Aspects Contributing to the Underemployment of the Top 3 Fields of Engineering in Las Piñas City, and Muntinlupa City

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Abstract: Up to this day, underemployment continuously becomes a significant contributor to poverty, and it happen to any other industry, including the engineering industry. As an attempt to contribute to the body of knowledge regarding underemployment, this study investigated the leading causes of underemployment in engineers at Las Piñas City and Muntinlupa City. The study used an online survey questionnaire with non-probability sampling to collect the necessary data from various licensed engineers. Descriptive statistics was the data analysis method of the study. The results indicate that the leading causes of underemployment in different engineering fields are lack of experience, limited job opportunities, many competitions, and the substandard education system. Mechanical Engineering, Electronics Engineering, and Electrical Engineering are
the top three engineering fields that often experience underemployment. The study concluded that experience is highly needed to attain employment in the engineering industry.

Key Words: underemployment; engineering fields; Las Piñas city; Muntinlupa city; college programs

1. INTRODUCTION

The Field of Engineering has been a respected industry since the 1500s. It is one of the significant components of the civilization of the human race. However, despite engineering being vital to the continuity of civilization and the tremendous number of people who choose to take engineering as their college program, the engineering industry still suffers from underemployment, just as engineers are underemployed. it still experiences underemployment just like other career fields. According to Chen (2020), underemployment is *"a measure of employment and labor utilization in the economy that looks at how well the labor force is being utilized in terms of skills, experience, and availability to work."*

There are two types of underemployment, namely: visible underemployment and invisible underemployment. Amadeo (2020) states that visible underemployment includes employees who are working fewer hours than is typical in their field. They are usually the ones who work part- time jobs. On the other hand, invisible underemployment includes workers in full-time jobs that do not use all their skills (Amadeo, 2020).

In the United States, the U.S. Bureau of Labor Statistics (BLS) prepares employment growth for 18 engineering occupations in the year 2016-2026, with Civil Engineering being the largest engineering occupation, followed by Mechanical Engineering and Industrial Engineering. Likewise, the engineering industry is thriving in Australia. The 2018 Graduate Outcomes Survey (GOS) report stated that engineering graduates have above-average employment outcomes, with a full-time employment rate of 83.1% in 2018. In addition to this, 71.9% are categorized as "professionals." According to the survey, civil engineers had the highest chances of having full- time employment with a percentage of 88.2%, followed by Electrical, and Electronics Engineers (85.5%). Despite these enticing figures, it is still uncertain whether an individual will fall under the desirable 83.1% or the remaining 16.9%. Brown (2019) stated that it is also not a guarantee that an engineering degree means an engineering-related job.

This research study principally focused on the aspects contributing to the underemployment of different engineering fields in Las Piñas and Muntinlupa City. Specifically, the researchers hope to address the main causes of underemployment of engineers in the Las Piñas and Muntinlupa City and the reasons resulting from these causes, as well as the engineering branches that often experience underemployment. Students, engineering students, government and engineering sectors, and future researchers may benefit from this study.

2. METHODOLOGY

2.1. Data Gathering Tool

According to Bhat (2020), "*survey is a research method used for collecting data from a predefined group of respondents to gain information and insights into various topics of interest.*" The researchers used an online survey questionnaire to collect the data. The survey was divided into three parts namely: the respondent's profile, semi-structured questionnaire, and a -point Likert scale. This questionnaire was distributed through Google Forms to different licensed engineers, who are the principal respondents of the study.

The researchers also used a Likert scale with given criteria of 4 strongly agreeing, 3 agreeing, 2 being disagreed, and 1 strongly disagreeing. Using the data collection tools, the researchers conducted their research using semi-structured questionnaires.

Before commencing the actual data collection, the researchers conducted a pilot testing where the mock respondents were students of Grade 12 STEM (engineering sections). The researchers conducted pilot testing to detect major and/or minor errors that may have been overlooked by the researchers. The researchers evaluated the time it took for a mock respondent to answer the whole survey, the data collection method, survey strategy, and the general aspects of the survey to further improve it.

2.2. Sampling Design

Purposive sampling and Snowball sampling were the chosen sampling designs for this study. Purposive sampling is believed to be the most suitable sampling design for this study, as the attributes that the researchers were looking for from the respondents were very specific. Through this, the researchers handpicked the participants who fit the specified criteria, that being: (1) a Filipino citizen of any age and gender, (2) a graduate of any engineering degree in the Philippines, (3) an engineering graduate that is residing and/or working in Las Piñas City or Muntinlupa City, and (4) a licensed engineer. After utilizing the Purposive Sampling, the participants referred to other people, who also fit with the given criteria, and were invited to be respondents of the study (Snowball Sampling).

2.3. Data Gathering Procedure

The researchers underwent three stages of data gathering procedure. The first stage is the preparation of the survey questionnaire, as well as the arrangement of proper credentials (i.e., acquisition of consent). The second stage is the distribution of the survey questionnaire to the respondents, and the last one is the collection and interpretation of the gathered data. Each stage entails different processes to fulfill the data gathering procedure.

2.4. Data Analysis Plan

The researchers used descriptive statistics as their data analysis method to analyze and provide the results in the survey data. The percentage and weighted mean were presented using pie charts to present the data under research questions 1 and 2, while bar chart for research sub- question a.

Formula of Percentage

% = f/N × 100

% = Percent

f = Frequency

N = Total number of respondents

FORMULA OF WEIGHTED MEAN

$$\bar{X} = \frac{\sum_{i=1}^{n} Wi \cdot Xi}{\sum_{i=1}^{n} Wi} = \frac{W_1X_1 + W_2X_2 + \cdots + W_n X_n}{W_1 + W_2 + \cdots + W_n}$$

Where $\bar{x}$ = Weighted Mean

w = weight

x = frequency

The formula of percentage was used to analyze the collected data under research question number 1 and 2, while the formula of the weighted mean was used to interpret the degree of agreement or disagreement of a respondent, used under research sub-question a.

3. RESULTS AND DISCUSSION

3.1. Leading causes of underemployment of engineers in Las Piñas City and Muntinlupa City

With the set of data collected, the results have shown that the leading cause of underemployment of engineers in Las Piñas City and Muntinlupa City is lack of experience, with a

percentage of 40%. Followed by limited job opportunities, many competitions, and a substandard education system. This indicates that experience is the utmost priority in the engineering industry. Meaning more experience, more chances of being employed.

Figure 1. Leading Causes of Underemployment of Engineers in Las Piñas City and Muntinlupa City

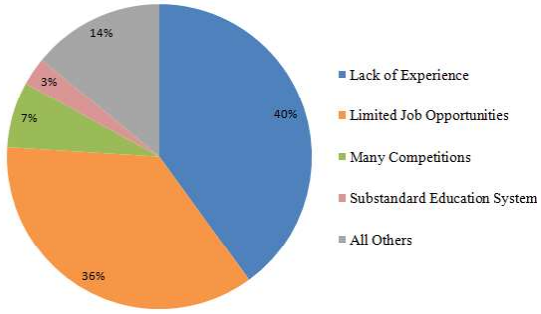


Table 1. Gender as a Factor of Underemployment (n = 65)

Response	Gender		
	Male	Female	Prefer not to say
Yes	19	3	1
No	34	8	0
Total	53	11	1

Table 1 shows the number of respondents who confirmed that they have experienced underemployment. Out of 65 respondents, 23 of them experienced underemployment—19 males, 3 females, and 1 who preferred not to say their gender. The engineering industry seems to be perceived as a male-dominated field; such notion can be also observed from the number of female respondents of the study. Despite this, the percentages of those who experienced underemployment per gender oppose that the engineering industry is more favorable to the male gender. The rate of female underemployment was juxtaposed with the percentage of male underemployment and as a result, male underemployment is higher, with a percentage of 35.48%, than the rate of female underemployment, which is 27.27%.

Table 2. Age as a Factor of Underemployment

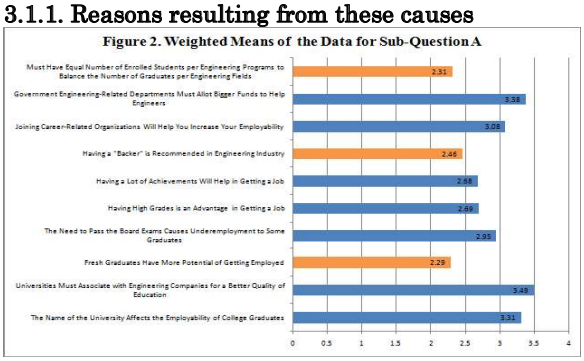
Field of Engineering	Age (in years)					Total Column
	21-30	31-40	41-50	51-60	61-70	
Mechanical	6	1	1	1	1	10
Electronics	4	1	0	0	0	5
Electrical	0	1	1	1	0	3
Civil	2	0	0	0	0	2
Computer	2	0	0	0	0	2
Materials	1	0	0	0	0	1
Total Row	15	3	2	2	1	23

As shown in Table 2, most of the engineers who are under the age bracket of 21-30 years old confirmed that they have experienced underemployment. This age bracket is most likely to be prone to underemployment as most of them are fresh graduates who, more often than not, lack work experience. Some on the other hand are not qualified for the job description needed by companies. These results show that engineers from ages 31 and above do not often experience underemployment and have stable jobs in their respective fields.

Some respondents have also specified other reasons for underemployment. Prominent responses included, "*few engineering positions required in the industry", "lack of specialization offering", "cyclic condition of oil and gas industry which impacts the requirement of manpower in hire and release",* and *"low paying companies that results to low salary."*

3.1.1. Reasons resulting from these causes

Figure 2. Weighted Means of the Data for Sub-Question A



The respondents were also asked to scale their agreeance in a statement in which each statement is also linked and aligned to the reasons that result in the aforementioned causes of underemployment. Figure 2 from the previous page shows the weighted means of their responses.

3.1.1.1. Reasons that result to lack of experience

Table 3. Having an Engineer Relative is Beneficial to an Engineering Graduate's Career (n = 65)

Response	Frequency	Percentage (%)
Yes	40	61.5
No	25	38.5
Total	65	100

The respondents were asked if they think that having an engineer relative will help them get a job related to their field of engineering easier. Table 3 shows that 61.5% of the respondents answered yes which therefore implies that it is beneficial to have an engineer relative. But because not everyone has the same advantage as those who have an engineer relative, this same reason results in a lack of experience.

On the other hand, the majority of the respondents disagreed that having a "backer" is recommended when planning to pursue any field in engineering, as seen in Figure 2. This implies that an engineering graduate does not necessarily need connections to thrive in the engineering industry.

3.1.1.2. Reasons that result in limited job opportunities

The results in Figure 2 show that the respondents agree that government engineering-related departments must allot bigger funds to help struggling engineers. This includes higher paygrade, more job opportunities in the country, and such. Respondents also agree that the need to pass the board exams can be a cause of underemployment as some fail to pass the board examinations. It can also be perceived from Figure 2 that experienced engineers are more likely to get employed rather than fresh engineering graduates. This limits the opportunity of fresh engineering graduates to gain and build experience, which eventually leads to a lack of experience.

3.1.1.3. Reasons that result in competition

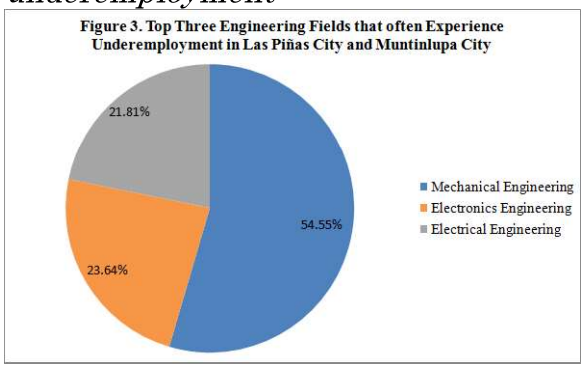
As shown in Figure 2, the respondents agree that the name of the university affects the employability of engineering college graduates. This gives more advantage to those who graduated from prestigious and excelling engineering universities. The respondents also agree that having high grades and a lot of achievements will increase the employability of an engineer, as well as joining career-related organizations. These results all lead to having many competitions.

3.1.1.4. Reasons that result in a substandard education system

According to the results also shown in Figure 2, engineer respondents agree that universities must associate with engineering companies for a better quality of education. However, the respondents disagree in restricting each engineering college program to also have a balanced number of students to also have an equal number of graduates per college program. This indicates that engineering students must already have firsthand experience and knowledge from experienced engineers while they are still in college.

Along the process of the data collection, it has also come to the researchers' attention that only a few universities here in the Philippines have undergraduate engineering programs that are ABET-accredited—and to name one of these few and fortunate universities is the De La Salle University-Manila. According to ABET's website, *"ABET accreditation assures confidence that a collegiate program has met standards essential to prepare graduates to enter critical STEM fields in the global workforce."* This could be a wake-up call to universities around the Philippines that are not doing the bare minimum to assure that engineering programs here in the country are leveled as those of other foreign countries. Graduating from an ABET-accredited program could make a significant impact on an engineering graduate's career.

3.2. Top three fields of Engineering that often experience underemployment



The results have shown, as seen in Figure 3, that the top three engineering fields that often experience underemployment are as follows: Mechanical engineering, Electronics Engineering, and Electrical Engineering. This data is derived from the (1) college degree of the respondents, which is indicated in their profile, and if they have experienced underemployment in that field of engineering, and (2) the respondent's knowledge of which field of engineering mostly experiences

underemployment. The researchers combined both data and constructed a unified interpretation.

4. CONCLUSIONS

Underemployment continuously happens around the world, most especially in the Philippines, regardless of the industry an individual is in. But just like any other discoveries made by many individuals, a once unsolvable problem is now susceptible to a solution.

The main cause of underemployment in Las Piñas City and Muntinlupa City is lack of experience. Followed by limited job opportunities, many competitions, and a substandard education system. The results from the Likert scale that the researchers used are also considered as driving factors of the main causes of underemployment. It has been discovered from the results that the name of the university affects the employability of engineering graduates, even the grades and achievements an engineering graduate attained during their student years. Fresh engineering graduates must also be more proactive since experienced engineers are more likely to be employed in the engineering industry.

The researchers have discovered that the top three engineering fields that often experience underemployment in Las Piñas City, and Muntinlupa City are: Mechanical Engineering, Electronics Engineering, and Electrical Engineering. It is recommended that engineering-related departments and agencies of the government must put more attention to these fields, as well as strategize on possible ways that can help struggling engineers of these fields, like collaborated projects, incentive awards, perks, benefits, and such to also avoid brain drain.

It is thereby concluded that experience is one of the vital weapons an engineer can and must-have in the engineering industry. It is suggested that universities and engineering firms and associations must work together to provide basic experience to engineering students. External help from the engineering departments of the government would also be beneficial in lessening underemployment in the country. Universities are also recommended to have ABET-accredited engineering programs. Employers are also recommended to set more realistic job qualifications and expectations for entry-level applicants.

Derived results are also similar to what the researchers have provided as choices in the survey questionnaires. Some respondents might have settled for what was provided rather than share from experience. For further research, a few modifications and improvements can still be made such as more items in the survey questionnaires, wider research locale, and a bigger number of respondents to also obtain more diverse responses.

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6. REFERENCES

Abel, J., Deitz, R., & Su, Y. (January 2014). Are Recent College Graduates Finding Good Jobs? Current Issues in Economics and Finance, Vol. 20, No. 1, 2014, Retrieved from https://ssrn.com/abstract=2378472

Abel, J., & Deitz, R. (December 2015, Revised September 2016). Underemployment in the Early Careers of College Graduates Following the Great Recession. Federal Reserve Bank of New York Staff Reports, no. 749.JEL Classification: I23, J23, J24, J62. Retrieved from https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr749.pdf?la=en

Abet. (2015). Accreditation. Setting the Standard Worldwide. Baltimore, MD:Abet,org. Retrieved from https://www.abet.org/accreditation/

Alves, A., Kahlen, F.-J., Flumerfelt, S., & Manalang, A.B.S. (2013, Published online April 2014). Comparing Engineering Education Systems Among USA, EU, Philippines and South Africa. Volume 5: Education and Globalization. https://doi.org/10.1115/imece2013-63254

Ambag, R. (August 2018). STEM in The PH Workforce: A Critical, Ever-Growing Need. Flip Science. Retrieved from https://www.flipscience.ph/news/features-news/features/stem-ph-workforce/

Atkinson H., & Pennington M. (December 2015). Unemployment of Engineering Graduates: The Key Engineering Education Issues. pp. 7-15 Retrieved from https://www.tandfonline.com/doi/full/10.11120/ened.2012.07020007

Balba, N. (October 2019). Graduate Tracer Study for Electronics Engineering Program (2016- 2018). LPU-Laguna Journal of Multidisciplinary Research. Vol. 3 No. 3. Retrieved from https://lpulaguna.edu.ph/wp-content/uploads/2019/11/8.-Graduate-Tracer-Study-for-Electronics-Engineering-Program-2016-2018.pdf

Bhaskar, S. (August 2019). A Research on Causes of Underemployment of Engineering Graduates through Quality Control (QC) Tool - Affinity Diagram (KJ Method). International Journal of Engineering and Advanced Technology. ISSN: 2249 – 8958. Volume-8 Issue-6S.https://doi.org/10.35940/ijeat.f1107.0886s19

Brooks, R. (February 2002, Posted January 2006). Why is Unemployment High in the Philippines? IMF Working Paper No. 02/23. Retrieved from https://ssrn.com/abstract=879369

Brown, R. (January 2019). New data reveals sunny outlook for engineering graduates' job prospects. Create Digital, Engineers Australia. Retrieved from https://createdigital.org.au/new-data-outlook-engineering-graduates-job/

Chavez, N., Camello, N., Dotong, C., & Pamplona, M. A. (February 2017) Employability of Engineering Graduates from 2013 to 2015 as Basis for a Propose. Asia Pacific Journal of Multidisciplinary Research. Vol. 5 No.1, 155-166. (Part II). P-ISSN 2350-7756 E-ISSN 2350-8442. Retrieved from http://www.apjmr.com/wp-content/uploads/2017/03/APJMR-2017.5.1.2.16.pdf

Chen, J. (November 2020). Underemployment. Investopedia. Economy, Economics. Retrieved from https://www.investopedia.com/terms/u/underemployment.asp

Cooper, P. (June 2018). Underemployment Persists Throughout College Graduates' Careers. Jersey, NJ: Forbes. Retrievedfrom https://www.forbes.com/sites/prestoncooper2/2018/06/08/underemployment-persists-throughout-college-graduates-careers/?sh=7184142f7490

Dotong, C., Chavez, N., Camello, N., De Castro, E., Prenda, M. T., & Laguador, J. (January 2016). Tracer Study of Engineering Graduates of One Higher Education Institution in the Philippines for Academic. Research Gate. Retrieved from https://www.researchgate.net/publication/309041049_TRACER_STUDY_OF_ENGINEERING_GRADUATES_OF_ONE_HIGHER_EDUCATION_INSTITUTION_IN_THE_PHILIPPINES_FOR_ACADEMIC_YEAR_2009-2012

Federal Reserve Bank of New York. (2021). The Labor Market for Recent College Graduates. New York, NY: Newyorkfed.org. Retrieved from https://www.newyorkfed.org/research/college-labor-market/college-labor-marketcompare-majors.html

Gibbons, S. (2016). The Lived Experiences of Underemployed First-generation College Graduates. Iowa, IO: University of Iowa. https://doi.org/10.17077/etd.q4olmx5x

Habito, C. (June 2019). Why Do We Lack Engineers? Philippines: Inquirer. Retrieved from https://opinion.inquirer.net/121900/why-do-we-lack-engineers

Hazaymeh, E.N.M., &Dela Pena, M.K. (2019). A Tracer Study of La Salle University College of Engineering Graduates. Retrievedfrom https://lsu.edu.ph/application/files/1114/7193/8568/Vol._18_No._1_A_Tracer_Study_of_La_Salle_UniversityCollege_of_Engineering_Graduates.pdf

Ingraham, C. (August 2014). The College Majors Most and Least Likely to Lead to Underemployment. Washington, DC: The Washington Post. Retrieved from https://www.washingtonpost.com/news/wonk/wp/2014/08/26/the-college-majors-most-and-least-likely-to-lead-to-underemployment/

Japan International Cooperation Agency Nomura Research Institute, Ltd. (2015). Data Collection Survey for Higher Education Sector in the Philippines: Final Report. Retrieved from https://openjicareport.jica.go.jp/pdf/12233029.pdf

Mapa, C.D. (September 2019). Employment Rate in July 2019 is Estimated at 94.6 Percent. Philippine Statistics Authority. Retrieved from https://psa.gov.ph/content/employment-rate-july-2019-estimated-946-percent

Mellors-Bourne, R. (November 2016). Employment Outcomes of Engineering Graduates: Key Factors and Diversity Characteristics. London, United Kingdom: Royal Academy of Engineering. ISBN: 978-1-909327-30-6. Retrievedfrom https://www.raeng.org.uk/publications/reports/employment-outcomes-of-engineering-graduates-key-f

Origeneza, G. (September 2013). Underemployment in the Philippines: A Problem Indeed. iBlog Geo. Retrieved fromhttp://animogeo.blogspot.com/2013/09/underemployment-in-philippines-problem.html

Santos, C. (July 2020). Struggles of Being an Engineer in the Philippines. Philippines: GineersNow. Retrieved fromhttps://gineersnow.com/leadership/struggles-engineer-philippines

Torpey, E. (February 2018). Engineers: Employment, pay, and outlook. Washington, DC: Career Outlook, U.S. Bureau of Labor Statistics. Retrieved from https://www.bls.gov/careeroutlook/2018/article/engineers.htm

Trevelyan, J. P., Tilli, S. (Accepted August 2009, Published online November 2015). Labour Force Outcomes for Engineering Graduates in Australia. Australasian Journal of Engineering Education. Volume 16, 2010. Issue 2. pp. 101-122. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/22054952.2010.11464047