2023 Annual Conference & Exposition
Baltimore Convention Center, MD | June 25 - 28, 2023
The Harbor of Engineering Education for 130 Years
ASEE
Paper ID #39721

A descriptive study of an innovative and sustainable model of work-integrated learning for industry professionals: An Indian case

Prof. Venkataraman PB, Birla Institute of Technology and Science Pilani

https://www.linkedin.com/in/venkataraman-pb-3056917

G Sundar

A descriptive study of an innovative and sustainable model of work integrated learning for industry professionals – An Indian case

Abstract:

Research on education models suggests work integrated learning (WIL) to be an effective approach for professional studies. An exhaustive, methodological review of literature on WIL reveals that in almost all of the cases the focus is on employability/ placement of college students and hardly any article on continuous learning or retention of employability skills of working professionals. This is of particular importance when evolving technologies are rapidly transforming the workplace. Research suggests that WIL adopted for working professionals can help them remain relevant and grow in their chosen profession. Our study confirms this and further demonstrates that such a model can be offered at scale in a sustainable way without compromising the quality of learning. We present here our descriptive study conducted in a multi-modal University that has institutionalized WIL to meet the continuing education demands of about 135,000 working professionals over a period of 40 years. We used direct observation, review of archived documents, social media posts by the students and open interviews/ discussions with the institute officials, students and the mentors of the collaborating organizations to collect data on five essential aspects, namely, employability, relevance, scalability, quality and sustainability. We believe this detailed account of the structure, processes and challenges will benefit institutions, business houses and policy-makers, who are involved in continuing education and skill building.

Keywords: Work integrated learning, employability, placement, relevance, college-students, working professionals, descriptive study

Introduction:

Research on education models suggest work integrated learning (WIL) to be an effective approach for professional studies. Both theoreticians as well as empiricists have shown that there are definite benefits from this type of education[1].

WIL is defined as an educational approach that enables students to experience relevant and authentic work-based learning through engagement with industry and/ or community partners as part of assessed university coursework[2].

WIL, as a structured education model, was started in 1904 by the University of Cincinnati in collaboration with a steel mill in the neighbourhood to meet the employability needs of its graduates[3]. Since then this model has grown across the United States, Germany, Australia, New Zealand, South Africa and Middle East and continues to expand across the globe[4] but still primarily focusing on the "*employability/ placement*" as the objective[5].

It is important not only that a student be employable at the end of his/ her graduation, but that s/he continues to remain employable for the rest of the career by staying relevant and future-ready, particularly in the sectors that adopt rapidly transforming technologies.

Can the WIL model of education, which has been found successful in meeting the *employability* demand serve the graduates to remain *relevant*? Can such a model be used to meet the continuing education needs of the people at *scale* without compromising on the

quality of learning? Can the model *sustain* the continuously changing needs of the businesses?

Our descriptive study conducted in a multi-modal university in India offers evidence that it may be possible to meet both the demands of *employability* and *relevance* at *scale* and *quality* in a *sustained* manner.

Literature Review on WIL Models

Our title level search in google scholar database on terms such as Cooperative Education, Work Integrated Learning, Work Integrated Education, Executive Education, Professional Education, Dual System of Education in higher education returned over 800 articles. Through an abstract level methodological review, we identified 41 articles that dealt with the model of WIL. A summary of these select articles is presented in this section.

There are three major systems of WIL, namely the Gilde, the Co-op, and the MKB-route. Each of the variants departs from the premise that students put their academic knowledge into action through relevant work experience outside the classroom and then bring the challenges and insights they gain on the job back to the class for further analysis and reflection.

- The Gilde variant (literally craftsman's guild system variant) goes the farthest, where the students are placed in paid positions from the beginning of their studies and the ratio of workplace/school bank in this model is roughly 60/40.
- The Co-op variant starts students in the workplace after they have completed one year of traditional education. Beginning in the second year, students spend one semester in the workplace and one semester in the school.
- Finally, the MKB-route (English: SME-route) variant, has its students first complete two years of traditional study and then placed in "more advanced" work positions within small and medium sized enterprises[1].

The following table lists how various Universities/ institutions have operationalized the above systems:

Model & Affiliation	Key Objective	Detail	Reference
Cincinnati Model, USA: University of Cincinnati, 1906	Preparing students for industry	Under graduate degree. Six years, including alternate weeks at the university and in the shop for each school year, and a three-months period of full-time shop-work.	[3]
MIT-GE Model, USA: MIT, 1908	Supply engineers to meet industrial demand	Master's degree. Five years, alternated between MIT and GE for three years, students worked by day in the plant, by night they took college courses, four nights each week, MIT instructors went to Lynn and taught.	[6]

Berufsakademie Model, Germany: Berufsakademie, 1972	Vocational training of post-secondary students for work placements	B.A., Three years. Semesters of academic study at the university level alternately with phases of on-the-job training and work-integrated learning programs in companies and social institutions.	[7]
DHBW Model, Germany, Baden-Wuerttemberg Cooperative State University, 1978	Industry readiness	Bachelors and Master's degree. Alternating three-month phases, with students learning theory at the university and receiving practical training from an enterprise or social institution.	[8]
LO'R-Exeter Model, UK: University of Exeter, 2017	Career progression through Charted Engineer certification	B.Engg, Five years. On-campus residentials and intensive experiential learning on real-world projects. Four, two-week residentials, remaining at workplace. Exact make-up of the course developed in partnership with employer.	University website
RMS, Australia: Western Sydney University, 2017	Job readiness	Associate Degree in Civil Engineering. Four years. Online study. Working with Transport for NSW for 35 hours/ week as a trainee.	University website
Practice School, India: BITS-Pilani, 1972	Job readiness	Internship in industry for 7.5 months in two phases during the entire period of study.	[9]
WILP, India: BITS-Pilani, 1979	Remain relevant in chosen profession and career growth	First and higher degrees, meant for working professionals with a certain experience, integrating informal learning at work with formal learning offered during weekends, online/ onsite similar to an equivalent campus program in terms of program structure, credit equivalence, instruction and assessment.	(University documents and bulletin, 2020)

Table 1: Literature dealing with WIL models and assessment

Research Method

Based on our literature review, we identified two possible instances, where WIL is aimed at relevance and career growth namely, Exeter and BITS Pilani. Out of these two, we selected

the latter considering the access to the data. Post 1992[10] no structured study has been published on this institute model hence we undertook to study the developments during the past two decades.

We adopted a case study methodology for our descriptive study. A case study can be described as an in-depth study or examination of a distinct, single instance of a class of phenomena such as an event, an individual, a group, an activity, or a community[11]. Case study, as a methodological approach, has frequently been critiqued for its possible limitation of outcome generalization. The concrete, context dependent nature of the knowledge which case studies unearth, on which these critiques focus, however, is precisely the source of its methodological strength. Case study can therefore be particularly appropriate to address research questions concerned with the specific application of initiatives or innovations to improve or enhance learning and teaching[12].

We obtained data through direct observation, review of archived documents, social media posts by the students and open interviews/ discussions with the institute officials, students and the mentors of the collaborating organizations. This can safely be termed as an ethnographic study within naturalistic tradition[13], as the researchers were mindful of their own influence on the data and the market promotional sources of the institute.

Work Integrated Learning Programs

The case in study is a multimodal, multilocation, multi-disciplinary University in India, which offers first and higher degree programs in all three modes of education namely, Campus-based, WIL and Online. The University has been recognized as an Institution of Eminence (IoE) in 2019 by the Ministry of Education, Government of India[14]. The institute, which was founded in 1901 as a Patshala (school) transformed itself into a full-fledged University in 1964. It adopted the WIL model of instruction in 1972 and started offering WIL programs exclusively for working professionals since 1979, which are known as Work Integrated Learning Programs (WILP). The scope of this study is limited to WILP.

The institute defines their work integrated learning programs (WILP) as:

> *A model of higher education, leading to a formal qualification, meant exclusively for working professionals, to set them in the path of life-long learning and in the process help them remain relevant in their chosen profession.*

As per the institute documents, WILP is defined by the following:

i. The Learner is in a professional environment, generally in industry;
ii. The Learner works towards a qualification that is relevant to the industry, and aligned with her/ his work profile;
iii. The workplace is the natural setting for the delivery of the education, and is converted into a learning environment or class room/laboratory;
iv. Synchronous instruction is employed to teach the fundamental principles, and applications, in core and advanced areas relevant to the domain, along with relevant laboratory sessions;
v. Asynchronous means of instruction are employed to provide flexibility and ease of access, and most importantly, to keep the learner engaged constantly.

vi. Knowledge is built around the learning gained from practice in the living laboratory that the workplace is, both in the natural course of work, and through structured interventions by way of assignments drawn from the workplace.

In terms of program structure, rigor (expressed as a credit equivalent), instruction, assessment and degree; WILP is comparable or identical to an equivalent campus-based program. The principal difference lies in that in regular on-campus education, the practice component, when it exists, is usually an add-on to the instruction process, whereas in work integrated learning, the instruction is built around the experiential learning at the workplace.

Characteristics of WILP as detailed in the institute documents are:

Nature of programme: A WILP is likely to be far more industry sector focused than a regular mode program on campus. While it will naturally derive largely from a specific discipline, it typically is also more cross, and inter-disciplinary in nature. There is a significant element of customization, which may be achieved by a judicious offering of electives, and by the use of cases drawn from the work environment, in instruction/assignments.

Organization commitment: In order to enrol for a program in WILP the students need to have an endorsement from their organization to provide necessary academic and logistic support. The enrolment is always only in a programme which is aligned with the work profile of the student. The academic support includes the availability of a mentor from the organization, who will be responsible for monitoring the progress of the candidate, and advising as necessary.

Industry collaboration: The engagement with industry starts right at the stage of program conception. The experts from the relevant industry sectors participate in designing and developing programs and curriculum. In certain cases, their expertise may be drawn in instruction as well.

Program and curriculum development: The strong industry connect of the institute enables in need identification. The sector specific program committees drive the design and development of new programmes, as well as the review and modification of existing ones in collaboration with the cross-campus faculty teams and industry experts, which is presented to the senate, a body of senior faculty members headed by the Vice Chancellor for debate and approval.

Instruction: Instructor-led synchronous lectures are delivered for all courses, usually during weekends to meet the constraints of the working professionals. The hours of instruction are comparable to regular campus-based programs. Instruction employs internet-communication technology, wherein students can join from any location using any communication device. The recordings of such lectures are provided to the students immediately after the class through a learning management system (LMS) to help the students who missed the session due to business exigencies.

In addition to the synchronous instruction, the institute provides professionally developed digital lecture content in majority of the courses. This serves as a supplementary material and/ or for flipped mode of delivery.

Labs: The curriculum includes regular exercises and practical sessions designed for each course. Since all students admitted are required to be working in a relevant industry, they

have access to physical equipment for laboratory and practical exercise. In addition to this the institute has invested significantly in simulations and software, which are hosted on the cloud and made accessible to all WILP students supplementing their practical experience. The institute has also built physical labs hosting equipment that students can remotely access and work with, while monitoring the process, via cameras mounted around the physical lab equipment.

Every program requires the students to undertake a capstone project from their place of work in the final semester, which is mentored by their organization supervisor and a faculty expert. This is periodically reviewed, assessed and graded. It is a required course for all the programs.

Assessments: The institute follows continuous assessment policy, which is administered through multiple components such as quiz, assignments, mid-semester and comprehensive exams. The make-up policy allows students to write the exams if they miss the regular one due to personal/ professional exigencies.

Technology: The institute liberally adopts ICT in almost all its teaching-learning processes such as instruction, labs, and assessments. The student lifecycle, and faculty management are also digitized. The pervasive adoption of technology has helped the programs to scale and the professional students the much-needed flexibility.

Faculty: Since the programs are meant for working professionals and focused towards emerging technology domains, the faculty team includes both researchers and industry experts. Candidates with good academic qualification and significant industry experience are considered for WILP. In addition to them, industry experts recruited from the professional community contribute in instruction and support. There is a significant contribution from the campus faculty as well.

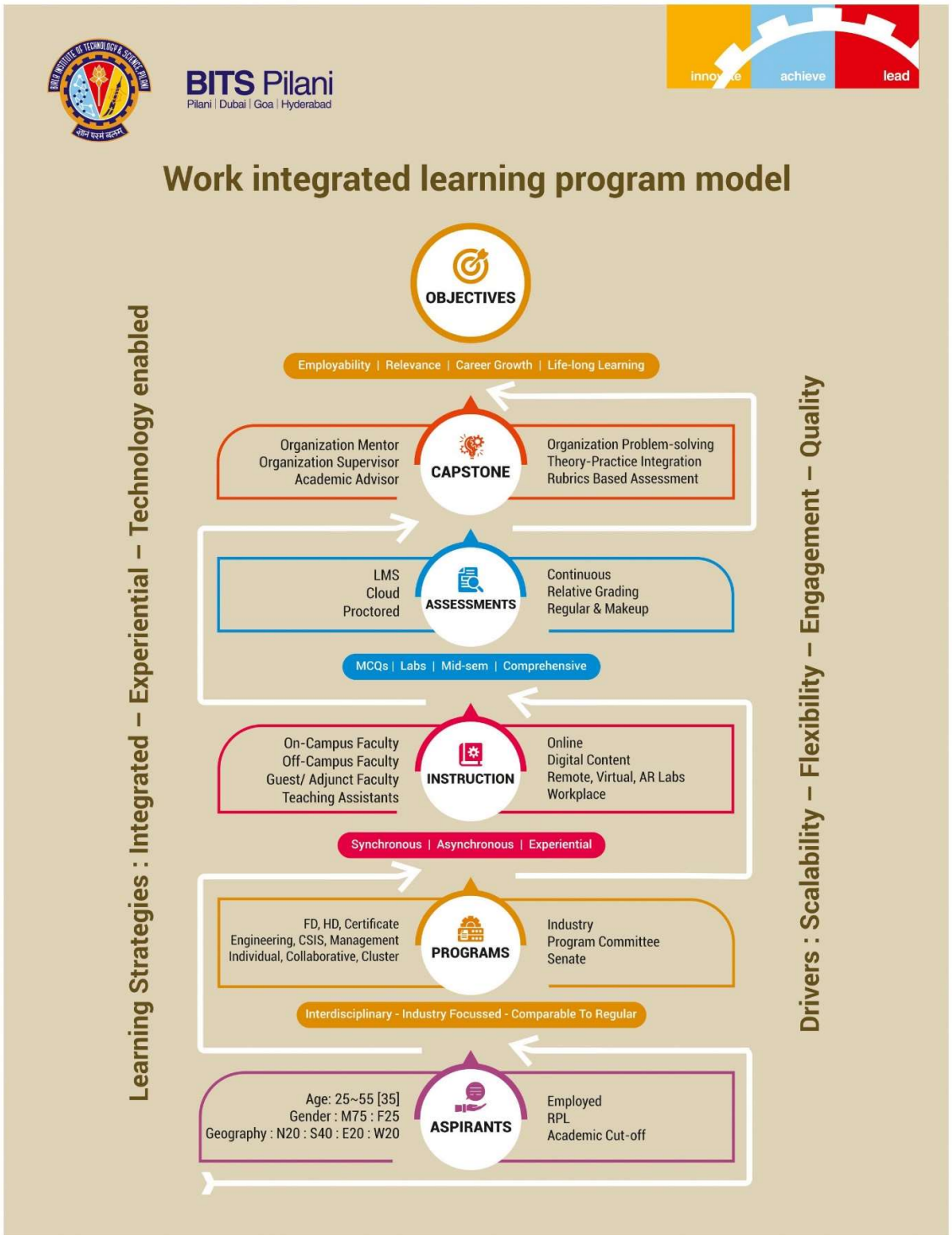

Figure 1: WILP Model [constructed by the researchers based on the institute inputs]

Discussions:

Our study focused on five factors that represent the success of the education model in context, namely:

1. *Employability*
2. Remaining *relevant*
3. *Scalability*
4. *Quality*
5. *Sustainability*

There may be other success factors, which do not form the part of this study.

Employability: Employability features more prominently on the agenda of higher education institutions when the economy falters or changes: the majority of students, and their families, expect a degree to deliver a career pathway as well as an education[15]. WIL model of education is considered by many to be an effective way to achieve graduate employability.

In WILP context, which is meant for the working professionals, the term *employability* needs to be thus, redefined. Definitions and models abound on just what graduate employability is and how it might be conceived (Yorke, 2004; Little, 2006; Pool & Sewell, 2007). Most agree that employability has little to do with labour markets and employment. Rather, employability is about enabled graduates. It is generally agreed that employability derives from complex learning, and is a concept of wider range than those of 'core' and 'key' skills, the transferability of which is often assumed (Yorke, 2006).

In the current context Stephenson's encompassing 'concept of capability' is more relevant: employability is best described as the 'capability' of becoming an effective operator in the world: capable people have confidence in their ability to take effective and appropriate action, explain what they are seeking to achieve, live and work effectively with others, and continue to learn from their experiences, both as individuals and in association with others, in a diverse and changing society (Stephenson, 1998).

Knight and Yorke summarise this idea as: *employability* is a combination of:

- Understanding of subject discipline(s);
- Skilful practices in context (the capacity to apply understanding judiciously);
- Efficacy beliefs, students' self-theories and personal qualities – the extent to which students feel that they might 'be able to make a difference'; and
- Metacognition, encompassing self-awareness regarding the student's learning; the capacity to reflect on, in and for action; and self-regulation (Knight & Yorke, 2006).

Going by this approach, there is evidence to argue that WILP through its integrated structure and instruction does contribute to *employability* of its students. The key features of the programs and learning supporting this argument are:

- Strong focus on core fundamental sciences, to prepare the students to solve organization problems using first principles
- A program that is designed to integrate the workplace into the instruction;
- Program rigor challenging the student to balance work-life-learning;

- Focus on higher order cognitive skills commensurate to the maturity of the student community rather than a mere math skill.

Relevance: As growing numbers of articles attest to massive job losses and redundancies, questions are being asked about the purpose and relevance of education. The primary drivers of this growing irrelevance include the transience of knowledge, skills and expertise[16].

Digital technologies are automating several human practices, particularly the ones that are routine, laborious and precise, requiring us to adopt them to remain relevant in the profession. We should learn more about emerging technologies in our profession, and search for ways to work with these technologies to complement the tasks we perform[17].

Since modern-day technologies typically evolve from a collaborative effort of academia and industry, the workplace that is integrated with academia can be the right setting to learn such technologies. WILP, which operates at the conjunction of the industry-academia collaboration offers such a learning opportunity by design.

We selected '*career progression*' of the students as a representative factor of *relevance* and studied one of the largest IT companies in the country, which sponsors around 3,000 students every year for WILP. This organization by default offers a higher role in the next level to those employees who successfully complete the WILP. Notwithstanding this, several of those employees have progressed to still higher levels in their profession within a few years of completing the program.

We conducted a more objective study in a manufacturing company, which has been sponsoring students every year for the past 10 years. The study shows that an employee graduating from WILP is invariably promoted to the next level on successful completion who further progressed to the next position in the organization within a period of 3.5 years (on an average).

Scalability: We assessed scalability in terms of student enrolment, geographical location, number of industry collaboration, number of programs & courses, instruction, number of industry projects undertaken by the students and proctored assessments. The following table lists these data as for fall semester:2022-23

#	Factor	Data	Remarks
1	Enrolment numbers	36,614	
2	Student geographical locations (States)	India: 28 states; 6 Union Territories; Overseas: 32 countries	
3	Number of industry collaborations	31	
4	Number of programs offered	46	
5	Number of courses offered every semester	841	803: Coursework; 38: Project courses
6	Number of instructor-led synchronous lectures delivered every semester	12,848 (each of 90-120	

		minutes duration)	
7	Number of students performing remote/ virtual labs every semester in core engineering disciplines	5,181	Each Student performed at least two labs
8	Number of industry projects undertaken by students every semester	4,843	
9	Number of proctored exams conducted every semester	247,308	Every student writes four exams twice every semester
10	Total number of students graduated under WILP so far	109,419	

Table 2: Data representing *scalability*

The above data confirms the scalability of the model, much of which has been possible due to pervasive adoption of ICT.

Quality: We assessed the quality of the model using the following metrics:

1. *Student completion rate*: expressed as a ratio of students graduated within the stipulated time to students enrolled for a given program. The students are expected to complete the program within twice the program duration.
2. *Achievement of learning outcomes*: While there are multiple student learning outcomes for each program, the one which was found to be common across was 'organizational problem solving'.

   Every single WILP student is required to undertake a dissertation/ project work during the last semester of his/ her program for which the problem has to be selected from one's workplace in consultation his/ her organization mentor. Such a project will be periodically reviewed and assessed by the organization mentor, supervisor and a faculty mentor.

   The outcome of the final project assessment is considered to be a suitable measure of the learning outcome on organizational problem solving. We collected this data for all the projects carried out by the students during the last 5 semesters, which is shared in the following table.

3. *Student feedback*: The institute has the habit of collecting feedback in a structured and sustained way at the end of every semester for several years. Such feedbacks include questions on every course the students undertake and the faculty who taught it. We limited our analysis to the quantitative data leaving the voluminous qualitative data for this study. The aggregated results are shared in the table.

Responses > 25

Semester	**Rating**	**Highest**	**Average**	**Lowest**
1st SEM 2022-2023	Course Rating	4.58	4.16	3.18

[n = 54,645; x = 352]	Faculty Rating	4.76	4.19	2.95
2nd SEM 2021-2022 [n = 43,428; x = 309]	Course Rating	4.62	4.14	3.15
	Faculty Rating	4.75	4.16	2.70
1st SEM 2021-2022 [n = 42,675; x = 314]	Course Rating	4.74	4.10	2.82
	Faculty Rating	4.81	4.13	2.69
2nd SEM 2020-2021 [n = 29,784; x = 279]	Course Rating	4.67	4.05	2.71
	Faculty Rating	4.80	4.07	2.42
1st SEM 2020-2021 [n = 26,670; x = 271]	Course Rating	4.60	4.13	3.07
	Faculty Rating	4.76	4.16	2.75

Table 3: Aggregated students [n] feedback on course [x] and faculty on a scale of 1-5

4. Number of organizations *repeating cohorts* for the same program is an indication of the value the program adds to the students and the organization hence we tracked this data and share it in the table.
5. *Unprompted independent media* comments were tracked to with a search word WILP. We could identify at least 7 independent YouTube channels each with several thousand followers. We couldn't find any of them reporting any quality issue about the program.
6. *Recognition* by the regulator. Engineering & Technology education adopting WILP model is not common in India. However, the institute persevered with the regulator to declare the WILP as a valid and effective model to offer continuing education for working professionals. Post this notification in 2020[18], other prominent institutes in the country have commenced their program adopting WILP model.
7. *International benchmark*. We reviewed a benchmarking report (2016) of an independent agency hired by the institute, which compared the WILP model against 31 other institutes across the globe on five factors namely, program depth & coverage, rigor, pedagogy, industry response, faculty model and return on investment. The WILP model was reported to be either comparable to, or better than the other institutes in all the five factors.

#	Factor	Data	Remarks
1	Student completion rate within nominal duration	75%	Within minimum nominal duration
2	Student drop-out rate	7.92%	7461 students dropped out during past 5 years out of 94,226 students admitted during the past 8 years
3	Achievement of learning outcome (capstone project performance in engineering group for the last 5 semesters: n=2028)	Excellent/ Good: 77% Average/ Poor: 33%	In manufacturing, design, and automotive programs
4	Organizations repeating cohorts	16	Engineering:11;

			CSIS:5

Table 4: Factors representing *quality*

Sustainability: We define sustainability as an ability not just to meet the growing needs of the industry but grow in emerging areas and adapt to the changing needs of the students. The metrics we chose to study this aspect were:

1. Growth in enrolment
2. New program addition in emerging areas
3. Continuous improvements undertaken to meet the needs of the students (LMS, Live lecture, Digital content, Remote labs, eLibrary, Proctored exams)
4. Affordability, measured as a return on investment

The student enrolment has been showing consistent growth as shown in the graph across the programs though some of them at a higher rate.

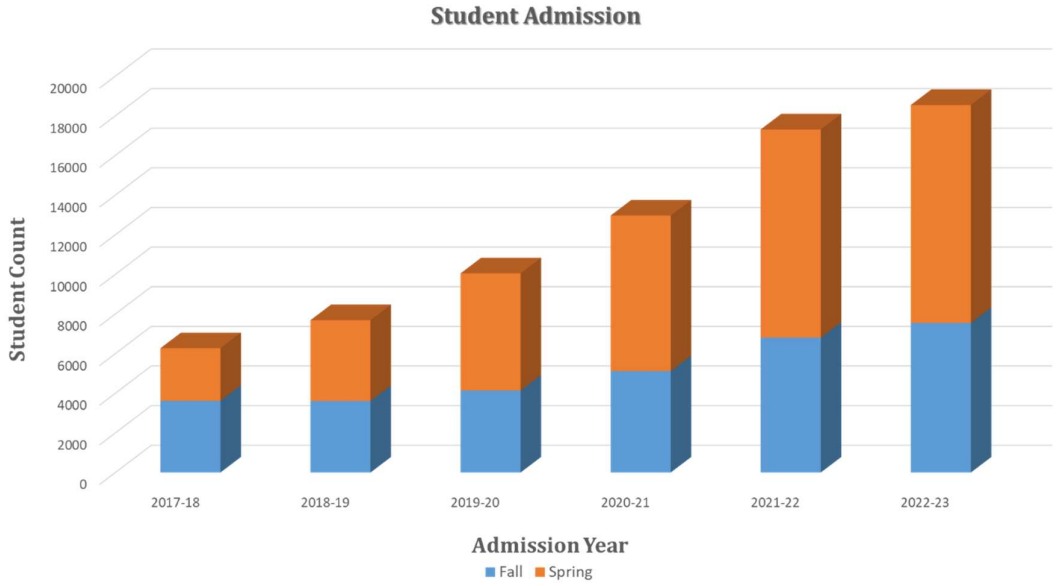

Fig 2: Student admissions

The growth has been supported by the launch of new programs in the emerging areas such as, IOT (2017), AI-ML (2018), Data Science (2018), Automotive Electronics (2019), Digital Manufacturing (2019), FinTech (2020), Full Stack Engineering (2020), Cloud Computing (2022), Automotive Cybersecurity (2023).

The institute is an early adopter of technologies both in teaching-learning and academic operations. Learning Management System using Moodle (2000), Instructor-led live lecture delivery using AT&T (2003), Digital content development using professional inhouse studio facility for flipped mode of instruction (2013), remote and virtual labs (2016) using a custom made interface, eLibrary using Open Athens (2020), and proctored examination using a custom made platform (2020) are some of the continuous improvements that the institute has undertaken periodically to meet the learning, engagement, scale and flexibility demands of the students. Such implementations are continually upgraded as the technology evolves.

Return on investment (RoI) is estimated to be around 2 years for a self-sponsored first-degree student in engineering. The estimate is based on the prevailing salary levels and the fee structure available in the institute's website. This estimate may vary between disciplines and the program. In many cases the students are sponsored by the organization and the RoI computation

Challenges

Interviews with the leadership team brought out four challenges:

1. *Work-life-learning balance* of the student: Since the program structure, rigor, instruction and assessments are equivalent to a campus-based program, students find it too demanding. This leads to delayed/ missed submission of assessment components. However, the high rate of program completion suggest that the students put in extra effort to meet the program demands. This was expressed during the convocations and social media by almost all the students who successfully graduate.
2. *Input quality differences*: The institute admits students based on certain level of academic performance in their prior learning. Since the program is offered across geographical locations, there appears to be significant difference in the quality of the incoming students. This is found to affect their performance in the program.
3. *Student heterogeneity*: Since the programs offered in the emerging areas adopt convergence technologies, the students reported difficulties in comprehending technologies of disciplines other than their own. The institute addresses this challenge by providing preparatory video content and additional optional lectures.
4. *Lack of faculty expertise* in emerging areas, which are inter/ transdisciplinary in nature such as automotive electronics, digital manufacturing, and electric vehicles. People with such expertise are not readily available and if they do, are recruited by leading organizations. The institute tries to address this challenge through structured faculty development initiatives, industry collaboration and by engaging with subject matter experts as guest faculty.

Conclusion

Work Integrated Learning adopts multiple deployment methods but most of them focus on employability/ placement as their primary objective. In a rapidly changing technological space employees need to remain relevant and future ready to retain the employment and grow in their chosen profession. Our extensive literature review of the WIL models revealed two institutes which focus on relevance and career growth as their objective in addition to employability. We conducted a detailed study of one of those institutes focusing on five essential aspects namely, employability, relevance, scalability, quality and sustainability. In addition to this the report describes the deployment model of WIL and the challenges the institute faces.

References:

1. Kirschner P. *The Inevitable Duality of Education*.; 2000.
2. Jackson D. Students' and their Supervisors' Evaluations on Professional Identity in Work Placements. *Vocations and Learning* . 2019;12:245-266. doi:10.1007/s12186-018-9207-1
3. Park CW. *Department of the Interior: The Cooperative System of Education - An Account of Cooperative Education as Developed in the College of Engineering, University of Cincinnati*. University of Cincinnati; 1916.
4. Aleisa AM, Alabdulahfez MA. Cooperative Education at the Riyadh College of Technology: Successes and Challenges. *Asia-Pacific Journal of Cooperative Education* . 2002;3(2):1-7.
5. Cook EJ. Evaluation of work-integrated learning: A realist synthesis and toolkit to enhance university evaluative practices. *International Journal of Work Integrated Learning*. 2021;22(2):213-239.
6. W. Bernard Carlson. Academic Entrepreneurship and Engineering Education: Dugald C. Jackson and the MIT-GE Cooperative Engineering Course, 1907-1932. *Technol Cult*. 1988;29(3):536-567.
7. Reinhard K. The German Berufsakademie Work-Integrated Learning Program: A Potential Higher Education Model for West and East. *Asia-Pacific Journal of Cooperative Education*. 2006;7(1):16-21.
8. Nolting T, Beedgen R. *Rethinking the Relation between Higher Education and Employment-The Dual Study System of the Baden-Wuerttemberg Cooperative State University as a New Way of Integrating Theory and Practice*.; 2013.
9. Mandke V V. *BITS Practice School - A Case Study in Industry-University Collaboration*.; 1980.
10. Vijay V. Mandke. Cooperative Education - The Indian Experience. *International Journal of Engineering Education*. 1992;10(1):52-60.
11. Case JM, Light G. Emerging methodologies in engineering education research. *Journal of Engineering Education*. 2011;100(1):186-210. doi:10.1002/j.2168-9830.2011.tb00008.x
12. Hodkinson P, Flyvbjerg B. Making social science matter--Why social inquiry fails and how it can succeed again / Response - ProQuest. *British Journal of Educational Psychology*. 2002;72. Accessed January 29, 2023. https://www.proquest.com/openview/92b0cc49784e5675ad6782c84ff942f1/1?pq-origsite=gscholar&cbl=32346
13. Eriksson P, Kovalainen A. Ethnographic Research. In: *Ethnographic Research. Qualitative Methods in Business Research*. Vol 1. 2nd ed. Sage; 2015:149-163. Accessed August 8, 2021. https://study.sagepub.com/sites/default/files/Eriksson%20and%20Kovalainen.pdf

14. UGC. *MoM 542 Meeting of UGC*. UGC; 2019:1-7. Accessed August 10, 2021. https://www.ugc.ac.in/pdfnews/2699769_Minutes-542-without-estaiblishment.pdf

15. Oliver B. Redefining graduate employability and work-integrated learning: Proposals for effective higher education in disrupted economies. *Journal of Teaching and Learning for Graduate Employability*. 2015;6(1):56-65.

16. Van't Land H, Corcoran A, Iancu DC. *The Constant of Change: Remaining Relevant in 21st Century Higher Education*.; 2021.

17. Pepito JA, Locsin R. Can nurses remain relevant in a technologically advanced future? *Int J Nurs Sci*. 2019;6(1):106-110. doi:10.1016/j.ijnss.2018.09.013

18. UGC. *4225371_Minutes-548th-UGC*.; 2020:1-7. Accessed August 15, 2021. https://www.ugc.ac.in/pdfnews/4225371_Minutes-548-th-.pdf