

Employability of University Leavers Using a Descriptive Analytics Case Study

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Abstract—High and successful employment of university leavers has been a challenging key performance indicator for decades as a result of diverse life circumstances, life goals and travel need. The COVID pandemic and subsequent online delivery have added further challenges to the work-based placement and practical skill delivery, particularly in the STEM subject areas. The purpose of this study is to consider the recent past employment history and leavers data by looking into salient but yet unanswered questions about the activity of student leavers, employment type, relevance, and contribution of the degree programme and gain insight into course modification, employability support and market analysis. The latest Graduate Outcome Survey is in its infancy, and the current response rate is reportedly low. Therefore, a subset of Destination of Leavers from Higher Education (DLHE) data from an inner London university is analyzed and the results are visualized with findings. Among the participants of a computing case study, Computer Science graduates produced the highest earnings in comparison to any other courses. Additionally, undergraduate courses with the title of Computer Forensics or Business Computing produced the highest number of skilled workers in positions relevant to their qualification and produced the highest levels of employed Higher Education (HE) leavers after graduation, demonstrating that degrees that combine IT skills and other speciality skills have higher levels of proven employability.

Keywords—DLHE, employability, computing, survey

I. INTRODUCTION

Student and graduate surveys are challenging to implement and yet they form the basis of much of the decision-making that HEIs undertake. In fact, the data produced by these surveys provides a valuable source for the application of data analytics. The Higher Education Statistics Agency (HESA) gathers and analyses the DLHE data to support the aims and effectiveness of the education sector [1]. In addition to student satisfaction levels being used for internal and external accountability as a Key Performance Indicator (KPI) and brand development, it is also being used as a ranking measure for qualified incoming local and international applicants to compare and guarantee the best fit universities [2–4]. These KPIs further enable higher education institutions to develop

employability strategies and resources providing a return on investment for the students and graduates.

The advantages of the DLHE survey disseminated throughout the UK include encouraging students to evaluate teaching as well as providing access to vast data sources, delivering invaluable insight to universities. Other highly distributed surveys across the nation such as the National Student Survey (NSS) and Postgraduate Taught Experience Survey (PTES) also present their own strengths and weaknesses. In addition, many surveys, such as the DLHE survey in the present study, are updated and further developed or replaced to gather deeper insights through the use of more meaningful questions based on previous data.

In the survey, all the data collected were from students in the different courses but only using similar degree level makes it a controllable variable as it has identical level of education for all. Although there are some variables such as salary that is an uncontrollable variable as some participants have entered their hourly rates whereas some have mentioned their annual salary skewing the data and causing imbalance in the result. But these issues are addressed while cleaning and processing the data. The column that determines whether students have got grad or non-grad job is uncontrollable because the values cannot be assigned constant as this column influences the outcome of other columns too, such as whether they were satisfied with the various HE experience or not, what is their salary, job title, what is their current work status and more. Salary obtained by the students is an evident observable variable that distinctly demonstrates the correlation between how choosing some specific course such as Computer Science and IT could lead to a higher salary compared to other courses. Similarly, the contracting time for any role is also an observable factor to determine which jobs are frequently applied and high in demand courses.

II. LITERATURE REVIEW

The DLHE survey presents the advantage of gathering data relating to the activities of part-time and full-time graduates approximately six months after graduation. As the survey was previously active from 2012 to 2018, it has since been replaced by the Graduate Outcomes Survey (GOS) which collects similar information about the

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activities and perspectives of graduates 15 months after completing their course. The currently administered GOS helps institutions gain an insight into both career destinations and development in collecting the survey data, but it will be sometime before enough data is available [5].

Contrary to the NSS and PTES which are criticized for administering the survey while students are still studying, which can lead to responses being weighted more towards the students' most recent experiences, the DLHE and GOS allow students to reflect on their employability after having completed their course.

Both the NSS and PTES however, present the strength of breaking down student satisfaction into dimensions making institutions more accountable for quality and supporting the decision-making of future university applicants. This presents a suitably valid measure of student satisfaction in terms of its dimensionality and content and allows institutions to identify strengths and address areas for development at both a discipline and institution level [6–8].

Disadvantages of both the PTES and NSS include analyzing all questions as continuous variables in a categorical Likert scale which continues to be controversial in that the distance between the categories cannot be assumed to be the same [9]. Weaknesses of the surveys further include structural issues with the perceptions of quality as the survey results vary from year to year as students only complete the survey once. Sampling errors and the surveys' census approach result in data vulnerability to non-response biases that are unaccounted for in statistical significance testing. This could undermine validity in the sense that the unidimensional scale could be influenced by previous questions in a survey and where participants tend to avoid choosing extreme options on the scale which leads to response style biases [10]. The next section includes detailed information on the survey data and the purpose of our case study.

III. MATERIALS AND METHODS

The DLHE survey gathered information relating to the activities of undergraduates, first degree and postgraduate taught and research students. The leavers reported up to eight activities including: working (full-time or part-time), due to start a job in the next month, engaged in either further study, training or research (full-time or part-time), taking time out in order to travel, unemployed or doing something else (e.g., retired, looking after home or family). They were then asked to indicate which of the activities they considered to be the most important from the activities selected.

Responses to the questionnaire regarding post graduate activity, age, gender, nationality and ethnicity, employer, relevance of qualification to their current job, how the job was obtained, the nature of the employer (including size and basis), location, salary and whether the leaver planned to undertake further study, training or research were recorded as shown in the questionnaire in Fig. 1. The final sections of the questionnaire requested that the leaver rank their overall higher education experience in three

categories which are their experiences across Business, Study and Work.

For the purpose of this case study, the DLHE data was combined using the 2014/2015, 2015/2016 and 2016/2017 academic years from both the January and April census. After removing null values and values in which the HE leaver explicitly refused to provide, 136 responses were recorded for the DLHE 2014/2015, 123 responses were recorded for 2015/2016 and 111 responses were recorded for the 2016/2017 academic years.

To preserve student privacy and confidentiality, all identifiers such as the names of students and survey administrator personnel were removed from the database to anonymise the records. Three hundred and ninety-six participants participated in the combined DLHE surveys and were recruited via online, by post or telephone but as some crucial questions such as their course title, gender, etc were not answered so those records were removed based on the requirement of each question. Out of the 370 records, some did not mention their gender so after removing those records, of the remaining 241 participants (M = 188, F= 53) aged 20 to 57 years old (mean = 30.37, std = 8.82), all students were from a mid-sized School of Computing. Gender was not recorded for the 2014/15 dataset.

Figure 1. Page one of the DLHE questionnaire.

The present study aims to analyze the results of the DLHE survey administered by pooling the 2014/15, 2015/16 and 2016/17 academic years data to allow the development of an in-depth understanding of the

Computer Science subject area. The present analysis was completed using Python coding to clean and analyze the data. ‘Matplotlib’ and ‘Seaborn’ libraries were further used to visualize the results.

The data cleansing phase initially included mapping values from columns that contained similar values in order to standardize and ensure consistency, to later combine the columns in a uniformed fashion. This included transforming values in the 2014/15 dataset to combine with the 2015/16 and 2016/17 pooled years obtaining 396 but later some records are dropped as some crucial values such as their status of employment or being a student were left empty. Further steps in the data cleansing phase reduced the redundancy of columns which included renaming columns to match sentence case and account for the spelling and grammatical errors that would have originally made the columns differ between the three datasets. In addition, gender values were re-coded in the 2016/17 dataset, as titles were recorded instead (i.e., MR = male, MS = female). Furthermore, responses with ‘DR’ as the preferred title were assigned as null values.

To prepare the data for further analysis, the three years of DLHE datasets were loaded and merged using functions from the ‘pandas’ and ‘numpy’ libraries in Python. Once the datasets were merged, 26 null values were removed as they failed to provide any contribution to the present study and would be irrelevant for further analysis. In addition, rows were removed where students explicitly refused to provide name and course details; however, as other useful details may have been provided in these instances and could be used for further research in relation to the present study’s aims and objectives, separate data frames were created for each focus question and graphs were plotted accordingly to prevent a negative impact on the sample size of the dataset by omitting said values.

In conducting the analyses, 13 focus questions were formulated based on DLHE survey questions to better understand the present dataset, build insight and produce further knowledge to aid in the growth development of the department of the Computer Science subject area. The focus questions are as follows:

- (1) How many HE leavers are employed (full-time or part-time) against HE leavers who are unemployed based on HE leavers’ course?
- (2) How many HE leavers are involved in further study or research (full-time or part-time) against HE leavers who are unemployed based on HE leavers’ course?
- (3) How many HE leavers are taking time to travel or doing something else (e.g., retired, looking after home or family) against HE leavers who are unemployed?
- (4) How many HE leavers are working in Information Technology (IT) related work against all who are employed?
- (5) What is the average, maximum and minimum of HE leavers’ earnings from the HE leavers who are working?
- (6) What is the distribution of the places of work amongst the HE leavers?

- (7) What is the relationship between the qualification and the relevance of the HE leavers’ job?
- (8) On what basis have HE leavers picked their jobs?
- (9) What are the best ways HE leavers find their jobs?
- (10) What is the percentage of HE leavers who went on to pursue a PhD/MSc qualification against those who went for employment?
- (11) What is the percentage of HE leavers who went on to pursue a PhD/MSc qualification in London Met against HE leavers who went on to pursue a PhD/MSc elsewhere?
- (12) What is the preferred MSc course picked after the HE leavers studies?
- (13) How well did the courses prepare the HE leavers for their future?

As a variety of data is collected including the HE leavers profile, module and course level data, funding information and qualifications awarded, this can be used to address the consumer-corporate dynamic instilled in the higher education sector. The data collected and analyzed in the present study is used by numerous stakeholders and is essential in the creation of funding, KPIs, publications and league tables. The findings from the present DLHE data analysis have the potential to contribute to the Computer Science subject area by assisting in the implementation of warranted and data-driven changes to course structures when addressing areas for development.

To achieve uniformity across the three datasets, columns and their corresponding values were mapped to standardize the results for analysis. Examples include the ‘Employment’ and ‘Study Status’ in the 2014/15 dataset, and ‘Gender’ in the 2016/17 dataset. Further to this, ‘Overall higher education experience’, ‘Currency’ and ‘Type of Qualification’ were re-coded from numeric values to string values using the corresponding HESA code to value labels for better understanding.

Each focus question was addressed individually in removing null values as necessary and rows where the HE leaver explicitly refused to provide details. In doing so, only the required columns or columns relating to the question were applied, employing aggregate functions and groupings of columns to plot the values accordingly.

IV. RESULT AND DISCUSSION

Q1. How many HE leavers are employed (full-time or part-time) against HE leavers who are unemployed based on HE leavers’ course?

Fig. 2 represents the HE leavers employed in both full-time and part-time positions against those who are unemployed based on course title (n=286). The course distribution is further divided by academic year with different patterns such as cross bar, standard bar, big circular dots, stars and small polka dots showing HE leavers in full-time work, part-time work, primarily in work and also studying, primarily studying and also in work and unemployed respectively. Just over 90% of HE leavers reported being engaged in part-time or full-time work, whereas 9.63% reported being unemployed. There does not appear to be a significant difference across the three academic years. However, HE leaver levels and basis

of employment are highest for the 2014/15 and 2016/17 academic years of whom were enrolled in Computing and Business Information Technology. Furthermore, Computer Forensics and IT Security produced the highest number of employed HE leavers in the 2015/16 academic year. Of the HE leavers who opted to respond to the DLHE survey, most HE leavers engaged in full-time work graduated with a degree in Business Information

Technology, whereas the majority of unemployed HE leavers graduated with a degree in Computing. This may indicate that degrees that can be applied to a broader variety of applied work demonstrate higher levels of proven employability, i.e., graduates that were able to apply skills in both business and IT or Forensics and IT towards their career as opposed to solely IT alone.

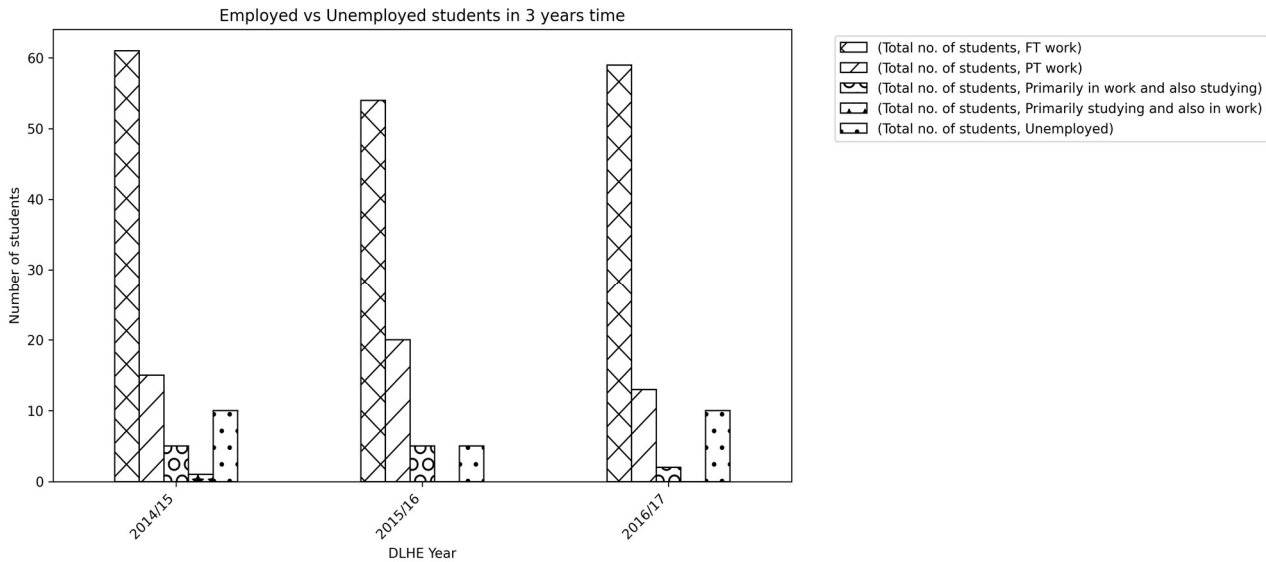


Figure 2. Employed vs. unemployed HE leavers based on course year and title.



Figure 3. HE leavers in further study against those that are unemployed per year.

Q2. How many HE leavers are involved in further study or research (full-time or part-time) against HE leavers who are unemployed based on HE leavers' course?

Fig. 3 indicates that across the three academic years, HE leavers were primarily engaged in further study, both full-time and part-time, as opposed to unemployed indicated by the stripped bars and polka dots in the graph respectively. Overall, there is a slight variation between the two in the 2014/15 and 2016/17 academic years, with the exception

of the amount of HE leavers engaged in part-time study which was significantly higher in the 2015/16 and 2016/17 academic years. The 2015/16 academic year presented the highest number of HE leavers engaged in further study as opposed to unemployed. Twice as many HE leavers across the years combined continued onto further full-time study than were unemployed. HE leavers opted to continue further studies in courses such as Computer Networking and Cyber Security, Computer Science, Computer System

Engineering and Computer Networking and IT. Interestingly, when assessing the total number of unemployed HE leavers across the academic years based on the graduated course of the HE leaver, Business Computer Systems, Computer Networking and Cyber Security and Computer Science did not produce any unemployed leavers. These findings suggest that HE leavers were more likely to be engaged in full-time further study or to be unemployed as opposed to engaging in part-time work or further study.

Q3. How many HE leavers are taking time to travel or doing something else (e.g., retired, looking after home or family) against HE leavers who are unemployed?

Fig. 4 depicts the total number of HE leavers who selected their most important activity as unemployed

against those who selected that they were doing something else (e.g., retired, looking after home or family). Overall, an average of over 50% HE leavers reported being unemployed across the three academic years; however, the highest levels of both activities were reported for the 2016/17 academic year. The majority of these HE leavers were retired, caring for someone and taking out time to travel respectively. For the 2014/15 and 2016/17 academic years, of those who reported ‘doing something else,’ the majority of these HE leavers were retired, followed by caring for someone and taking out time to travel. The 2015/16 produced the highest amount of HE leavers who were caring for someone (unpaid) and had no reported cases of HE leavers using the time to travel.

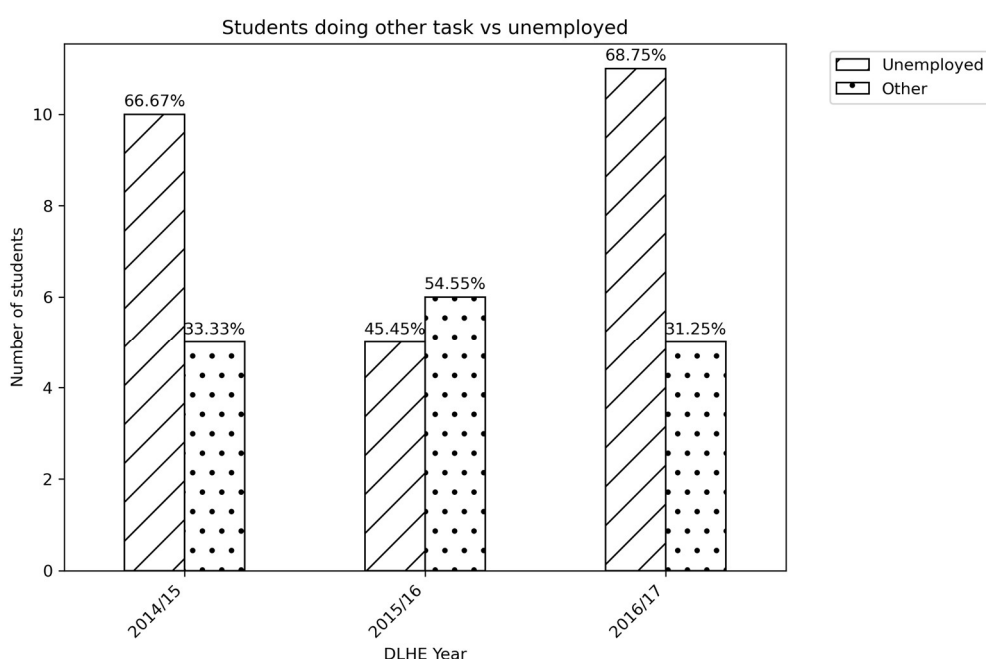


Figure 4. HE leavers ‘doing something else’ (e.g., retired, looking after home or family) vs those who are unemployed per year.

Q4. How many HE leavers are working in Information Technology (IT) related work against all who are employed?

TABLE I. IT VS NON-IT JOB HOLDERS BASED ON COURSE TITLE FOR ALL YEARS 2014–2017

Course Title	IT Job	Non-IT Job
Business Computer Systems (top-up)	5	7
Business Information Technology	10	12
Computer Forensics and IT Security	15	17
Computer Games Programming	3	1
Computer Networking	9	7
Computer Networking and Cyber Security	1	1
Computer Networking and IT Security	3	1
Computer Networking and Security with Work Experience	1	1
Computer Science	2	3
Computer Systems Engineering	2	1
Computing	8	18
Information Technology (Distance Learning)	4	2
Information Technology with Work Experience	1	1
Network Management and Security	2	2
Software Development	3	1
Grand Total	69	75

Within the 23 reported courses, Computer Forensics and IT Security in 2016/17 demonstrated the greatest number of HE leavers who obtained an IT related job after graduation. Interestingly, Table I also demonstrates that the same course in the previous 2015/16 academic year reported working at a non-IT related job after graduation. Courses such as Computer Systems (2016/17), Business Information Technology (2016/17), Computer Networking (2015/16) and Networking Management and Security (2014/15) support the previous findings in suggesting that as the aforementioned courses produced an equal amount of HE leavers who continued onto IT related and non-IT related jobs, this may indicate that multifaceted degrees, as opposed to IT alone, produce higher levels of proven employability.

Q5. What is the average, maximum and minimum of student’s earnings from the HE leavers who are working?

The average HE leaver in the School of Computing reported earnings of £22,454. Some of the salary below 20K are removed as they are just single- or double-digit

salary as some surveyors assumed it as their hourly rate and not annual salary. Fifteen percent of HE leavers who graduated with a Computer Science degree significantly produced the highest earnings in comparison to any other course with a salary of up to £160,000, whereas 68.45% of HE leavers who received the lowest earnings graduated

with a degree in Computer Systems and Engineering with a salary of up to £25,000. The top earners across the courses graduated with degrees in Computing, Business Computer Systems (top-up) and Software Development as represented in Fig. 5.

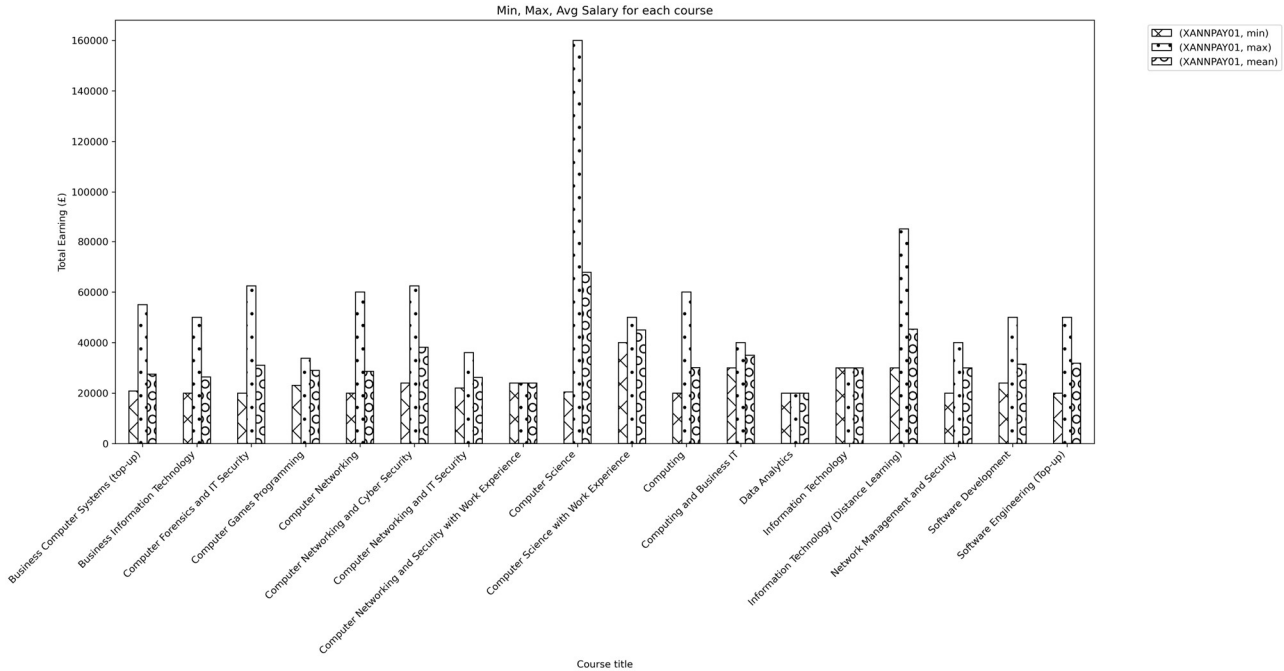


Figure 5. Minimum, maximum and average salary earnings per course from 2014–2017.

Q6. What is the distribution of the places of work amongst the HE leavers?

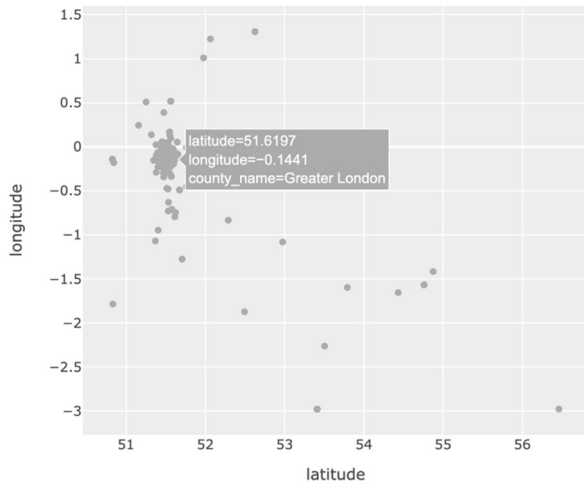


Figure 6. Scatter plot displaying latitude, longitude and county name from 2014–2017.

Across the three years, 84.1% of HE leavers were working in the Greater London area six months after graduation which is also evident in Table II. Fig. 6 displays the latitude and longitude, calculated using the reported postcodes, of the distribution of the places of work amongst HE leavers. As pictured above in the cluster, most HE leavers were working in the Greater London area and further dispersed in locations such as, Buckinghamshire, Merseyside, East Sussex and Essex. This yields great

confidence for upcoming graduates as many HE leavers started their careers capital city, irrespective of academic year with less than 10 HE leavers reporting relocation per county in the UK.

TABLE II. DISTRIBUTION OF HE LEAVER WORK ACROSS ALL THREE YEARS BY COUNT

County Name	Count of County Name
Bedfordshire	1
Berkshire	1
Buckinghamshire	9
Cambridgeshire	3
Dorset	1
Dundee City	1
Durham	4
East Sussex	6
Essex	6
Greater London	318
Greater Manchester	1
Hampshire	1
Hertfordshire	3
Kent	2
Merseyside	8
Norfolk	4
North Yorkshire	1
Northamptonshire	1
Nottinghamshire	1
Oxfordshire	1
Suffolk	2
Tyne and Wear	1
West Midlands	1
West Yorkshire	1
Grand Total	378

Q7. What is the relationship between the qualification and the relevance of the HE leavers' job?

Amongst the 2015/16 and 2016/17 academic years, the number of HE leavers who accepted a graduate job was nearly identical. However, 18% more HE leavers accepted a non-graduate position for the 2015/16 academic year than the 2016/17 academic year datasets. These results in Fig. 7 indicate that significantly more undergraduates from the Computer Science subject area have accepted positions that were relevant to their qualification. As the 2014/15 did not record graduate and non-graduate obtained position information, it has been excluded from the present findings. Of the HE leavers who continued onto graduate jobs in the 2015/16 academic year, the majority accepted associate professional and technical occupations where fewer HE leavers accepted leadership positions such as managerial, directorial and senior official roles. Within the same year, those who continued onto non-graduate jobs undertook

sales and customer service positions with few skilled trade occupations. This was also seen in the 2016/17 academic year. Contrarily, the 2016/17 academic year produced more professional occupations including managerial, directorial and senior official roles. As depicted in Fig. 7, graduates from Computer Forensics and IT Security, Business Information Technology and Computing degrees produced the highest number of skilled workers in positions relevant to their qualification. Graduates with degrees in Computer and Information Systems, Computing and Business IT and Computing and IT Security demonstrated the least amount of job relevance to attained qualification. In regard to HE leavers from postgraduate courses, degrees in Computer Networking and Security with work experience, and Data Analytics demonstrated higher job to qualification relevance than Computer Networking and Cyber Security.

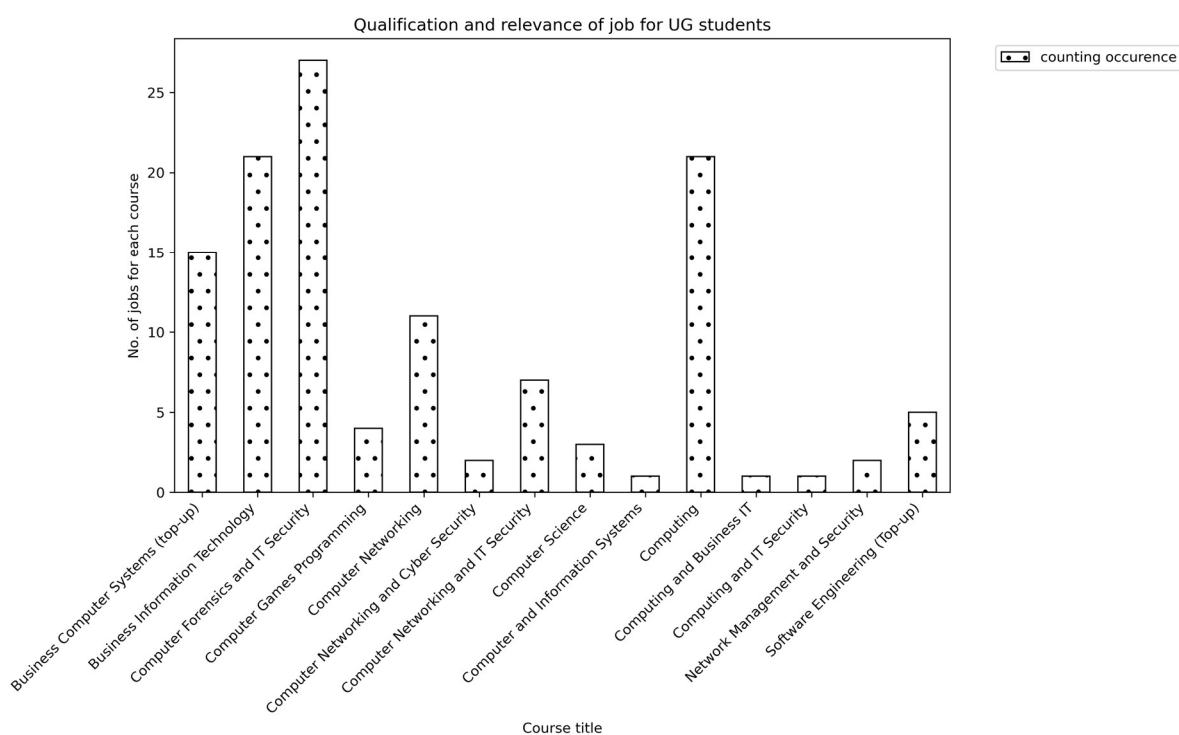


Figure 7. Relevance of job for each undergraduate course from 2014–2017.

Q8. On what basis have HE leavers picked their jobs?

In another analysis of the 2015/16 and 2016/17 academic years as the 2014/15 was not included due to variations in the questionnaire, the basis of which HE leavers picked their jobs is explored. The 2015/16 academic year presented the highest number of private sector job holders. HE leavers who completed a Computing course demonstrated the highest number of HE leavers working in private sectors. Fig. 8 displays that out of the 11 listed bases of job selection, more HE leavers found work on a permanent or open-ended contract, with the least amount developing a profession portfolio or creative practice. This was followed by fixed term contracts lasting at least one year and self-employed or freelance work respectively.

Q9. What are the best ways HE leavers find their jobs?

In section B of the questionnaire, nine options were listed to assess the how HE leavers first found out about their current jobs. In Fig. 9, cross bar strips, polka dots and round circles represent the 2014/15, 2015/16 and 2016/17 years respectively. The 2014/15 results demonstrate that the majority of HE leavers already worked at their place of work, including being on an internship or placement. In the 2015/16 academic year, the most successful means of HE leavers obtaining their jobs were via the employer's website. Whereas for the 2016/17 academic year, HE leavers most successfully obtained their jobs using a recruitment agency or website. These findings may suggest that with the advancement of technology, the means by which HE leavers are able to secure a job in the

workforce has also evolved. Amongst the three academic years, the most uncommon way of finding a job was

through Media (e.g. newspaper/magazine advertisement) or via speculative applications.

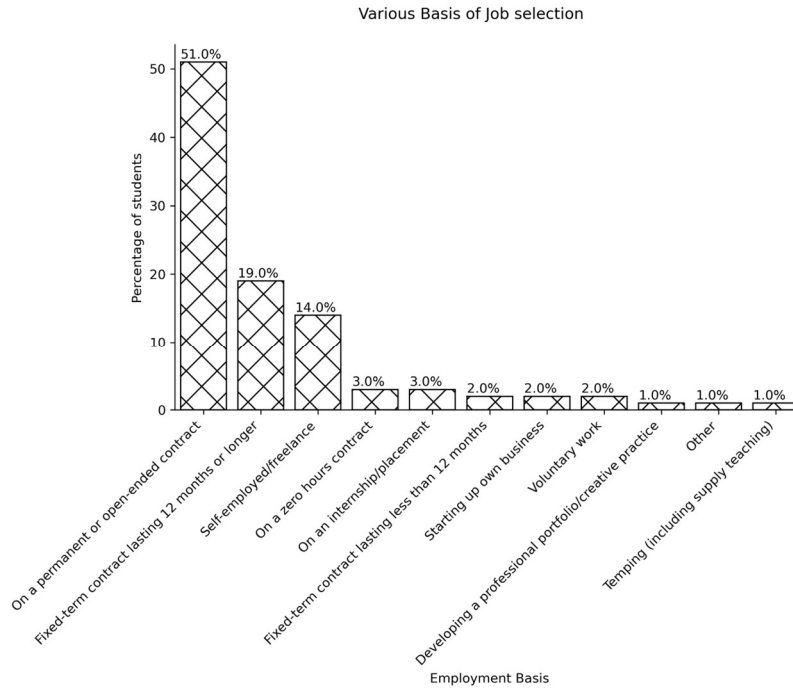


Figure 8. Various bases of job selection for 2015–2017.

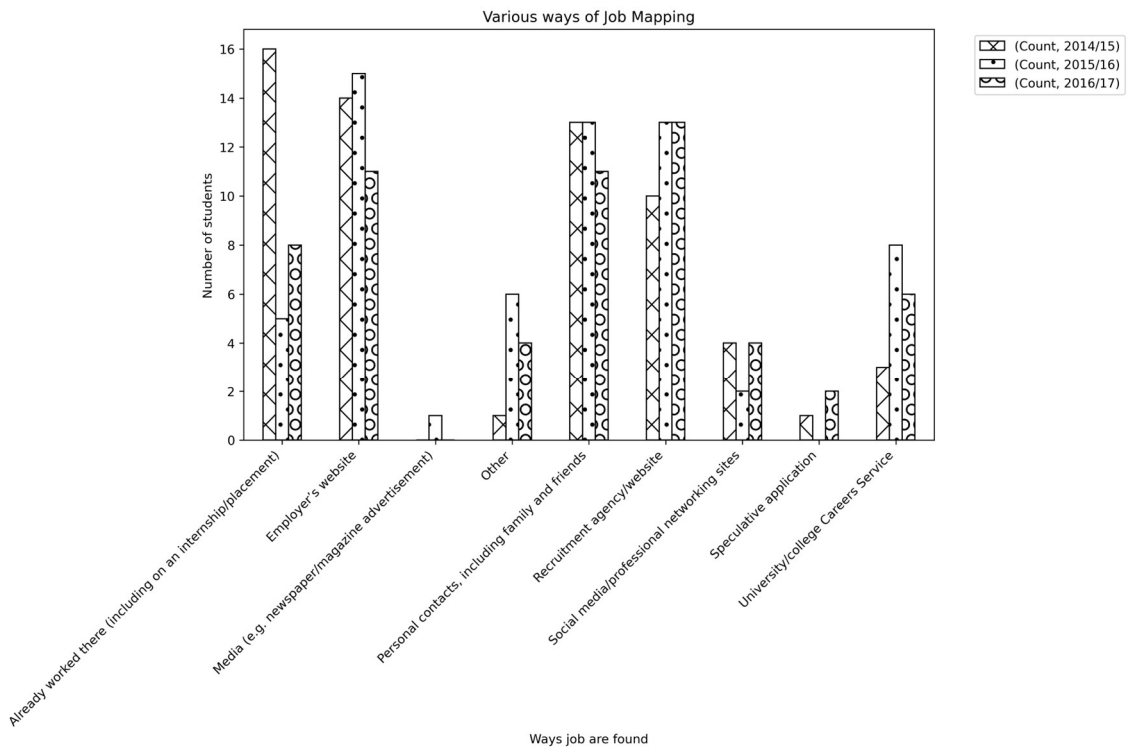


Figure 9. Various ways HE leavers found their jobs and the total number of HE leavers each year.

Q10. What is the percentage of HE leavers who went on to pursue a PhD/MSc qualification against those who went for employment?

Fig. 10 demonstrates that in all three years, the total number of HE leavers who were employed when the questionnaire was administered was relatively greater than the number of HE leavers who pursued a PhD or MSc

qualification with 77.56% of HE leavers in employment. The 2014/15 year presented the greatest number of HE leavers both employed and pursuing further higher education. The courses that produced the highest levels of employment irrespective of year were Computing, Computer Forensics and IT Security, Business Information Technology and Computer Networking. HE

leavers who undertook courses such as Computer Science, Computing and Computer Forensics and IT Security presented the most prevalent amount of those furthering their education.

Total students who went for a PhD/MSc qualification vs employment

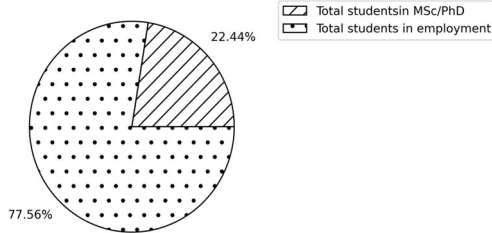


Figure 10. Total number of HE leavers who pursued a PhD or MSc degree against those who were employed.

Q11. What is the percentage of HE leavers who went on to pursue a PhD/MSc qualification in London Met against HE leavers who went on to pursue a PhD/MSc elsewhere?

Amongst the HE leavers who opted to further their education, 59% continued studying at the same institute, London Metropolitan University as represented in Fig. 11. Irrespective of year, a significant number of HE leavers continued their education at London Metropolitan University, however, the number of HE leavers began to decrease in the 2015/16 academic year. Leavers chose to pursue further study in and around London.

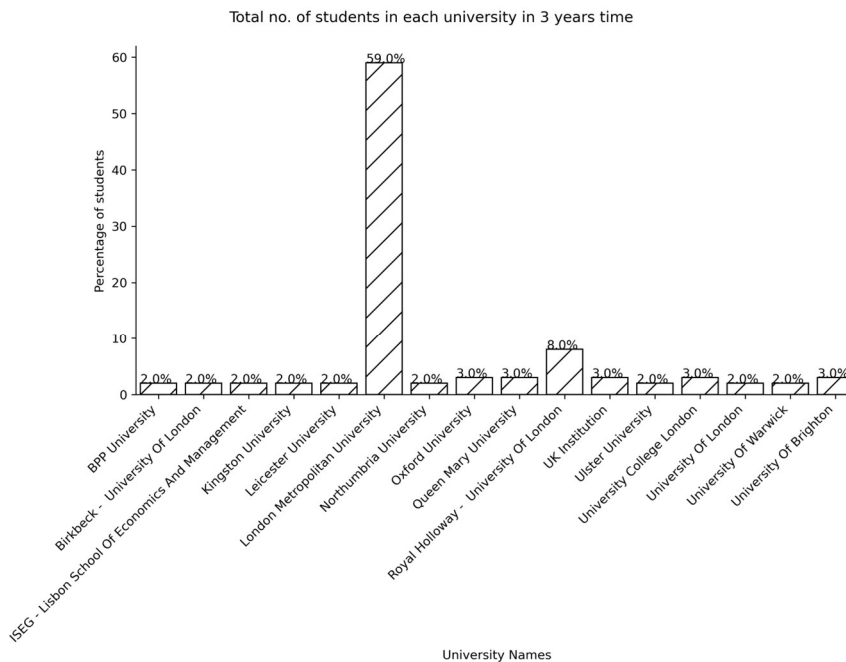


Figure 11. MSc at London Metropolitan University against other universities for all three years combined.

Favourite MSc Course in 3 yrs combined

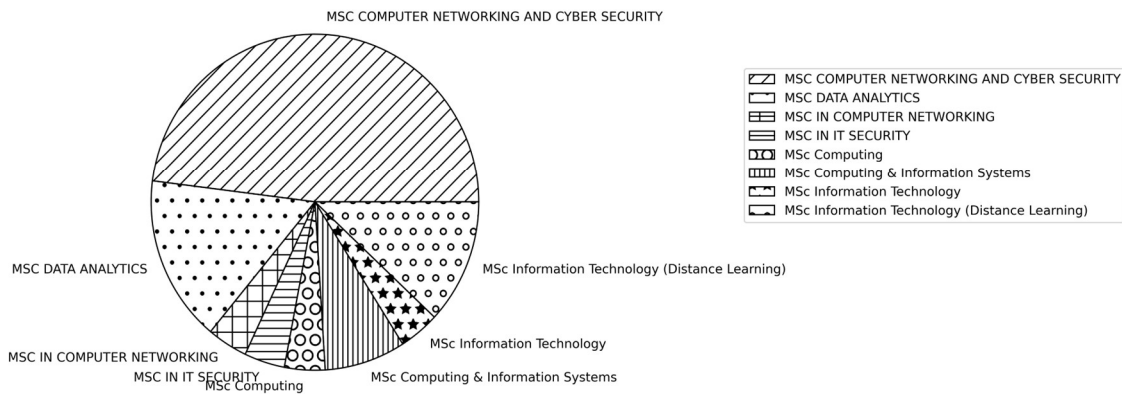


Figure 12. Preferred MSc course at London Metropolitan University for all three years.

Q12. What is the preferred MSc course picked after the HE leavers studies?

The preferred MSc course offered by London Metropolitan University by HE leavers was an MSc in

Computer Networking and Cyber Security which is represented in Fig. 12. The MSc in Data Analytics and MSc in Information Technology (distance learning) courses followed respectively. Although Computer

Networking and Cyber Security were the definite preferred amongst all three years, Data Analytics followed closely behind for the 2015/16 and 2016/17 academic years and Computing and Information Systems for the 2014/15 academic year.

Q13. How well did the courses prepare the HE leavers for their future?

Fig. 13 demonstrates that HE leavers from the Computer Science subject area reported overall positive feelings towards their perceived levels of preparation in business, further study, and work experience. The most positive reported feelings of preparedness were expressed towards further study, which is further reflected in the re-enrolment rates seen in those who chose to continue a post-graduate degree at their current institution.

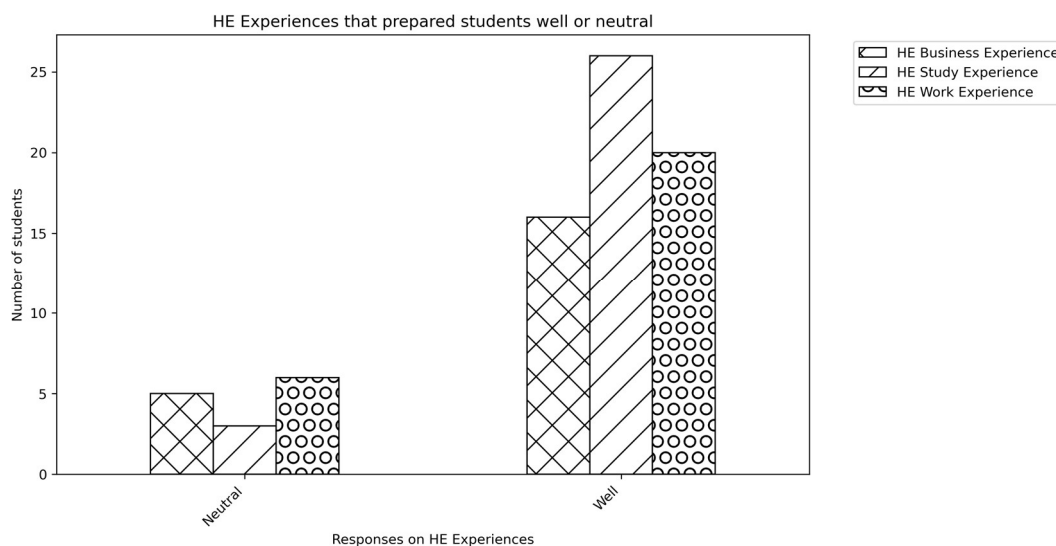


Figure 13. Overall higher education experience responses are 'neutral' or 'well' across all three years.

V. CONCLUSION

The present case study has revisited and evaluated important factors relating to the student experience by re-interpreting the findings of the 2014–2017 DLHE survey via focussed questions.

With regard to employment, we found that multifaceted degrees, as opposed to Computing alone produced the highest levels of proven employability. These graduates also produced the highest number of skilled workers in positions relevant to their qualifications. We have found that observable variables such as the courses selected, contracting basic of a job and location are some determining factors to select one job over the other but some factors such as prior experience, taking online courses or placement/internships taken could lead into obtaining graduate and qualification related role. Since these factors aren't assigned as a constant factor while taking the survey henceforth these are uncontrollable variables in the dataset. We also found that HE leavers were most successful in attaining their reported job positions via the employer's website and that average earnings of £22,454 were reported just six months after graduation, with Computer Science graduates producing the highest earnings in comparison to any other course.

With regard to further study, we found that the majority of HE leavers opted to continue further studies in multifaceted Computing courses, including Computer Networking, Cyber Security and Computer Systems Engineering. We also believe that many students have a proclivity to remain at their current institution for

postgraduate study, particularly where there may be financial incentives to do so.

A valuable future aim could be the analysis of data at the transition point of DLHE and GOS. The merging and aligning of disparate data is an area where data science tools and techniques can be very serviceable. Further, as the GOS contains more nuanced questions designed to elicit reflective responses, for example, related to subjective wellbeing, the analysis itself can be more nuanced. Many institutions may find that continuous and informal engagement with new graduates may be beneficial as they await GOS data to be available after 15 months.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

SF and PP conceived and supervised the presented idea. SS developed theory and performed analysis and computation. SF and PP verified and supervised the findings. MP wrote the manuscript with support from SS and SF. SS and SF interpreted the results and finalized the designed figures and tables. All authors discussed the results, commented on the manuscript, and had approved the final version.

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