

Institutional Practice for Engineering Students Employability: Automate Offline Employability Tracking Instrument with Data Mining

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Abstract

The analysis of graduate employability is substantial to interpret Higher Education Institutions (HEIs) capability to produce career-ready graduates. Therefore, data gathering related to employment and employability to assess the current trends is crucial. However, developing a fast and accurate programming language for analysing enormous data is a challenging task. This paper presents an Automate Offline Employability (AOE) data analysis using a spreadsheet program; it reduces the time consumption in analysing lots of data and increases data analysis accuracy. The system utilises various Excel formulas and functions to execute multitasking algorithms simultaneously. The instrument can sort the data according to various study fields, matching the initial and current data, analysing them based on employability attributes, and generating multiple interpretable graphs. It can also extract the Uniform Resource Locator (URL) of email and WhatsApp of graduate. Additionally, it has a desktop layout to help the user retrieve any information with a single click. All functions provided by the instrument has successfully executed and verified to achieve the design objectives. Using the instrument, the user can only gather 211 data within 12 days. The instrument provides various information such as the percentage of employment status, field of work, salary, and entrepreneurship.

Keywords: career development; employability analysis tool graduate employability; learning analytic; spreadsheet program.

Introduction

In recent years, graduate employability has become one of the Higher Education Institutions (HEIs) priorities, especially in Malaysia. As a result, all undergraduate programs' design must be in line with the Ministry of Higher Education of Malaysia (MoHE) vision. According to MoHE, every HEI should produce competent graduates to fulfil national and international human resources needs; they should work in their relevant fields within six months after their graduation (Mohamad, Rose, Azlin & Puvanasvaran, 2012).

According to Belen, Gemma & Thelma (2018), employability is the probability of getting a job or the ability to be employed. Nevertheless, authors in (Lee, 2001) stated that employability is the proportion of graduates from an institution that secured job placement after graduation.

The study outcomes are essential to support the development of strategies and employment policies for universities (Michavila et al., 2015). A study about the correlation between graduate employability skills and previous work experiences was conducted by

Dershem, (2016). From the findings, graduates who had past work experiences have a better chance to be hired. According to Pažur Aničić & Divjak (2020), both individual and institutional factors usually affect graduates' employability potential.

In Malaysia, researchers are focusing on employability issues such as unemployment problems, graduate skills (hard and soft skills) or attributes (Hashim, Chang & Abdul Rahman, 2016), (Tahir et al., 2018), (Shahrifudin, 2018). According to Misni, Mahmood & Jamil (2020), there was a direct correlation between curriculum design and employability competency. A study about the effect of training certifications in increasing the employability rate was conducted by Shariff & Abdul Aziz (2019). The findings recommended that other factors such as industrial training, work activities in industry and soft skills should be in the syllabus, to enhance students' competence and marketability. Nevertheless, no study focuses on developing tools to acquire, manage, and analyse graduate employability data to date. The dominant discourse in graduate employability has tended to centre on the prediction for employability

trend, which reflects HEIs' capacity to nurture graduate for the labour market. This paper reviews the graduate employability concept's application to establish a link between graduate employability and students who are at risk of unemployment. Furthermore, a new instrument named Automate Offline Employability (AOE) using a spreadsheet program is introduced to reduce data collection time and increase data analysis accuracy.

Engineering Graduate Early Transition in Employability

Students are projected to seek career objectives via early-career mobility rather than working in various jobs. The concept of early-career mobility emphasises mobility in which employability often reflects the role of degree obtained when entered the industry. The supporting view of employability in early-career mobility represents students' ability to transition knowledge and skills gained from university to industry and within the industry. The most notable terminologies used for this scope of the study is graduate employability and early career mobility. Employability is defined as the self-sufficient to move self within the labour market for sustainable employment (Rothwell & Rothwell, 2017). The concept of career mobility begins with occupational mobility by Sicherman & Galor in 1990. The underlying assumption for this concept is to understand the knowledge transition or transferability between fields. Early-career mobility allows HEIs to determine the possibilities of educational return investment to human capital (Sicherman & Galor, 1990).

There are two types of career mobility known as an intra-firm career (move ladder by promotion) and interfirm career (uncertain direction) (Sicherman & Galor, 1990). In Lindberg (2009), the authors situated the mobility as the transition between higher education-to-work transitions and relation with labour markets. Instead, the authors in (Tolkach & Tung, 2019) recognised career mobility as a prominent human resource management topic. Previous studies looked at occupational patterns (Sicherman & Galor, 1990), career projection and career trajectories (Jacob & Klein, 2019) as part of the determining factors that contribute to career mobility. When considering the difference in the mobility definition for a graduate's career, the contrast can be either the study focus on career development after graduating or looking at students' mobility when they are still in the university.

Previous studies focus on earning or salary (Sicherman & Galor, 1990; Jacob & Klein, 2019) as an indicator to come out with a theoretical explanation about the pattern that existed in early career development among graduates. We identify the literature gap on lack of emphasis as students make a transition from higher education to work, which is early-career mobility. It is essential to note this phase of transition because the national degree organising

requires input to inform the higher education policy on modularity and transferability of degree for students' mobility (Lindberg, 2009).

The early career transition explained how students perceived graduate employability with the university's degree and its inter-linkage with the labour market (Kenneth & Gary, 2018). The debates circulated on employability among engineering educators due to persistent news from labour markets pointing at higher education for compromising quality over quantity. By looking at this matter, early-career mobility often discussed from the labour market's perspective, and not much explanation can be obtained from a higher institution (Lindberg, 2009).

As regards employment addressed earlier, the concept of employability is extended to early-career mobility. According to the authors Inge et al., (2020), there is no consensus on the definition of employability among researchers. It is because there were different approaches used to represent the quality of being employed. However, the narrations focus on employability as a set of skills that graduates must acquire or develop. Thus, these qualities must be supported by the faculty members during teaching and learning and their employers (Education Policy Planning and Research Division, 2019). Hence, movements along the employability studies suggest looking at the transition phase to look at students' ability to differentiate themselves and stand apart when applying for specific job outcomes like engineering. Employability outcomes for early career mobility are resourceful to explain cases like lower-earning degree course or capture the complexities of career-oriented focus as students graduated from university. Employability and early career mobility are used interchangeably throughout the paper to assert our paper's essential contribution in representing students' career transition. Since this study's focus is on graduates, we gravitate to the concept of early-career mobility by looking at where students end up after completing their degrees. Career is conceptualised as the series of jobs that graduates hold in their work-life (Inge et al., 2020). In Inge et al. (2020), the authors use motivation as the premise for career mobility and identified motivation to change careers as one of the crucial factors. In this study, a career change may imply and the engineering degree holders might not end up in the engineering industry as an engineer. Most studies described the disappearance of young engineering graduates from entering the labour market as the leaking pipeline between academia and industry. However, the analysis that seeks an understanding of educational background's career trajectories is mostly unknown among faculty members. As engineering educators, questions like what happened to the students once they completed their degree, are the students are being employed, or self-employed or moving to another type of career that is unrelated to the degree have their roots in preparing students for employment.

Therefore, this type of information is required with the current urbanisation era to make higher education remain relevant for career mobility. This study is a significant determinant of graduates' labour market outcomes for curriculum developers and faculty members at a higher education institution.

To understand the persistent gap between graduating and job shopping among graduates, the shortcoming and barriers in early-career mobility transition may be able to assist the university with career crafting. Managing the transition from HEIs to the labour market has highlighted the increasing pressure experienced by graduates to get employed. Therefore, the graduate's individualisation employability map increasingly received attention among HEIs to come out with astute planning, preparation, and foresight.

The present study aims to contribute to a more elaborated understanding of early-career mobility by mapping individual early-career mobility. In defining early-career mobility that represents HEIs' social structure, this study considers how data mining can be used to provide resources for this purpose. Hence, the following questions shall be addressed:

- Can data mining become an algorithm in an assessment model for early-career mobility?
- How to identify structural circumstances that influenced early-career mobility?

Research Method

The effectiveness of the assessment instrument is later deployed as a survey to students. Hence, each item asked in the survey should be designed to reach the assessment instrument's aim. In this work, the questionnaires are constructed based on the criteria highlighted in the official employability reports produced by the Ministry of Education Malaysia (Science Po Graduate Employability, 2019) and the Science Po Graduate Employability (Gauckler & Körner, 2016). According to the reports, the survey should gather information about the graduate education field, employment status, type of employment, type of position, type of employment sector, salary and contribution to the economic sector. According to (Gauckler & Körner, 2016), the questionnaire's task is to translate what the researcher wants to know into a language that the respondent understands.

The Participants

For the preliminary study, the questionnaires focus on defining employability and identify suitable constructs that may benefit the faculty members'

decision making. The first questionnaire involved 211 final year students Semester March 2019 – July 2019 in the Faculty of Electrical Engineering. The online survey was conducted before the end of the final semester. The sampling strategy is purposive because this preliminary study is aimed at improving the instrument. Within six months after the end of the final semester, the same students must answer the second questionnaire. The link for the survey was posted to the email or WhatsApp app. For the nonresponsive graduates, their information was gathered through a phone call. Without a proper instrument, the time consumption to gather the second questionnaire's responses took weeks to complete. Furthermore, several staffs were needed to help the coordinator to collect the data.

Application Modelling and Development

Data mining and data analytics are essential in evaluating data of graduate employability effectively (Belen, Gemma & Thelma, 2018). Data mining is an educational tool to enhance learning quality from a different perspective. By using the technique, HEIs can identify students' prospective ability by predicting the present performance through earlier period performance and awareness to ensure the student starts the career and moves ahead in the right path for better quality (Misni, Mahmood & Jamil, 2020). Meanwhile, data analytics is the science of discovering and communicating meaningful patterns in data and developing actionable plans (Inge et al., 2020). It also provides insights into what has already happened (Michavila et al., 2015; John, 2014).

An online observatory instrument had been developed referring to previous work by Michavila et al. (2015). By using the instrument, they can track the graduates and provide counselling to improve their employability. The instrument utilised a data analytics approach to evaluate all data. Nevertheless, online has some limitations such as internet reliance, speed, security, and browser support. Hence, an offline instrument should be considered to overcome the limitations of the online instrument.

This paper examines employability among graduates at the Faculty of Electrical Engineering, UiTM Shah Alam. To trace graduate employment, the faculty members decide to develop an instrument to trace graduates' employment. The development of the proposed instrument undergoes two phases. The first phase involves constructing an employability questionnaire for the final year students, and the second phase includes data management and analysis. Figure 1 shows the flowchart of developing the Automate Offline Employability (AOE) instrument.

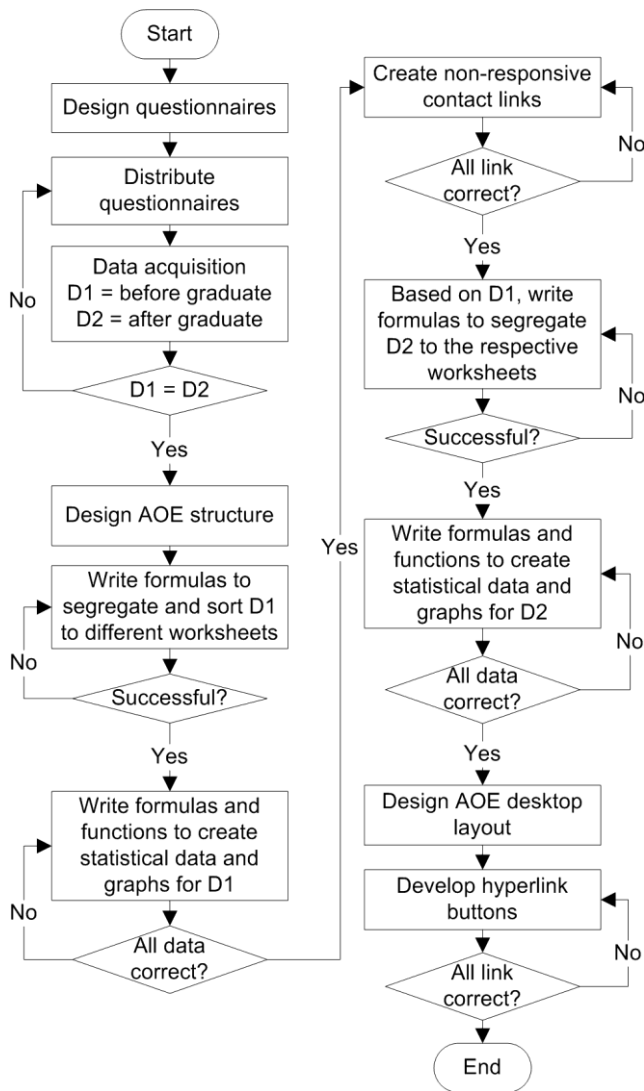


Figure 1. Flowchart to develop AOE system

To comply with the ministry requirement, the faculty initiates a tracking instrument to engage with the graduates six months after they graduate from UiTM. The instrument adopted the employability framework proposed by Defillippi & Arthur (1994). They define employability as graduates' capability to get hired or develop a personal career; it refers to graduates' career mobility. Therefore, the questionnaires applied various classification algorithms on the data set that classifies graduate employability.

The questionnaire consists of demographic and career mobility parts. The demographic section obtained information such as name, email address, mobile phone number and current employment status. For employment status, the students will be clustered into five categories: employed (full time), employed (part-time), self-employed, students/trainee, and none of the above. From here, students further proceed into section two, in which the questions focus on the type of industry, job position, job title, type of industry, salary, company's name, industrial linkage with training and entrepreneurship details.

The platform of the questionnaires is a Google Form. It is a user-friendly, stable, and safe medium for online collecting data. The first questionnaire (D1) aims to gather personal and academic information to create an initial database for students who will complete their study in the current semester. Additionally, the questionnaire collects information related to the job application activities and status, entrepreneurship involvement and future planning. The final year students need to answer the questionnaire upon their final semester. Typically, they must complete the questionnaire before the submission of the Final Year Project (FYP) report; the FYP coordinators supervise the students to complete this task. Finally, based on the graduate status declared in the questionnaire, the graduate employability coordinator can filter out the information of the students who are not yet completing their study. Their information will save in the next batch initial database.

Meanwhile, the second questionnaire (D2) goal is to obtain updated information about the students' current employment details and entrepreneurship involvement within six months after graduation. Thus, it creates another database. Usually, on the first day of the sixth month, the graduate employability coordinator sends a notification email for answering the questionnaire. If the students do not reply after the third reminder, the notification is forwarded to their private WhatsApp account. Lastly, if the students are still not responding, the coordinator will personally call them. The coordinator will know who is not completing the questionnaire by screening the personal information in both databases. Therefore, it is crucial to have an automatic instrument to monitor the students' feedback to reduce the time consumption in monitoring much information simultaneously. Moreover, the instrument is essential to match, sort and analyse the information from both databases.

Data Processing

The AOE instrument aims to execute multitasking operation simultaneously using various Microsoft Excel formulas and functions. The algorithm of these formulas and functions depends on how the instrument should interact with the databases. It started with processing the initial database and followed with the second database. The work involves four processes: (1) to sort, match and extract data from both databases into different worksheets, (2) to generate statistical data and informative graphs, (3) to produce clickable WhatsApp links and a list of emails of the nonresponsive students, and (4) to provide a user-friendly desktop function. Hence, the AOE instrument can systematically process many data and promptly increase the accuracy of data analysis.

First, each name will transfer to different worksheets under various study fields (Sheet 1, Sheet 2, ...). There are five study fields in the Faculty of Electrical Engineering, UiTM: electronics, system,

communication, computer and power. Before the sorting process begins, each worksheet should count the total number of students for the respective study fields using the 'COUNTIF' function. The number acts as a reference to halt the cataloguing process. Then, the 'IF' function checks whether the student names belong to the study field. Later, the 'INDEX' function retrieves the name from the database and transfers it into the worksheets. A mathematical equation using the 'AGGREGATE' function stops the sorting process. Finally, based on the student names, the 'VLOOKUP' function transfers other information in the initial database to each worksheet. Once completed, the second database's information is sorted into their respective study field using the 'IF' and 'VLOOKUP' functions.

The AOE instrument generates the statistical data and informative graphs of both databases in four separate worksheets. Two worksheets tabulate the statistical data, while another two display the informative graphs. For the initial database, the instrument produces information about the percentage of students who applied for jobs, received, and attended job interviews, secured a job position, and was involved in entrepreneurship during the final year. Nevertheless, for the second database, the instrument shows information related to the percentage of graduate marketability, job status and category, basic salary, and entrepreneurship. These processes utilise many 'IF', 'COUNTIF' and 'charts' functions.

When the students do not respond to the second questionnaire, the instrument will flag the students' names in each study field worksheet. Based on the flag and the study field, the 'IF', 'INDEX' and 'AGGREGATE' functions transfer the students' contact information into another five worksheets. Next, a 'HYPERLINK' function combines the phone number and the Uniform Resource Locator (URL) link of WhatsApp messengers. The length of the URL link should be less than 255 characters. It is the maximum length allowed by Excel. Eventually, another one worksheet used the 'TEXTJOIN' function is created to assemble all emails from the five worksheets. Table 1 presents several formulas and functions employed in the instrument.

Table 1. Microsoft excel formulas and functions utilized in the AOE instrument

Operation	Formulas and functions
Count students for each study field	=COUNTIF('BEFORE) INFO'!\$A\$10:\$A\$1009,'D1'!\$B\$3)
Sort, match and extract data from D1 to multiple worksheets based on the study fields	=@IF(ROWS('D1'!\$A\$6:A6)<=\$A\$3,INDEX('BEFORE) INFO'!\$E\$10:\$E\$1009,AGGREGATE(15,3,('BEFORE) INFO'!\$A\$10:\$A\$1009='D1'!\$B\$3)/('BEFORE) INFO'!\$A\$10:\$A\$1009='D1'!\$B\$3)*(ROW('BEFORE) INFO'!\$A\$10:\$A\$1009)-ROW('BEFORE) INFO'!\$A\$9)),ROWS('D1'!\$A\$6:A6))),''')

Retrieve reminding data from D1 to multiple worksheets	=IF(ROWS('D1'!\$A\$6:A6)<=\$A\$3,VLOOKUP(B6,'(BEFORE) INFO'!\$B\$10:\$AN\$1009,5,FALSE),'')
Sort, match and extract data from D2 to multiple worksheets based on information in D1	=IF(ISERROR(VLOOKUP(C6,'(AFTER) INFO'!\$A\$10:\$AN\$1009,4,FALSE)),''),(VLOOKUP(C6,'(AFTER) INFO'!\$A\$10:\$AN\$1009,4,FALSE)))
Extract and calculate number and percentage for D1 statistical data	1) =COUNTIF('D1'!\$N\$6:\$N\$205,\$D\$6) 2) =COUNTIF('D1'!\$O\$6:\$O\$205, "Yes") 3) =COUNTIFS('D1'!\$N\$6:\$N\$205, "Yes", 'D1'!\$P\$6:\$P\$205, "Yes", 'D1'!\$O\$6:\$O\$205, "Less than 5")+COUNTIFS('D1'!\$N\$6:\$N\$205, "Yes", 'D1'!\$P\$6:\$P\$205, "Yes", 'D1'!\$O\$6:\$O\$205, "Between 5 to 10")+COUNTIFS('D1'!\$N\$6:\$N\$205, "Yes", 'D1'!\$P\$6:\$P\$205, "Yes", 'D1'!\$O\$6:\$O\$205, "Between 11 to 15")+COUNTIFS('D1'!\$N\$6:\$N\$205, "Yes", 'D1'!\$P\$6:\$P\$205, "Yes", 'D1'!\$O\$6:\$O\$205, "Between 16 to 20")+COUNTIFS('D1'!\$N\$6:\$N\$205, "Yes", 'D1'!\$P\$6:\$P\$205, "Yes", 'D1'!\$O\$6:\$O\$205, "More than 20") 4) =COUNTIFS('D1'!\$O\$5:\$O\$204, "Yes", 'D1'!\$P\$5:\$P\$204,Q6, 'D1'!\$Q\$5:\$Q\$204, "Yes")
Extract nonresponsive contact info to multiple worksheets based on various study fields.	=@IF(ROWS(C_D1!\$A\$6:A6)<=\$B\$3,INDEX('D1'!\$J\$6:\$J\$205,AGGREGATE(15,3,('D1'!\$B\$6:\$B\$205="NO")/('D1'!\$B\$6:\$B\$205="NO")*(ROW('D1'!\$B\$6:\$B\$205)-ROW('D1'!\$B\$5))),ROWS(C_D1!\$A\$6:A6))),''')
Create WhatsApp links	=IF(B6<>''',HYPERLINK(F6&G6&H6&I6,"CONTACT"),''')
Merge emails	=TEXTJOIN("","1,C_D1!\$B\$6:\$B\$205,C_D2!\$B\$6:\$B\$205,C_D3!\$B\$6:\$B\$205,C_D4!\$B\$6:\$B\$205,C_D5!\$B\$6:\$B\$205)

The verification and troubleshooting of all formulas and functions are using the existing data from the previous batch. Once completed, the last stage of the instrument design is to build a user-friendly desktop layout. From this page, the user can retrieve any essential data by clicking the 'HYPERLINK' functions. Hence, it eases the user to browse the comprehensive data in the instrument with a single click. Furthermore, the user can change the title of each graph in the instrument through the desktop only.

Findings and Discussion

This section presents the results of both phases mentioned in previous section. The discussion will correlate the outcomes of the first and second phases in terms of the AOE instrument's role in reducing time consumption for gathering the information from the second questionnaire. Furthermore, it includes elaborating the instrument capability to generate

functions and data analyses elaborated in the previous section.

Figure 2 shows screenshots of the first and second questionnaires designed for the AOE instrument. Since there is no significant difficulty in collecting the initial data from the first questionnaire; hence, the form does not have an eye-catching headline to attract students' attention. Without completing the form, students cannot submit their FYP report. Time taken to gather all data was one to three days only. Nevertheless, an eye-catching headline is crucial for the second questionnaire.

completed in the middle of July 2019. The first questionnaire gathered 211 data from the students. Table 2 presents the distribution of the data according to the specific study field.

Timestamp	Email Address	Name (as shown in Identification Card (IC))	Field
7/1/2019 16:17:46	affiffuddinros	MOHAMAD AFFLI	Power
7/2/2019 15:06:55	Badiuzzam	Ahmad badiuzzar	System
7/4/2019 14:02:26	meorshazw	Meor Muhammad	Electronic
7/5/2019 11:54:46	amiruddin9	MUHAMMAD AM	Communication
7/5/2019 11:57:44	ar.nr.aza14	Ahmad Zaki Aima	System

7/8/2019 17:02:02	masanzais	MASANIZA ISKA	Communication
7/9/2019 10:18:02	fadhil_nazir	MUHAMMAD FAD	Power
7/9/2019 10:37:22	umiizzati15	UMI IZZATI MOHD	Power
7/10/2019 14:53:00	haziqhussir	HAZIQ BIN HUSS	Power
7/15/2019 0:42:35	afiqah_jalil1	NUR AFIQAH BIN	Computer

(a)

Timestamp	Email Address	Name (as shown in Identification Card (IC))	Current status
1/9/2020 9:03:52	mirrahfarhana	MIRRAH FARHAN	Employed (full-time)
1/9/2020 9:06:55	azmizulhasni	AZMI ZULHASNI E	Employed (part-time)
1/9/2020 9:06:58	muhammada	MUHAMMAD ASL	Student/Trainee (alre
1/9/2020 9:33:54	idl.azri@yahoo	MUHAMAD AIDIL	Non of the above
1/9/2020 13:03:02	wannurumair	Wan Nur Umaira E	Self-employed (such

(b)

Figure 3. Samples of responses in the (a) first (D1) and (b) second (D2) questionnaires

Table 2. Microsoft excel formulas and functions utilized in the AOE instrument

Study field	Number of students
Electronic	46
System	29
Communication	17
Computer	4
Power	115

Subsequently, the data collection of the second questionnaire happened in early of January 2020. The period between both questionnaires is six months. Fig. 3(b) presents the first and the last five responses of the second questionnaire. By referring to the timestamp, it shows the duration of gathering the data is only 12 days. This time frame includes the waiting time for three emails, one WhatsApp message and phone calls. The time interval of dispatching emails and messages is three days per reminder. Using the AOE instrument,

Students Employability Survey (Before graduation)

Unit Kebolehpasaran (Pembangunan Kerjaya HEP), Faculty of Electrical Engineering, UITM Shah Alam

* Required

Email address *

Your email

You will receive a copy of your responses via email

(a)

3-Minute Employability Survey (within 6 months after graduation)

Unit Kebolehpasaran (Pembangunan Kerjaya HEP), Faculty of Electrical Engineering, UITM Shah Alam

* Required

Email address *

Your email

You will receive a copy of your responses via email

(b)

Figure 2. The (a) first and (b) second questionnaires.

The form title depicted in Figure 2(a) was highlighting the time needed to answer the questionnaire. Due to the short time frame, students or graduates are more likely to answer the questionnaire on the spot. Other than that, some graduates do not consider their part-time job as a real job. This claim is in line with the finding in Gauckler & Körner (2016), where small and informal jobs are likely to be overlooked in household surveys. For them, the actual job should be in the area of electrical engineering.

Thus, it is difficult to obtain accurate data on their employment status. Thus, the second questionnaire consists of a question related to the source of their monthly income. From the answer, the coordinator can verify whether they are currently working or not.

Figure 3 displays samples of responses from the D1 and D2 questionnaires. According to the timestamp shown in Figure 3(a), the initial database was

the process's speed increases, and the execution involves only single personnel.

Table 3 tabulates the total number of graduates that answering the second questionnaire. In overall, only 98.59% of graduate had answered the questionnaire. The contributing factors of 1.41% nonresponsive students are invalid email addresses and phone numbers. Figure 4 depicts the percentage of responders and the WhatsApp links and emails of the nonresponsive students generated by the AOE instrument.

Table 3. Total students responded to second questionnaire

Study field	Number of students
Electronic	45
System	28
Communication	17
Computer	4
Power	114

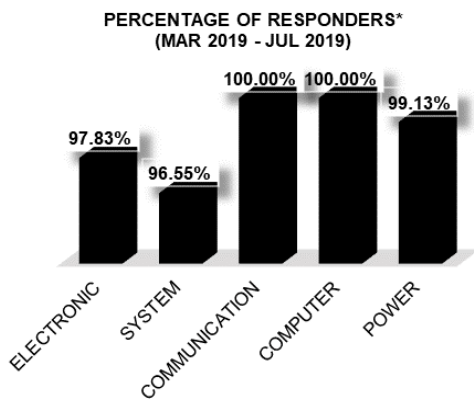


Figure 4. The responders' percentage for D2 questionnaire.

As mentioned, the AOE instrument can segregate and sort all raw data according to various study fields. The sorted data then transferred to different worksheets: electronic, system, communication, computer and power. Figure 5 presents data in the Excel worksheet. According to the fifth column in Figure 6(a), we can see that all students came from the power course only. Hence, it verifies the AOE instrument's capability to segregate the first questionnaire's raw data based on the study fields. Meanwhile, Figure 6(b) shows the sorted data from the second questionnaire. All data in Figure 6(b) matched the data in Figure 6(a).

No of non-responder	FIELD
1	Electronic

NO	EMAIL	PHONE	NAME	STUDEN T.I.D	WHATSAPP LINK
1	dizahxxxx@gmail.com	018-313xxxx	DIZAH	2.02E+09	CONTACT

No of non-responder	FIELD
1	System

NO	EMAIL	PHONE	NAME	STUDEN T.I.D	WHATSAPP LINK
1	Badixxxx@gmail.com	019-244xxxx	Ahmad	2.02E+09	CONTACT

(a)

Email To	Subject	Body
dizahxxxx@gmail.com, Badixxxx@gmail.com, syafxxxx@yahoo.com	Kaji Selidik Kebolehpasaran Graduan FKE, UTM Shah Alam (semester akhir MAR 2019 - JUL 2019)	Tuan/ Puan, Dengan hormatnya perkara di atas adalah dirujuk. Pihak Hal Ehwal Pelajar (HEP), FKE memohon ke melengkapkan borang kaji selidik di pautan beriku https://forms.gle/73M2Vjk2xtCWjB5Q7 Masa yang diperlukan untuk melengkapkan kaji s daripada 3 minit. Untuk makluman, data tersebut akan digunakan u graduan yang telah/ belum bekerja dalam tempoh pengajian. Melalui data tersebut, pihak FKE dapat industri terhadap graduan FKE, dan seterusnya ke

(b)

Figure 5. The (a) WhatsApp links and (b) email addresses of nonresponsive students

NO OF DATA	FIELD	DATA BEFORE GRADUATION	DATA AFTER GRADUATION
3	Power		

NO	NAME	STUDENT NO	PROGRAM	FIELD	IC	(HOME) PHONE NO	HP NO	(ALTERNATIVE) HP NO	EMAIL
1	ifan	2015xxxxxx	EE242	Power	xxxxxxxxxxxx	03-8723xxxx	012-917xxxx		ifanxxxx@gmail.com
2	MUHAMAD	2015xxxxxx	EE242	Power	xxxxxxxxxxxx		019-77xxxx		haziqxxxx@gmail.com
3	HAKIEM	2015xxxxxx	EE242	Power	xxxxxxxxxxxx		011-6125xxxx		nhakioo@gmail.com

(a)

NAME	STUDENT NO	HOME PHONE (Main)	HP	(ALTERNATIVE)	EMAIL	(ALTERNATIVE)	Current Status
IFAN	2015xxxxxx	03-8723xxxx	012-917xxxx		ifanxxxx@gmail.com		Employed full-time/Already get a full-time job offer and will start working soon.
Muhamad	2015xxxxxx		019-77xxxx		haziqxxxx@gmail.com		Student/ trainee (already enrolled will enroll this year)
Muhammad	2015xxxxxx	011-6125xxxx			nhakioo@gmail.com		Employed (part-time/Already get a part-time job offer and will start working soon.

(b)

Figure 6. Sorted data from the (a) first and (b) second questionnaires in the Excel worksheet.

Eventually, Figure 7 shows some of the statistical data generated by the AOE instrument. Using the instrument, the user can retrieve various statistical data such as the number of students who apply for jobs and receive job offers during the final semester and the employment status of students after graduation. To get the percentage of selective information, the user can refer to the graphical data. These data are valuable to study the trend of applying for jobs among the final semester students and employability among the graduate. To obtain these data by a single click, the user can use the desktop layout buttons. Figure 8 shows the desktop layout of the AOE instrument.



PROGRAM	NO OF STUDENT	No. of students applied for full/part-time jobs						
		Less than 5	Between 5 to 10	Between 11 to 15	Between 16 to 20	More than 20	TOTAL	%
EE241(ELECTRONIC)	41	12	11	0	0	1	24	58.5
EE241(SYSTEM)	28	9	3	1	0	1	14	50.0
EE241(COMMUNICATION)	16	8	1	0	0	0	9	56.2
EE241(COMPUTER)	4	0	0	0	0	0	0	0.0
EE242(POWER)	112	27	18	4	1	7	57	50.9
TOTAL CURRENT STUDENTS	201	56	33	5	1	9	104	51.7

(a)



PROGRAM	NO OF STUDENT	NO OF RESPONDER		WORKING		NOT WORKING		JOB CATEGORY		
		FIELD	%	TOTAL	%	TOTAL	%	Employed (full-time)/Already get a full-time job offer and will start working soon	Employed (part-time)/Already get a part-time job offer and will start working soon	Still looking for a job
EE241(ELECTRONIC)	46	45	97.83%	40	88.89%	5	11.11%	26	9	4
EE241(SYSTEM)	29	28	96.55%	26	92.86%	2	7.14%	15	3	3
EE241(COMMUNICATION)	17	17	100.00%	16	94.12%	1	5.88%	8	3	3
EE241(COMPUTER)	4	4	100.00%	4	100.00%	0	0.00%	0	3	0
EE242(POWER)	115	114	99.13%	108	94.74%	6	5.26%	60	17	1
TOTAL STUDENTS	211	208	98.58%	194	93.27%	14	6.73%	109	35	2

(b)

Figure 7. Statistical data from the (a) first and (b) second questionnaires.

EMPLOYABILITY INFORMATION & DATA ANALYSIS

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Before graduation [Students' data during the last semester]

a) Students' Information

Sheet	Program	Study Field
D1	EE241	Electronic
D2	EE241	System
D3	EE241	Communication
D4	EE241	Computer
D5	EE242	Power

b) Data Analysis

Sheet	Description
(Before) S	Data statistic *Tabulated data
(Before) A	Data analysis *Graphs

SEM : **MAR 2019 - JUL 2019** UPDATE

TABULATED STATISTIC DATA FOR REPORTING Malay Version

After graduation [Students' data 6 months after the last semester]

a) Students' Information

Sheet	Program	Study Field
D1	EE241	Electronic
D2	EE241	System
D3	EE241	Communication
D4	EE241	Computer
D5	EE242	Power

Unmatched Data: 0

b) Data Analysis

Sheet	Description
(After) S	Data statistic *Tabulated data
(After) A	Data analysis *Graphs

c) Non-responders' Contact Information

*Click on the study field to call/ send Whatsapp

Sheet	Program	Study Field
C1	EE241	Electronic
C2	EE241	System
C3	EE241	Communication
C4	EE241	Computer
C5	EE242	Power

NOTE: Don't cut or apply Ctrl+X for any data, table or graph in this file

Figure 8. AOE desktop layout.

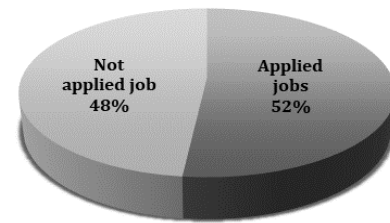
The Scholarship of Application: Scholarly Experience Sharing Papers

Figure 9 to 11 represent graphical analysis from D1 data. Additionally, Figure 12 to 14 depict graphs and pie charts from D2 data. Information from D1 is essential to analyse the effects on the students' action during the final semester related to job employment. Meanwhile, data form D2 can be used to measure the market demand for the Faculty of Engineering graduates.

Except for the computer majoring, Figure 9(a) shows that at least 50% of students from each study field had applied for jobs during the final semester. However, since students' denominator ratio in each study field is significantly different, this analysis focuses on the percentage of overall students, as shown in Figure 9(b). The approximate ratio between electronic, system, communication, computer and power majoring are 10:7:4:1:28. To increase the employment percentage, the faculty needs a plan to enhance the employability skills and job applications among the final year students. According to Figure 9(b), the percentage of job applications is 52% from 201 students. However, from 104 students who applied for jobs, there are 29.81% got an interview call before they completed their study. The statistic is shown in Figure 10(a).

These findings show that there is a chance for the students to obtain an interview call when they start to apply for it during the final semester. Nevertheless, based on Figure 10(b), only 23% of them managed to secure a job offer. This result is also affected by the students who successfully received a job offer without going through an interview session. Nevertheless, these results are sufficient to show market demand for the Faculty of Engineering graduate. Other than that, Figure 11 shows 6% of the overall students already involved in entrepreneurship during their final semester.

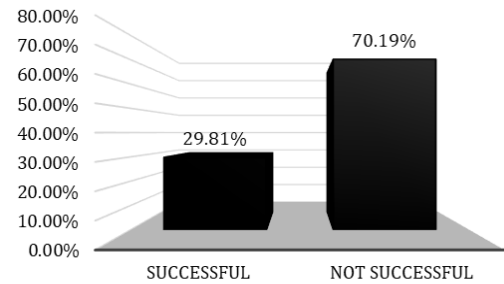
Percentage of Students Applied Jobs Before Graduation (MAR 2019 - JUL 2019)



(b)

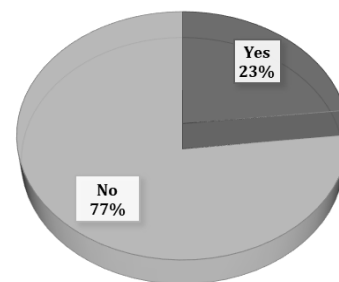
Figure 9 Percentage of students applied for jobs during the final semester. Data is based on (a) study filed and (b) overall students.

Percentage of Students Received Interview Calls Before Graduation (MAR 2019 - JUL 2019)



(a)

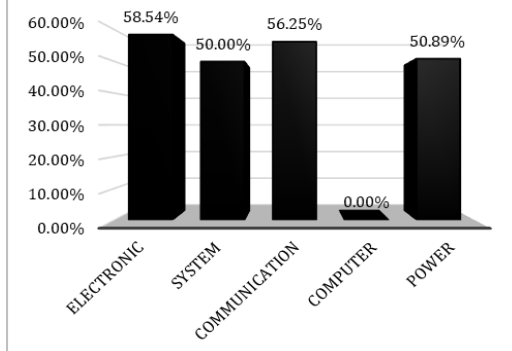
PERCENTAGE OF STUDENTS SECURED JOB POSITIONS BEFORE GRADUATION (MAR 2019 - JUL 2019)



(b)

Figure 10. Percentage of students (a) received job interviews and (b) secured job positions during the final semester.

Percentage of Students* Applied Jobs Before Graduation (MAR 2019 - JUL 2019)



(a)

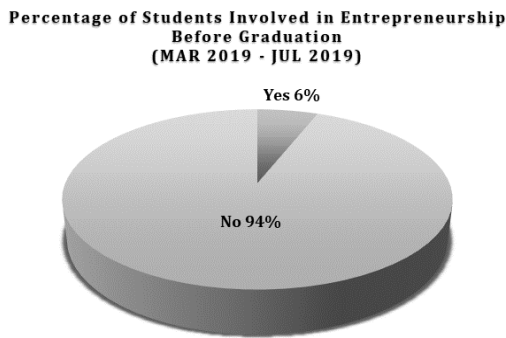


Figure 11. Percentage of students involved in entrepreneurship during the final semester.

Figure 12(a) displays 93% of 208 graduates who responded to the D2 questionnaire was employed within six months after the end of the final semester. This percentage considered full-time employment, part-time employment, self-employed and those who continue their study or training. The percentage calculation did not consider 3 graduates who did not respond to the questionnaire. Nonetheless, according to Figure 12(b), only 52.4% of 194 working graduates managed to get a full-time job placement.

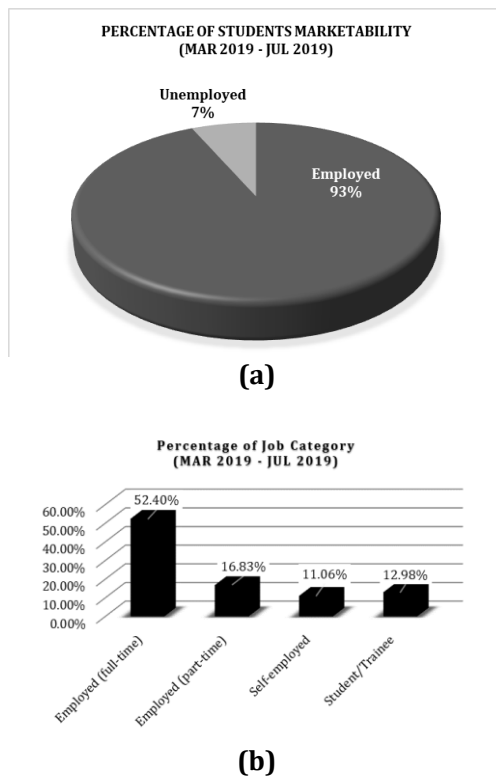


Figure 12. Percentage of graduates' (a) employment status and (b) job status

Based on Figure 13(a), most of them work in the science, technology and engineering sectors. Thus, we can say that most of the Faculty of Engineering graduates worked according to their study field. Hence, it shows there is a high demand from the industrial for these graduates. However, according to Figure 13(b), the highest salary range was between RM2,000 and

RM2,499.99. The second highest salary range was RM2,500 to RM2,999.99. These salary ranges considered low based on the current living standard in Malaysia. This factor can be motivation for graduates to pursue a career in engineering fields. This low salary range is one reason why many engineering graduates pursue a job internationally or a job in various fields. Furthermore, due to high competition to seek jobs as an engineer or an alternative opportunity, some graduates changed their careers.

This finding in line with the finding from Inge et al. (2020); the authors use motivation as the premise for career mobility and identified motivation. The government should do an immediate rectification action to avoid any migration of these engineering graduates. Otherwise, problems related to the low number of graduate engineers in Malaysia will never resolve.

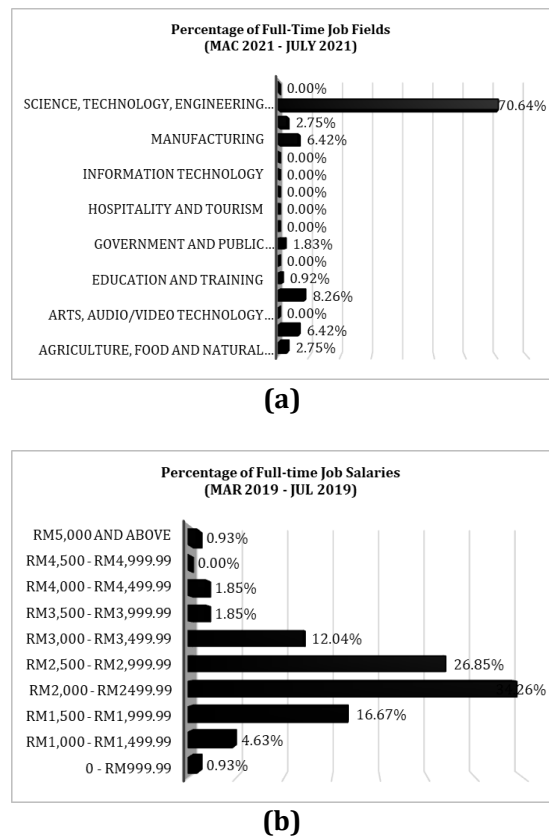


Figure 13. Percentage of graduates' (a) employment sector and (b) raw monthly salary

Finally, Figure 14 presents the percentage of entrepreneurship involvement among students before and after graduation. From the figures, we can see no change in the percentages of students engaged in the business. Other than those already involved in entrepreneurship, the data tells us there are no graduates who choose business as their full-time job. Hence, these findings help the faculty plan to increase students' interest to join the entrepreneurship field.

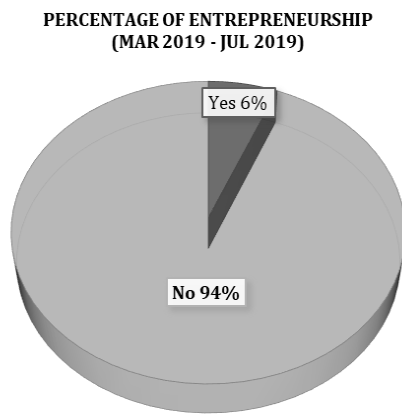


Figure 14. Percentage of graduates involved in entrepreneurship.

Conclusion

This section is used to acknowledge people who have aided authors in accomplishing the work presented as well as sources of funding. The AOE instrument was successfully executed and verified for its effectiveness. The instrument can reduce the time consumption in analysing plentiful data and increase data analysis accuracy. By sorting and matching all data, the instrument can generate many informative graphs based on employability attributes. Thus, the AOE instrument is significant to be used as a data collection and analysis instrument. Based on the statistical data, the faculty can take proper actions to increase the graduates' employability percentage for the next batch. Furthermore, the tracking functions such as WhatsApp links and emails help the coordinator to gather information quickly and efficiently. This instrument could help institution to evaluate the correlation between the curriculum design, student activities and employability prospects to secure jobs. In the future, we can conduct various employability analyses based on gender, community, salary and challenges. Moreover, the AOE instrument should have additional features to broaden employability criteria that can be collected and analysed.

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