four thematic areas: KDU support, organizational environment, student interest, and training effectiveness. The instrument was based on the KDU Industrial Training Manual (2024), which outlines the learning outcomes and assessment procedures aligned with the IESL requirements.

The questionnaire contained four sections: University Support (8 items), Organizational Environment (9 items), Student Interest (10 items), and Training Effectiveness (10 items). Questions were adapted from relevant internship literature and the KDU Industrial Training Manual to suit the local context. Printed questionnaires were distributed to all 38 eligible civil-engineering students of Intake 39 during a scheduled classroom session after they had completed the 24-week industrial training in March 2025, and 31 valid responses were collected on site.

The instrument included both closed-ended Likert-scale items and a few optional open-ended questions to capture students' perceptions. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics such as means, standard deviations, and frequency distributions were used to understand overall patterns of responses. Inferential techniques, including Pearson correlation and multiple linear regression, were applied to assess the relationships between the independent variables and perceived effectiveness of training. In addition, group comparisons using t-tests and one-way ANOVA were conducted to explore any potential differences based on the type of organization (government vs. private) and the role undertaken (client, consultant, contractor). However, these differences were not statistically significant. The reliability of the instrument was assessed using Cronbach's alpha, which yielded values above 0.70 for each section, indicating acceptable internal consistency

4. DATA ANALYSIS AND RESULTS

To better understand the contextual background of the training experience, the study reviewed the organizational settings, trainee roles, and travel distances involved. A majority of undergraduates (58%) were placed in government sector organizations, while 42% were assigned to private institutions. Regarding functional roles, 42% of students were involved in contracting companies, 35% in consultancy firms, and 23% in client organizations as shown in Figure-2. Additionally, 65% of undergraduates reported commuting between 10 to 50 kilometers from their hometowns to their training locations, indicating that placements were generally accessible.

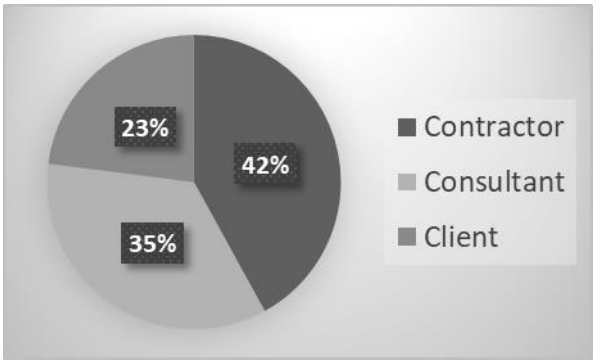

Figure-2-Distribution of student industrial training placements by organization type (functional role)

Descriptive analysis of the student responses indicated overall highly positive experiences across the four main variables. Training Effectiveness recorded the highest average score of 4.38, reflecting strong perceived learning outcomes. Student Interest followed with a mean of 4.22, suggesting high levels of motivation and proactive engagement. The Organizational Training Environment scored 4.19, indicating that students generally received structured tasks and effective mentorship. KDU Support showed a mean score of 4.10, reflecting a moderately strong level of academic coordination and preparatory guidance provided by the university.

Pearson correlation analysis was conducted to examine the strength and direction of the relationships between the independent variables and the effectiveness of industrial training. The results indicated that KDU Support had a correlation coefficient of 0.697, Organizational Environment had a coefficient of 0.645, and Student Interest showed the highest correlation at 0.749. All three variables demonstrated strong and positive associations with training effectiveness, with student interest emerging as the most strongly related factor.

To determine the predictive power of the independent variables, multiple linear regression was applied. The model was statistically significant ($R^2 = 0.735$, $p < 0.001$), indicating that the three variables collectively explain approximately 73.5% of the variation in perceived training effectiveness. The standardized coefficients (beta values) were as follows:

- Student Interest: $\beta = 0.4924$ ($p = 0.002$)
- Organizational Environment: $\beta = 0.2188$ ($p = 0.010$)
- KDU Support: $\beta = 0.2213$ ($p = 0.051$)

Student interest was the strongest and most significant predictor.

5. DISCUSSION

The findings support the view that industrial training effectiveness is shaped by a triad of academic, organizational, and personal factors. Students who were more self-motivated and well-oriented performed better and gained greater benefit from training. Organizations that provided clear supervision, structured tasks, and supportive environments helped enhance student learning. The marginal significance of KDU support suggests opportunities for improving academic coordination and orientation.

The correlation results affirm that each independent variable is strongly associated with training effectiveness, particularly undergraduate interest, which showed the highest correlation and regression coefficient. This implies that training becomes more valuable when undergraduates are self-driven, take initiative, and see the process as a meaningful opportunity for career development. These findings are consistent with prior literature which highlights the importance of intrinsic motivation and early preparation.

The organizational environment also played a key role, especially in cases where structured tasks, regular supervision, and orientation sessions were present. It was evident from the data that organizations that integrated undergraduates into real project teams and provided mentorship contributed significantly to a positive training experience. However, inconsistencies among organizations in approach and expectations may have limited the overall uniformity of training quality.

KDU's role, while positive, revealed areas for enhancement. Undergraduates rated the institutional preparation and support moderately well, but feedback indicated the need for more structured communication, regular academic follow-ups, and stronger alignment between the documented learning outcomes of the industrial training module and the tasks assigned during placements. This observation is consistent with literature advocating closer university–industry linkages to bridge expectations and workplace realities in work-integrated learning (Chan, 2012; Jackson, 2015).

Notably, the group comparison analysis did not show significant differences in training effectiveness across organization type or trainee role. This may reflect a level of standardization in industry practice or student adaptability. However, it also underscores the importance of tailoring support mechanisms to ensure equitable outcomes regardless of placement type.

Overall, the study highlights that while structural and environmental factors matter, student-level attributes such as interest, initiative, and perception of the training as a growth opportunity are critical to success. Universities must therefore not only coordinate placements but actively foster these personal attributes through mentoring, guidance, and ongoing reflection during the training period.

6. CONCLUSION AND RECOMMENDATION

The study confirms that undergraduate interest, organizational support, and university guidance are critical components influencing the effectiveness of

industrial training. Among these, undergraduate interest emerged as the most significant predictor, reinforcing the notion that internal motivation, initiative, and responsibility taken by them are key drivers of a productive training experience.

Organizational training environments that foster real project exposure, provide structured supervision, and ensure the inclusion of trainees in engineering teams contribute positively to training outcomes. Meanwhile, KDU's role in orienting undergraduates and maintaining contact during the training period also showed a positive effect, although marginal in regression results. This indicates a need for improvement in institutional communication, monitoring, and alignment of training objectives with real-world tasks.

Several practical recommendations emerge from the findings. KDU is encouraged to further strengthen pre-training programmes that familiarize undergraduates with training expectations, module outcomes, and documentation requirements. Academic staff can be more actively involved during the training period through regular check-ins or progress tracking tools. Meanwhile, training organizations should adopt consistent supervision practices, offer proper orientation, and ensure meaningful task allocation that aligns with the undergraduate's academic background.

Undergraduates should be encouraged to view industrial training as more than a degree requirement — rather, as a valuable opportunity for growth, skill development, and industry readiness. Academic advisors and coordinators may consider mentoring sessions before and during training to instill this mindset.

The findings of this study not only validate the importance of industrial training within civil engineering education but also emphasize the need for a collaborative effort between universities, industry partners, and students. These insights can guide continuous improvement of KDU's training module and may serve as a reference for similar programmes across higher education institutions in Sri Lanka and beyond.

7. REFERENCES

Bilsland, C., Nagy, H. & Smith, P. (2014) 'Planning the journey to best practice in developing employability skills: Transnational university internships in Vietnam', *Asia-Pacific J. of Cooperative Education*, 15(2), pp. 145–157.

Chan, C.K.Y. (2012) 'Exploring an experiential learning project through Kolb's Learning Theory using a qualitative research method', *European J. of Engineering Education*, 37(4), pp. 405–415.

Dressler, S. & Keeling, A.E. (2011) 'Benefits of cooperative and work-integrated education for students', in Coll, R.K. & Zegwaard, K.E. (eds.) *Int. Handbook for Cooperative and Work-Integrated Education*. WACE, pp. 261–275.

Institution of Engineers Sri Lanka (IESL) (2018). *Recognition Manual*. Colombo: IESL.

Jackson, D. (2015) 'Employability skill development in work-integrated learning: Barriers and best practice', *Studies in Higher Education*, 40(2), pp. 350–367.

Kolmos, A. & Holgaard, J.E. (2019) 'Employability in engineering education: Are we ready for the challenge?', *European J. of Engineering Education*, 44(6), pp. 678–695.

Kotelawala Defence University (KDU) (2024) *Faculty Industrial Training Manual*. Ratmalana, Sri Lanka: General Sir John Kotelawala Defence University.

Smith, C., Ferns, S. & Russell, L. (2019) 'Placement quality has a greater impact on employability than placement structure or duration', *Int. J. of Work-Integrated Learning*, 20(1), pp. 15–29.

Suraweera, S. & Wijesinghe, A. (2016) 'Contribution of industrial training towards graduate employability: A Sri Lankan perspective', *Sri Lanka J. of Economic Research*, 4(2), pp. 41–56.