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Towards Developing Industry-Driven Curricular Offering: An Industry Needs Analysis for Computer Engineering Program

Gerby R. Muya*,*Lyceum of the Philippines (LPU), Laguna Campus ,Km. 54 Pan-Philippine Hwy, Calamba, 4027 Laguna, Philippines*,gerby.muya@lpulaguna.edu.ph
Merlita C. Medallon, *Lyceum of the Philippines (LPU), Laguna Campus, Km. 54 Pan-Philippine Hwy, Calamba, 4027 Laguna, Philippines.*
*Corresponding author:

Abstract. The study determined the needs of the manufacturing industries in CALABARZON in terms of graduate competencies, skills and values, and the curricular and non-curricular components that support the qualifications for Computer Engineering graduates. A random sample of 10 industrial manufacturing zones were identified and 147 manufacturing companies participated in the study. Data were gathered from 147 representative human resource (HR) managers/supervisors and 188 computer engineers using a validated researcher-developed questionnaire. Results show that there is a demand for degree holders for most positions in line with Computer Engineering who demonstrate confidentiality, integrity, objectivity, professional behavior. The top five competencies include managing and maintaining system (network security; hardware and software), practicing professional ethics, troubleshooting, repairing and restoring hardware/software and network, designing and developing appropriate computing solutions to problems, and producing good documentation and technical manual. Computer engineers should have logical thinking and reasoning abilities, problem solving skill, strategic and analytical thinking skills. The values required of computer engineers are confidentiality, professional behavior, integrity and moral values. Basic general and core courses, as well as the professional courses, contribute to the holistic development of a student in preparation for transition to the workplace.

Keywords:competency, computer engineer, industry, manufacturing, skills, values

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INTRODUCTION

CALABARZON (Cavite, Laguna, Batangas, Rizal and Quezon) is a very strategic place for business establishments. The Department of Labor and Employment (DOLE) 2020 Vision (2010) mentioned that Region IV-A is known for industries, agriculture, and services sector. Labor force participation was recorded at 63.9% according to the Current Labor Statistics. Industries provide employment to the population of the region.

According to the APEC Skills Mapping Economy Review (2013), the Labor Force Survey conducted from 2001 to 2011 stated, that majority of employment among major industries in CALABARZON is in the manufacturing industry, followed by the financing, Insurance, Real Estate and Business Services and the Transport, Storage, and Communications industries. Jobs fit (2017) also mentioned that of the total 40,335 total persons employed by majority industry in the region, the manufacturing sector employed 18.0% or 7,371.

Majority of the workforce in the manufacturing industry are in the production department. Data confirms that the production department is the most labor intensive and thus, requires a big number of personnel. The manufacturing sector produces their specific products utilizing human service. This also confirms that companies today are still reliant on human resource rather than the use of robots. Operations of machines are still done by people. Skilled labor augmenting technologies result in higher productivity growth in human capital-intensive industries (Ciccone & Papaiannou, 2009). The number of engineering workforce is bigger compared to other areas in the manufacturing sectors, suggesting that engineering is a relevant field and is therefore highly in-demand in the manufacturing companies. Employment generated from the manufacturing industry is helpful in boosting the economy of the region. Nevertheless, reports from the DOLE showed some volatile trends in the manufacturing industries: employment went up in 2010-2016 but in early 2017, there was an increase of 5.7% in the unemployment rate (Jobsfit, 2017). This study reveals the need to improve the manufacturing industry because it is vital to the growth of the Philippine economy.

But what does it take to be qualified for an engineering position in one of these industries? Cameron, Dhakal, and Burgess (2017) highlighted that mismatch between skill sets and labor market needs has led to poor productivity and unemployment in Asia Pacific countries. Based on the APEC Skills Report: Employment Trends & Data Availability in the Philippines (2013)," the so-called "21st century skills" should be evident among the new hires. This includes creativity, logical thinking, and literacy in technology. Having good interpersonal skills and leadership abilities are also needed. Another study conducted by the Philippine Skills Survey of 2008 reveals that employers seek to hire employees with high generic and job specific skills for employers in the manufacturing industry. The said further states that creativity, independence, teamwork, problem-solving, and communication skills are very important core skills (World Bank, 2010). The World Bank (2010) report shows that the manufacturing industries tend to have challenges in finding production and sales staff with the proper skills. Skills gap can be lessened through quality education.

Nangpuhan (2014) emphasized that some of the challenges in employment in the country today are the few studies related to labor market relations, lack of enough training in the academe, and skills gap of workers. In addition, there are not much established linkages between heads of industries/economic zones and the academe. The task of the government is not only to ensure ample supply of workers but also to produce graduates with the right skills and competencies.

In the light of the rapidly increasing global competitive market and technological changes, Higher Education Institutes (HEIs) need to match knowledge, skills, and competencies to the needs of the industries (DOLE, 2015). Based on the National Statistics data (2015), the country's unemployment rate has dropped to 6.7% in July 2015 from 7.3% in April of the same year. According to Socioeconomic Planning Secretary Arsenio Balisacan, the decrease in unemployment is attributed to employment generation led by services and industry (Rappler, 2014). In this view, the role of education sector is to ensure that they provide graduates with knowledge and skills to match employment needs.

The key is the quality of education the students received prior to graduation. It is important that HEIs provide quality education anchored on the needs of the industries. This can minimize skills gap and help lessen unemployment. Regular consultations, as well as the formation of organizations, consisting of the academe and industry leaders should be done to ensure skills and competencies among students are developed.

An estimated 172 million people worldwide were unemployed in 2018 and this number is expected to increase by 1 million per year to reach 174 million by 2020 because of the expanding labor force (World Employment and Social Outlook: Trends 2019, 2019). Likewise, in the Philippines, thousands of new graduates and unemployed people would wait in a long queue during job fairs every year in the hope to be interviewed. Hence, this study was carried out determine the computer engineering needs of the manufacturing industries in terms of graduate competencies, skills and values. The study also identified the curricular and non-curricular components that supports the graduate's qualification.

METHODOLOGY

The study used the descriptive research design to analyze manpower needs of selected manufacturing industries in Region IV-A. Both quantitative and qualitative methods were used in gathering data from major industrial sites or processing zones in Cavite, Laguna, and Batangas area. According to the PEZA or Philippine Economic Zone Authority (2015), there are a total of 32 operating manufacturing economic zones in the area: nine (9) in Cavite, 14 in Laguna and nine (9) in Batangas. Out of the total manufacturing companies, 147 were included in the study.

Stratified random sampling was used in selecting the economic zones in the area. The study focused on the manufacturing industries because the CALABARZON region has the bulk of the manufacturing economic zones in the country (Jobsfit, 2017).

The participants from manufacturing industries were from the three provinces namely, Batangas, Cavite, and Laguna. Majority of the participant manufacturing industries come from Laguna (56.5%), followed by Cavite (36.1%), and Batangas (7.5%). The numbers were correspondingly distributed among the three areas. There was a total of 417 (13%) recorded industries from seven industrial zones in Batangas; total of 1,210 (38%) industries from seven industrial zones in Cavite; and total of 1,569 (49%) industries from twelve industrial zones in Laguna.

After the random sampling, ten industrial manufacturing zones were selected as the focus of the study. Random sampling was done to choose the companies that will participate in the research. The manufacturing economic zones were taken from the list of manufacturing economic zones (PEZA, 2015). Out of 200 companies chosen for the study, 147 manufacturing companies participated. Respondents included managers or those in supervisory positions from the said companies. The confidentiality of

information and ethical considerations were observed during the entire research. Data were gathered from 147 representative HR managers/supervisors and 188 computer engineers. Most of the computer engineer respondents are holders of the Bachelor degree and the work experience ranges from one to ten years (53 or 28%).

Aresearcher-made survey questionnaire consisting of four parts assessing the level of competencies, skills and values (Parts 1 to 3) on a seven-point Likert scale was used to gather data. The fourth part elicits information on the curricular and non-curricular requirements needed for graduates of Computer Engineering. Comments and suggestions of the respondents were noted.Mean and standard deviation (SD) were calculated on the data from the Likert scale and coefficient of variation was used to compare the agreement of the respondents on the items evaluated (Hussain et al. 2018).

RESULTS AND DISCUSSION

Competencies graduates must possess

Competency is defined as a fundamental knowledge, ability, or expertise in a specific subject area or a specific behavior," says Helen Brand, chief executive of ACCA (CFO Innovation Asia Staff, 2013). The course content of a curriculum is basically addressing the competencies required for a graduate of a particular program.

Most of the required competencies for Computer Engineers fall under the technical skills. Managing and maintaining systems deal with the company's whole system processes. As a computer engineer, it is important that they can perform system design and development to address the needs of the company. The top five competencies include managing and maintaining system (network security; hardware and software), practicing professional ethics, troubleshooting, repairing and restoring hardware/software and network, designing and developing appropriate computing solutions to problems, and producing good documentation and technical manual (Aasheim et al., 2019). Having a high level of trainability is important because this is what builds a solid foundation for an employee's growth as the company's support. In a company's busy environment, an employee should be able to grasp easily the standards and process flow without having too much supervision (referTable 1).

Table 1.*Competencies required of computer engineers*

Competencies	**Mean**	**SD**
Manage and maintain system (network security; hardware and software	6.37	0.83
Practice professional ethics	6.35	0.89
Troubleshoot, repairs and restores hardware/software and network	6.31	0.86
Design/ develop appropriate computing solutions to problem	6.29	0.79
Produce good documentation and technical manual	6.27	0.80
High level of trainability	6.27	0.78
Use appropriate mix of hardware/software to meet needs	6.24	0.83
Conduct system analysis	6.22	0.79
Conduct quality assurance	6.21	0.87
Evaluate performance of computing devices, equipment, computing infrastructure or service	6.21	0.79
Perform system design and development	6.20	0.78
Evaluate customer requirement	6.19	0.86
Prepare, implement and manage project	6.18	0.79
Competency in written English	6.18	0.74
Provide appropriate technical support	6.13	0.82
Implement project management	6.11	0.87
Engage in continuing professional development	6.11	0.85
Provide help desk and technical support	6.08	0.92
Design for minimal downtimes	6.08	0.89
Engage in new product development	6.07	0.87
Test products and develop end-of-life strategy	6.06	0.89
Competency in spoken English	6.06	0.78
Analyze business process and requirements for system architecture	6.05	0.93
Design system and architecture/infrastructure	6.02	0.91
Good capabilities in dealing with foreign partners	5.97	0.96
Build and manage data warehouse, web presence	5.95	0.92

Conduct personnel development	5.95	0.85
Facilitates interoperability of diverse systems	5.90	0.90
Undertake relevant research and development	5.85	0.99
Engage in technopreneurship	5.83	0.94
Adaptability to foreign business practices	5.74	1.05
Broad base of knowledge concerning macro-environment, economic and industry issues	5.62	0.99
Understanding of different cultures of the world and international perspectives	5.57	1.23

Scale: 6.50 to 7.00 - extremely important; 5.50 to 6.49 - very highly important; 4.50 to 5.49 – highly important; 3.50 to 4.49 – moderately important; 2.50 to 3.49 - slightly important; 1.50 to 2.49 – least important; 1.00 to 1.49 – not important

The study of Cassel et al., (2014) states that the computer engineers need the designing, troubleshooting, and debugging hardware and software and must be able to convey clearly the technicalities of their tasks to both technical and non-technical co-workers. University of Houston (2016) states that engineers are not being "people-friendly" person, instead they are focused only with their teams and assigned task. Gutierrez (2007), on the other hand, focused more on the soft skills in the manufacturing industries. This includes leadership skills, ability to see the big-picture, problem solving skills, organization understanding, coping skills and technological awareness and understanding.

Suggestions were given through the survey by a respondent computer engineer. It was mentioned that with the current demand of Information technology, a computer engineering student needs to have knowledge in ITIL (Information Technology Infrastructure Library) to manage ICT Services. This course will prepare him for managing IT Staff, IT Department, and all ICT services needed by the company. The Crystal Reports mentioned that development is now a must in a large environment. Managers nowadays are relying on on-line reports rather than traditional hard copy printouts. Salary wise, a security professional is rocking up the ICT Market.

One of the respondents in the focus group discussion (FGD) mentioned that Certified Ethical Hackers are now being paid higher to protect any company's critical files. It was added that any Microsoft Certification (MCSE or MCSA) or CISCO certification (CCNA, CCNP, and CCIE) is a must for any engineering student who wants to land on an ICT company. A working knowledge on Cloud Management is needed to cope up with today's ICT Infrastructure and Management. Seminars and fieldtrips was suggested to be in industrial parks.

Skills graduates must possess

Table 2 shows the top skills desired for employees in the areas of computer engineering. Results reveal that computer engineers should have logical thinking and reasoning abilities, problem solving skill, strategic and analytical thinking skills. Problem solving skill, on the other hand, is a requirement for computer engineers based on the FGD.Application of appropriate techniques in the workplace is needed for computer engineers as well as finding relationships between facts and structure and making sense of data and information. Computer engineers, on the other hand, should have decision making and problem solving skill. They should possess the ability to apply knowledge of engineering and science principles, understanding the community (Zaharim et al., 2009). Computer engineers should be able to generate new and innovative ideas. Communication skill is a desired attribute for all groups. Graduates should be able to express themselves both in written and oral communication. One FGD participant stressed the need for good communication skills especially if a student intends to work abroad. Most reports are written in English. They should be able to write correspondences and reports. Employers said that students must establish stronger writing skills, avoidance of slang, further education concerning creativity, and management impression (Stevens, 2005). Employers give more importance to skills like creativity, communication, interpersonal, decision making and problem solving, while engineering graduates perceive that their technical skills would play a major role in getting them jobs (Manzoor et al,2018).

Table 2.*Skills required of computer engineers*

Skills	**Mean**	**SD**
Logical thinking/reasoning (thorough with structure, for relationships between facts, and for chains of reasoning that "make sense")	6.48	0.70
Problem solving skill (discerning the true nature of a situation and evaluation of applicable principles and techniques)	6.47	0.69
Problem solving skill (reliable evaluation of information, openness to constructive change	6.44	0.76

and consideration of future contingencies and developments)		
Strategic/critical thinking (linking data, knowledge and insight together from different sources and disciplines to make informed decisions)	6.42	0.67
Analytical (ability to review, interpret, evaluate financial data and systems/operational data/ controls in order to form conclusions and/or make recommendations)	6.35	0.86
Creative/innovative thinking/generation of new ideas	6.33	0.74
Analytical (on validity/usefulness/correctness/compliance within established policies, procedures, guidelines, agreements and/or legislation)	6.33	0.78
Communication skill (ask clear, concise and relevant questions to obtain desired information to perform a task)	6.31	0.73
Interpersonal (ability to work in groups and being a team player, persuasive, confident and diplomatic)	6.28	0.76
Communication skill (ability to communicate effectively one's points of view, both orally and in writing at all organizational levels)	6.28	0.73
Interpersonal (capable for hard work and able to respond well to pressure)	6.28	0.74
Communication skill (active listening skills)	6.25	0.71
Interpersonal (discreet, open minded and patient)	6.23	0.80
Communication skill (able to justify one's position, deliver impressive presentations and to persuade and convince others)	6.22	0.74
Communication skill (explain verbally and/or in writing financial/statistical/administrative matters/policies/procedures/regulatory matters/audit results at a level appropriate to the audience)	6.21	0.79
Communication skill (negotiate effectively)	6.19	0.75

Scale: 6.50 to 7.00 - extremely important; 5.50 to 6.49 - very highly important; 4.50 to 5.49 – highly important; 3.50 to 4.49 – moderately important; 2.50 to 3.49 - slightly important; 1.50 to 2.49 – least important; 1.00 to 1.49 – not important

Graduate attributes in terms of values

Firms are looking for an employee with solid basic skills, high-level soft skills, and the right attitude to maintain a competitive advantage over the other firms. Good personal values are what make the foundation for a good employee. Values represent basic convictions that "a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence." (Rokeach, 1973, p. 5, in Safrit et al., 2003). Values tend to be relatively stable and enduring. Most of our values are formed in our early years—with input from parents, teachers, friends, and others.

For computer engineers, confidentiality is the topmost value. Confidentiality is important to maintain privacy, security and trust in personal and professional relationships. One FGD participant claimed that in the industry, there are a lot of confidential information and an employee should know when and to whom to share with the information. Confidential issues must be safeguarded in all transactions to prevent legal implications for the company. Information should be disclosed only to appropriate personnel. Employers and employees have an obligation to keep certain information private (refer Table 3).

Table 3.*Values required of computer engineers*

Values	**Mean**	**SD**
Confidentiality (refraining from disclosing confidential information acquired in the course of work, except when authorized, unless obligated to do so)	6.48	0.71
Confidentiality (refraining from using or appearing to use confidential information acquired in the course of work for unethical or illegal advantage either personally or through third parties)	6.45	0.79
Professional behavior (discharging responsibilities with competence and diligence and performing to the best ability with concern for the best interest of those whom services are performed)	6.45	0.73
Confidentiality (informing staff as appropriate regarding the confidentiality of information acquired in the course of their work)	6.41	0.82
Integrity (refraining from engaging in any activity that would prejudice their ability to carry out their duties ethically, refusing any gift, favor or hospitability that would influence their actions)	6.40	0.75

Moral values (ability to discern between what is morally right or wrong)	6.40	0.75
Integrity (avoiding actual or apparent conflicts of interest and advise all appropriate parties of any potential conflict)	6.34	0.84
Professional competence and due care (ongoing development of knowledge and skills)	6.33	0.76
Professional behavior (self-discipline above and beyond requirements of laws and regulations; unswerving commitment to honorable behavior, even at the sacrifice of personal advantage)	6.32	0.74
Professional competence and due care (performing one's professional duties in accordance with relevant laws, regulations and technical standards)	6.32	0.78
Professional competence and due care (preparing objective and complete reports and recommendations after appropriate analysis of relevant and reliable information)	6.32	0.76
Objectivity and independence (communicating information fairly and objectively, disclosing fully all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, comments and recommendations presented)	6.27	0.71

Scale: 6.50 to 7.00 - extremely important; 5.50 to 6.49 - very highly important; 4.50 to 5.49 – highly important; 3.50 to 4.49 – moderately important; 2.50 to 3.49 - slightly important; 1.50 to 2.49 – least important; 1.00 to 1.49 – not important

Issues that deem confidentiality important include employee, management, and business information. Disposal of personal identifying information such as home address, telephone numbers, internet identification and parent's information should be avoided. Management information includes employee relations issues, disciplinary actions, termination, workplace investigation, and employee misconduct. Disclosure of such information though may not be illegal should be considered ethical. Business information includes trade secrets in manufacturing processes, financial data client lists and supplier's lists that are an issue with competitors (Halpen, 2010).

Professionalism is the individual's conduct at work. It covers legal and ethical compliance in rules and regulations in the workplace. It entails performance of one's duties and responsibilities with diligence and competence. Continuous self -development is needed to provide professional service at all times. Being ethical requires doing the work within certain moral values and in accordance with the generally accepted code of conduct (Valente, 2014).

Curricular and co-curricular qualifications

The transformation of higher education is taking place in response to the demands of the 21st century global industries. The learning outcome becomes more accountable, and the framework is of better quality assurance frameworks. Along with Baumgartner, Ilse, and Shankararaman (2013), the focus of assessing higher education programs now is based on their goals instead of simple procedures and outcomes instead of inputs. Moreover, as stated by Alam et al. (2015), due to the progressive introduction of improved educational technologies, the delivery of higher education has been facing vast changes and challenges that affect all aspects of traditional teaching and learning.

Schools and universities are required to help students to better address the current challenge in the business and also to effectively and carefully train the industry's future employees. This is a strategy to eliminate the misalignment between university and industry. The student can now match their skills with what industry needs. What industry needs, the university must give.

As mentioned by Loquias (2015), HEIs' ultimate goal is to make sure that there is an increase in graduate employment. Hence, HEIs have high expectations that they can produce professionals who can answer the demands of the industry and give back to society by fulfilling their responsibilities proficiently. Deriving from the Philippine National Statistics Office's (NSO) employment data report and CHED 2010 data, the employment rate of newly graduates was 82% and 19% was unemployed. In 2012, the employment rate increased to 93%, leaving only 7% of unemployment. These reports are proof of increased job opportunities, as well as progress in labor force quality. Philexport.ph also stated in one of their reports that until now, the Philippines remains the top global supplier of skilled workers and knowledge-based jobs; with a labor force of 32 million. One hundred thousand of which are composed of engineers, I.Ts, and technical graduates, annually.

Computer Engineering course content/domain.

Bingham et al. (2015) stated that engineering knowledge is significant and that a strong technical knowledge fundamental is key to employability and essential for the development of professional skills.Advances in technology mandates the usefulness of computer technology in a curriculum.

Companies transact using internet communication tools. According to CHED, Software engineering education programs are projected to prepare the students for a field that involves immediately changing conditions and expectations. Therefore, there is always a risk that the abilities, knowledge, and skills delivered may soon turn out to be outdated.

Professional courses contain the courses that a computer engineering must have in order to meet the expectations of the industry. According to Lethbridge et al. (2007), the software engineering community could have a significant impact on the upcoming discipline by focusing its determinations on improving the education of software engineers. There are certain bright spots such as the numerous projects to organize knowledge, and the development of undergraduate Software Engineering programs. There are still persisting several challenges: 1) providing education for standing practitioners; 2) defining curricula that are forward-looking; 3 guaranteeing that Software Engineering educators have the required background; 4) meeting education properly; 5) making programs eye-catching to students; 6) making Software Engineering education having more proof- founded; 7) cooperating industrial reality more efficiently; and 8) raising the prestige and excellence of Software Engineering educational research.

Among the mathematics courses required for engineering courses, advanced algebra is a priority course. This course provides the fundamental concepts for all higher mathematics courses in the curriculum. Computer engineer needs to know the importance of every aspect of the computer and all of this mathematics courses are required for them in order to be qualified in the Industry. According to Wang, (2008), concepts are the most fundamental unit of understanding that transmits definite meanings in system modeling, reasoning, expression, and thinking. In denotational mathematics, a concept is officially demonstrated as a dynamic and abstract mathematical structure that encapsulates relations, attributes and objects. The most important things of an abstract concept is its adaptive ability to autonomously correlate itself to other perceptions.

In the category of mathematics, advanced algebra is highly important while integral calculus is the least important. Advance algebra provides solutions to different types of inequalities and systems and solutions for linear equations using determinants and matrices. Arithmetic and geometric series are also included in this course.

This result agrees with the curriculum implemented by CHED (2008). Upon completion of the course, the students will be able to determine solutions of systems involving quadratics, solutions of inequalities, and solutions for the indicated sum for arithmetic and geometric sequence. Computer engineering students will also use manipulative and analytic skills to solve different word problems.

These are the courses clustered as Basic Engineering Sciences based on CHED. In Fundamentals, and Programming including Management, Safety, Drawing, Drafting, Economy and Mechanics of Rigid and deformed bodies of computer engineering courses and as a basic computer science. This aim to determine and monitor the progress and percentage of each individual department and responsibilities.

The result shows that most of the computer-engineering students deal with the computer fundamentals and programming in their basic engineering sciences course. Moreover, this includes fundamentals of algorithm development, basic information technology concepts, computer solutions of engineering problems, and high-level language and programming applications that will provide backgrounds in programming analysis and the design of computers. Due to the complexity of the concepts in learning programming, Topalli and Cagiltay (2018) proposed the use of Scratch to enrich the understanding and knowledge of students in learning introduction to programming through problem-based game projects. Jawawi et al. (2017) also agreed that adapting a project of problem based learning framework does help students can acquire a better understanding in learning introductory programming concepts.

Computer engineering is designed to equip students with the fundamentals of mathematics, physics, and computer engineering and science. These fundamentals are necessary for an engineering graduate to analyze and evaluate both hardware and software computer systems. They will also be able to design and implement computer systems, which may help them to solve a multiplicity of computing problems; including systems with both software and hardware components that interact with one another, and the evaluation of the associated engineering trade-offs.

Information technology (IT) education is important. According to Mun et al. (2006), technology is one of the factors that influence the acceptance decisions by professionals and it provides new thought in the understanding of user acceptance of technology. Universities also need to adapt change thus the need to introduce accounting students to technology in addition to using pen and papers.

Meanwhile, Electronic Circuits Analysis and Design has the highest importance in allied courses because it includes analysis of transistor circuits, frequency transistor models, differential amplifiers and operational amplifiers, multi-stage amplifiers, integrated circuit families and feedback.

Computer networks is likewise of importance in the curriculum of computer engineering. Computer networks and open system standards include network services, network administration, management and security, wireless networks, transmission media and methods, host-to-host communications, LAN and WAN technologies, packet forwarding, and computer network design. Knowledge of these content will provide foundations for both theory and practice in solving problems that will make them constantly expected to become innovative.

These professional courses will help them boost their ability in analyzing and interpreting data through designing and conducting engineering experiments through actual practices. This will also help them to become locally and globally competitive by using modern tools appropriate to competencies that will make them ready in the rapid technological changes in the industry.

Al-Junaid et al., (2019) reported that there are many factors such as continuous advances in technologies, accreditation, professional standards, local and international market requirements, student intake background, and institutional objectives and resources, which need to be taken into account in developing Computer Engineering curriculum for undergraduate students. Rao andRamesh (2012) also emphasized thatcourse design is the most crucial in providing effective educators and satisfied and professional learners. It marks the competencies the students need to acquire at the end of the program. It includes selected instructional strategies, which specify review structures necessary.

Co-curricular qualifications

In today's global economy, a productive interface between the academe and industry is a critical requirement. Failure to recognize individual roles may result in the mismatch of demand and supply of manpower and may lead further to disruption in the job market Menezes and Pinto, 2016)

Universities, industry organizations, and government agencies have traditionally maintained informal ways of working together, including student internships, faculty exchange, among others. By the late 90s, the existence of relations between HEIs and industry became a common and wildly accepted phenomenon. It should be mentioned, however, that academe-industry relations have various formats. A particular type of HEIs may be linked to major high-technology corporations for multi-year joint research and development. A small regional school may also collaborate with a small company and provide technical assistance to upgrade existing level technology and management techniques (Bernarte, 2012).

Internship

Companies are accepting interns because they are finding future employees. The students in return are trained and become exposed to the industry. The company on the other hand can easily get work done at moderate expense compared to full-timers. The company can also take advantage of the fresh ideas and specialized the skills and strengths that interns provide.

Majority of the participant companies in the manufacturing sector (63%) are willing to accept interns. Doing so can help them hire employees who are already trained and whose skills and capabilities have already been tested. Hence, they can simply absorb interns instead of hiring other new employees. As a result, companies can save time and resources in hiring and training new employees.

Most of the companies' respondents are willing to accept interns in their company because interns may give a set of hands that will help them accomplish their work quickly. Some of the companies see interns as possible full-time employees and is cost effective. Students also give energy and new ideas to the company. Through this, interns will also learn new skills and learn more about the industry that will give them a great learning experience.

Internship provides a planned transition from the classroom to the job, and internships are a natural bridge between college and the work world (Divine et al., 2007). Students, educational institutions, and businesses believe that internships complement the student's academic work. Internships help students get a chance to gain work experience (Wilbanks, 2009), conclude whether their interests fit a given area or group and create networks of contacts in the field (Cord et al., 2010).

The internship is one of most important ways to fill the gap between classroom learning and the practices of the industries. Companies want competent and skilled interns to be their employee. Most universities in other countries such as China, Malaysia, and India are requiring students to complete a minimum time during their final year in studies. Students perceived it a way to develop their skills and talent by applying the knowledge they learned from school.

Internship has a big impact among the students and companies. According Fiori and Pearce (2009), student internship in the industry is very beneficial to the growth of the student. It can enhance the relationship between the academic program and industry partners by allowing faculty members to include in the school curriculum the current information and industry practices that students learned during the internship. Through internship, students can interact with personnel from various levels and

at the same time can discipline themselves in a working environment. Students can also document their daily routines and use them to benchmark their goals.

The engineering department accounts for 33% of the needs for student interns in addition to the production department with 23%, IT department with 22% and quality control with 19%.

Scholarships

There are many reasons why organizations and companies might want to create and provide a scholarship for students. It can be used as an employee benefit program, corporate social responsibility (CSR), and an integral part of a graduate recruitment or talent development program.

Most employers consider their employees as an investment both to achieve the organizational goals and place the right workers in the future. Companies always look forward to employing the finest, brightest and the best staff and give them the education and experience they need to progress through the levels. Companies have several tax-free options offered to encourage workers to take advantage of education opportunities. Scholarships and allowances are the two most common.

Current study shows majority (81%) of the industries are willing to offer scholarships either as employee incentive or as part of the social responsibility program to support deserving students. In the service sector, only a meager 4% are willing to provide scholarships. Among the companies surveyed, 9% of scholars are in the engineering department.

CONCLUSION

There is a demand for degree holders for most positions in line with Computer engineering who demonstrate confidentiality, integrity, objectivity, professional behavior. Good oral and written communication skills is a desired attribute in addition to interpersonal, analytical and logical thinking skills. In terms of competencies, the industries require technical skills for Computer Engineers as well as excellent written and spoken English. Basic general and core courses as well as the professional courses contribute to the holistic development of a student in preparation for transition to the workplace.

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