

Bridging the Skills Gap: Examining the Electronics Technology Students' Competence and Industry Demands

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Abstract. Educational institutions often struggle to keep up with the emerging trends in the electronics industry, leading to a gap between what students learn in their programs and what is in demand in the job market. Beyond technical skills, electronics technology students also need to develop soft skills vital for success in any job but can sometimes be overlooked in traditional academic settings. Previous studies reported a skills gap between industry demands and students' preparedness. Thus, this study determined the skills demanded by the electronics industry in Leyte, emphasizing both technical and soft skills; it also explored the acquired skills of the electronics technology students based on their experiences. This study employed mixed-method research, specifically the convergent parallel design, wherein quantitative and qualitative data were collected simultaneously and analyzed separately. For the quantitative data collection, 21 online job postings were utilized in the web scrapping technique and were limited to Leyte province only. For the qualitative data collection, an interview was conducted with 14 purposively selected 4th-year Electronics Technology students. Descriptive statistics were used to summarize quantitative data, while qualitative data underwent thematic analysis. Results revealed a skills gap among electronics students, influenced by the dearth of electronics-related industries and job openings in the province. Most employers require technical skills in troubleshooting and maintaining electronic systems. Being keen on details, being customer-oriented, and working well as a team are the necessary soft skills. The qualitative findings from the interview complement the quantitative results. The implication is clear for educational institutions that soft skills development should be emphasized in educational programs, preparing students technically and socially for the workplace.

Keywords: Electronics technology students; Employability; Graduates; Jobs; Skills gap.

1.0 Introduction

The global skills gap presents a significant challenge to organizations worldwide. Universities serve as institutions for cultivating specialized human talent, and access to university education indicates a country's production of skilled personnel (Abdulla, 2013). Rising economic growth and development in the Philippines signifies a drive to enhance the economy's resilience and competitiveness (Surya et al., 2021). Labor productivity can be raised through improved quality and quantity of education and training, including constant skills upgrading and lifelong learning. However, for education and training to successfully raise productivity, there is a need to focus on the internal and external efficiency of education and training programs (Jackson & Bridgstock, 2021). Neglecting the emphasis on internal and external efficiency could stem from a discrepancy in the number of graduates available for the industrial and services sectors. Similarly, this mismatch might lead to an oversupply of graduates ill-suited for the job market, consequently driving up unemployment rates. The electronics industry is pivotal in driving innovation and shaping economies in today's rapidly evolving technological landscape. The

electronics industry is characterized by its continuous advancements and dynamic nature, resulting in a growing need for employees with technical and adaptive skills that align with emerging trends. New tools, programming languages, hardware, and software frameworks emerge frequently. Educational institutions often struggle to keep up with the latest trends, leading to a gap between what students learn in their programs and what is in demand in the job market.

While classroom learning is essential, hands-on practical experience is equally important (Treceña, 2022), if not more so, for electronics technology fields. Students need opportunities to work with real-world projects, troubleshoot issues, and collaborate with others to develop problem-solving and teamwork skills that are valued in the industry. Beyond technical skills, electronics technology students must also develop soft skills such as communication, teamwork, critical thinking, and adaptability. These skills are vital for success in any job but can sometimes be overlooked in traditional academic settings. The Philippine electronics industry is the main driver of the nation's manufacturing sector, according to the Department of Trade and Industry [DTI]. In 2013, the industry generated US\$ 918 million in domestic and international investments, 41% of all exports, and employed 2.2 million people. Since member companies want to transition to greater value-added production to fulfill global demand, the industry's potential is still quite high. Over the next several years, these organizations want to grow their workforce further, increase their present research and development and design skills, and enhance their manufacturing capacity. By determining consumers' needs, comprehending suppliers' baseline capabilities, constructing relevant capabilities, matching industry supply and demand, and conducting regular performance evaluations, the industry is trying to raise the country's electronics manufacturing index. In addition, the industry recommends that higher education provide programs for operators and technicians, improve the country's business environment, conduct more research and development capability, and continue to strengthen the curriculum of the institutions to match the industry demands (Cornillez Jr, 2020). However, significant concern remains about the mismatch between the skills possessed by electronics technology students and the skills demanded by the industry for optimal employability.

Existing academic programs may lack the agility to adapt their curricula to the industry's rapid changes, leading to a discrepancy between the skills acquired by students and those demanded by employers. Bridging this gap is essential for ensuring that electronics technology graduates are adequately prepared for the demands of the workforce. The disconnection between academia and industry has raised a compelling concern regarding the preparedness of electronics technology graduates for the job market. The existing academic programs may not be equipped to rapidly adapt their curricula to keep pace with the swiftly evolving industry landscape. Consequently, graduates with degrees often lack the practical and cutting-edge skills employers require, leading to potential underemployment or a slow integration into the workforce. This dichotomy frustrates students and hinders the industry from tapping into a pool of skilled professionals.

Job sites are important in graduates' employment journey, offering many benefits that significantly streamline the job search process. These platforms serve as a centralized hub for job listings, catering to various industries and sectors. Graduates can easily access many opportunities, making the employment search considerably more efficient than traditional methods. While job sites have certainly made job listings more accessible, the issue of skills alignment remains a significant concern. Employers often seek specific skills, competencies, and qualifications that may not perfectly align with what graduates have acquired through their educational experiences.

Previous studies have addressed skills gap phenomena across various industries and regional contexts (Angafor et al., 2020; Suroysuroy, 2023), highlighting inherent issues with the pipeline from education to employment. However, a more thorough examination is important in the particular field of electronic technology. Few studies have been conducted concerning the skills the electronics industry needs, including technical expertise and essential soft skills. Thus, understanding the industry's unique skill set is essential to provide direction-focused curricular improvements. Moreover, there is a gap in the literature concerning the evaluation of the existing curriculum of Electronics Technology. While studies acknowledge the need to adapt and enhance higher education curricula to align with industry demands (Okolie et al., 2020; Sarin, 2019), there is a lack of in-depth analysis focused on the electronics technology discipline. Identifying certain gaps in the curriculum will provide educators and policymakers with crucial knowledge to address deficiencies and improve graduates'

preparedness. Furthermore, little investigation has been conducted regarding the regional aspect of the skills gap in the electronics industry. According to Loquias (2015), there is a skills gap among electronics students, which is impacted by the dearth of electronics-related industries and job openings in some provinces. In the case of Leyte province, its economy is largely based on agriculture, fishing, and some manufacturing companies. The province is not a major hub for electronics manufacturing companies, limiting the availability of jobs in the electronics field. Nevertheless, an in-depth evaluation of the regional disparities in skill acquisition and industry demands is lacking, resulting in a significant knowledge gap concerning location-specific opportunities and challenges. In light of these, this study aimed to (1) determine the skills demanded by the electronics industry in the region, emphasizing both technical and soft skills, and (2) explore the acquired technical and soft skills of the electronics technology students based on their experiences. The study seeks to contribute valuable insights to the ongoing discourse on addressing the skills gap in the electronics industry and higher education.

To accomplish the objectives, the study employed data mining techniques to extract information from numerous online job platforms in the Philippines, including Indeed, JobStreet, LinkedIn, and Online Jobs. This data was utilized to conduct an in-depth analysis of the skills and qualifications sought by employers. The research also incorporated interviews with electronics students to gain a more comprehensive understanding of students' skill development, allowing for insights derived from their self-assessments regarding their acquired skills. This study will provide a data-driven approach to inform curriculum improvements and teaching strategies within the electronics technology program. By identifying the specific skills and qualifications demanded by the industry through data mining techniques, school administrators can tailor the curriculum to align with current industry needs, ensuring that graduates are better prepared for the job market. This aligns with the university's mission to provide relevant and high-quality education. Moreover, this study will promote the importance of bridging the gap between academia and industry, providing stronger partnerships that can lead to internships and collaborations, and enhancing student opportunities. Such collaborations can also facilitate research and development efforts, benefiting academia and the electronics industry. Lastly, this study can potentially improve the current practice of education by making it more responsive to industry demands, eventually enhancing graduates' employability and strengthening the university's reputation as a source of skilled and industry-ready professionals.

2.0 Methodology

This study aims to identify patterns and trends in job postings, including salary ranges, academic qualifications, technical skills, and soft skills. Also, it quantifies the students' technical and soft skills as emphasized in the academic curricula of the BS Industrial Technology major in Electronics program. Moreover, qualitative insights from students regarding the skills they acquired during their academic studies were also gathered. This study employed mixed-method research, specifically using a convergent parallel design. This method collected quantitative and qualitative data simultaneously and analyzed separately (Demir & Pesmik, 2018). After the analyses, the results will be integrated and compared to the conclusion. For the quantitative data collection, job postings from Indeed, Job Street, and online jobs ph were collected using the web scrapping technique done using Python programming and executed in Jupyter Notebook. The following data points were extracted: salary information, academic qualification requirements, and technical and soft skills. During the job posting scrapping, search was limited to Leyte only, part of the Eastern Visayas Region in the Philippines, from January 1, 2022, to September 30, 2023. Key terms such as "electronics," "electronics technician," and "electronics engineer" were used in the study. After saving the data in CSV format, the following criteria were implemented: the job posting must be directly related to electronics, the job posting must be a technical job, and it should be within the Leyte Province. After implementing the criteria, from 78 job postings, 21 were used in the study. An interview with the Electronics Technology students was conducted for the simultaneous qualitative data collection. A purposive sampling was employed to select 4th-year students in their On-the-Job Training. Structured interview protocols were used to conduct interviews with 14 students. The interviews were used to explore the skills they believe they have acquired during their academic studies. During the interview, informed consent was secured to inform the voluntary participation of the participants. Descriptive statistics such as frequency distribution were used to summarize quantitative data obtained from job postings. Moreover, qualitative data from student interviews underwent thematic analysis to identify common themes and patterns related to skills acquired during academic studies (Braun & Clarke, 2013). According to Braun and Clarke (2013), the 6-phase coding framework for thematic analysis was used to identify themes and patterns in the data (Braun & Clarke, 2006). The analysis method includes

familiarizing data, generating codes, combining codes into themes, reviewing themes, determining significant themes, and reporting findings. Findings from the quantitative analysis of job data and qualitative analysis of student interviews were integrated to provide a holistic understanding of the alignment between academic programs and job market demands. This research study followed ethical guidelines.

3.0 Results and Discussion

3.1 Quantitative Phase

Table 1 shows the salary bracket of the various job postings scrapped from the three job sites. Most electronics jobs in Leyte are between Php 15 000 and Php 11 000 (42.86%), while 33.33% are within the salary range of Php 24 00 – Php 16 000. Moreover, 14.29% are within the range of Php 10 000 below, while only 9.52% are Php 25 000 and above. The prevalence of mid-range salary offerings suggests a standardized remuneration structure in the region, potentially influenced by local economic factors. Wages and salary structures differ in the Philippines depending on several factors, including industry, working hours, type of employment, education, and professional experience (Caligagan et al., 2022). However, it depends on the entity's location; those working in the major cities of business districts receive higher pay than those working in provincial areas. In the Eastern Visayas Region, particularly in Leyte, there will be a second-tranche increase in wages in 2023 (Meniano, 2022). The minimum wage for non-agricultural workers in retail and service sectors increased from PHP350 to PHP375 per day.

Table 1. Salary bracket of the job postings

Salary Bracket	Frequency	Percentage
Php 25, 000 and above	2	9.52
Php 24, 000 - Php 16, 000	7	33.33
Php 15, 000 - Php 11, 000	9	42.86
Php 10, 000 and below	3	14.29
Total	21	100.00

Table 2 provides an overview of the technical skills requirement based on the various job postings in Leyte, which were scrapped online from Indeed, Job Street, and online jobs ph. Troubleshooting and Repair of Electronic Equipment is highlighted as an essential requirement for electronics technology students, with a frequency of 4 and a percentage of 10.0%. This suggests that a significant percentage of the job advertisements highlight the requirement for applicants to have experience finding and repairing issues with electronic devices. Moreover, Equipment Inventory and Systems Monitoring, along with Conducting Preventive and Reactive Maintenance of Electronic Systems, both have frequencies of 6 and percentages of 15.0%. These skills highlight how important it is for applicants to have experience with proactive and reactive maintenance procedures, system monitoring, and inventory management of equipment. Furthermore, Maintenance in Laboratories, Equipment/System Installation and Modification, and Performing Detailed Data Gathering, Reporting, and Documentation each have frequencies of 3, constituting 7.5% of the total requirements. This suggests that proficiency in maintaining laboratory equipment, installing and modifying systems, and thorough data handling and reporting are essential in many job postings. Similarly, Knowledge of Electronics Theory and Industry Standards shows a similar percentage (7.5%), emphasizing the importance of a basic understanding of electronics theory and being familiar with industry standards. Lastly, Equipment and System Testing, Design, and Layout of Printed Circuit Board (PCB), including its Requirements, comprise 5.0% of the total skills requirements. Meanwhile, 12.5% of the online job postings in Leyte are about skills in embedded systems.

For electronics graduates to perform successfully in the workplace or for the organization to succeed, they need to be trained in the essential skills (Ayeng, 2023). The emphasis on technical skills such as laboratory maintenance, equipment or system installation and modification, and detailed data gathering, reporting, and documentation underscores the multidimensional nature of electronics job requirements. Wang and Parker (2020) posit that industries nowadays demand diverse skill sets to cope with the evolving nature of electronics jobs. Moreover, according to Carminati and Scandurra (2021), the growing technological complexity in embedded systems is reflected in the importance of skills in that field. Additionally, factors that an electronics graduate consists of are both knowledge and skills. In contrast, school factors comprise the curriculum, placement program, physical and laboratory facilities, OJT program, industry linkages, enhanced teaching strategies (TRECENE, 2023), and skills enhancement program (Loquias, 2015).

Table 2. Technical skills requirements from the job postings

Technical Skills	Frequency	Percentage
Troubleshooting and Repair of Electronic Equipment	4	10.0
Equipment Inventory and Systems Monitoring	6	15.0
Conduct Preventive and Reactive Maintenance of Electronic Systems	6	15.0
Maintenance in Laboratories	3	7.5
Equipment/System Installation and Modification	3	7.5
Performs Detailed Data Gathering, Reporting and Documentation	6	15.0
Knowledge of Electronics Theory and Industry Standard	3	7.5
Equipment and System Testing	2	5.0
Design and Layout of Printed Circuit Board (PCB), including its Requirements	2	5.0
Embedded Systems	5	12.5
Total	40	100

Table 3 shows the soft skills needed by electronics-related jobs in Leyte, as extracted from online Indeed, Jobstreet, and OnlineJobsPH postings. Among the soft skills considered essential, customer orientation stands out as one that appears three times and accounts for 16.7% of the overall criteria. Given the client-centric nature of these industries, this emphasizes how important it is for applicants to recognize and prioritize the customer's demands. In addition, 16.7% for "Ability to Work Effectively in a Collaborative Team Environment" and "Building Productive Trusts" both highlight the importance of interpersonal relationships and teamwork, demonstrating the collaborative nature of Leyte's electronics-related positions. These soft skills highlight how crucial it is to develop positive relationships and productive teamwork to meet the demands of the jobs.

Furthermore, the demand for "Detailed-Oriented" soft skills is quite common, with 22.2% suggesting that tasks involving electronics place a high value on accuracy and precision. This makes sense, given how complex and systematic such a job is. While "Responsible and Hardworking" only occurs twice, accounting for 11.1% of the total, it shows how important responsibility and diligence are in these jobs. According to Loquias (2015), soft skills useful for jobs are critical thinking, problem-solving, and communication skills. The qualitative findings from the interview with electronics students complement the quantitative results. The job advertisements emphasized soft skills such as customer orientation, collaborative teamwork, and building productive trust. The research outlining the increasing focus on client-centric approaches in technology-related fields (Lee et al., 2021) supports the importance of customer orientation.

Furthermore, the demand for detail-oriented skills aligns with the quantitative findings, emphasizing the importance of meticulousness in electronics-related tasks. The implication is clear for both educational institutions and employers. Soft skills development should be integrated into educational programs, preparing students technically and socially for the workplace. Employers should recognize the significance of these soft skills in ensuring the success of their workforce and consider incorporating them into their hiring criteria.

Table 3. Soft skills requirements from the job postings

Soft Skills	Frequency	Percentage
Customer-Oriented	3	16.7
Build Productive Trusts	3	16.7
Ability To Work Effectively in a Collaborative Team Environment.	3	16.7
Detailed-Oriented	4	22.2
Responsible and Hardworking	2	11.1
Contribute Innovative Idea	1	5.6
Excellent Problem-Solving Skills	1	5.6
Communication Skills	1	5.6
Total	18	100

3.2. Qualitative Phase

An interview was conducted with the 4th year electronics students of the Eastern Visayas State University on the skills acquired based on their experiences throughout their studies. The data were analyzed using Braun and Clarke's (2006) 6-phase coding framework for thematic analysis. Results were categorized into soft and technical skills; both developed four themes. Soft skills include communication skills, collaborative abilities, cognitive skills, and professionalism. In contrast, technical skills include Network Cable Management and Troubleshooting, Computer Hardware Maintenance, Electronic Systems Integration and Testing, and Electronic Infrastructure Management. The identified skills and salary trends are crucial for electronics students, educational institutions,

and employers. For students, understanding the predominant skill requirements and salary expectations guides skill development and career planning. Educational institutions can leverage this information to align curriculum with industry demands, enhancing graduates' employability. Employers benefit by gaining insights into the prevalent skill sets and salary expectations, aiding in recruiting and retaining skilled professionals.

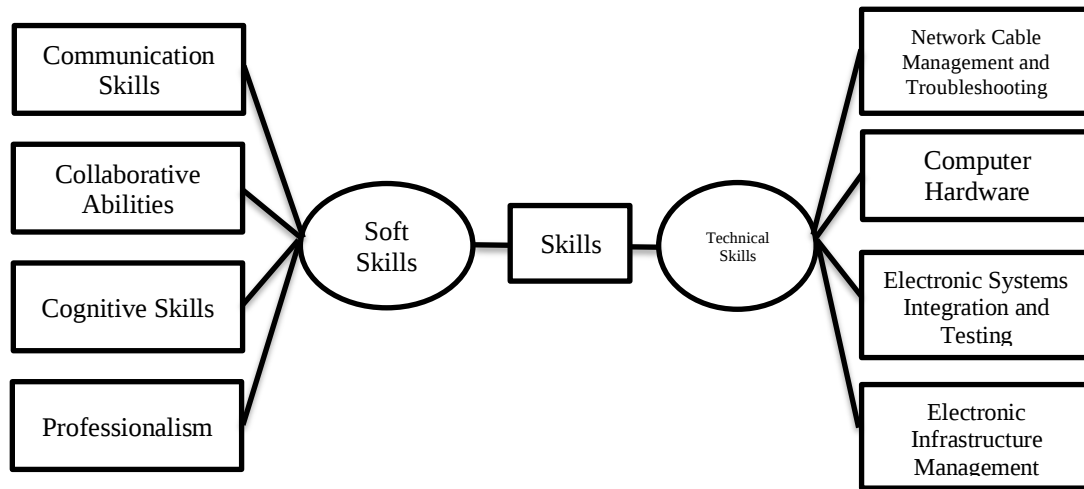


Figure 1. Results from the interviews conducted to students on their soft and technical skills

4.0 Conclusion

This study explored the multifaceted context of electronics-related employment in Leyte, Philippines, by examining online job postings and understanding how students acquired soft and technical skills during their studies. The study revealed that the salary of the electronics job market in Leyte is in the mid-range, which reflects the region's standard salary remuneration structure. The findings emphasized the importance of technical and soft skills in the electronics industry, highlighting skills in troubleshooting, maintenance, and customer orientation. Skills like teamwork, customer orientation, and communication are increasingly recognized as important for employment. For educational institutions, these insights provide a roadmap for curriculum development, ensuring that graduates are well-equipped to meet industry demands. For future research, a deeper study on the evolving demands of the electronics industry in the region, particularly in response to technological advancements and market trends. A curriculum evaluation can also be done further to understand the alignment of industry demands and the curriculum. Moreover, further examination into effective strategies for integrating soft skills development into educational programs would be beneficial, aiming to equip students with technical proficiency and the interpersonal and problem-solving abilities essential for success in the workplace.

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7.0 Conflict of Interests

The author declares no conflict of interest.

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