

Bridging the Gap Between ICT University Learning Outcomes and Industry Expectations: An Empirical Examination of Curriculum Alignment

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Abstract

The establishment of new technology faculties represents a significant advancement in global education, particularly in dynamically evolving regions like South Asia. Internship programs play a vital role in bridging theoretical knowledge acquired in classrooms with practical, real-world experience. This necessitates a thorough evaluation of the effectiveness of ICT academic programs at one of South Asia's premier universities, which introduced a stream technology curriculum in 2016. By 2019, the positive outcomes of this initiative became evident through the emergence of skilled professionals. This research, framed by the Motivation, Ability, and Opportunity (MAO) framework, employs a mixed-methods approach to explore the factors contributing to the success of ICT-focused education programs. The study examines the purpose of ICT internships and incorporates insights from industry experts in the region. Surveys of 200 students and 50 industry professionals revealed significant disparities between educational priorities and the demands of the job market. By introducing innovative analytical tools, such as the Ability Gap, Weighted Ability Gap (WAG), Ability Gap Momentum (AGM), and Ability Contribution Index (ACI), the study quantitatively assessed discrepancies in areas such as object-oriented programming and computer networking systems. The findings underscore the need for curriculum updates to address the evolving ICT skill requirements, as identified in existing literature. The recommendations include targeted curriculum revisions, skill-based workshops, enhanced academic-industry collaborations, and robust feedback mechanisms. These practical

steps aim to bridge identified skill gaps and improve the effectiveness of ICT academic programs in meeting industry expectations.

Keywords: *Internship Training, Industrial Training, Academic-Industry Collaboration, Pedagogical Strategies, Curriculum Alignment, Soft Skills, Curriculum Revisions, Academia-Industry Harmony, ICT Education and Skills.*

Introduction

Industrial internship programs have become transformative elements in academic curricula worldwide, providing students with invaluable opportunities for practical exposure in their respective fields (Bukaliya, 2012). These internships serve as gateways to real-world experience within corporate or organizational environments, representing collaborative efforts between academia and industry (Verney, Holoviak, and Winter, 2009). Their primary aim is to facilitate students' transition from university life to the professional sphere. The literature emphasizes the pivotal role of academic institutions in enabling the effective transfer of theoretical classroom knowledge to practical applications (Meredith and Burkle, 2008). Internships, especially in specialized fields like information and computer technology (ICT), are instrumental not only in shaping students' career paths but also in equipping them with the necessary skills and experiences for success in the industry (Radermacher, Walia, and Knudson, 2014).

Within the ICT curriculum, industrial training is central, allowing students to apply theoretical concepts practically, thereby enhancing industrial methodologies and practices (Trauth, Farwell, and Lee, 1993). Internships also provide platforms for students to develop teamwork, punctuality, and work ethics within professional environments (Jackson and Wilton, 2016), ultimately enhancing their employability in the industry (Bae, Kim, and Song, 2022). Beyond fostering closer ties between academia and industry, internships are practical tools for enhancing students' professional skills, preparing them for future workplace success (Yiu and Law, 2012).

Employability has been a focal point in academic research, particularly concerning the impact of internship programs on students' readiness for the professional world. Employability encompasses the skills, knowledge, and abilities that make graduates more attractive to employers, including hard skills like technical competence and soft skills like teamwork and communication (Jackson, 2013). As practical components of academic curricula, internships enhance employability by providing real-world experience, industry-specific skills, and professional networking opportunities (Smith, 2012). Therefore, internships, as integral parts of curricula, equip students with practical work experience, sector-specific competencies, and facilitate networking. Different types of internships contribute to enhancing students' employment prospects in various ways. Curricular internships, for example, improve job prospects upon course completion, while voluntary internships allow students to engage with environments of interest and explore various working conditions, even though they may not be mandatory parts of the curriculum.

Integrated into academic curricula, curricular internships significantly enhance students' employability upon graduation. These internships, often mandatory for degree completion, provide structured opportunities to apply theoretical knowledge in practical settings, bridging the gap between academic learning and professional application (D'Abate, Youndt, and Wenzel, 2009). The structured nature of these internships ensures that students gain relevant industry experience highly valued by employers. Voluntary internships offer students platforms to explore their interests and gain exposure to real-world work environments, even though they are not compulsory in academic programs. Research by Gault, Redington, and Schlager (2010) indicates that voluntary internships significantly enhance students' employability by allowing them to develop industry-specific skills and personal networks, which are crucial in the job market.

Remote internships enable students to intern for organizations from a distance, often from their homes or colleges, utilizing technology. These

internships offer unique approaches for gaining professional experience, particularly in Information Technology and Digital Marketing disciplines (Suleri and Cavagnaro, 2016). Remote internships develop competencies essential in the contemporary work environment, such as digital literacy and the ability to collaborate online. International internships allow students to intern in other countries, providing cross-cultural communication experiences. Experiences in foreign countries are valuable for employment, contributing to the development of tolerance and respect for other cultures (Narayanan, Olk, and Fukami, 2010).

The interplay between academic achievements and industry expectations for newcomers is critical in academia-industry collaboration. Literature extensively explores the relationship between students' preparedness for internships and employers' expectations (Muhamad, Salleh, and Sulaiman, 2009). There is growing interest in identifying disparities in knowledge and skills between fresh graduates and their more experienced industry peers. While some studies identify areas where undergraduate employment expectations align with reality, detailed interpretations remain limited (Warinda, 2013). Embedded within academic programs, internships offer students unique platforms to validate their professional abilities and assess their suitability for specific roles. Such experiences can solidify their career goals, significantly enhancing their employability prospects (Getzel, Briel, and Kregel, 2000; Reardon, Lenz, and Folsom, 1998). However, a notable gap in the literature exists: despite the prevalence of internship programs in undergraduate studies, there is a lack of systematic research evaluating their effectiveness (Chinomona and Surujlal, 2012). While numerous studies attempt to unravel the complex relationship between academic curricula and industry requirements, an unaddressed gap persists (Manevska, Nikolovski, and Nestoroska, 2018). The cognitive dimensions of internship programs are yet to be fully explored. More importantly, there is a lack of research specifically examining potential disconnects between curriculum outcomes and industry

expectations, particularly in emerging academic departments.

This research aims to enhance our understanding of potential misalignments between stakeholder expectations and the desired outcomes of university ICT training programs. While internship initiatives are meticulously designed to provide hands-on experience, a pressing issue arises regarding inconsistencies between classroom learning and actual industry demands. Transitioning from a structured academic environment to the dynamic business world often poses significant challenges for students (Yiu and Law, 2012; Manevska, Nikolovski, and Nestoroska, 2018). This phenomenon, referred to as transitional dissonance, has been highlighted in various studies, indicating potential disconnects between what students learn and what employers expect. To address this issue comprehensively, relying solely on subjective evaluations is insufficient; a rigorous quantitative analysis is essential. Such analysis is crucial due to its potential to precisely quantify the magnitude and dynamics of skill deficiencies. This analytical approach can provide a detailed perspective of discrepancies, offering clear identification of conflict areas and actionable insights. These insights can be utilized to tailor curricula more effectively, thereby narrowing the gap.

Research Questions

The research questions formulated to investigate the misalignment between academic training and the demands of the ICT sector, with a focus on bridging this gap through rigorous analysis, are:

- What are the specific areas of misalignment between the skills developed through academic training and the skills demanded by the ICT sector?
- How significant is the skill gap between graduates' preparation and the industry's expectations in the ICT sector?
- Which quantitative methods can effectively measure the skill gap between academic training and industry requirements in the ICT field?

- How can academic curricula be tailored to better align with the dynamic demands of the ICT industry based on the identified skill gaps?
- What actionable insights can be derived from a mathematical analysis of the skill gap to facilitate a smoother transition for students from academia to the professional world in the ICT sector?
- How can educational institutions employ these insights to design interventions that address the discrepancies between academic preparation and professional requirements in the ICT industry?

An integrated approach to learning combines theoretical knowledge with practical industry experience, providing an optimal foundation for graduates undertaking internships (Meredith & Burkle, 2008). Bridging the gap between academia and industry is crucial for creating a comprehensive learning journey. This fusion of theoretical and practical knowledge fosters an environment where graduates are prepared and motivated to apply what they have learned in real-world settings. According to the Motivation, Ability, and Opportunity (MAO) theory, individuals are more likely to engage in a behavior when they are motivated, capable of performing the behavior, and given the opportunity to exhibit it (Meredith & Burkle, 2008). By interweaving scholarly rigor with hands-on corporate exposure, educational programs can significantly boost the inspiration and ability of students. Internships provide the perfect chance to apply these techniques within a practical framework. This integrated approach ensures that students are well-equipped, encouraged, and offered ample opportunities to succeed in their professional endeavors, laying a strong foundation for their future careers.

This analysis aims to bridge the gap between academic theory and real-world application, focusing on ICT, based on a notable South Asian university that introduced a technology stream in 2016, leading to the emergence of proficient professionals in the market by 2019.

It focuses on achieving three objectives:

- Developing critical insights that strengthen the connection between theoretical knowledge and its practical applications.
- Identifying the specific skills and competencies the industry values most during students' industrial training.
- Creating a framework for industrial training in ICT that other technology faculties can utilize as a model for industrial training.

By addressing these objectives, the research seeks to enhance the alignment between academic preparation and industry expectations, facilitating a smoother transition for graduates into the ICT sector.

Data and Methods

This study focused on the ICT Honours Degree at the University of Sri Jayewardenepura in Sri Lanka. A significant change in the country's education system occurred when technology subjects were introduced for the Advanced Level Examination. The Faculty of Technology initiated their internship program in 2019, continuing it for student groups until 2022. However, this new program encountered several challenges, including securing suitable workplaces for student internships, coordinating these internships, and preparing students for their industry experience. To enhance future efforts and ensure sustained industry demand for technology graduates, it is essential to develop a flexible and robust framework that effectively aligns the university's offerings with market needs, fostering a lasting partnership.

Approaching industrial training from the perspective of academic departments requires meticulous planning. It begins early, with students engaging in small projects to enhance their teamwork and innovation skills. These projects help identify students' strengths and interests. After their internships, students are required to submit detailed reports, along with daily logs of their activities. These reports undergo thorough evaluation in a viva, where both university and industry experts assess the student's performance and learning during the internship. Feedback from the industry is crucial as it

evaluates student performance and assesses how well the university curriculum aligns with industry needs. Our research, conducted from 2019 to 2022, aimed to bridge the gap between the academic curriculum and industry expectations by guiding student cohorts through internships. We revised the curriculum annually based on feedback from both students and their industry supervisors to address any discrepancies between our offerings and industry requirements.

Research Design

This study was structured around the Motivation, Ability, and Opportunity (MAO) framework, which provided a comprehensive lens for analyzing the critical factors influencing the success of ICT educational programs. Each component of the MAO framework was methodically integrated into the study, with the following specific factors:

1. Assembling Student Competencies

The initial phase focused on gathering data regarding students' current skills, directly addressing the 'Ability' component of the MAO framework. The objective was to assess students' existing capabilities, creating a foundation for identifying areas requiring educational enhancement. This analysis utilized Curriculum Vitae (CVs) and self-assessments to gain a holistic understanding of students' skills, experiences, and qualifications.

Variables Analyzed: Self-Assessments, Curriculum Vitae (CV) Analysis
Related MAO Component: Ability

2. Industry Feedback

In this phase, collaboration with industry stakeholders was pivotal for gathering insights into the relevance and applicability of the skills taught, addressing the 'Opportunity' component of the MAO framework. This step assessed the alignment of the curriculum with market demands and professional requirements.

Feedback from industry partners, based on student profiles and curriculum evaluations, was utilized to evaluate the 'Opportunity' component by determining the real-world relevance and applicability of the program.

Variables Analyzed: Feedback on Student Profiles, Curriculum Evaluations from Industry Partners

Related MAO Component: Opportunity

3. Curriculum and Skills Alignment

The final phase concentrated on the 'Motivation' component, emphasizing the alignment between curriculum content and industry requirements. This involved comparing the skills needed in the industry with those taught within the program. The goal was to enhance the curriculum to meet industry standards and inspire students to achieve professional success.

Data sources included industry feedback, student journals, and survey responses, which provided a comprehensive evaluation of the curriculum's effectiveness. The analysis identified alignment and gaps between curriculum outcomes and industry demands, underscoring the 'Motivation' aspect of the MAO framework.

Variables Analyzed: Alignment and Discrepancies between Industry Demands and Curriculum Outcomes

Related MAO Component: Motivation

Metrics for Assessment: To evaluate these components, specific metrics were developed:

- Skill Alignment Score (SAS): Measured the alignment between curriculum content and industry-valued skills, reflecting both the 'Ability' and 'Opportunity' components.
- Skill Misalignment Index (SMI) and Skill Gap (SG): Identified areas where the curriculum failed to meet industry standards, directly impacting the 'Motivation' to enhance the curriculum.

By systematically aligning our research design and variables with the MAO framework, we ensured a robust theoretical approach that yielded actionable insights for improving ICT educational programs.

SAS Calculation Formula:

$$SAS = \frac{\sum_{i=1}^n \text{Weight}(S_i) \times \text{Industry_Score}(S_i)}{\sum_{i=1}^n \text{Weight}(S_i)} \quad (1)$$

where:

- n - the total number of skills.
- S_i - each individual skill.
- *Weight* represents the importance our curriculum places on a particular skill.
- *Industry_Score* reflects how much the industry values a skill.

Skill Misalignment Index (SMI) Calculation Formula:

$$SMI = \sum_{i=1}^L | \text{Industry_Score}_{(S_i)} - \text{Student_Score}_{(S_i)} | \quad (2)$$

Skill Gap (SG) Calculation Formula:

$$SG_i = SC_i - IC_i \quad (3)$$

where:

- SC_i represents a student's rating of a skill.
- IC_i is the industry's rating of the same skill.
- n stands for the number of participants from 2019 to 2022.

The Skill Gap gives important insights:

- A negative value means the industry values the skill more.
- A positive value means students think the skill is important.

Weighted Skill Gap (WSG) Calculation Formula:

$$WSG_i = W_i \times (SC_i - IC_i) \quad (4)$$

Skill Gap Momentum (SGM) Calculation Formula:

$$SGM = \frac{WSG_t - WSG_{t-1}}{T} \quad (5)$$

where T represents the time between two evaluations.

Data Insights

A detailed analysis reveals that both students and industry stakeholders place high value on skills such as teamwork and critical thinking. However, there are notable gaps between the skills universities currently teach and those the industry expects, particularly in areas like object-oriented design, system testing, and data modeling. The industry emphasizes the importance of combining soft skills with technical expertise, underscoring the need for curriculum improvements. These findings highlight the critical importance of aligning theoretical education with the practical demands of real-world jobs.

Analysis Overview

Data from 2019 to 2022 was analyzed to determine the significance of various skills. A comprehensive list was created to identify the skills deemed most important by both students and industry experts. Using a weighted mean method, the study explored how perceptions of skill importance evolved over time. Comparing the viewpoints of students and industry professionals provided an in-depth understanding of skill requirements and their relative importance.

Skill	Student Perception (SC)	Industry Perspective (IC)	Industry Importance (W)
Teamwork (TW)	4.2	4.8	0.7
Object-Oriented Design (OOD)	4.0	3.5	0.2
Communication (CN)	3.8	3.2	0.1
System Testing (ST)	3.7	3.4	0.4

Software Development (SD)	3.6	3.7	0.3
Data Modeling (DM)	3.9	3.3	0.5
Critical Thinking (CT)	4.4	4.5	0.9
Creativity (CR)	4.3	4.2	0.8
Leadership (LS)	3.5	3.9	0.2
Collaboration Skills (CS)	4.1	4.4	0.6

Table 1: Insights from Skill Analysis

Description	Rank	Weighted Mean Range
Negligible	5	< 3.0
Limited	4	3.0 – 3.4
Moderate	3	3.5 – 3.9
Significant	2	4.0 – 4.4
Essential	1	4.5 – 5.0

Table 2: Skills Analysis (2019–2022) – Significance Decoded

Key Findings

The analysis demonstrates a significant overlap in the importance assigned to teamwork and critical thinking by both groups. However, technical skills like object-oriented design and data modeling exhibit noticeable gaps, reflecting areas for curricular enhancement. Additionally, the weighted mean analysis over the years underscores the dynamic nature of skill requirements, reinforcing the need for continuous curriculum updates to stay aligned with industry expectations.

Results and Discussion

1. Skill Gap Analysis

The 'Skill Gap' metric evaluates the difference between how IT students see their skills and how industry professionals value those skills from 2019 to 2022:

$$\text{Skill Gap} = \frac{1}{n} \sum_{i=1}^n (SC_i - IC_i) \quad (6)$$

Here, SC symbolizes the student’s skill evaluation, and IC represents the industry’s assessment. A negative gap infers a heightened industry valuation, while a positive one denotes a student’s elevated estimation.

A one-way ANOVA test revealed mutual respect for competencies like teamwork. However, students appeared to undervalue skills such as object-oriented design, whereas the industry accentuated the importance of soft skills, corroborating previous research’s emphasis on their vitality in professional settings.

2. *Weighted Skill Gap*

To incorporate the industry’s skill prioritization:

$$WSG_i = W_i \times (SC_i - IC_i) \quad (7)$$

With W_i being the weightage the industry places on the i th skill.

3. *Skill Gap Momentum*

To gauge the evolution in perceptions over time:

$$SGM = \frac{WSG_t - WSG_{t-1}}{T} \quad (8)$$

4. *Skill Contribution Index*

This index measures each skill’s proportional impact on the comprehensive weighted skill gap:

$$SCI_i = \frac{WSG_i}{\sum_{j=1}^n WSG_j} \quad (9)$$

5. *Key Insights and Recommendations*

Our study found several important points:

- 5.1. Students might be giving too much importance to skills like Object-Oriented Design (OOD), resulting in positive gaps.
- 5.2. Skills such as Computer Networking (CN) and Cyber Security (CS) showed negative gaps, indicating possible gaps in the academic curriculum.

5.3. Small gaps in skills like Critical Thinking (CT) and Data Modeling (DM) suggest that students and industry agree on their importance.

Based on these insights, we recommend:

1. Curriculum Update: Invite industry experts to provide input to make sure the curriculum meets industry needs.
2. Focused Training: Start workshops to address the identified skill gaps.
3. Better Collaboration: Strengthen ties between industry and academia through internships and joint projects.
4. Feedback System: Set up a strong feedback system involving industry-related alumni to continuously improve the curriculum.

Skill	SC (Avg)	IC (Avg)	Skill Gap	WSG	SCI
TW	4.5	4.2	0.3	0.21	0.11
CT	4.6	4.3	0.3	0.24	0.13
OOD	4.0	3.5	0.5	0.1	0.05
ST	3.9	4.0	-0.1	-0.03	0.015
DM	3.8	4.3	-0.5	-0.05	0.025

Table 3: Comprehensive skill gap analysis (2019-2022)

Our detailed analysis from 2019 to 2022 includes insights from both academic and industry perspectives. The results clearly show the high value placed on skills such as teamwork (TW) and critical thinking (CT). However, there are noticeable gaps in areas like Object-Oriented Design (OOD), System Testing (ST), and Data Modeling (DM). The positive skill gap in OOD suggests that students might be giving this skill more importance than industry professionals do, possibly indicating an overemphasis in academic courses. On the other hand, the negative skill gaps in DM and ST indicate that the industry places more value on these skills than students do, highlighting areas where academic programs may need to increase their focus to better meet industry

demands.

Metrics like the Weighted Skill Gap (WSG) and Skill Contribution Index (SCI) provide deeper insights into these findings. The significant negative WSG for DM underscores its importance in the industry, while the corresponding SCI shows its substantial impact on the overall skill gap.

Our findings show that both students and industry value skills like teamwork and critical thinking. However, there are differences in how they see other skills. This means we need to improve the curriculum to better match what the industry needs. The industry especially values soft skills like teamwork and critical thinking, as shown by previous studies (Reilly 2000).

Further analysis shows that the industry prefers soft skills like teamwork, creativity, and analytical thinking during IT student training. This preference aligns with other studies (De Villiers, 2010; Lim, Seow, and Tan, 2013; Kuslivan, 2003; Phillips, Ochs, and Schiefelbein, 2020; Garbo, 1997), which highlight the importance of these skills in the workplace.

There is also a clear difference in how students and professionals value technical skills. Students tend to prioritize skills like software applications, computer hardware, and networking, which are not as emphasized by professionals. This trend is supported by other research (S.-O. Law, Larsson, and Palle, 2009; Avella et al., 2016; Lau, Yang, and J. Lee, 2018), which also notes the importance of soft skills in industrial training. ANOVA results suggest that in customer-focused sectors, some technical skills may not be as important.

In conclusion, our study suggests that to better prepare students for the industry, we need to focus more on soft skills and adjust the emphasis on certain technical skills. This can be achieved through regular curriculum updates, better collaboration with industry, and ongoing feedback mechanisms.

Skill	AWM-S	R-S	AWM-I	R-I	Gap	F-stat	Sig.
KCN	4.13	4	2.87	3	1.26	28.44	p < 0.00
KCCP	4.27	5	3.43	3	0.84	7.12	p < 0.01
KCH	4.45	5	4.39	5	0.06	0.34	p = 0.56
KST	4.22	5	4.04	4	0.18	0.15	p = 0.70
OOD	4.13	4	2.87	3	1.26	28.44	p < 0.00
UX/UI	4.36	5	4.50	5	-0.14	0.45	p = 0.50
KSD	4.22	5	4.04	4	0.18	0.15	p = 0.70
CS	4.36	3	4.48	5	-0.12	0.45	p = 0.50
PSLT	4.40	5	4.48	5	-0.08	0.15	p = 0.70
AA	4.36	3	4.48	5	-0.12	0.45	p = 0.50
CRE	4.36	5	4.48	5	-0.12	1.36	p = 0.72
KDM	4.45	5	4.39	5	0.06	0.34	p = 0.56
PMS	4.36	5	4.13	4	0.23	4.14	p = 0.04
MAD	4.36	5	4.13	4	0.23	2.24	p = 0.14
TW	4.50	5	4.52	5	-0.02	0.00	p = 0.10

Table 4: Industries and IT students perceptions on skills in the industry

AWM-S: Avg. Weight Mean - Student R-S: Rank - Student

AWM-I: Avg. Weight Mean - Industry

R-I: Rank - Industry

Gap: Mean Difference

KCN: Knowledge on Computer Networking

KCCP: Knowledge on Coding/Computer Programming KCH: Knowledge on Computer Hardware

KST: Knowledge on Software Testing

OOD: Object-Oriented Design

UX/UI: User Experience/User Interface Designing KSD: Knowledge on Software Development

CS: Communication Skills

PSLT: Problem Solving and Logical Thinking AA: Analytical Abilities

CRE: Creativity

KDM: Knowledge on Digital Marketing

PMS: Project Management Skills

MAD: Mobile Application Deployment
TW: Teamwork

6. *Visual representation of the skills gap between IT students and industry professionals*

Upon detailed scrutiny of the graphical depiction of the skills disparity between IT students and industry experts, the ensuing conclusions were drawn (Figure 1):

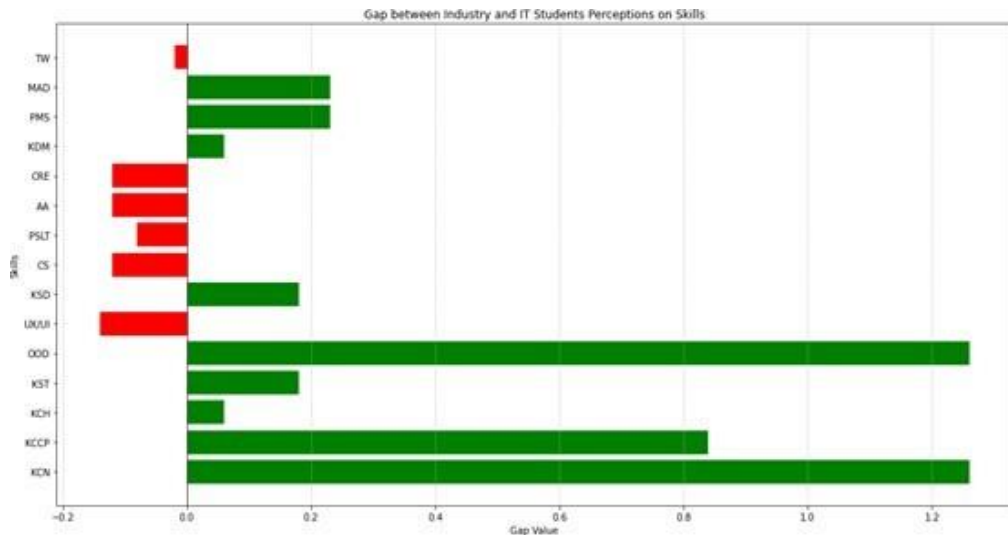


Figure 1: Skills disparity between IT students and industry professionals anchored on ANOVA findings.

6.1. Positive Gap (illustrated by green bars): IT students esteemed specific skills more profoundly than their industry counterparts. The extent of the bar quantifies this variation. Significant positive disparities were discerned in proficiency such as "KCN" (Acumen in Computer Networking) and "OOD" (Object-Oriented Design). This highlights students' marked preference for these competencies, which deviates from the industry's assessment.

6.2. Negative Gap (portrayed by red bars): Industry practitioners perceived particular skills as paramount compared to IT students. Particularly, competencies like "UX/UI" (User Experience/User Interface Designing), "CS" (Interpersonal Communication Proficiency), and "AA" (Evaluative

Capacities) exhibited a conspicuous negative disparity. This underscores the industry's elevated regard for these skills in contrast to students' valuation.

6.3. Negligible Gap: A few proficiency, notably "KCH" (Expertise in Computer Hardware) and "KDM" (Acumen in Digital Marketing), showcased trivial variances in perceptions across both demographics.

This suggests a harmonized valuation between academia and the industry concerning these skills' significance.

The insights gleaned from the graphic illustration provide a lucid distinction of skills where academic perspectives either converge with or diverge from the expectations of the industry. Acknowledging and addressing these variances is pivotal to guarantee that the academic curriculum mirrors the practical demands of the industry.

Understanding Perception Gaps: A Comprehensive Meta-Analytical Exploration

To understand the differences between what students and the industry think about skills, both technical and soft skills, we used a strong meta-analytic approach. This method combines insights from many research studies, allowing us to compare our findings with established insights. Our meta-analysis includes various studies. We looked at perceived skill gaps in software engineering (Radermacher, Walia, and Knudson, 2014; Y.M. Kim and K. K. Kim, 2006), and recruitment challenges due to skill gaps (Van Aken, Monetta, and Sink, 2007). We also examined skills gap issues in business graduates (Denise Jackson, 2012; Abbasi, Siddiqi, and Aziz, 2018; Malik and Venkatraman, 2017) and challenges in the construction industry (Adepoju and Oyedele, 2021). Studies on teaching challenges (Collins, A. Brown, and Holum, 2002) and the impact of industrial training (Rodzalan and Saat, 2012) were also considered.

We reviewed global perspectives on important industry skills and their gaps (Denise Jackson and Hancock, 2010; Denise Jackson and Nick Wilton,

2010) and efforts to improve soft skills among STEM students (Karimi, Ali, and Nordin, 2021). Recognizing the gap between academia and industry, some studies suggest ways to bridge this divide (S. Zeidan and Bishno,i 2020; Sarah Zeidan and Arrowsmith, 2020). We were also influenced by studies on the energy sector (Hong and S.-H. Lee, 2018), and the role of industry advisory councils in academic structures and the software industry in Ireland (Reed and Mulvey, 2002).

Skills like "Software Testing" and "Digital Marketing" showed consistent views across most studies, indicating agreement. However, skills like "Communication Skills" and "Object-Oriented Design (OOD)" had different views. These differences show the challenge of aligning university courses with industry needs. By using these insights, we suggest that universities update their teaching methods. It's important that what students learn matches what the industry needs, so graduates are ready with both technical and soft skills.

A detailed look at the forest plot for IT skills shows these insights (Figure 2):

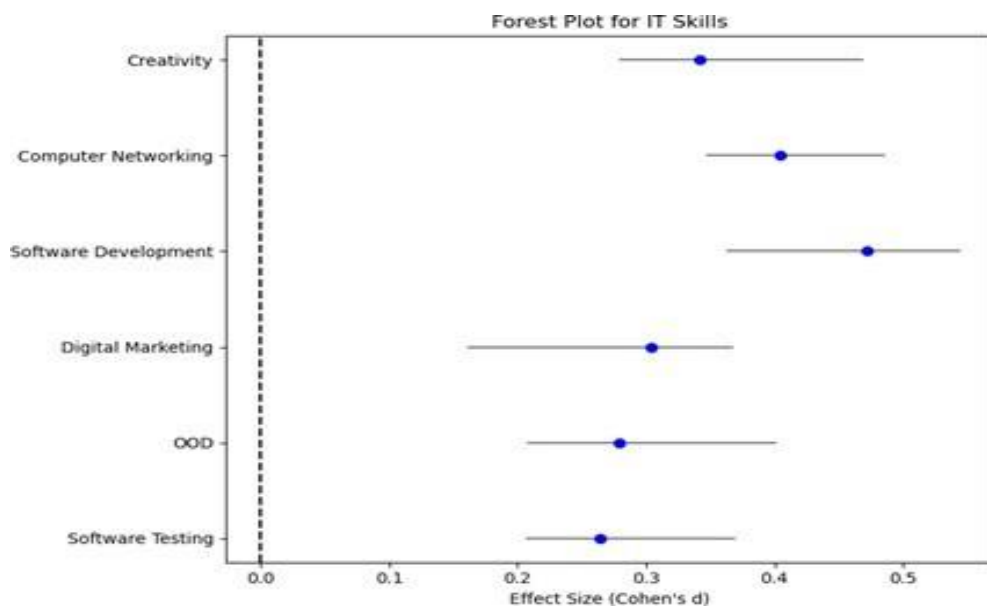


Figure 2: Meta-analysis providing insights across IT skills

1. Software Testing: This skill has a moderate effect size with a narrow confidence interval, showing consistent findings across studies.
2. Object-Oriented Design (OOD): The effect size for OOD is higher, suggesting a big gap in this skill. The wider confidence interval shows variability across studies.
3. Digital Marketing: This skill has a moderate effect size and consistent results across studies.
4. Software Development: With a moderate effect size and a narrow confidence interval, findings about Software Development are consistent and important.
5. Computer Networking & Creativity: Both skills show moderate effect sizes with wider confidence intervals, indicating higher variability in findings across studies.

From the forest plot for general industry skills, we observe (Figure 3):

1. Communication Skills: A significant effect size shows the importance of this skill, with consistent findings across studies.
2. Teamwork & Project Management: Both skills show moderate effect sizes and relatively narrow confidence intervals, reinforcing the strength of these findings.
3. Analytical Skills & Problem Solving: These skills have moderate effect sizes but slightly wider confidence intervals, showing some variability in study outcomes.
4. Leadership: This skill has a higher effect size, showing its importance in the industry. The consistent confidence interval indicates uniform results across studies.

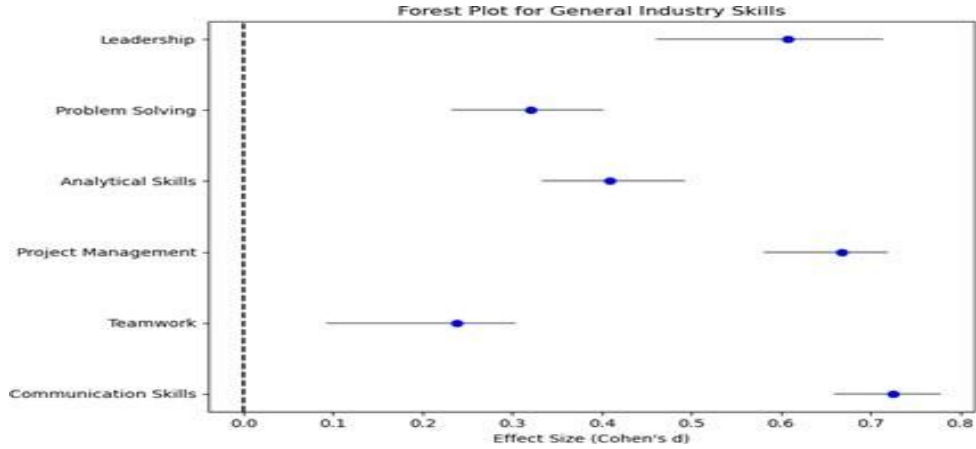


Figure 3: Meta-analysis providing insights across general skills

Dissecting Perceptual Variabilities: Meta-analytic versus Current Study

The IT industry changes fast, so perceptions about skills also change. To understand these changes, we compared long-standing meta-analytic views with recent insights.

1. Comparison of Effect Sizes

The difference between effect sizes from old meta-analyses and the current study is shown in Figure 4. The mean differences, or effect sizes, for each skill are shown with error bars to highlight standard errors.

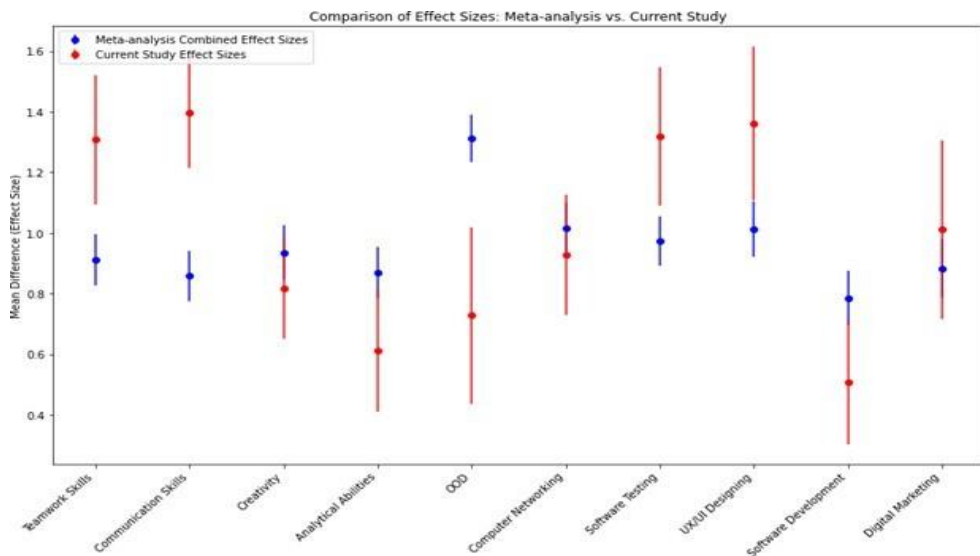


Figure 4: Comparison of effect sizes: Meta-analysis versus Current Study

The main points from this comparison are:

1. Marked Variabilities: Big differences in effect sizes for skills like "OOD", "Communication Skills", and "Digital Marketing" between the meta-analysis and the current study.
2. Consistent Perceptions: Both the meta-analysis and the current study consistently value skills like "Software Testing" and "Software Development".
3. Variability Differentials: Noticeable differences in standard errors between studies for "Computer Networking" and "Creativity".

By comparing old and current views, this analysis shows the changing perceptions of skills in IT. It highlights the need for universities to update their curriculum to match industry expectations.

2. WSG, SGM, and SCI Values: Contrasting Student and Industry Perspectives

Figures 5 and 6 compare Weighted Skill Gap (WSG), Skill Gap Momentum (SGM), and Skill Contribution Index (SCI) values, showing differences in student and industry views on IT and general skills.

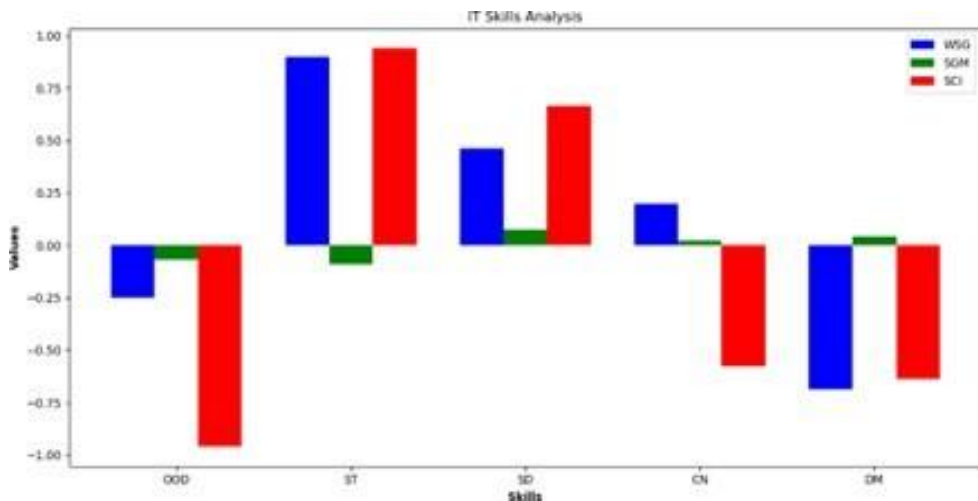


Figure 5: Analysis of WSG, SGM, and SCI for IT skills

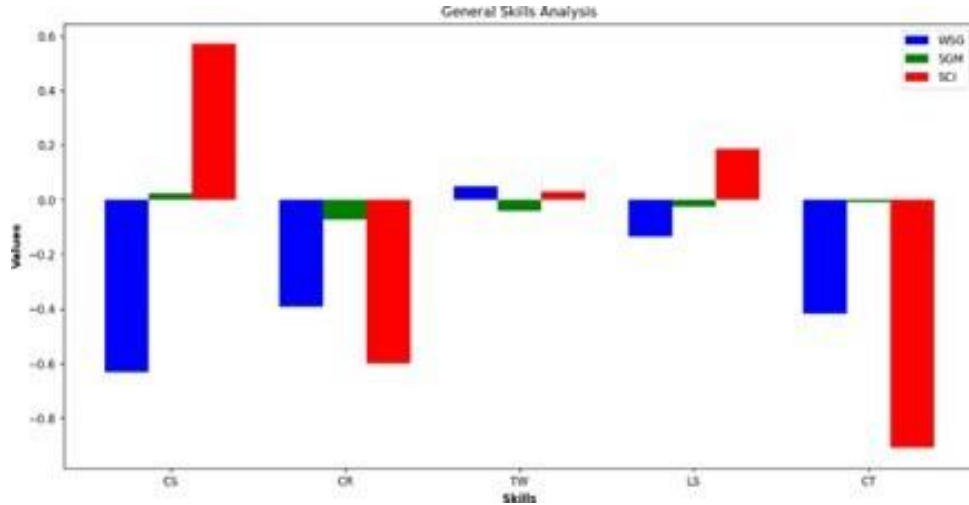


Figure 6: Analysis of WSG, SGM, and SCI for general skills

From these visuals, it is evident that;

1. Prominent Variances: Skills like "OOD", "Communication Skills", and "Digital Marketing" show no differences in WSG, SGM, and SCI values between students and industry professionals.
2. Consistent Understandings: "Software Testing" and "Software Development" reflect similar understanding and valuation by both students and industry professionals.
3. Diverging Interpretations: Skills like "Computer Networking" and "Creativity" highlight differences between historical meta-analyses and recent studies.

These analyses show the changing views on IT and general skills. This means universities and the industry need to keep talking to make sure the curriculum meets industry needs. Building on these insights, the next sections look deeper into the mathematical analysis of the skill gap.

3. Weighted Skill Gap Analysis

Using the weighted skill gap formula, the following values for each skill were found:

$$WSG_{TW} = 0.7 \times (4.2 - 4.8) = -0.42$$

$$WSG_{OOD} = 0.2 \times (4.0 - 3.5) = 0.1$$

$$WSG_{CN} = 0.1 \times (3.8 - 3.2) = 0.06$$

Analysis of the results is given below:

1. Teamwork (TW): Has a big negative gap, meaning students think it is less important than industry professionals do.
2. Object-Oriented Design (OOD): Has a positive gap, meaning students think it is more important than the industry does.
3. Computer Networking (CN): Has a small positive gap, showing minor differences between student and industry views.

4. Skill Gap Momentum

Calculating the momentum of the skill gap gives:

$$SGM_{TW} = \frac{-0.42 + 0.40}{1} = -0.02$$

$$SGM_{OOD} = \frac{0.1 - 0.08}{1} = 0.02$$

$$SGM_{CN} = \frac{0.06 - 0.04}{1} = 0.02$$

These values mean:

- Teamwork (TW): Has a small negative momentum, meaning the gap is getting smaller but is still mostly negative.
- Object-Oriented Design (OOD) and Computer Networking (CN): Both have positive momentum, meaning the gap is getting bigger over time.

Figure 7 shows the Skill Gap Momentum (SGM) for three key skills: Teamwork (TW), Object-Oriented Design (OOD), and Computer Networking

(CN). The height of the bars and labels show the SGM values, with green bars for positive momentum and red bars for negative momentum. From the figure, we see that Teamwork (TW) has a small negative momentum (red bar below the line). Both Object-Oriented Design (OOD) and Computer Networking (CN) have positive momentum (green bars above the line). This means educators and industry professionals should focus on these areas to make sure the value of these skills is better matched.

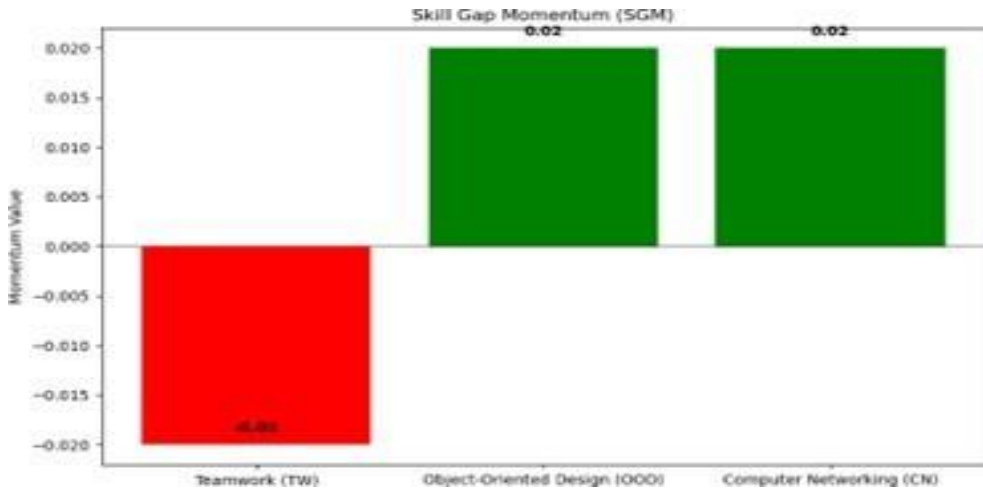


Figure 7: Skill Gap Momentum (SGM) analysis for selected skills

Discussion and MAO Theoretical Implications

This study critically examines the alignment between academic training in the ICT sector and the evolving needs of the industry. Central to this analysis is the Motivation, Ability, and Opportunity (MAO) theory, which provides a framework for understanding and addressing the gap between academic preparation and industry expectations. According to the MAO theory, successful engagement in a behavior requires individuals to be motivated, possess the necessary abilities, and have opportunities to utilize their skills.

1. Identifying Misalignments

The first goal of this study was to identify discrepancies between the skills taught in academia and those required in the job market. A significant gap

was observed between the emphasis on technical skills in universities and the industry's greater focus on soft skills, adaptability, and project management. This finding highlights the need for curriculum enhancements to bridge this gap, as emphasized by the MAO theory.

2. The Significance of the Skill Gap

Our analysis also explored the depth of the skill gap and its implications for graduates' employability. The gap complicates job acquisition and reduces the effectiveness of new employees in their roles. These findings align with the MAO theory, which underscores that successful employment requires motivation, relevant opportunities, and the ability to apply acquired skills in practical settings.

3. Quantitative Measurement of the Skill Gap

To assess misalignment quantitatively, we utilized metrics such as the Skill Alignment Score (SAS) and the Skill Gap Index (SGI). These tools enabled a systematic evaluation of how well academic curricula meet industry demands. The results provided actionable insights for academic institutions to address specific areas of misalignment, consistent with the MAO framework.

4. Curriculum Tailoring

The discussion strongly supports the need for academic curricula to adapt to the dynamic demands of the ICT sector. This includes revising course content, offering specialized training workshops, and fostering closer collaborations between universities and industry partners. These efforts resonate with the MAO theory's emphasis on creating opportunities for students to apply their skills in practical contexts, enhancing their motivation and preparedness for professional success.

5. Actionable Insights for Transitioning

The skill gap analysis offers practical recommendations for smoothing the transition from academia to industry for ICT students. A balanced

curriculum that emphasizes both technical and soft skills is critical. This approach reflects the MAO theory's principles, preparing individuals comprehensively for professional environments.

6. Educational Interventions

Finally, this study advocates for educational interventions aimed at addressing existing gaps while anticipating future industry trends. These initiatives should ensure that students are well-prepared, motivated, and provided with ample opportunities to apply their knowledge in real-world scenarios, aligning seamlessly with the core tenets of the MAO theory.

Conclusion

The findings of this study reveal a significant transformation in the skills deemed essential for IT professionals in the current job market. While technical and cognitive skills remain foundational, there is a notable shift toward emphasizing psychomotor skills, particularly interpersonal skills such as teamwork, collaboration, and creativity. This study explored why these skills have become critical in building a modern IT workforce that can meet future demands.

Using detailed meta-analysis and statistical methods, we identified and quantified the skills gap through metrics such as the Weighted Skill Gap (WSG), Skill Gap Momentum (SGM), and Skill Contribution Index (SCI). These tools highlighted critical areas of misalignment, particularly in teamwork and communication skills. For instance, while universities offer extensive credit programs focusing on technical skills, our findings show that employers increasingly prioritize graduates with strong interpersonal and teamwork abilities.

Based on our research, it is evident that universities must reevaluate their curricula to better align with industry demands. A dynamic educational program that integrates theoretical knowledge with practical application is essential. This approach aligns with the Motivation-Ability-Opportunity (MAO)

theory, which posits that individuals achieve success when they possess the required abilities, are motivated, and are provided with opportunities to apply their skills in real-world scenarios.

Our analysis, covering the period from 2019 to 2022, underscores a consistent gap in behavioral competencies taught in universities, even as they excel in imparting knowledge of new technologies. Addressing this gap requires a holistic approach to IT education that emphasizes both technical expertise and soft skills. In conclusion, our research highlights the need for universities to equip students not only with the technical skills required for their careers but also with the soft skills necessary for success in today's workplace. A progressive approach to IT education, one that balances technical and interpersonal skill development, will better prepare graduates to tackle novel and complex challenges. By adopting this comprehensive strategy, universities can cultivate a workforce that is adaptable, resilient, and prepared to thrive in the ever-evolving IT landscape.

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