Academic Community and Practitioner Perceptions on Information Technology Competencies: A Gap Analysis

CHRISTINE LOURRINE S. TABLATIN
Information Technology Department
Pangasinan State University
San Vicente, Urdaneta City, Pangasinan
PHILIPPINES

Abstract: - Academic institutions must be able to adapt to rapid technological advancements and bridge the continuous skill gap between industry expectations and student academic preparation. This study aimed to analyze and present an updated view of the essential IT competencies perceived by IT practitioners and highlight the skills gap between the perceptions of industry practitioners and the academic community. The study utilized quantitative and qualitative research to determine the most relevant competencies according to IT practitioners and academicians. The findings revealed that competencies in microprocessors, semiconductors, embedded systems, mobile and wireless computing, and robotics were perceived as somewhat important/important by IT practitioners. However, IT faculty members perceived these competencies as very important/important. These findings suggest that there is a gap between the acquired competencies in the university and the competencies needed by the industry. Further, the analysis of the competencies in the different IT jobs revealed the competencies perceived by the IT practitioners vary depending on the specific IT job. This research brings insights into the relevant competencies of the IT workforce and how to improve the IT curriculum to produce professionals who meet industry demands.

Key-Words: - Knowledge, Skills, Tools, Competencies, Information Technology, Gap Analysis

Received: August 11, 2023. Revised: October 1, 2023. Accepted: October 8, 2023. Published: October 18, 2023.

1 Introduction

The level of knowledge, skills, and abilities in Information Technology (IT) acquired through a high-quality education tailored to the demands of the industry determines the employability of an IT graduate. Graduate employability is one of the indicators of performance on the level of accreditation of higher educational institutions, [1], [2], and accomplishment in the Philippines, [3]. With the rapid evolution of the IT field, academic institutions must evolve alongside the computing industry to ensure students acquire the relevant knowledge, skills, and abilities needed to succeed in their future careers. Therefore, academic institutions must be able to adapt to rapid technological advancements and bridge the continuous skill gap between industry expectations and student preparation. Integrating industry experience into the curriculum is one way to prepare students for their professional practice. Analysis of job advertisements and industry feedback is also significant in assisting educational institutions in assessing students' professional preparedness and determining the skills gap. Based on the feedback from industry partners and the experiences of IT students participating in the internship program, one study looked at the value of soft and hard skills in IT professional practice. The study's findings indicate that the institution should strengthen the curriculum's emphasis on the acquisition of soft skills and fundamental hard skills, [4]. Several studies looked at the content of job postings to see what skills employers look for when recruiting IT employees, [5], [6], [7], [8], [9], [10], [11]. Other studies conducted interviews with IT managers and practitioners to ascertain the knowledge and skills required to meet the demands of an IT profession that is becoming more and more dynamic, [12], [13], [14]. These studies found that there is a vast range of skill sets and that IT professionals must possess both technical and non-technical skills to stay relevant in the digital age.

Hiring graduates with technical competencies is important from an industry perspective. Graduates with the most in-demand technical and non-technical skills will have excellent job prospects. Therefore, educational institutions have the responsibility to help students acquire the relevant knowledge, skills, and abilities that will ensure their employability in the IT industry.

Non-technical or soft skills are nearly universally agreed upon as a primary factor for employing a graduate in an IT profession by industry managers. To evaluate the skill requirements for agile personnel in the IT sectors of Germany and the United States, [15], analyzed job postings of online job portals and discovered that non-technical skills are more common in the United States than in Germany. Further, both countries considered test and requirements management the most essential concept in management. Project management, business domain expertise, and interpersonal skills are relevant because they allow IT departments to collaborate successfully with other departments, internal users, external customers, and suppliers, [10]. The increased emphasis on having more business content in educational institutions' IT courses has resulted in a reorientation of Hong Kong's computing courses, with fewer technical subjects included in their curriculum to meet the industry's business skills demands, [8]. Previous research has found that college graduates lack the required soft skills, [16], [17], and struggle with communication skills, implying that colleges or universities should teach students how to develop these skills, [18], [19]. Therefore, academic institutions must improve their curriculum by giving students access to the extended practice of these abilities for them to obtain a position in the IT industry.

In terms of technical skills, the industry assumes that an IT graduate will have the fundamental IT knowledge, skills, and abilities necessary for industry employment. However, it is impossible to foresee the specific technology students will use after graduation and the competencies needed due to the rapid evolution of computing technologies. The top skills identified in 2005 include Web programming, Unix, C++, Java, SQL programming, and Oracle DB, [10], while, [19], identified operating systems, security, hardware, networking, and database as the top five skills in 2010. These skills have been part of the IT core curriculum for a long time. The development of skills in wireless communication and applications, security, online applications, and data management is also growing, [20]. However, the top competencies required of IT workers in 2020 have shifted. Security, cloud computing, data analytics and data science, networking and wireless, software development, AI and machine learning, project management, programming, IT service management, and virtualization are among the top 10 skills, [21]. The changes in the list of top skills indicate that IT technical skills evolve with time, and academic institutions should regularly review their curriculum to ensure that their graduates possess the technical skills required to navigate and succeed in an ever-changing IT industry.

Despite efforts to address the problem of keeping up with new and emerging technological advancements in the field, the gap between the skill sets required for IT employees and the competencies gained in the academic environment by IT graduates continues to widen, [21]. A global IT skills gap has resulted from the increasing demand for IT workers, which is projected to persist and potentially increase in the future, [22]. To effectively bridge the IT skills gap and increase the employability of graduates, there is a need to evaluate the IT core competencies from time to time because technology does not remain constant and must be aligned with significant developments in the industry. The IT competency model published by the United States Department of Labor (Figure 1) defines the competencies required for people to succeed in their chosen career in IT, [23]. Tiers 1-3 represent “soft skills” and work readiness skills that most employers need, and tiers 4 and 5 represent industry-wide technical competencies required to develop career paths within the IT industry. These competencies are cross-cutting since they enable an employee to switch between industry sub-sectors. Regardless of the sector in which they operate, Tier 4 covers the competencies to wherein employees across the industry can benefit. Tier 5 covers a sub-set of industry technical competencies specific to an industry sector. The ACM Committee for Computing Education in Community Colleges (ACM CCECC) used this competency model to identify the technical competency areas of an associate degree in information technology. These IT competencies are client computing and user support, database and information management, digital media and immersive technology, networking and convergence, programming and application development, and competency in servers, storage, and virtualization, [24]. Further, the Minnesota Dual-Training Pipeline identified industry-sector technical competencies for IT Infrastructure Administration using the model of, [23]. These competencies include network/system architecture, configuration and management, storage/data/backup/disaster recovery, cloud, network support and security, telecommunications and collaboration, systems analysis, hardware devices/platforms, virtualization, and monitoring, [25].

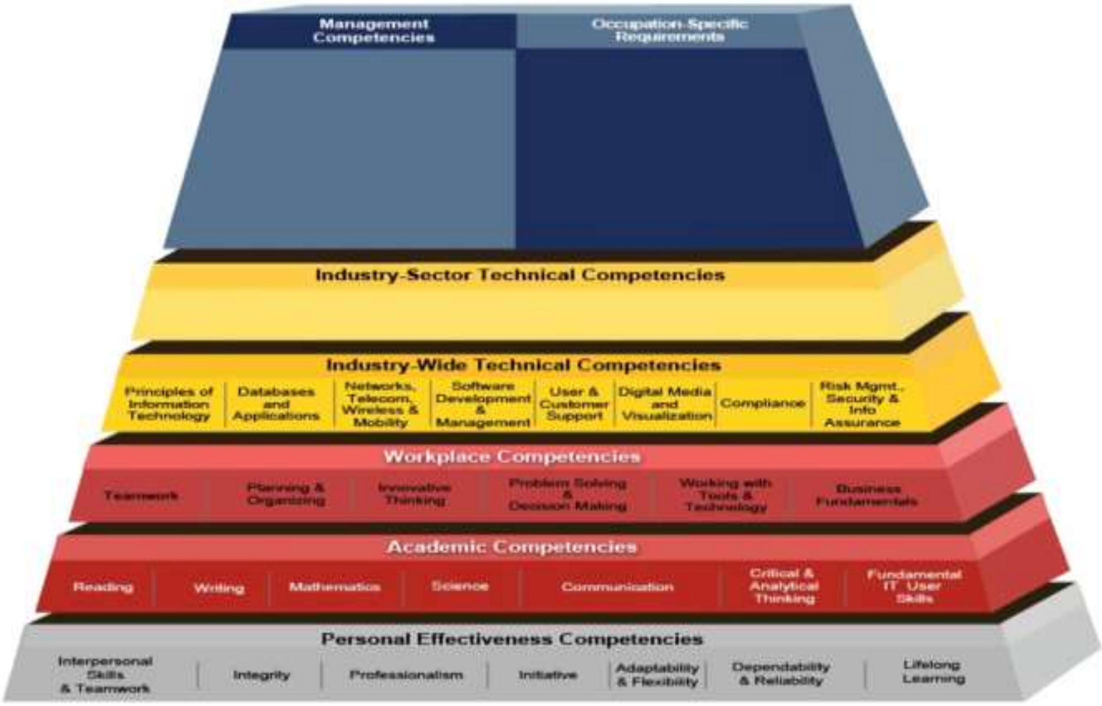

Fig. 1: IT Competency Model

Identifying the competencies vital for IT professionals to thrive in the workforce will provide educational institutions with relevant information for curriculum improvement. Therefore, examining the gaps between the perceptions of industry practitioners and the academic community is essential in keeping the IT curriculum up to date. This study aimed to present an updated view of the essential IT competencies as perceived by the IT industry and highlight the skills gap between industry expectations and student academic preparation. Educators will benefit from the findings of this study in improving their curricula to better prepare students for the IT job market. Students would benefit from this research since they can gain insights into the essential competencies needed for their future roles in the IT industry. Thus, the result of this study would be a significant input in updating the current IT curriculum by integrating the required knowledge areas to develop the relevant competencies of future IT graduates and for them to succeed in their chosen IT careers.

The remaining sections of this study are structured as follows: Section 2 details the research materials and methods that this study used for selecting the participants, the survey instrument used, the data collection procedure, and data analysis; section 3 presents the findings regarding the distribution of the respondents, and discusses the relevant knowledge, skills, and tools required for IT graduates and the fundamental competencies according to specific IT jobs; and section 5 provides a summary of the main points of the study.

2 Materials and Methods

The study utilized quantitative and qualitative research to determine the most relevant competencies according to IT practitioners and academicians. We performed a quantitative analysis of the responses about the important IT knowledge, skills, and tools to determine the difference in the perception of industry practitioners and the academic community. Qualitative analysis of the responses using text analytics was employed to determine the specific IT job competencies suggested by IT industry practitioners.

2.1 Participants of the Study

The respondents in this research were two hundred (200) managers or supervisors or team leaders who oversee other employees of various companies situated dominantly in the Philippines. The selected companies are employers of IT graduates from Pangasinan State University (PSU) who are assigned to manage, develop, and implement IT projects.

The respondents from the academic community were composed of forty (40) Information

Technology faculty members from various higher educational institutions (HEI) in Pangasinan.

2.2 Instruments

The survey questionnaire utilized in this study was adopted from other studies. However, we modified the questionnaire by adding some questions to make it more appropriate for this study. The survey questionnaire is composed of four columns. Column 1 shows the knowledge areas, which are IT core technical skills. Column 2 consists of the skills, tools, and knowledge needed to implement the IT core technical skills. Column 3 shows the rating columns where respondents identify whether the knowledge and skills are essential using a five-point Likert-type scale. The last column shows the other tools, skills, and knowledge that are also important but not included in Column 2. To remove survey question ambiguity and increase the instrument's reliability, the instrument was revised based on the needed information and pilot-tested with OJT undergraduate students, OJT supervisors, and OJT coordinators who were not included in the actual survey. The survey questionnaire was revised based on the findings and suggestions from the pilot study.

2.3 Data Collection Procedure

To recruit industry practitioner respondents, we obtained a list of IT graduates with their contact numbers and email addresses from the registrar's office. We used the graduates' email addresses to disseminate the graduate tracer form we created to find out where the graduates are affiliated or employed. 200 graduates responded and filled out the graduate tracer form. We then sent a letter to their employer seeking permission to float the survey questionnaire. After approval of the request, we distributed the questionnaire to the graduates. The graduates were tasked with requesting that their managers, supervisors, or team leaders complete the survey questionnaire. The survey questionnaire was sent to 200 IT graduates and their managers, supervisors, or team leaders. However, only one hundred seventy-four (174) managers, supervisors, or team leaders of their respective companies had the time to participate in the survey and offer complete and accurate answers. The survey questionnaires from the remaining managers, supervisors, and team leaders were incomplete, while other respondents failed to provide key responses, so we excluded their answers from the data analysis.

The respondents from the academic community were selected from different universities in Pangasinan offering IT courses. We sent a permission letter to the prospective faculty respondents asking them to participate in the study. After approval of the request, the respondents were requested to use the same survey instrument that was distributed to the industry practitioners. The target IT faculty respondents were 50, but only 40 provided complete answers. Some faculty members did not respond to our request to be part of the research.

2.4 Data Analysis

Descriptive statistics and visualizations were utilized to characterize the profile of the respondents. In the descriptive statistics, respondent data were described using counting and percentages. A bar chart was used to show the distribution of the industry practitioners according to their job titles. Pie charts were used to present the distribution of industry practitioner respondents according to the industry sector and IT faculty respondents according to their academic rank. To describe the level of importance of IT knowledge, skills, and tools, we used the Average Weighted Mean (AVM) based on the perception of the managers, supervisors or team leaders, and IT faculty members. To test if there is a difference in the level of importance of knowledge, skills, and tools for IT jobs, Welch's T-test was utilized. Table 1 presents the description and range used to interpret the results of the degree of importance and level of competencies. Further, qualitative analysis of the responses using text analytics was employed to determine the specific IT job competencies suggested by IT industry practitioners.

Table 1. Interpretation of the Results of the Level of Importance of the Knowledge Areas

Description Degree of Importance	Range
Very Important (VI)	4.21 – 5.00
Important (I)	3.41 – 4.20
Somewhat Important (SI)	2.61 – 3.40
Less Important (LI)	1.81 – 2.60
Least Important at all (LSI)	1.00 – 1.80

2.5 Skills Gap Analysis

The measure of the difference is defined as the mean average difference between the perceptions of IT industry practitioners and the IT academic community on the importance of skills, knowledge, and tools in the IT industry.

Skills Gap = ∑ i-1 n [(Practitioner Mean – Academic Mean) n]

Where:

i refers to the ith respondents
n refers to the total number of respondents
Practitioner Mean refers to the student's perception of the importance of skills
Academic Mean refers to the industry's perception of the importance of skills

3 Results and Discussion

3.1 Distribution of Industry Practitioner Respondents

The demographic information of the industry practitioners provides general information about the respondents in terms of the nature of their jobs and the industry sector of their companies. Based on the demographics, the respondents handle software and systems development and administration, security, and technical support. Further, in terms of the industry, most of the respondents are employed in IT companies. This result implies that the respondents could provide accurate information about the industry-wide technical competencies needed by IT graduates who wish to have a career in IT firms and work with software and systems development and administration, security, and technical support.

Figure 2 shows the distribution of the industry practitioner respondents. Out of the one hundred seventy-four (174) managers, supervisors, and team leaders from various companies situated dominantly in the Philippines, 43% handled IT support staff, followed by software engineers (14%) and system analysts (14%). Further inquiry revealed that most of the IT support staff handled by the respondents were support technicians and IT specialists who were highly skilled IT staff and team members developing IT products. Technical knowledge and skills in computer and programming are important to support and produce software. This finding revealed that many of the respondents have high technical skills and focus more on the management and development of IT products, applications, and systems.

In terms of the industry sector where the IT practitioners were employed, we found that 42% of the respondents are from the IT industry, 15% are from Business Process Outsource (BPO), 14% are from financial institutions, and 8% are from the public sector. Based on the data presented in Figure 3, we can see that many of the respondents are employed in IT firms. This finding shows that most IT graduates were applying their IT knowledge and skills to use.

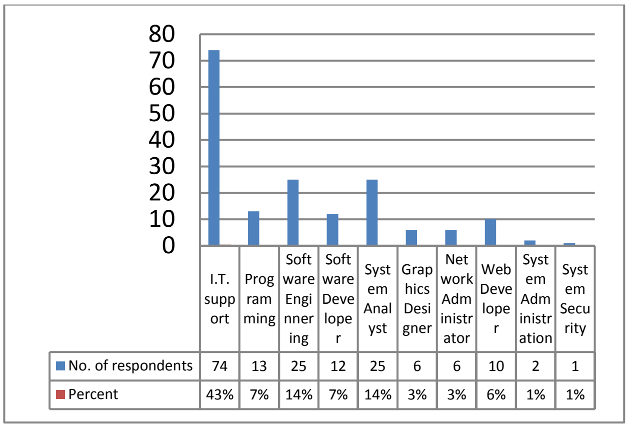

Fig. 2: Profile of Industry Practitioners according to Job Title

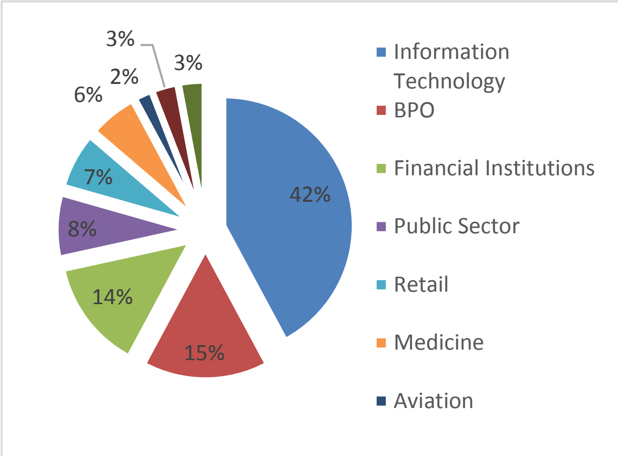

Fig. 3: Profile of Industry Practitioners according to Industry Sector

3.2 Distribution of IT Faculty Respondents

As mentioned in Section 2.1, there were forty (40) IT faculty respondents. Figure 4 shows that the academic rank of most of the respondents (27 or 68%) were instructors, followed by assistant professors (11 or 27%), and (2 or 5%) were associate professors. Further inquiry revealed that some instructors have been in the service for more than 5 years and have previous working experience in an IT-related company. Furthermore, most of the respondents have master's degrees, while some have ongoing master's studies. The Commission on Higher Education (CHED) memo requires college faculty members to have a master's degree as a minimum requirement before teaching in college. These findings revealed that the respondents meet the qualifications as respondents of this study and could provide valuable insights about the competencies needed by the students to succeed in the IT industry.

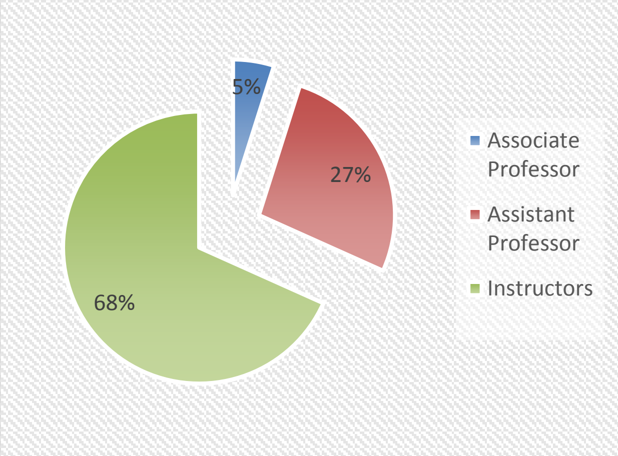

Fig. 4: Profile of the IT Faculty Respondents according to Academic Rank

3.3 The Important IT Knowledge, Skills, and Tools

As mentioned, Table 2 cshows the gap in the knowledge areas as perceived by the IT faculty members and industry practitioners. The result of the analysis revealed that the microprocessors, semiconductors, and embedded systems (-1.02) knowledge area has the biggest gap among all the knowledge areas followed by Telephony, Mobile and Wireless Computing (-0.86), and Artificial Intelligence and Robotics (-0.75). Industry practitioners perceived these knowledge areas as somewhat important/important in performing their tasks and functions. However, IT faculty respondents perceived these as very important/important. The Table 2 (Appendix) also shows that Document Management and groupware (0.11) obtained the lowest gap among all knowledge areas followed by the Internet (-0.29) and electronic publishing (-0.31). IT faculty members and industry practitioners have the same perception of the importance of these knowledge areas. Both respondents expect all IT graduates to possess these knowledge, skills, and tools as these are basic in IT.

The Table 2 (Appendix) also shows that the perception of industry practitioners and IT faculty members have a significant difference in almost all the knowledge areas except Document management and groupware where both respondents agree that the knowledge is important. Overall, there is a significant difference in their perceptions of the importance of the knowledge areas. The results revealed that the important competencies that should be acquired were not provided by the institutions that offer IT programs based on the perceptions of the academic community and industry practitioners. As observed in Table 2 (Appendix), most of the knowledge, skills, and tools that were perceived as very important by IT faculty members are perceived as only important by the IT practitioners except for the Internet and Applications and Systems - Languages for Development and Management knowledge areas. Furthermore, the overall average weighted mean of the rating of IT practitioners and IT faculty members revealed a significant difference.

The academic community and industry practitioners concur that acquiring competencies in programming languages such as Java, JavaScript, ASP.NET, C#, IOS, Android, Python, PHP, SQL, and Ruby and the Internet is very important for IT graduates. However, the academic community perceived all the other identified knowledge areas as very important and important, whereas industry practitioners only perceived these knowledge areas as important and somewhat important. These findings suggest that there is a gap between the acquired competencies in the university and the competencies needed by the industry.

3.4 Important IT Competencies According to Specific Jobs

Table 2 (Appendix) shows the list of important IT knowledge, skills, and tools perceived by the IT practitioners and the academic community. The identified knowledge areas are: (1) applications and systems – languages for development and management, such as Java, JavaScript, ASP.NET, C#, IOS, Android, Python, PHP, SQL, and Ruby, (2) artificial intelligence and robotics where knowledge in Internet of Things (IoT), machine learning, computer vision, expert systems, and industrial control systems is necessary, (3) CAD, computer design, graphics, modeling and multimedia, (4) data capture focused on barcodes, optical character recognition, and automatic identification, (5) document management and groupware, such as Lotus notes and domino, MS Exchange and Outlook, and search engines, (6) electronic publishing using desktop publishing, google forms, and HTML, (7) electronic commerce through website management, smart cards, and e-mail brodcast, (8) enterprise systems such as SAP, data mining, supply chain, intranet, and peoplesoft , (9) Internet, (10) microprocessors, semiconductors and embedded systems, (11) networks – hardware and software such as fiber optics, LAN, and DSL, (12) operating systems, (13) storage, (14) servers – hardware and software, (15) personal use software, (16) systems and computer security, and (17) telephony, mobile, and wireless computing.

Based on the result presented in Table 2 (Appendix), there is a substantial disparity in the perception of the industry practitioners and academic community about the knowledge, abilities, and tools specific to certain IT jobs. The results indicate that every IT job requires different sets of knowledge, skills, and required tools to perform the tasks and functions. This finding is consistent with, [19], suggesting that competencies for specific IT jobs are context-specific. Further, this study reveals that it is very important for software engineers, computer programmers, web developers, software developers, and network administrators to be knowledgeable in Applications and Systems – Languages for Development and Management. The result also indicates that these jobs focused on application and systems development, wherein graduates should possess knowledge of programming languages for development. Microprocessors, semiconductors, and embedded systems obtain the lowest AWM, indicating these knowledge areas are only marginally significant to IT professionals. This finding reveals that computer hardware knowledge is not very relevant in the information technology field. However, the Internet obtains the highest AWM, which implies that Internet knowledge and skills are vital for all IT jobs. Therefore, educational institutions should revisit and update their IT curriculum to ensure that fundamental knowledge areas are effectively taught to students to meet the demands of the IT industry.

Table 3 (Appendix) presents the essential IT competencies according to specific jobs suggested by the industry practitioners. In terms of knowledge, IT graduates should have a solid foundation in the design and implementation of databases, the development of applications using various platforms, and the application of different operating systems. Practitioner respondents also suggested relevant skills such as the application of different frameworks for system development, data analytics, and many more. Furthermore, industry practitioners proposed many tools that can be utilized in both the development and maintenance of application systems.

4 Conclusion

This study identified important IT competencies as perceived by the industry and the knowledge and skills gap between industry perception and the academic community. Responses from industry practitioners reveal that microprocessors, semiconductors and embedded systems, mobile and wireless computing, and robotics were perceived as those knowledge areas that are somewhat important/important in performing their tasks as IT practitioners. However, IT faculty members perceived these knowledge areas as very important/important. The results also reveal that the important knowledge, skills, and tools that should be acquired in the school were not provided by the academic community that offers information technology programs. These results show that there is a gap in the knowledge that should be acquired in the school and the needed requirements of the industry. Thus, this study would be significant in bridging the IT competency gap and increasing the employability of graduates by identifying the core competencies needed by IT companies in the Philippines. Further, the study also found that the IT competencies vary depending on the specific IT job. These findings bring something new to the literature since we can use the identified competencies across industries and specific IT jobs to establish a Philippine IT competency model. We can define the knowledge, skills, and abilities required for IT graduates to succeed in their IT careers.

This research brings insights into the relevant competencies needed for the Philippine IT workforce and how to improve the IT curriculum to produce professionals that meet industry needs. Thus, the study recommends that the academic community should revise and update its curriculum from time to time to address necessary IT knowledge, skills, and tools that students should acquire. Furthermore, stakeholders like the alumni, industry partners, and students should be involved to solicit their input in the enhancement of the curriculum.

Acknowledgement:
The authors would like to thank Pangasinan State University for the financial support extended in the conduct of the study. We would also like to extend our gratitude to the faculty members, alumni, and their employers who participated in the survey.

References:
[1] N. Mezhoudi, R. Alghamdi, R. Aljunaid, K. Gomathi, and D. Düştegör. "Employability prediction: a survey of current approaches, research challenges, and applications," J Ambient Intell Human Computing, 14, 2023, pp. 1489–1505. https://doi.org/10.1007/s12652-021-03276-9
[2] C. D. Casuat, E. D. Festijo, &A. S. Alon. "Predicting students' employability using support vector machine: a smote-optimized

machine learning system," Int J Emerg Trends Eng Res., 8, 2020, pp. 2101–2106. DOI: https://doi.org/10.30534/ijeter/2020/102852020

[3] B. M. Tapado, G. G. Acedo, & T. D. Palaoag, "Evaluating Information Technology Graduates' Employability using Decision Tree Algorithm," in Proc. of the 9th International Conference on E-Education, E-Business, E-Management and E-Learning, 2018, pp. 88-93, https://doi.org/10.1145/3183586.3183603

[4] F. F. Patacsil, & C. S. Tablatin. "Exploring the Importance of Soft and Hard Skills as perceived by IT Internship Students and Industry: A Gap Analysis," Journal of Technology and Science Education, 7(3), 2017, pp. 347-368. DOI: http://dx.doi.org/10.3926/jotse.271

[5] E. Modzelewski, Tech jobs go begging for lack of workers in area. Pittsburgh Post-Gazette, 2021, p. C1.

[6] K. S. Koong, L. C. Liu, & Z. Liu. "A Study of the Demand for Information Technology Professionals in Selected Internet Job Portals," Journal of Information Systems Education, 13(1),2002, pp. 21-28. https://aisel.aisnet.org/jise/vol13/iss1/4 (Accessed Date: 15/7/2023)

[7] S. D. Galup, R. Dattero, & J. J. Quan. "The Demand for Informatino Technology Knowledge and Skills: An Exploratory Investigation," Journal of International Technology and Information Management, 13(4), 2004, pp. 253-262. DOI: https://doi.org/10.58729/1941-6679.1200

[8] P. Lee. "Information Technology Professionals' Skill Requirements in Hong Kong," Contemporary Management Research, 2(2), 2006, pp. 141, DOI: https://doi.org/10.7903/cmr.11

[9] M. A. Kenna, P. Willard, D. Cecez-Kecmanovic, & C. S. Wilson. "IS Knowledge and Skills Sought by Employers: A Content Analysis of Australian IS Early Career Online Job Advertisements," Australasian Journal of Information Systems, 15(2), 2008, pp. 1-22. Available at https://ssrn.com/abstract=1168044 (Accessed Date: 15/7/2023)

[10] F. Patacsil, M. Acosta. (2021). Analyzing the relationship between information technology jobs advertised on-line and skills requirements using association rules. Bulletin of Electrical Engineering and Informatics, 10 (5), pp. 2771-2779, October 2021, doi: https://doi.org/10.11591/eei.v10i5.2590

[11] M. Alghamlas and R. Alabduljabbar, "Predicting the Suitability of IT Students' Skills for the Recruitment in Saudi Labor Market," in Proc.of the 2nd International Conference on Computer Applications & Information Security (ICCAIS), Riyadh, Saudi Arabia, 2019, pp. 1-5, doi: 10.1109/CAIS.2019.8769577.

[12] K. P. Gallagher, T. H. Goles, J. C. Simon, K. M. Kaiser, C. M. Beath, & M. J. B. "A Typology of Requisite Skills for Information Technology Professionals," in Proc of the 2011 44th Hawaii International Conference on System Sciences, Kauai, HI, USA, 2011, pp. 1-10, doi: 10.1109/HICSS.2011.39.

[13] R. P. Bringula, A. C. Balcoba, & R. S. Basa. "Employable Skills of Information Technology Graduates in the Philippines: Do Industry Practitioners and Educators have the Same View". in Proc. of the 21st Western Canadian Conference on Computing Education, 2016, pp. 1-6. https://doi.org/10.1145/2910925.2910928

[14] M.E. McMurtrey, J. P. Downey S. M. Zeltmann, & W. H. Friedman. "Critical Skill Sets of Entry-Level IT Professionals: An Empirical Examination of Perceptions from Field Personnel," Journal of Information Technology Education, 7, 2008, pp. 101-110. https://doi.org/10.28945/181

[15] C. M. Aldenhoven, D. K. Brosch, B. Prommegger, & H. Krcmar. "Differences in Skill Requirements for Agile Workers in the German and the US IT Industries," In: Ahlemann, F., Schütte, R., Stieglitz, S. (eds) Innovation Through Information Systems. WI 2021. Lecture Notes in Information Systems and Organisation, 47. 2021, pp. 582-595. Springer, Cham. https://doi.org/10.1007/978-3-030-86797-3_38

[16] J.B. Noah & A. A. Aziz. "A Systematic review on soft skills development among university graduates,". EDUCATUM Journal of Social Sciences, 6(1), 2020, pp. 53-68. DOI: https://doi.org/10.37134/ejoss.vol6.1.6.2020

[17] S. Majid, C. M. Eapen, E. M. Aung & K. T. Oo. "The Importance of Soft Skills for Employability and Career Development: Students and Employers Perspectives,". The IUP Journal of Soft Skills, Vol. XIII, No. 4, December 2019, pp. 7-39

[18] A. C. Williams. "Soft Skills Perceived by Students and Employers as Relevant Employability Skills," Walden University. 2015. https://scholarworks.waldenu.edu/dissertations (Accessed Date: 15/7/2023)
[19] A. Radermacher, G. Walia, &D. Knudson. "Investigating the skill gap between graduating students and industry expectations". in Proc. of the 36th International Conference on Software Engineering, 2014, pp. 291-300. https://doi.org/10.1145/2591062.2591159
[20] C. Aasheim, J. Shropshire, L. Li, & C. Kadlec. "Knowledge and Skill Requirements for EntryLevel IT Workers: A Longitudinal Study". Journal of Information Systems Education, 23(2), 2012, pp. 193-204. Available at: https://aisel.aisnet.org/jise/vol23/iss2/8 (Accessed Date: 15/7/2023)
[21] R. Day. "The 10 Most Important IT Skills for 2020," 2020, Retrieved September 2021, from Global Knowledge: https://www.globalknowledge.com/us-en/resources/resource- library/articles/the-10-most-important-it-skills-for-2020/#gref (Accessed Date: 15/7/2023)
[22] IT 2017 Task Group. "Information Technology Curricula 2017," Association of Computing Machinery and IEEE Computer Society, 2017.
[23] Employment and Training Administration United States Department of Labor. "Information Technology Competency Model," 2012, Retrieved January 2023, from Information Technology Competency Model - September 2012 (iit.edu)
[24] ACM Committee for Computing Education in Community Colleges (CCECC). "ACM Competency Model of Core Learning Outcomes and Assessment for Associate-Degree Curriculum in Information Technolog," Association of Computing Machinery, 2014, doi: 10.1145/2686614
[25] Minnesota Dual-Training Pipeline. "Minnesota Dual-Training Pipeline Competency Model for Information Technology Infrastructure Administration Career Cluster Pathway," Retrieved January 2023, from https://mndlidev.prod.acquia-sites.com/sites/default/files/pdf/IT-infrastructure-administration.pdf (Accessed Date: 15/7/2023)

APPENDIX

Table 2. Important IT Knowledge, Skills, and Tools as Perceived by IT Practitioners and Academic Community

Knowledge Area	AWM (Rating) Practitioner / Description	AWM (Rating) Academic/ Description	Mean Difference	Ranks	Significant Difference
Applications and Systems – Languages for Development and Management	4.31/(VI)	4.70 / (VI)	-0.39	12	$p < 0.001$ *s* at $p < .05$.
Artificial Intelligence and Robotics	3.53 / (I)	4.28 (VI)	-0.75	3	$p < 0.001$ *s* at $p < .05$.
CAD, Computer Design, Graphics, modeling and Multimedia	3.56 / (I)	4.18 / (I)	-0.62	5	$p < 0.001$ s at $p < .05$.
Data Capture	3.74 / (I)	4.15/ (I)	-0.41	10	p 0.007 s at $p < .05$.
Document Management and Groupware	3.79 / (I)	3.68 / (I)	0.11	16	p 0.457 *n*s at $p < .05$.
Electronic Publishing	3.89 / (I)	4.20 / (I)	-0.31	14	p 0.049 s at $p < .05$.
Electronic Commerce	3.90 / (I)	4.23 / (VI)	-0.33	13	p 0 .022 s at $p < .05$.
Enterprise Systems	3.89 / (I)	4.48 / (VI)	-0.59	7	$p < 0.001$ s at $p < .05$.
Internet	4.39 / (VI)	4.68 / (VI)	-0.29	15	p 0.018 s at $p < .05$.
Microprocessors, Semiconductors and Embedded Systems	3.08 / (SI)	4.10 / (I)	-1.02	1	$p < 0.001$ s at $p < .05$.
Networks - Hardware and Software	3.93 / (I)	4.53 / (VI)	-0.6	6	$p < 0.001$ s at $p < .05$.
Operating Systems	4.06 / (I)	4.45 / (VI)	-0.39	12	p .003 s at $p < .05$.
Storage	3.80 / (I)	4.35 / (VI)	-0.55	8	$p < 0.001$ s at $p < .05$.
Servers - Hardware and Software	3.78 / (I)	4.43 / (VI)	-0.65	4	$p < 0.001$ s at $p < .05$.
Personal Use Software	3.51 / (I)	3.98 / (I)	-0.47	9	p 0.002 s at $p < .05$.
Systems and Computer Security	4.13 / (I)	4.53 / (VI)	-0.4	11	$p < 0.001$ s at $p < .05$.
Telephony, Mobile and Wireless Computing	3.47 / (I)	4.33 / (VI)	-0.86	2	$p < 0.001$ s at $p < .05$.
Average Weighted Mean	3.81 / (I)	4.3 / (VI)	-0.50		$p < 0.001$ s at $p < .05$.

Legend:

Description	Range	
5 - Very important (VI)	4.21 - 5.00	
4 - Important (I)	3.41 - 4.20	ns - not significant
3 - Somewhat Important (SI)	2.61 - 3.40	s - significant
2- Less Important (LI)	1.81 - 2.60	
1- Least Important at all (NIA)	1.00 - 1.80	

Table 3. Important IT Competencies According to Specific Jobs

Job	IT Competencies
System Analyst	Databases, test automation, integration tools
Graphics Designer	Autodesk-Maya, Auto-desk 3ds Max. Logo Design, Photo Compositing, 3D Graphic Design. Photoshop, Illustrator, After Effects.
Network Administrator	Cisco, network management
Computer Programmer	Adobe Apps, Corel, RFID, Biometrics, Google Docs, Devices and server network connection, Windows Servers
Software Developer	Unity 3D, Python => Django, Java => Spring Frameworks, JavaScript => Angular / React Android Java => Kotlin, SQL => AWS Migration, Php => Laravel, Bootstrap => Angular Material Javascript Frameworks such as React JS, Vue JS, Angular JS, and Node JS as a Backend, Machine Learning, Motion Sensor, Blender
Web Developer	Need to introduce frameworks that are being used in the real world. Laravel, CodeIgniter, Node.JS, React.JS, Django etc. NDA, GDPR, SEO, Google Analytics, Cache systems, Need to introduce API programming, IPaaS solutions like Boomi or Mulesoft, Need to introduce CMS platforms like WordPress, Joomla, Drupal, etc. Need to introduce HTML frameworks like Bootstrap, zurb foundation, etc.
Software Engineer	Kotlin, Javascript Frameworks (React, Vue.js, nodeJS) Software Engineer SQL and C# Java 8+, Springboot, Angular, Regular Expression Jabascript Frameworks such as React JS, Vue JS, Angular JS and Node JS as a Backend. Angular + Node.js & Express. Xamarin, .Net 5 and up, Blazor, Source Control: GIT, VSTS, SVN Adobe XD supports vector design and website wireframing, and creating simple interactive click-through prototypes Data Science, Cloud Computing ie. AWS services, Automated Testing using Selenium/Krypton, Continuous Integration Continous Deployment, Development platform and Repositories ie. Gitlab, Unit Testing Database Administration: MySQL, SQLServer, Oracle, AWS RDS/Aurora Business Intelligence, SAAS, PAAS, TAAS" Knowledge in ERP such as SAP, Oracle, and Career as ERP is now a trend. Cyber Security, Security specific tools i.e., Owasp Zap, Source Code Scanning, System Hardening, Penetration Testing API AWS web services Webex
System Support	Biometrics, MS Office. Knowledge of data recovery once there's a case of data corruption, Cloud

Contribution of Individual Authors to the Creation of a Scientific Article

The sole author of this scientific article independently conducted and prepared the entire work from the formulation of the problem to the final findings and solution.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

This study was funded by Pangasinan State University.

Conflict of Interest

The sole author has no conflict of interest to declare.