

## Transversal and Technical Competency of Engineers with Masters' Degree in the Philippines

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**ABSTRACT:** This study intends to determine the set of transversal and technical competencies of Engineers with Masters' Degree in the Philippines. Correlating with the set of competencies acquired, this study also aims to connect the relationship between the said competency and the respondents' journey to masters' degree. Descriptive Quantitative type of research was used in this study with 52 engineers with masters' degree as respondents. Results showed that most of the respondents believed that it has been a great advancement technically and transversally after having their respective masters' degree. In addition to that, all the respondent's insight about the transversal and technical competency they obtain are the same, that it has been their strength for their institution. Most of the Engineers with masters' degree now enjoy the fruit of their hard work for pursuing the degree advancement. Apart from the competency level which emerged gradually, they also enjoy the benefits of salary adjustments and promotions. The labor market has been competitive nowadays and it is an advantage for an engineer to obtain masters' degree for them to adapt well.

**KEYWORDS:** Transversal, Technical, Competency, Engineering

### INTRODUCTION

Competencies are sets of knowledge, abilities, and behaviors that learners acquire and apply to be successful in school, in life, and in the workplace. They place an emphasis on qualities of learning that relate to all topic areas. Many nations have attempted to consolidate their human core capabilities in adapting to new and changing conditions in the workplace in response to the more diversified and quick changes in our global and knowledge-based current society (Rychen & Salganik, 2003). Moreover, the distinctive circumstances in which each country finds itself determined how important talents were recognized and utilized for the country's unique inventions and ambitions.

The relevance as to whether transversal abilities, or non-technical skills such as problem-solving and interaction skills, are critical to student achievement in the employment market. There is no denying that learners require transversal competences to be successful in their professions. However, little is understood well about exact competency level which engineering graduates must acquire upon completing their bachelor's or master's degree.

Although certification programs motivate the inclusion of transversal competencies in engineering educational curriculum as well as higher education institutions emphasize their incorporation into the course material to increase students' employment prospects, there still is a gap between industry requirements and graduates' labor force readiness.

Several studies investigated which transversal competencies engineering students should possess from an industry or academic perspective. Ethics, lifelong learning, taking initiative, thinking creatively, and focusing on objectives were identified as less important, but still vital.

The researcher hopes to assist higher education institutions, employers, and future graduates in encouraging the development of industry-required abilities. As a response, the goal of this research is to look at the technical and transversal skills of Engineers with a master's degree in the Philippines.

### STATEMENT OF THE PROBLEM

The Philippine Institute of Civil Engineers (PICE) represents more than 100,000 members of the civil engineering profession in over a hundred chapters in the Philippines and 12 international chapters worldwide. These numbers do not cover all the Civil Engineers who successfully passed the board examination, as not all board passers are members of the said organization. And there are other more engineering disciplines which can be found in the Philippines. The labor market has been very competitive and only those with appropriate 21st century skills could be able to adapt in the changing landscape of the corporate world. Graduates are prepared to attain cognitive, behavioral, and social skills which are essential components of learning outcomes to

perform efficiently the duties and responsibilities in the workplace.

Work related values or the personal characteristics of the graduates that they learned or acquired through experiences from the university and other social environment might help them define who they are as a person and as a graduate of a certain institution that serves as their identity. Work values are considered important element of human resources.

Today’s labor environment is complex and changing at a fast pace. Tough problems require technical expertise to create cost-effective & sustainable solutions. All industries need technical skills to accomplish complex actions, tasks, and processes relating to computational and physical technology as well as a diverse group of other enterprises. The acquisition of advanced technical skills requires specific education certification or training, often with practical hands-on learning. Correlating Technical and Transversal skills which were learned from graduate school, this study aims to determine how both skills combined improve the level of competency of Engineers in the Philippines.

#### SCOPE AND LIMITATION

This study was conducted to describe, analyze, and interpret the connection and importance of transversal and technical skills, with achieving the related master’s degree in engineering. This study focuses on these two skills in engineering and engineering management; thus, this research does not encompass the competency level of other degrees and their respective master’s degree. This study is also limited to engineers with master’s degree in certain parts of region 3 and NCR.

#### SIGNIFICANCE OF THE STUDY

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##### The Higher Education Institutions (HEI)

Higher Education Institution has greater responsibility in providing quality education relevant to the demands and requirements of the community. This research aims to be of aid in the search of HEI for feedbacks and ideas.

##### The Employers

This study helps the employers in engineering field to have a glimpse on what level of competency an individual may provide if he has obtained his master’s degree in their engineering field.

##### The Future Graduates

This study will be of help to future graduates to give them an advantage of what the society upholds after their

undergraduate studies, and what impact having a master’s degree may provide.

##### The Future Researchers

This study will be beneficial to the academe society, i.e., students, future researchers etc. This research can be used as reference materials for another future research.

#### RESEARCH DESIGN

To collect the needed information, the researcher used the descriptive design method of research. As defined by Martinez et al. [26], descriptive method involves collecting data to answer questions concerning the status of the object of a study. This has provided essential knowledge about the nature of the subject. The researcher had to gather all the information and conduct interviews to gather necessary data to be used to achieve the objectives of the study.

The researchers will use a questionnaire to obtain the information on how the respondents see their growth technical and transversally while obtaining their master’s degree. Several questions are given to the respondents, and they will be required to answer the questions based on their experiences. This will give the researchers the required data that will be analyzed and to give answer to the study.

#### PARTICIPANTS

There were total populations of 52 Engineering Graduates from different universities and academic year. 67.31% of the respondents are Male while the remaining 32.7% of the respondents are female. Age ranges for the participants are as follows: 21-25 years old (50%), 26-30 years old (25%), 31-35 years old (11%) while those aging 36 and above are 3.85%. All respondents are employed in their respective fields, 67.31% of the participants are employed by government institutions, 26.92% are affiliated by private companies and 5.77% are self-employed.

#### INSTRUMENT AND PROCEDURE

The primary data gathered in the study are from the respondents of the survey while the secondary data were gathered from books, journals, and other online references. This study utilized survey questionnaire as the main instrument.

The researchers made use of advanced online technology to create an online survey, using Google Forms. The researchers also used different online platforms such as Facebook, Messenger, and Emails to spread the online survey to the target respondents, to obtain the necessary data needed to conduct this research. Questionnaires is then divided into two categories: For transversal and technical competency. Each category includes a question regarding the competency area and is measured by linear scale, from 1 as the competency is not demonstrated, 2 is the area that needs development – rarely practices the key behavior or inconsistent in practicing the key behavior, 3 as adequate –

practices the key behavior repeatedly, with isolated lapses and 4 as being the competency area is their strength.

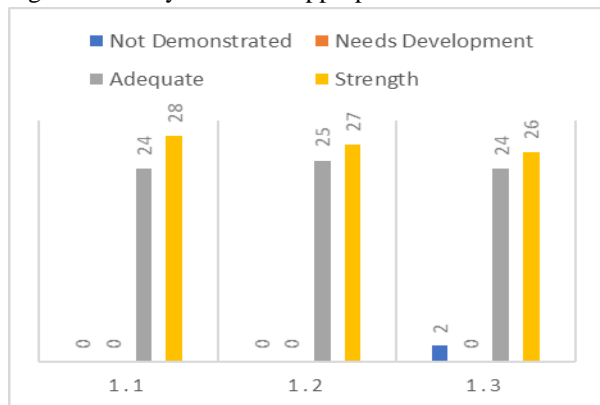
**DATA ANALYSIS**

The researchers used their knowledge in using measures of central tendency, to determine the average of the given data sets. Weighted Mean was used to determine the summary of results of each competency area. Pearson-r was used to test the relationship between the transversal and technical skills learned from master’s degree to the level of competency of engineers. In this study, the data obtained will be represented using column and bar graphs.

**RESULTS AND DISCUSSION**

The first competency area for transversal competency is Problem Solving and Decision Making. Figure 1.1 and 1.2 shows the first three questions, while figure 2 show the last two questions on how the respondents rate their growth when it comes to problem solving and decision-making.

- 1.1 Recognizes the existence of a problem or an issue that needs to be addressed or resolved
- 1.2 Identifies the information needed to solve a problem or an issue effectively
- 1.3 Determines sound and appropriate solutions to simple problems or issues
- 1.4 Addresses or resolves a simple problem or issue by implementing an efficient and appropriate stock intervention
- 1.5 Refers problems beyond one’s scope for resolution by a higher authority or a more appropriate unit

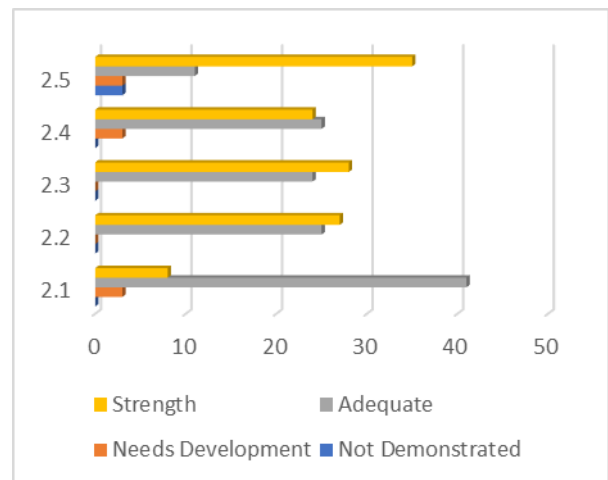


**Figure I.I: Problem Solving and Decision Making**

Tally shows that most of the respondents believe that masters’ degree enhanced their ability to identify and evaluate all available and alternative solutions to come up with timely, responsive, and logical actions. Survey shows for the five questions that 0% of the respondents chose the Not Demonstrated, only 0.77% believe that there are some factors which needs development, 48.08% believe that they have adequate skills when it comes to problem solving and decision making, and 51.15% believe that the said competency is their strength.

The second area of transversal competency is Communication. Figure 2 shows how the respondents rate their growth in terms of communicating with people inside their respective organization.

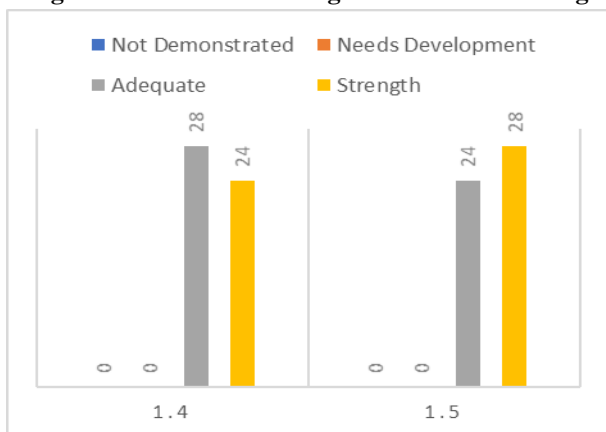
- 2.1 Articulates ideas clearly and firmly without antagonizing others
- 2.2 Paraphrases the speaker’s ideas to ensure understanding before responding
- 2.3 Elicits comments and responds to questions with clarity and sincerity
- 2.4 Provides constructive feedback with due regard for the other person’s situation and feelings
- 2.5 Readily accepts suggestions and opinions when an unpopular decision or unwelcome information is shared



**Figure II: Communication**

Survey shows that there are still engineers with masters’ degree who do not demonstrate the ability to convey and receive face-to-face messages in a timely manner, and in a way that minimizes psychological noise, so that the information and the action required by it are clearly perceived and accepted. While their growth of other respondents in communication is minimal, the participants firmly believe that obtaining masters’ degree made an impact on how they communicate with the organization.

In terms of communication, 1.15% of the respondents believe that sometimes, they do not demonstrate well communication in their organization, 3.46% believe that it still needs development, 48.46% believe that they practice



**Figure I.II: Problem Solving and Decision Making**

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communication effectively with just isolated lapses and 46.92% believes that communication is a strength they gain with knowledge connected to obtaining their masters’ degree.

The third area of transversal competency is Teamwork. Figure 3 shows how the respondents rate their relationship with the team when tasks are given.

- 3.1 Performs one’s fair share of the work for the team or office consistently
- 3.2 Checks the completeness and correctness of documents before endorsing for approval
- 3.3 Informs superior ahead of time if targets are not likely to be met because workload is too difficult or too heavy
- 3.4 Adjusts overcome challenges as they become apparent
- 3.5 Admits one’s errors and willingly discusses solutions with team members.

Teamwork is the ability to discharge work duties dependably and accept responsibility for results, consequences, and decisions within one’s ambit. Most of the participants have shown their respective organizations that they are team players, and that having their masters’ degree is a tool for adaptation of the said competency

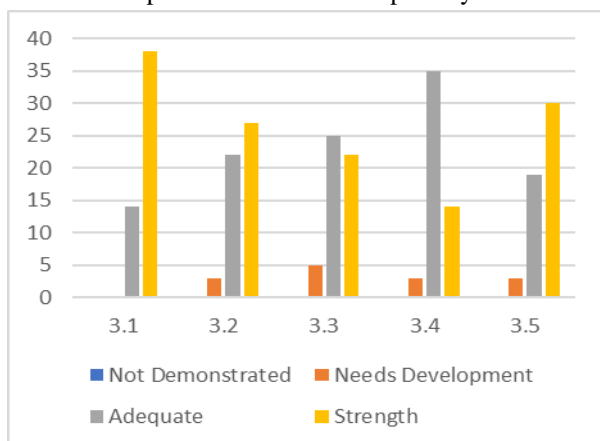


Figure III: Teamwork

0% of the respondents answered Not Demonstrated, in which they believe that they have been a team player in their organization. 5.38% answered that at some point, teamwork is a self-trait of them which needs development, 44.23% chose that, most of the time they are a team player and that there are just minimal lapses, and 50.38% answered that this is their strength.

The last area of transversal competency is Analytical and Creative Thinking. Figure 4 shows the participants’ reflection on how they think they have boosted their thinking skills with the help of the respective masters’ degree.

- 4.1 Identifies the interactions and relationships between components parts and processes of a complex system
- 4.2 Identifies gaps in information and makes assumptions to continue analysis and/or act
- 4.3 Infers likely implications from available information
- 4.4 Actively contributes to brainstorming sessions in their work area to generate new ideas

4.5 Fosters a work climate that allows new and creative ideas to surface

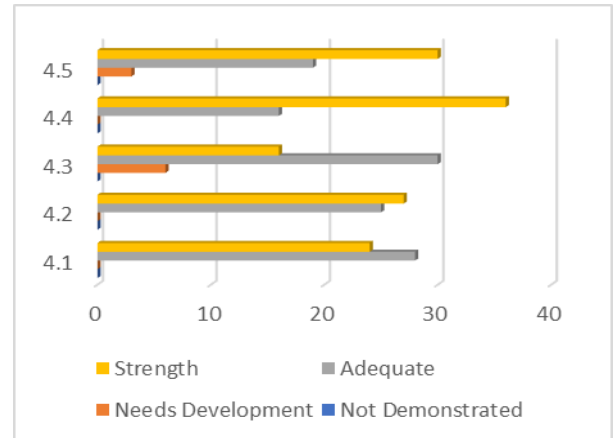


Figure IV: Analytical and Creative Thinking

No respondent believe that they are not analytical and creative thinkers, which gained 0% average. Very few respondents, in a total of 3.46% believe that they have this transversal skill, but it still needs improvement. 45.38% of the participants are positive that they have adequate skill with this matter and 51.15% of the respondents believe that analytical and creative thinking is a strength of them.

Summary of this tally shows that most engineers with masters’ degree could simplify, interpret, explain, relate, and extrapolate from complex information, ideas, concepts, systems, and situations to aid in decision-making; to conceive, innovate, and develop new perspectives and ideas for improving or enhancing systems, methods, and procedures, and for solving problems or overcoming challenges.

The first competency area for technical competency is General Technical Competencies. Figure 5 shows the percentage of the respondents’ answer within the five subsections.

- 5.1 Use the necessary techniques for engineering practice
- 5.2 Use the necessary skills for engineering practice
- 5.3 Use the modern engineering tools and software
- 5.4 Work toward quality standards and specifications
- 5.5 Assemble equipment following written directions

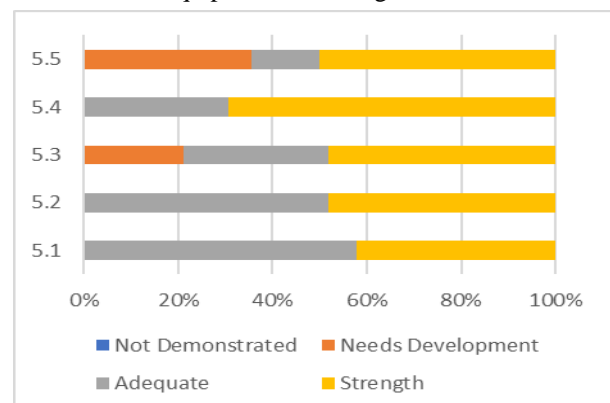


Figure V: General Technical Competencies

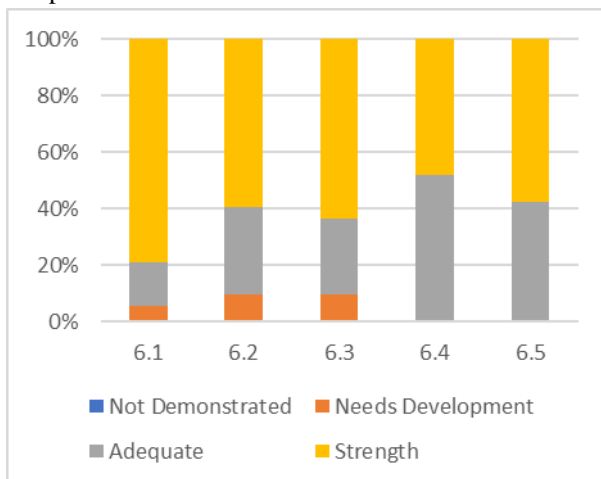
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Technical Competence is an area of knowledge or skill that is useful in a particular industry's job responsibilities. Different industries require diverse skills for candidates, so employers emphasize different competencies, depending on the products or services they offer.

The survey shows that no respondent, or 0% of the total participants does not demonstrate their general technical competence, 5.38% believes that there are some points in which they require development, 38.46% believe that they have adequate knowledge and skills, and majority of 56.15% firmly believe that it is their strength.

The second competency area for technical competency is Knowledge of Science and Engineering Disciplines. Figure 6 shows the percentage of the respondents’ answer within the five subsections.

- 6.1 Continue to acquire knowledge of sciences and engineering fundamentals
- 6.2 Apply the knowledge of engineering fundamentals
- 6.3 Select and use proper tools and equipment for job/task
- 6.4 Access, analyze and apply skills and knowledge of science and engineering
- 6.5 Understand principles of sustainable design and development



**Figure VI: Knowledge of Science and Engineering Disciplines**

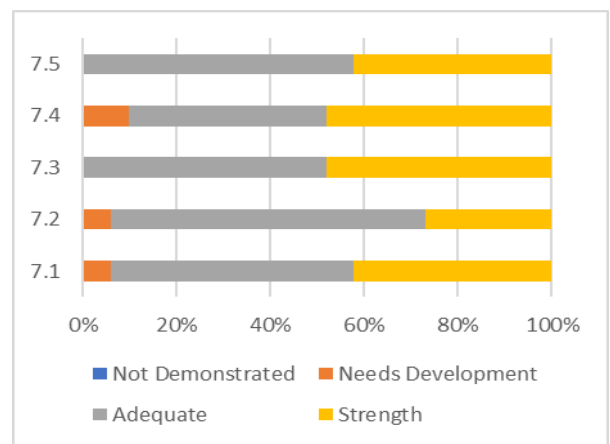
Knowledge of Science and Engineering Discipline is a very important aspect of competency for Engineers. This is their ability to understand and apply the principles which they have learned beforehand. By obtaining their respective masters’ degree, each participant believes that not only they learned new skills, but they have also learned how to maximize their potential and knowledge with the said topic.

As survey concludes, 0% of the engineers believe that they always demonstrate and apply their knowledge in engineering to their organizations. 5% believe thinks that at some subsections of this competency level, they still need to develop, 33.46% of the participants has huge amounts of knowledge and skill and has only minimal lapses, and most of the engineers, which garnered 61.54% of the total

respondents believe that knowledge of science and engineering discipline is an engineer’s strength.

The third competency area for technical competency is Engineering System Approach. Figure 7 shows the percentage of the respondents’ answer within the five subsections.

- 7.1 Utilize a systems approach to design operational performance
- 7.2 Utilize a systems approach to evaluate operational performance
- 7.3 Design systematically
- 7.4 Analyze engineering design
- 7.5 Demonstrate a knowledge and understanding of engineering system for management and business practices



**Figure VII: Engineering System Approach**

Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge. The individual outcome of such efforts, an engineered system, can be defined as a combination of components that work in synergy to collectively perform a useful function.

The summary of the survey shows that, still, 0% of the participants firmly believe that they demonstrate knowledge and understanding for engineering system. 4.23% said that there are some cases in which they understand the topic but still needs future improvement. 54.23% of the respondents believe that engineering system or theoretical approach is something they practice daily but missed out details occasionally. 41.54% of the respondents believe that this approach is their strength.

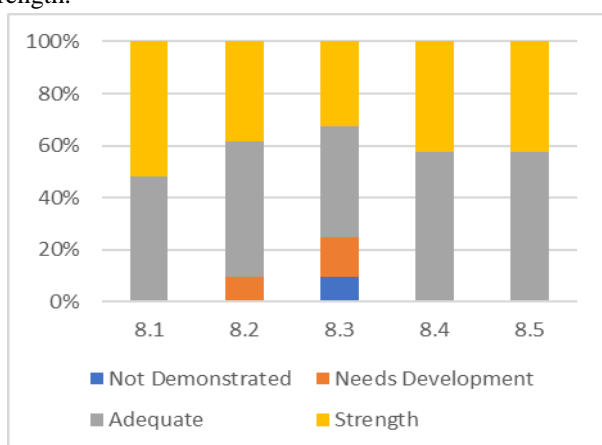
The last area of technical competency is Competent in Specific Engineering Discipline. Figure 8 shows the participants’ reflection on how they think they have boosted their competency with their respective engineering discipline with the help of the respective masters’ degree.

- 8.1 Continue to acquire in-depth technical competence in a specific engineering discipline

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- 8.2 Apply technical skills in a specific engineering discipline effectively
- 8.3 Design and conduct experiments
- 8.4 Analyze and interpret data
- 8.5 Apply knowledge in multidisciplinary engineering

Engineering is a broad area. This last question tackles about the competency level of each engineering graduate with their respective discipline. Each of the respondents are situated in different areas of specialization. 1.92% of the participants believe that they lack knowledge in some aspects of engineering discipline. 5% of the participants are still on the process of learning and adapting to multi-disciplinary engineering. 51.54% of the respondents are believed that even though there are minimal lapses and errors, they still have adequate amount of knowledge with regards to the subject. While the remaining 41.54% believe that while having their masters’ degree, this area of competency became their strength.



**Figure VIII: Competent in Specific Engineering Discipline**

**Table I: Relationship Between having Masters’ Degree to growth of Transversal and Technical Competency of Engineers**

<i>Variables</i>	<i>R Value</i>	<i>P Value</i>	<i>Interpretation</i>
Skills and Value	0.528	0.021	Significant

\* Significant at  $p\text{-value} < 0.05$

Table 1 reveals that significant positive relationship exists between having masters’ degree to their growth of transversal and technical competency of engineers as denoted by the computed p-value of 0.021. This signifies that those engineering graduates with high level of acquired skills and high level of work-related values are also those engineering graduates who pursued to obtain their master's degree. Pursuing an additional degree is an opportunity to stay up to date with the latest emerging technology, gain knowledge of the financial implications of your work, take a deeper dive

into a particular area of interest, and build on your undergraduate education and workplace experience to improve the quality of your work. It will not only help you to be the best you can be in your field but show employers that you are ready to take on a leadership role within your organization.

### CONCLUSION AND RECOMMENDATION

The total respondents who believe that the different transversal ad technical given has been adequate and strength of them has overpowered than those who believe that it is not demonstrated nor needs development. As an engineer, you likely already spent four or more years of late nights and long hours earning your bachelor’s degree. Consequently, making the decision to go back to school to earn a master’s can be a big decision, especially if you are not in a place to take a year off from work to pursue your education. Ultimately, the choice to pursue a master’s degree is largely dependent on where you want to take your career. For most engineers, the masters’ degree offers not only the right academic background to specialize in the field of their choice, but appealing salary benefits as well. By making an investment of both your time and finances to pursue a higher degree, you can advance both your professional career and your wages.

It is recommended that Engineers, in their respective field of specialization, seeks help to determine what masters’ degree is best suitable for them. For engineers who may be in the industry or academe, a masters’ degree is always an advantage. It is also recommended to participate in trainings and/or actively participate in their respective professional organizations to be updated on the contemporary issues in their disciplines.

This study is limited only to engineering graduates of one private university in the Philippines, therefore, the findings of the study cannot be generalized to the entire engineering students of the country. Further studies may be conducted considering larger population to get a bigger picture of the competencies each engineering obtained while having their masters’ degree in the Philippines.

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