Employability of Computer Engineering Graduates during Academic Year 2015-2016 and their Lifelong Learning Options

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Abstract – *Employability of graduates is considered important output and measure of quality among higher education institutions. Identifying the employment status of the graduates is one of the objectives of this study specifically for Computer Engineering Graduates of batch 2016 as well as determining the relevance of school related factors in their job placement in terms of curriculum, skills learned from the university and work values. Descriptive type of research was utilized in the study. Result of the survey showed that 83.3 percent of the computer engineering graduates of one Higher Education Institution in the Philippines are gainfully employed with job assignment relevant to computer, electronics and information technology. They considered salaries and benefits as well as career challenge as top reasons for accepting and staying on their present jobs. They also believed that the knowledge and skills they learned most from the University in terms of Information Technology and communication have contributed much to their job placement with hard, leadership and perseverance as topmost work related values. In terms of curriculum, they considered the knowledge in MS Office Applications, Engineering Management, Data Communications/ CISCO Networking, Computer Programming and Computer Troubleshooting/Maintenance as very relevant to their job placement. The lifelong learning options include attending graduate studies and short courses, taking difference certifications CISCO Networking, Project Management Professional, Certified Quality Engineer*

Keywords: *Employability, Computer Engineering, Information Technology, Lifelong learning*

INTRODUCTION

Tracking of graduates after one or couple of years upon joining the workforce is always the responsibility of the higher education institutions (HEIs) to get necessary data and feedback of graduates' job hunting experience and employment status. Employability of graduates is one of the measures of success of higher education institutions, making this as an important component of providing quality education to the community [1]-[4]. This activity is being done regularly by faculty researchers as one of their functions to identify some areas of the teaching-learning process that need improvement based from the requirements and demands of industries. The implementation of curriculum and development of work-related values among students are some of the important aspects of learning that this study would like to explore among BS Computer Engineering graduates.

Hundreds of thousands of fresh graduates every year are joining the labor force and competing for any available entry level positions in private and public sectors. They possess different levels of the acquired skills from their alma mater that are expected to be relevant and matched to the requirements of the job like technical skills, Information Technology skills, communication skills, entrepreneurial skills, etc. These are some of the common or generic skills that the graduate should master or demonstrate before they will be considered for further assessment of the human resource department.

Casserly [5] noted in her article that skills on Computers and Electronics is on number 5 of the 10 skills that will get people hired in 2013, where knowledge of circuit boards, processors, electronic equipment and computer hardware including applications and programs. Lester and Piore [6] noted that design and development needs problem solving

skill, that's why, integrating this immensely in the core courses of engineering is highly needed.

Computer Engineering profession as one of the allied disciplines related to Information Technology as well as computer science makes it more challenging and demanding to compete with the other graduates of these programs. Although, they have specific functions to perform that distinguish them from one another based on their curriculum but still they have more commonalities and similarities rather than differences. When they join the industry, sometimes they were assigned to do tasks with similar job descriptions. This argument could somehow explain the reasons on why the enrolment of Computer Engineering is continuously declining in most Colleges and Universities in the Philippines while Information Technology is constantly in demand.

On the other hand, Computer Engineering graduates like any other any engineering disciplines are trained to analyze and solve problems in a very systematic way considering all the given conditions of the situation [7]. Therefore, arriving with good alternatives or decisions is inevitable. According to Lester and Piore [6], problem solving is central to the professional identity of engineers, and it is the approach to engineering that is taught to students.

Aside from employability skills, good work values and habit are of great importance for the applicants to demonstrate during personal interviews. Tantuco [8] noted from rappler.com that the three (3) factors that affect a fresh graduate's chances of getting hired are attitude, field of study, and asking salary. Studies also show that the person with the right attitude and positive behavior towards work and the organization would lead to efficiency and productivity [9]-[13]. They could generate outcomes which are most favorable for the company to improve its services and business operations.

Studies have shown that lack of commitment to the job and organization brings unwanted results like low performance rating, tardiness and absenteeism, dissatisfied customers, high risk of failure in the operation and among others [14]-[18]. Millennials are prone to various types of distractions that may affect their concentration from work like having engaged in social media networks and being too much tech savvy that is one way or another could have an advantage to the organization but it could also have negative effect that need to neutralize and control from occurrence.

The relevance of work-related values developed in the four corners of the University is one way of preparing the students on how to be adaptable to the different settings of work environment. They come to realize the need for proper adjustment and understand the behavior and culture of the company. This is an important trait or character they have to possess in order to make good interactions and interrelationship within the workplace. The strong relationship with the company can still be enhanced with continuous professional development. It gives better opportunity for the engineers to become lifelong learners in making sense of their time to understand the need for training and further improvement of their skills through certifications. Most especially in the field of computer hardware, software and networks where everything is truly fast- changing due to innovations and advancement in technology. There are many lifelong learning options available for computer engineers which this study also explored.

OBJECTIVES OF THE STUDY

This study aims to determine the employability of Computer Engineering graduates of 2016. It specifically aims to determine the present employment, employment status, nature of employment, competencies learned in college, work – related values and the relevance of Computer Engineering professional courses; and to determine the life-long learning options for computer engineers.

METHOD

Research Design

This employability study used the descriptive research design wherein according to Shuttleworth [19], it is a scientific method which involves observing and describing the behavior of a subject without influencing it in any way. The subject is being observed in a completely natural and unchanged natural environment. Descriptive research is often used as a pre-cursor to quantitative research designs, the general overview giving some valuable pointers as to what variables are worth testing quantitatively. Quantitative experiments are often expensive and time-consuming so it is often good sense to get an idea of what hypotheses are worth testing.

Participants

Total population of 12 Computer Engineering graduates of 2016 served as the respondents of the study.

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Instrument

Survey questionnaire is the main instrument used in this study. The instrument was crafted from the prescribed instrument for tracer study of the University wherein some variables were omitted just for the purpose of determining some basic data and information from the graduates which include: the present employment, employment status, nature of employment, competencies learned in college and work – related values of the respondents.

Procedure

The respondents were informed on the purpose of the study and invited to participate in the survey with the assurance that the data provided in the survey will be treated with utmost confidentiality and will solely be used for the purpose of this research. The researchers administered the questionnaires through online survey and achieved 100 percent retrieval rating.

Data Analysis

Percentage was used to analyze the profile of the respondents with respect to the selected variables. Weighted Mean was used to determine the degree of perception of the graduate-respondents in the school factors related to their job placement.

The respondents were given four options to identify the factors that contributed to their job placement and determine the skills developed by the University and work related values of the respondents. To arrive at a verbal description of each item, the arbitrary numerical guide was followed: 1.00-1.49: Very Little; 1.50-2.49**:** Very little; 2.50-3.49: Much; and 3.50-4.00: Very Much.

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of the Engineering Graduates in Terms of Present Employment Data

Employment Data	Total	
	F	%
Presently Employed	10	83.3
Unemployed	2	16.7
Status	Total	%
Regular or Permanent	8	80.0
Contractual/ Casual	1	10.0
Temporary	1	10.0
Nature of Employment		
Gainfully employed	10	100.0
Location		

Table 1 (cont). Frequency Distribution of the Engineering Graduates in Terms of Present Employment Data

Employment Data	Total	
	F	%
Length of Job Search		
Less than a month	4	40.0
1 to 6 months	5	50.0
7 to 11 months	1	10.0
Local	10	100.0
Job Level Position		
Professional, Technical or Supervisory	10	100

Computer Engineering graduates could be able to find a job in 1 to 6 month-period while four or 40 percent of them landed a job in less a month and 1 or 10 percent within 7 to 11 months. Findings of the study of Mason et al. [20] suggest that structured work experience has clear positive effects on the ability of graduates, firstly, to find employment within six months of graduation and, secondly, to secure employment in graduate-level jobs.

Table 2. Reason(s) for accepting and staying on the job of the Engineering Graduates

	Accepting	%	Staying	%
Salaries and benefits	8	90.0	7	70.0
Career challenge	9	70.0	8	80.0
Related to special skill	2	20.0	3	30.0
Related to course or program of study	5	50.0	4	40.0
Proximity to residence	2	20.0	3	30.0
Family influence	1	10.0	-	

One of the common reasons of computer engineering graduates in accepting and staying on the job is due to career challenge followed by salaries and benefits and their present job is related to the course or program of study completed in the University. Meanwhile, the least reason of the graduates is proximity to residence and family influence. The result of present study confirms the finding of the previous study of Dotong et al. [11] that proximity to residence as well as family influence and peer influence were the least reasons of the engineering graduates for staying on the job. Likewise, Aguila [1] on their study found out that the reason on salaries and benefits is the most

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common answer of the employed computer engineering graduates on their motive of staying on the job followed by career challenge which confirms the finding of the present study. The career challenge and salaries and benefits provide motivating factors for any employee to accept and stay on the job especially to entry level positions and new employees. Engineering graduate-respondents are driven by the demand of their degree program in the labor market where they can test and apply what they have learned for five years in college.

Table 3. Frequency Distribution of Engineering Graduates in Terms of Skills Learned in College They Find Very Useful in Their First Job

Skills Learned in College	F	%	Rank
Communication skills	9	90.0	2
Human Relations skills	8	80.0	3
Entrepreneurial skills	2	20.0	6
Information Technology skills	10	100.0	1
Problem-solving skills	7	70.0	4
Critical Thinking skills	6	60.0	5

**Multiple Responses*

Information Technology skill (10 or 100%) is the most common and useful in their job placement followed by communication skill (9 or 90%) and human relations skill (8 or 80%). Likewise, problem solving and critical thinking skills are considered useful by most of the computer engineering graduates while entrepreneurial skill (2 or 20%) is considered useful to only few graduates.

Communication skill is of great importance where some of them were not used to talk in front of many people. They can express ideas technically but certain issue on the organization of thoughts and grammar would be encountered. Loquias' [21] study found out that communication skill registered as having the most impact in securing employment for electronics engineering graduates from one local state college in the Philippines.

But they developed how to think critically and analytically through solving mathematics problem using appropriate formula and technique on how to arrive in exact answer which requires a lot of diligence, patience, perseverance and hard work. They are expected to apply their problem solving skill in the situations where they need to decide based on scientific findings and available information. Undergraduate programs in engineering must first and foremost provide the students with a general education and help them develop analytical and critical thinking skills.

Computer literacy has always been part of every job requirement that graduates should possess in order to be considered in the position aside from other technical skills. Knowledge on basic skills MS Office and other application software brings confidence to the graduates that they could accomplish any assigned task with accuracy and precision using any available electronic equipment and devices in the department. Fundamentals of Database Management and record keeping of data and information using computers are some of the skills considered useful for employment. Experience on the analysis of those data to become substantial information would demonstrate analytical and critical thinking skills of the graduates.

Since graduates are employed in various institutions, entrepreneurship skill has no direct application on their present employment. They don't perceive its usefulness as contributory to their job placement. Interviewers were not able to ask the graduates about their experience of putting-up a business on their own effort and creativity as what entrepreneurship is regarded as basically. Aguila et al [1] on their study found out that entrepreneurial skill is also the least useful in finding their first jobs and the graduates find the communication skill as very essential most especially during the interview process where they need to impress the interviewee regarding their knowledge and skills acquired in college.

On the process, graduates could have some thoughts on the actual operation of how business works and how employees share their expertise to put everything in place. Graduates could still acquire a lot of experiences and business ideas from their employers and the people within the organization to learn about starting a business. They may be lacking for some business ideas but they have the capacity to make things possible through guidance from the experts in the field they want to pursue.

Preparing classroom for generic skills development certainly requires proper planning and preparation and giving a full lecture or demonstrating the skills are not proven methods of developing the skills among the students [22]. It always requires hands-on experience for the engineering students to experience what they have learned from the demonstration and practice the skill consistently. Chavez et al., [23] noted that the University has the capacity to cultivate the knowledge of their students and put them in a more progressive tract with right interpersonal skills and significant

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manipulative and technical skills towards the achievement of their future goals in industry.

Table 4. Work – Related Values Contributed in Meeting the Demands of the Present Employment of the Respondents

Work-Related Values	WM	VI	Rank
Love for God	3.45	M	9
Honesty and love for truth	3.31	M	11
Punctuality	3.64	VM	5
Obedience to superior	3.28	M	12
Hard work	3.72	VM	1
Creativity and innovativeness	3.54	VM	7
Courage	3.49	M	8
Professional Integrity	3.65	VM	4
Love for co-workers and others	3.42	M	10
Unity	3.27	M	13
Fairness and Justice	3.16	M	16
Leadership	3.68	VM	2
Tolerance	3.24	M	14
Efficiency	3.58	VM	6
Supportiveness	3.21	M	15
Perseverance	3.67	M	3
Nationalism	2.53	M	17
Composite Mean	**3.40**	**M**	

The value of hard work (3.72) is considered with very much contribution to their job placement followed by leadership (3.68), perseverance (3.67), professional integrity (3.65), punctuality (3.64), efficiency (3.58) and Creativity and innovativeness (3.54).

Leadership skill is very essential for successful management and also beneficial for a person's career in any field of endeavor [24]. Mumford et al. [25] noted that different categories of leadership skill requirements emerge at different organizational levels, and that jobs at higher levels of the organization require higher levels of all leadership skills. In addition, although certain Cognitive skill requirements are important across organizational levels, certain Strategic skill requirements only fully emerge at the highest levels in the organization. Aguila et al [1] also mentioned that inner motivation to give the best of their ability to perform any job assignment brings the character of hard work and perseverance as significant attribute of great employees who are willing to commit themselves and take higher responsibilities in the organization. Meanwhile, Carlson et al [26] noted that there is no substitute for fabricating working (or not!) prototypes of conceptual designs, and learning first-hand that designing within constraints and through iteration unleashes creativity and motivates deeper understanding.

Being innovative and creative would not be expecting instantly to demonstrate among graduates with less than five years in employment because it requires experience and expertise to execute breakthroughs in the organization. Maybe some opportunities for improvement could be identified by the new employees with certain level of creativity and being resourceful.

Meanwhile, courage (3.49), love for God (3.45), love for co-workers (3.42), honesty and love for truth (3.31) and obedience to superior (3.28) are also considered important work values that contributed much to the job placement of computer engineering graduates. Working in a multidisciplinary team requires unity and support from each member towards the achievement of a common goal. Engineering graduate-respondents believed that being a follower at first needs obedience to superior as a sign of a good future leader with considerable respect and love for co-workers through demonstrating competence and efficiency in the work place. However, fairness and justice (3.16), tolerance (3.24), supportiveness (3.21) and nationalism (2.53) are considered the least work values that contribute to their present employment.

Work values of graduates are formed from their personal and family background as observed from their behavior and kind of decisions they made in life. They keep on pursuing something notable as part of their dreams and aspirations to have a successful career in engineering and allied discipline in the future to prove their worth and potentials in living their purpose. They see the truth and justice in performing their duties and responsibilities with professional integrity and respect to authorities and superiors in the organization. Graduates believed that those values really contributed to their job placement as instrumental that influence their character and attitude towards work.

Chavez et al. [2] found out that honesty and truthfulness, commitment and dedication; diligence and hard work; attendance and punctuality and love of work were considered to have very much contribution to the present employment of the employed engineering graduates in the University under study. According to the respondents, these are the work values they possessed which helped them obtained their first jobs. The value of honesty in all aspects of life really matters a lot, most especially in establishing a good name in the company, dignified profession and ensuring a lifelong treasure.

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Table 5. Relevance of Computer Engineering Curriculum to the Job Placement of Graduates

CpE Professional Courses	WM	VI	Rank
1. Computer Programming	3.52	Very Relevant	3.5
2. MS Office Applications	3.65	Very Relevant	1
3. Computer System Architecture	2.63	Relevant	9
4. Computer Troubleshooting/ Maintenance	3.51	Very Relevant	5
5. Microprocessor System	3.12	Relevant	6
6. Logic Circuit & Switching Theory	2.43	Slightly Relevant	10
7. Software Engineering/Development	3.07	Relevant	7
8. Data Communications/CISCO Networking	3.52	Very Relevant	3.5
9. Control Systems	2.32	Slightly Relevant	11
10. Electronics/Electricity	2.98	Relevant	8
11. Engineering Economy	2.27	Slightly Relevant	12
12. Engineering Management	3.57	Very Relevant	2
Composite Mean	**3.05**	Relevant	

The Computer Engineering Graduates answered that the MS Office Applications (3.65) and Engineering Management (3.57) are considered very relevant in their job placement as well as the Data Communications/CISCO Networking (3.52), Computer Programming (3.52) and Computer Troubleshooting/Maintenance (3.51). MS Office Applications as a general computer course is application for all degree programs which is always necessary in all job skills and requirements for employment. It confirms the previous findings of the study of Laguador and Dotong [27] that the Computer Engineering graduates of the same University from 2005 to 2009 also considered MS office applications have contributed much to graduates' job placement.

The fundamental and advanced knowledge of computer in terms of hardware and software is an advantage for the graduates. Likewise, principles of Engineering Management are very applicable in manufacturing and electronic industries. Computer Engineers could be able to adapt in a multidisciplinary environment where employees have individual differences in terms of culture, work values, and behavior that are being considered to properly handle different kinds of people in the organization towards better understanding on the success factors of the industrial system

Likewise, Computer Programming and Networking are two of the most common and useful skills that the graduates of Computer Engineering program should possess because that would make them highly employable as software developers and network administrators that offer solutions to the needs of various industries.

However, Logic Circuit & Switching Theory (2.43) and Control Systems (2.32) are considered slightly relevant in their job placement. Most of the computer engineering graduates of this batch were not able to apply these professional courses directly to their respective job assignments due to its nature of being highly technical and being used for design and development of electronic products. Engineering Economy (2.27) is another course which has slight relevance to their job placement which is not also being directly applied during the employment process but could be useful on their later journey in the field of engineering where cost and benefits analysis will be utilized.

Lifelong Learning Options

Professional certifications bring a lot of benefits to climb the corporate ladder; assist in job retention and increase the potential of being hired in high paying positions. The skills and competencies earned from the certifications served as a human capital that nurtures one's value for the improvement of the organization. This is still part of the training that nurtures the capacity of individuals to generate outcomes more effectively [28].

They may be offered to take Microsoft Certification Programs and CISCO Certification to enhance their IT skills. They can start obtaining the Microsoft Technology Associate which can prepare them to have solid foundations to take Microsoft Certified Solutions Associate (MCSA) and Microsoft Certified Solutions Developer (MCSD) Certifications.

Likewise, they may choose to start as Cisco Certified Entry Networking Technician (CCENT) which covers basic networking knowledge and Cisco Certified Technician (CCT) have the skills to diagnose, restore, repair and replace critical Cisco Networking and system devices at customer sites [29]. Most certifications have validity of three (3) years because technology varies from time to time where advancement in applications is inevitable.

Knowledge and skills on Project Management would also help the engineering graduates to supervise and administer a project to produce a certain product, service or any result with specific goals and success parameters within specified time and often constrained

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by funding or staffing. Cattanni et al [30] noted that the management of such distinct production approaches requires the development of distinct technical skills and management strategies. This is very useful in software development projects where the team needs to work on specified set of constraints described in project documentation to meet and deliver all the customer requirements. Certification on Project Management Professional validates the competence to perform in the role of a project manager, leading and directing projects and teams [31].

Certified Quality Engineer (CQE) is a professional who understands the principles of product and service quality evaluation and control [32]. CQE is another lifelong learning option for Computer Engineering graduates to explore if they are planning to work in manufacturing or semiconductor companies which will require the competencies on the development and operation of quality control systems, ability to use metrology and statistical methods to diagnose and correct improper quality control practices and an understanding of human factors and motivation and the ability to develop and administer management information systems.

If they want a lifetime title, pursuing graduate studies is also a good option. They may also consider taking Master of Science in Computer Engineering, MS in Information Technology, Master in Business Administration or any Graduate programs suitable to their present employment or related to job prospects as investment. This is one of the requirements if they also want to join the academe as part time lecturer.

The bottom line of all these lifelong learning options is the capacity of the graduates to be innovative in any aspects of their career. They should have the basic foundation of problem solving skill before they get into the real challenges of the world and how they can contribute to the community development and progress of the organization where they exist as assets.

CONCLUSION

Computer Engineering graduates of this University during 2016 is highly employable with 83.3 percent or 10 out of 12 graduates who are gainfully employed in the Philippines with regular or permanent status in professional, technical or supervisory position. One of the common reasons of computer engineering graduates in accepting and staying on the job is due to career challenge followed by salaries and benefits and their present job is related to the course or program of study completed in the University. Information Technology skill is the most common and useful in their job placement followed by communication skill and human relations skill.

The value of hard work has very much contribution to their job placement followed by leadership, perseverance, professional integrity, punctuality, efficiency and Creativity and innovativeness. Furthermore, MS Office Applications and Engineering Management are considered very relevant in their job placement as well as the Data Communications/CISCO Networking, Computer Programming and Computer Troubleshooting/Maintenance.

RECOMMENDATION

Learning to apply the theories and concepts of Total Quality Management is an essential component of a successful professional engineer combined with the culture of excellence and good characteristics of being committed, competent, credible and caring for the people and for the organization would bring a harmonious relationship between the employees and the employers.

The HEIs must strengthen the implementation of the new curriculum supported by the internationalization activities to develop the awareness of the students in global issues and challenges of their profession as well as to enhance their leadership capabilities in facilitating programs of the department. They should learn how to work in a multidisciplinary environment with other students from different degree programs so that they can be exposed to the culture and practices of other members of the academic community.

The ASEAN Qualification Reference Framework aims to encourage the development of structures and agenda that can facilitate lifelong learning. Therefore, the engineering students must recognize its significance and the mission of ASEAN Economic Community to give them a better view of what to expect and achieve as well as what to develop more and improve on their skills and competencies required by all ASEAN Member States, so that they can freely join the international labor force. The dissemination of information could be in a form of classroom discussion most probably as part of the instruction in professional courses as well as through symposia and conferences. The teachers may relate the subjects or topics from the lesson to the real world problems where students can enhance their critical, analytical and problem solving skills.

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All teaching and learning processes of the students must have internalized the leadership brand of the University in terms of 4Cs: competence, commitment, credibility and collaboration. These 4Cs must be emphasized in all curricular and co-curricular activities as part of the objectives and outcome of the projects or any academic program. Measuring the effectiveness of the completed program must ensure that these outcomes have met by the participants.

The listed lifelong learning options served as a reference for the graduates to give them a piece of advice on what to do after joining the workforce. While they are acquiring more learning experiences from the tasks and responsibilities assigned to them, they must look into the possibilities of performing higher roles in the organization by enhancing qualifications through attending advanced studies and acquiring certifications through rigid training and workshops related to computer engineering, job assignment or maybe based from curiosity and personal interest. All lifelong learning activities serve as investment if not yet directly benefiting from the output.

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