Department for Business Innovation & Skills

RESEARCH

Computer Science Graduate Employability: qualitative interviews with graduates

Contents

1. Executive summary

Context and background

1.1   IFF Research were commissioned by BIS in 2015 to conduct a series of qualitative interviews with a group of computer science graduates to better understand the experiences and activities that might be behind the (lower) employment outcomes associated with this group.

1.2   The research involved 64 qualitative telephone interviews conducted in autumn 2015 with individuals who graduated from an undergraduate Computer Science degree in 2010/11. The sample was purposely skewed to include a higher proportion of certain groups of computer science graduates in order to help understand the particular employment challenges faced. For example, graduates who were not in work six months after graduating and/or 3.5 years after graduating were over-sampled, as were graduates who had attended lower tariff Higher Education Institutions (HEIs) (see chapter 2 for further detail on the profile of the graduates interviewed). Interviews, on average, took just under an hour to complete.

1.3   The specific objectives of the research were to understand:

- Computer science graduates' routes into employment and the steps they take to improve their outcomes and employability since graduation, including training, employment and job-search activities;

- Computer science graduates' views on why outcomes appear relatively poor six months after graduation (but improve after 3.5 years);

- The experiences, actions and motivations that appear to make a difference to improving skills and employment outcomes – generally and to computer science-related ('tech specialist') jobs;

- Computer science graduate views on the value of degree accreditation to employability;

- How patterns might vary between different groups of computer science graduates e.g. by course-type, institution-type, age, gender, as well factors associated with their attitudes and outcomes.

1.4   This chapter summarises the headline findings from the report. Further detail is provided within the main body of the report.

1.5   Respondents are referred to as 'graduates' throughout this report. This terminology is used even, for example, where experiences of undergraduate learning are discussed because the interview required respondents to reflect in hindsight on their course and other experiences in the time since they graduated.

1.6   The sample for the study was drawn from Computer Science graduates who responded to the Longitudinal Destinations of Leavers from Higher Education

(LDLHE) survey in November 2014 – March 2015. The survey, which is collected annually by the Higher Education Statistics Agency (HESA), considers graduate destinations 3.5 years (or 40 months) after leaving HE (i.e. individuals who graduated from their computer science course in 2010/11).

1.7   The purpose of the study, therefore, is to explore in detail what might lie behind lower employment outcomes experienced by computer science graduates, rather than provide an overview of what computer science graduates have experienced more generally in the job market since graduating.

1.8   HESA data indicates that computer science graduates are five percentage points more likely to be unemployed 6 months after graduating than other graduates overall and six points more likely than STEM graduates (13.0% of 2012/13 computer science graduates; 7.6% of 2012/13 graduates; 7.0% of 2012/13 STEM graduates[1]). Similar patterns have persisted for a number of years, and although the differences are significant it represents only a small minority of computer science graduates that are 'holding back' the cohort overall below average levels of employment.

1.9   As this study (and 2012/13 Longitudinal DLHE findings) suggests, employment levels among computer science graduates increase closer to the average over time (5.4% of 08/09 computer science graduates were unemployed 3.5 years after graduating – compared with 3.4% of 08/09 graduates overall and 3.0% of 08/09 STEM graduates[2]) – it is therefore possible to extrapolate that there are issues for a minority of computer science graduates, specifically with the pace at which they progress to employment.

1.10   Individuals who had experienced less positive employment outcomes and/or had demographic characteristics more generally associated with less positive outcomes were over-represented in the study (compared to the overall population of computer science graduates). In particular:

•   Those not in work 6 months after graduating;

•   Those not in work 3.5 years after graduating;

•   Those who attended an HEI with lower entry requirements;

1.11   Computer science graduates with certain demographic characteristics were also over sampled so as to allow for analysis by particular subgroups. As part of this, female graduates were over-represented in order to provide a large enough sample for analysis by gender.

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[1] 2013/14 Early Destinations of Leavers from Higher Education (EDLHE) (12/13 graduates) available at: www.hesa.ac.uk/index.php?option=com_pubs&Itemid=&task=show_year&pubId=1714&versionId=54&yearId =292
[2] 2012/13 Longitudinal Destinations of Leavers from Higher Education (LDLHE) (08/09 graduates) available at: www.hesa.ac.uk/index.php?option=com_pubs&Itemid=&task=show_year&pubId=1708&versionId=36& yearId=306

1.12 On this basis, the findings are not, nor were they intended to be, representative of all computer science graduates. Indeed, it would be problematic to attempt to draw conclusions about all computer science graduates on a sample of 64 respondents (even if they were selected to match a known population profile).

1.13 On this front, several coherent messages and recurring themes have emerged which will help BIS understand existing data observations about this cohort of computer science graduate outcomes. What the study cannot fully provide is an indication of the extent to which these findings are unique to computer science graduates or shared by other graduate groups as no corresponding research was carried out with other groups. However, it may well be the case that messages are applicable to other types of course.

Summary of key findings

1.14 Graduates in this study were motivated to study computer science at HE level because they had an interest in the subject area and were further encouraged by the notion that graduates with such skills were in demand (a handful were aware of the skills shortage in the computer science industry) and as such would enjoy good career prospects. There is evidence that graduates undertook some research prior to selecting a specific course and / or institution and that this incorporated a general review of provider ranking and reputation. However, the level of research carried out by graduates into the specific employment outcomes of different HE providers was limited. Some, however, considered course content and structure (e.g. sandwich courses) when making their applications.

1.15 The perception held by several graduates that they would be in high demand from employers after graduation sometimes manifested itself as complacency further down the line when they came to apply for jobs. Some adopted a blanket approach to submitting CVs and did not tailor their applications to specific roles.

Misplaced conception of what is considered a 'good' course at the point of applying to HE providers and computer science subjects.

1.16 Course satisfaction changed with time as graduates tried to enter into employment. Most were happy at the time of their study, but further down the line graduates reassessed the value of their course as they found it had not always adequately prepared them for the working world. This was especially the case among those who had less understanding of computer science upon applying to university or conducted little or no research when selecting their provider and / or course.

Course and HEI selection based on convenience linked in some cases to less positive employment outcomes.

1.17 Convenience of location was a commonly cited reason for HEI selection amongst graduates with less positive employment outcomes, and was sometimes the sole or most important factor for them. This was linked to affordability, with some graduates wanting to continue living at home with parents and/or be within commutable

distance to the HEI, or in some cases personal circumstances (such as health issues or family responsibilities).

1.18 In contrast were graduates who took into account other factors when selecting their HEI, such as employment outcome stats and careers advice. While these graduates generally did not research every aspect when choosing their course and HEI, and were not able to fully anticipate all factors that would enable them to find work effectively after graduation, they were certainly better placed than several individuals who, by limiting their choice or even simply 'defaulting' to their nearest HEI, restricted their access to certain opportunities – especially those regarding the availability of work experience. This was more likely to be the case for graduates based in regions away from centres of industry such as the west or north east of England. James' case study **(detailed case study 3)** is a good example of this.

Course accreditation is of little significance to graduates when selecting their course and further down the line.

1.19 Even though the vast majority of graduates may have taken a BCS accredited course, they were either unaware of course accreditation or ambivalent about its impact and value. As such, course accreditation had little or no influence on graduates when choosing their specific course or HE provider. Among graduates who had not taken an accredited course, none felt this was something that had held them back or something they would change in hindsight.

Mixed views among graduates about how well computer science courses prepare them for the world of work and whether the balance between technical and general skills is right.

1.20 Graduates in this study who studied more specialist courses tended to think that their course was relevant to computer science related jobs / employers. On the other hand they also thought that they lacked more transferrable skills that would allow them to work across industries and even softer skills to help them interact in the workplace.

1.21 Most graduates felt that their course provided opportunities to develop soft skills, although the nature of this provision varied. While a few graduates said they developed soft skills through specific modules on employability, or team working and presentation opportunities, most were generally expected to 'pick up' soft skills during the lifetime of their course, i.e. provision was less structured.

1.22 In terms of technical skills, several graduates stated that after graduating they lacked knowledge and experience of different programming and coding languages. Additionally, a number of graduates found that some aspects of their course were outdated by the time they entered into employment. Computer equipment, technical facilities, software operating systems, programming content and other areas of technical focus were all mentioned by graduates in this context.

1.23 More generally, graduates felt that their university hadn't done enough to prepare them for work in terms of commercial skills and business acumen. Linked to this, a

lack of awareness about the options and pathways into employment as well as the services available to them when making key career choices.

1.24 Graduates acknowledged that the fault does not lie entirely with institutions; many became frustrated, unsurprisingly, when they struggled to find work after graduating and some commented on what they considered to be potential employers' unclear and differing expectations of new recruits. According to a handful of graduates, employers want a 'jack of all trades' on the one hand, but on the other a candidate with specialist skills. Indeed, many (around half of graduates) initially applied for general IT / computer science related roles after graduation with a broad job description and range of responsibilities. However, at the point of interview these graduates were told that they were missing specific skills which were necessary to do the job (e.g. programming languages). This was a point of frustration for many, prompting them to change their approach to job applications and / or undertake further training or education to develop their skillset.

Work experience was considered to be crucial to securing employment in the computer science industry. Work experience while at university was particularly helpful for securing employment immediately / soon after graduation.

1.25 Among those interviewed, work experience opportunities were most commonly generated by graduates themselves, either by purposively selecting a sandwich course or by independently organising a placement themselves.

1.26 In a handful of cases students had organised their own placement but had used HEI resources or facilities to do so - for example one student had found a job advertised on the careers section of their HEI website. Some students, while having a placement organised as part of their sandwich course, actually considered themselves to have organised the placement - presumably because they were responsible for the logistics of setting the placement up.

1.27 Graduates considered work experience – ranging from general to technical placements as well as purpose designed sandwich courses which incorporated a year in industry – as very important in terms of improving their employability not only because they learned new skills but because having this experience on their CV was a way of evidencing their skills, experience and employability to employers.

1.28 Overall graduates thought such placements were more impactful in terms of softer skill development than technical skills (although a positive impact on technical skills was reported by many).

1.29 Most graduates in this study felt that any work experience would improve their employability in general. However, placements which were directly related to a subject of interest or which enabled the development of specific skills, were particularly beneficial in helping to develop graduates' careers.

1.30 The majority of those who had not undertaken any form of work experience later rued this decision, seeing it as a lost chance to boost employment prospects, forge industry contacts and build on the skills and knowledge acquired from their course.

1.31 A number of those who did not undertake work experience had made the active choice not to. A number of graduates admitted they had not realised the importance or value of gaining work experience at the time. Some had chosen to prioritise their studies over work experience, were keen to complete their studies before entering the labour market, or cited reasons relating to (in)convenience – such as the distance of travel involved – for not taking up work experience during their course.

1.32 Graduates who felt that a lack of technical and / or soft skills had held them back from finding work in computer science had, without exception, taken a course that did not incorporate a sandwich placement. This underlines the importance of work experience in enhancing computer science graduate employability – as a way of developing and improving skills and becoming 'work ready' in the eyes of employers.

Some links with private industry were forged during sandwich placements, but these were not long lasting and had little impact on a graduate's career trajectory.

1.33 The research suggests that any contacts made with industry while on sandwich placements were not always maintained and so did not bear fruit when graduates later sought employment. Gaining skills and being able to show relevant work experience on a CV were considered more important for securing work in the future, than developing contacts or networks.

Most graduates interviewed had taken some action to improve their job-chances and specific skills whilst and since leaving HE (and before entering into employment).

1.34 Most graduates had received some careers advice or guidance (formal or informal) while studying at university. Graduates more actively sought informal advice through channels such as lecturers, friends and family, and less so formal guidance at careers events and fairs which were generally considered less helpful than informal sources (as advice was felt to be generic). Of the small number who had not sought careers advice whilst at university (as they felt they did not need it), the majority thought it could have been useful to them in the longer term and that the university should have done more to ensure that careers advice was offered and taken up. There was no evidence of careers advice being sought after graduation among those interviewed (though this was not specifically explored in the interviews).

1.35 Most graduates had taken some form of action to improve their employability since graduating from their courses. Small numbers had gone on to postgraduate computer science based study, others had gone on to formal training in business and project management and some had undertaken self-learning via online.

1.36 There were a handful of cases where graduates supplemented computer science related postgraduate study with business / project management training – this tended to be a job seeking strategy – i.e. to try and set themselves above other applicants with both industry-specific and more general business credentials.

1.37 Where graduates had undertaken more informal self-learning, this tended to be a strategy to improve performance / achieve progression within a job they were in at the time – rather than being a job seeking strategy.

Graduate job search strategies compromised with time.

1.38 Most graduates interviewed aspired to enter employment upon graduation (a few entered further study such as a master's and a few started PhDs), however the point at which they entered employment varied. Many began their search for employment before graduation and those who didn't had generally wanted to prioritise their studies before embarking on their job search.

1.39 Virtually all graduates initially pursued employment in computer science roles. Some targeted very specific roles - including usability and software development, web development and forensic computer science roles – whilst others opted for more generic roles but within the computer science sphere. Job searches were invariably conducted online - mostly using general job portals as opposed to industry specific sites.

1.40 There was wide agreement among graduates that finding jobs to apply for was relatively straightforward, the challenge came in securing these positions, and in many cases even just being invited for interview. This meant that many who started out by targeting specific roles, broadened their search and applied for a wider array of positions and in more extreme cases, roles outside of computer science altogether.

1.41 There is little evidence to suggest that once in employment graduates receive much / any formal or structured training in the workplace – a key concern given that several graduates considered keeping skills up-to-date a barrier to securing a job in the first place. Any skill development is usually done so through informal on-the-job training.

1.42 There was little difference between the skills development reported by graduates working for (or who had worked for) larger and small employers respectively (although this was not explored fully in the topic guide). Graduates in more 'technical roles' received less training compared to those in 'customer focused' ones. Those in 'technical roles' felt that they had started their jobs better prepared and ready for their line of work. The sense was that graduates in 'technical roles' were more likely to have targeted their applications towards a particular type of work, and applied for roles which suited their skills set – as a consequence they put forward that they were less likely to need further skills training.

Strong evidence of positive career outcomes by the time of research.

1.43 The vast majority of graduates interviewed were in employment over the period the research was conducted. The majority of which were working in full-time, permanent roles which made use of their computer science skills at least to some extent. A significant proportion of roles were at the professional level, and many graduates interviewed commented that they would be happy to stay in their line of work for the foreseeable future. There is evidence of a career progression 'slow burn' whereby

graduates initially take up low level roles and eventually build up experience and skills, ending up in roles that are more computer science based.

1.44 A few graduates ultimately ended up pursuing a career completely outside of the computer science sphere and for them their HE experience has become increasingly less relevant with time. However those who have moved into other industries consider these outcomes to be positive and agreeable to them.

1.45 Graduates in this study who entered employment in computer science related jobs are happy to remain in their line of work because these roles fit into their longer term career plan. Low / junior level roles are used as a 'springboard' by some graduates to further develop their career and chances of progression.

1.46 Overall, the findings of this study indicate that a number of related factors were at play in shaping the employment outcomes of the computer science graduates interviewed. While to some extent outcomes were shaped by the individual choices of the graduates themselves – such as a choice of whether or not to take up a work experience placement – some graduates also seemed to lack support in their decision making and / or to have little awareness or understanding of the factors associated with positive outcomes at the time of making key decisions about their future.

1.47 Among those interviewed, some graduates expressed a desire for greater guidance on employer expectations, and others felt that their HEI could have better prepared them for 'the world of work' in terms of developing their employability skills and knowledge. Of course it is not possible to determine with accuracy the extent to which any of these factors influenced computer science graduates' employability outcomes, but among those interviewed, these factors all had a part to play.

1.48 These issues will be explored in more depth in the main body of the report and conclusions chapter.

2. Introduction

Context and background

2.1 Data indicates that computer science graduates are more likely to be unemployed six months after graduating than the average graduate and STEM graduates in particular. Employment outcomes for computer science graduates significantly improve 3.5 years after graduation although they are still lower compared to other graduates.[3]

2.2 These findings are seemingly contradictory to evidence of increasing employer demand for digital skills and above average levels of recruitment difficulty in the ICT sector.[4]

2.3 There is evidence that computer science is one of the least competitive degree-level subjects to apply for[5]; also, computer science graduates have comparatively low levels of prior attainment and are less likely to achieve first class honours and more likely to achieve third class honours in their degree.[6]

2.4 To better understand these issues, and to support the government's science and innovation strategy, the government asked Professor Sir Nigel Shadbolt to conduct a review of computer science degree accreditation and graduate employability.

2.5 The Shadbolt Review links to the parallel Wakeham Review of STEM degree provision and graduate employability, which is exploring whether there are other STEM disciplines which suffer from relatively poor graduate employment outcomes and would warrant similar Shadbolt-style investigation, and which has been broadly divided into the following evidence-gathering phases:

- Analysis of HESA data including the Destinations of Leavers from Higher Education (DLHE) surveys (of 2008/09 leavers 3.5 years after graduation and 2011/12 and 2012/13 cohorts six months after graduation);

- An online survey of stakeholders to gather perspectives on graduate employability and accreditation systems in computer science among key stakeholders – including universities and colleges, business and industry, professional, statutory and regulatory bodies;

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[3] For example see HESA's statistical first release (www.hesa.ac.uk/sfr217) or HEFCE's interactive data tool (www.hefce.ac.uk/analysis/supplydemand/destination/).
[4] 'UKCES Technology and skills in the Digital Industries' available at: www.gov.uk/government/publications/technology-and-skills-in-the-digital-industries
[5] 'UCAS 2015' available at: www.ucas.com/corporate/data-and-analysis/ucas-undergraduate-releases/ucas-undergraduate-end-cycle-data-resource-5
[6] 'UCAS 2015' available at: www.ucas.com/corporate/data-and-analysis/ucas-undergraduate-releases/ucas-undergraduate-end-cycle-data-resource-5

- A series of focus groups with employers, universities, professional bodies and students, to consider supply and demand for computer science graduates, the nature of the skills gap, and the role played by accreditation in employment outcomes.

2.6 This report presents findings from a qualitative survey of computer science graduates, complementary to the Shadbolt Review, intended to provide a valuable insight into the views of this particular group. IFF Research was commissioned by BIS to carry out research that would enable better understanding of:

- Computer science graduates' routes into employment and the steps they take to improve their outcomes and employability since graduation, including training, employment and job-search activities;

- Computer science graduates' views on why outcomes appear relatively poor six months after graduation but improve after 3.5 years;

- The experiences, actions and motivations that appear to make a difference to improving skills and employment outcomes – generally and to computer science-related ('tech specialist') jobs;

- Computer science graduates' views on the value of degree accreditation to employability;

- How patterns might vary between different groups of computer science graduates e.g. by course-type, institution-type, age, gender, as well factors associated with their attitudes and outcomes.[7]

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[7] Overall, there are limitations to the extent to which the research is able to provide an insight into how experiences varied between different groups of computer science graduates. The number of interviews achieved (64 is a good base size for a qualitative study of this nature, but does not enable robust comparisons between demographic groups) and the sheer range of graduate experiences and circumstances, mean making generalisations problematic. Where relevant and appropriate, however, findings relating to specific groups are discussed in this report.

Methodology

2.7 The research involved 64 qualitative interviews conducted over the phone with computer science graduates. Fieldwork was conducted in September 2015 with interviews lasting just under an hour on average.

2.8 The sample for the study was drawn from computer science graduates who took part in the Longitudinal Destinations of Leavers from Higher Education (LDLHE) in November 2014 – March 2015 which covered graduate destinations 3.5 years after leaving HE (i.e. individuals who graduated from their computer science course in 2010/11).

2.9 To be eligible to take part in the study, graduates had to meet the following criteria:

- Graduated in 2010/11 in a computer science subject;

- Studied at undergraduate degree level;

- Graduated from an English HEI;

- Were domiciled in the UK at the time of enrolment;

- Completed the 2014/15 LDLHE survey;

- Consented for their contact details to be passed on to HESA and BIS's survey partners.

2.10 In total, 1,997 graduates met the first five of these criteria (i.e. prior to factoring in consent for their contact details to be passed on) – representing the sample population (N.B. this is the known population – i.e. individuals who responded to both DLHE and LDLHE surveys, rather than the overall population of 2010/11 computer science graduates). Just over two-fifths of these consented for their details to be passed on leaving 856 individuals who could be contacted for the study – i.e. the available research sample.

2.11 In order to meet the research objectives it was important to cover the full range of employment outcomes at 6 months and 3.5 years after graduation. Accordingly, the sample was split into four key groups depending on their activity at these two points in time as shown in table 2.1.

Table 2.1. Sample by employment activity at six months and three and a half years after graduation

Graduate groups by employment outcomes	Sample Population n.	% of Sample Population	Available sample	Interviews achieved n.	Interviews achieved %
Group 1 - In work at 6 months; in work at 3.5 years	1,367	68%	591	14	22%
Group 2 - In work at 6 months; not in work at 3.5 years	76	4%	36	11	17%
Group 3 - Not in work at 6 months; in work at 3.5 years	401	20%	159	24	38%
Group 4 - Not in work at 6 months; not in work at 3.5 years	153	8%	70	15	23%
Total	**1,997**		**856**	**64**	

2.12 A cap was placed on the number of interviews achieved in group 1 – who were in work both at 6 months and 3.5 years after graduation – even though this group make up two-thirds of the population. Instead, groups 2 to 4 were over-sampled in order to fully explore the less positive employment outcomes (at different points in time). As a result, two-fifths (40%) of graduates interviewed were not in work 3.5 years after graduation – a higher proportion than found in the population (12%).

2.13 An objective of the study was to unpick the relative improvement in employment outcomes from 6 months after graduation to 3.5 years, therefore the greatest number of interviews were conducted with those who had progressed from non-employment to employment between 6 months and 3.5 years after graduation (Group 3).

2.14 A further objective of the study was to understand how outcomes vary between different groups of graduates. Data indicates that, compared with other degree subjects, there are a disproportionally high number of computer science entrants from Black and Minority Ethnic (BME) backgrounds and a disproportionally low number of female entrants. In order to ensure the experiences of both groups were covered in detail, BME and female graduates were over-sampled.

2.15 Minimum targets were set by region to ensure a spread and help understand how graduates' experiences of seeking employment vary in these different areas.

Table 2.2. Sample size by demographic characteristics

Graduate demographics	Sample Population n.	% of Sample Population	Available sample	Interviews achieved n.	Interviews achieved %
Male	1,610	81%	683	46	72%
Female	387	19%	173	18	28%
BME	534	27%	229	20	31%
Non-BME	1,463	73%	627	44	69%
North	525	26%	233	21	33%
Midlands & East of England	597	30%	255	15	23%
South	825	41%	349	27	42%
Total	**1,997**		**856**	**64**	

The impact of sandwich placements was of key interest and so graduates who had undertaken such placements were over-sampled. As mentioned, HE level computer science courses are known to be less competitive to apply for and entrants have low prior attainment levels. Targets were therefore set to ensure that the majority of interviews were conducted with graduates from courses with lower entry requirements.

Table 2.3. Sample size by demographic characteristics

HE learning	Population n.	Population %	Available sample	Interviews achieved
Full-time course	1,669	84%	705	55
Part-time course	328	16%	151	9
Sandwich placement	344	17%	155	14
No sandwich placement	1,653	83%	701	50
HEI tariff quartile 1 (highest entry requirements)	54	3%	19	1
Quartile 2	173	9%	70	7
Quartile 3	825	41%	368	47
Quartile 4 (lowest entry requirements)	718	36%	307	9
Not known	227	11%	92	0
Total	**1,997**		**856**	**64**

2.16 It is important to note that the profile of graduates targeted for the study was not intended to be representative of all computer science graduates. Rather, as detailed earlier in this chapter, certain groups of key interest were over-sampled in order to better understand graduates' views of less positive employment outcomes.

'Group' summary case studies

2.17 Unlike the more detailed case studies used throughout this report (which show how a variety of factors, from course selection through to choices made after graduation, combine to influence graduate employment prospects), the following case studies act as 'snapshot' examples of the four 'groups' of employment outcomes at 6 months and 3.5 years (which were used to build the survey sample – as per Table 2.1). These examples are intended to provide a flavour of the actions and circumstances which may explain variations in employment outcomes since graduation.

Group 1 Case study: Lee
Male, Non-BME

UCAS Tariff Quartile 2, No Sandwich Year, Full-Time Course

Lee's career started soon after graduation and has continued to progress upwards

Lee's job search was targeted and was closely linked to the skills he acquired on his degree. He works as an ethical hacker and has been promoted within the same company.

I am very satisfied because I seem to be progressing rather quickly. Everything's going the way it should be.

At all stages Lee had a clear idea of what was expected of him to secure certain types of employment – he displays a good understanding of the computer science-related job market.

Figure 2.1 Group 1 Case Study - Lee

2.18 **Group 1 graduates were in work 6 months and 3.5 years after graduating**. This group is the largest in the population (68%). Lee is typical of this group and displayed characteristics associated with positive outcomes such as being proactive and highly engaged with kick-starting and progressing his career, and with gaining valuable work experience while on his course through a sandwich placement.

Group 2 Case study: Michael
Male, Non-BME

UCAS Tariff Quartile 3, No Sandwich Year, Full-Time Course

Michael's career path was taking a positive direction until he was hit with illness

Michael secured a first class degree and gained a publishing deal off the back of a final year project. But illness meant that he had to abandon his career and now he is struggling to find a suitable job.

My career fell apart when I got ill. It's nothing to do with the course or anything. It's just bad luck.'

For those graduates who fall into the Group 2 category there tends to be a logical explanation for failing to secure employment, such as further study, personal reasons or illness.

Figure 2.2 Group 2 Case Study - Michael

2.19 **Group 2 graduates were in work 6 months after graduating but were no longer in work 3.5 years after graduating**. This is a comparatively small group within the population (4%).

2.20 Michael's story is individual to him, but it is typical of this group – factors beyond his control prevented him from achieving (or, rather, maintaining) employment 3.5 years after graduating.

Group 3 Case study: Stuart
Male, Non-BME

UCAS Tariff Quartile 3, No Sandwich Year, Full-Time Course

Stuart left university with a shortage of skills but addressed this through further study.

Stuart thought his university let him down in terms of passing on technical skills and careers advice. In response he took a master's degree and a number of other courses. Following this he was then able to secure employment as a Network Manager.

To put it simply the course was not detailed enough - it was all based on very out dated stuff

Figure 2.3 Group 3 Case Study – Stuart

2.21 **Group 3 graduates were not in work 6 months after graduating but had moved into work 3.5 years after graduating**. This group makes up 20% of the population and are of particular significance because understanding the progress of this group between 6 months and 3.5 years after graduating helps understand possible reasons why computer science graduate employment outcomes 'improve' in relation to graduates overall.

2.22 As discussed, graduates not in work 6 months after graduating could be in this situation for a variety of reasons – one of the more common and explicable reasons is further study. Stuart typifies the computer science graduates who felt that their course hadn't fully equipped them with the technical skills needed to enter work and endured a period of unemployment after graduating. Stuart's solution was to undertake postgraduate study, which he felt prepared him better for work as it involved far more hands-on development work.

Group 4 Case study: Hamid
Male, BME

UCAS Tariff Quartile 3, No Sandwich Year, Full-Time Course

In the years following graduation, Hamid has not been employed.

Hamid thinks his failure to secure a job is as a result of a combination of reasons: shortcomings with the quality and content of his degree; his 2:2 mark; a lack of work experience.

Most of the time they will ask you for experience. Once you have experience you can say 'I've done this, I've done that'. Employers will be more impressed.

In hindsight he would have secured work experience (even if that was unpaid) and ensured he got a better mark in his degree.

Figure 2.4 Group 4 Case Study – Hamid

2.23 **Group graduates were neither in work 6 months after graduating, nor 3.5 years after graduating**. This group makes up 8% of the population.

2.24 Hamid is fairly atypical in that he had not been in work at any point since graduating at the time of being interviewed. However, his primary barriers to finding work are typical of group 4 graduates – and of those who struggle to find work at any point after graduating.

2.25 Hamid felt that his degree hadn't equipped him with sufficient technical skills, but most of all he believed that his prospects suffered most because he has no work experience to impress potential employers. Worse still that this is a vicious circle and the longer he lacks work experience, the more difficult it is for him to gain any.

2.26 Hamid explained that his course did provide the option for a 1 year placement but availability was extremely limited and his application was unsuccessful.

Report structure

2.27 The remainder of this report is divided into four chapters which go through each aspect of computer science graduates' journeys from studying through to entering the labour market and their subsequent career path.

2.28 Where appropriate, case studies are used to illustrate the experiences of computer science graduates and show how a variety of factors can combine to influence a particular graduate's employment prospects.

2.29 Chapter three explores the main reasons for graduates' choice to study computer science and select a particular HEI institution or course. This includes a consideration of whether course selection was linked to career ambitions and whether accreditation was a motivating factor or not in decision-making.

2.30 Chapter four goes on to consider graduates' views of their course and overall experience of learning, including skills development. The role of work placements are also examined as part of this, with a focus on the impact they have had on graduates' employability.

2.31 Chapter five follows the graduate journey into work after graduation, exploring the different approaches taken by graduates when looking for work, and the main barriers experienced. Within this context, the link between work placements, skills and knowledge acquired by graduates through their course and employer requirements are also examined.

2.32 Chapter six pulls together the analysis developed in the preceding chapters to summarise graduates' employment outcomes six months after graduation and more generally. Career progression and the extent to which graduates feel they have achieved positive employment outcomes are explored, with a specific focus on understanding what is driving the relative improvement in computer science graduates' employment outcomes.

2.33 The final chapter presents a summary and conclusions of the key findings explored throughout the report.

3. Choosing to study computer science

3.1   This chapter explores graduates' motivations for studying computer science, how they selected their course and HEI (including the importance or not of courses being accredited) and the extent to which individuals had specific career goals in mind.

Career aspirations and motivations

3.2   All graduates in this study had chosen to study computer science at a higher level because they had an interest and/or previous experience in the subject. For example a number had studied computer science at A Level or enjoyed computer science as a personal hobby.

"I just knew I enjoyed what I was doing. I'd done it at college and wanted to carry on rather than just leave it at college. I wasn't really sure what I wanted to go into at the time."

Male, Not in work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

3.3   Another major motivating factor was the perception that studying computer science offered good career prospects. Most graduates interviewed held the view that IT is a growing industry with a variety of job opportunities and high employer demand for computer science skills. While some graduates had undertaken research which supported this – looking at employment statistics for the course, contacting universities or using careers advice at their school or college – the majority of our respondents had not. In this latter case, graduates' opinions on employment prospects were often based on informal advice or discussions with friends and family (some of whom had studied computer science or worked in IT). Some graduates stated that they 'knew' or 'felt' that IT was a growing industry and computer science was a good degree to do.

"[I] pretty much knew that IT was in demand of some sort, and I had vague ideas of what sort of roles were available. I knew it wasn't going to be a dead end degree".

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

"It's an employable skill, that's how I viewed it at the time. If I could qualify within IT, I'd be alright. I'd graduate and I'd be employable."

Male, Not in work at 6 months; in work at 3.5 years, BME, Midlands and East of England, Sandwich course

3.4   Finally, a desire to develop and improve on IT skills more generally was also a factor in some graduates' decisions to study computer science (particularly among mature students or those who had been out of work for a period).

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3.5 Around half of graduates had a specific career in mind when choosing their course. In most cases, this had influenced graduates' course selection in terms of the topics or skills areas covered. In a few cases, mostly linked to teaching careers, the degree was a pre-requisite. Specific careers that graduates were particularly interested in included:

- Teaching
- Working in animation or computer gaming
- Programming
- Data analysis
- Network administration
- IT or technical support
- Website or application development.

3.6 Female graduates were more likely to have had specific career aspirations at the time of choosing a course than their male counterparts. These included wanting to teach computer science, web or game development, and business analysis.

3.7 Graduates who were not targeting a specific career also commonly identified specific aspects of computer science that they were keen to study, such as programming or gaming. This was linked to these graduates' personal interest in the subject, which was often the sole motivating factor for studying computer science for this group.

Selecting a course and HEI

3.8 Positively, most graduates in the study had done some research on HEIs and/or courses before making their selections. Research largely took the form of speaking to careers advisers at school / college or the prospective HEI, looking at HEI ranking tables or researching HEI reputations, researching general employment prospects, or speaking to friends or family.

"The prospectus has got testimonials from people who had studied the course and what they've gone on to, so it gave me a pretty good idea of where people went."

Female, Not in work at 6 months; in work at 3.5 years, BME, region not given, Sandwich course

3.9 However, a minority of graduates interviewed admitted having a limited understanding of what a computer science degree involved at the point of choosing. This was reflected in decisions to change their course partway through (in one case in the first two weeks, someone who thought the course would centre on coding and programming and found the chosen course was more about computer architecture), or in hindsight feeling that the course had not been as helpful as initially anticipated in getting a job or improving knowledge and skills.

3.10 Overall, graduates who had researched their HEI or course in detail at the point of choosing tended to have had more positive career paths than those who were simply motivated by personal interest.

3.11 In terms of the decisions graduates made regarding their selection of course and HEI, there was, inevitably, variation between individuals. Aside from a strong interest in computer science generally, employment prospects were the most commonly cited and influential factor associated with graduates' course selection.

3.12 Reputation and/or ranking were mentioned by several as being influential in their choice of HEI - two graduates explicitly mentioned that they had chosen a Russell Group HEI based on their research.

3.13 However, convenience of location was the most commonly cited factor in graduates' choice of HEI (and tended to be the deciding factor in these cases). This was linked to affordability, with some graduates wanting to continue living at home with parents and / or be within commutable distance to the HEI, or in some cases personal circumstances (such as health issues or family responsibilities). Female graduates were almost twice more likely than their male counterparts to have selected their HEI or course based, at least in part, on convenience and location. For a few female graduates, the proximity of the HEI was a key influencing factor due to family and childcare responsibilities.

3.14 Choices based on convenience were in contrast to other course and HEI selections made by more 'proactive' graduates who considered various factors.

3.15 Other key reasons for choosing to study at a HEI or do a certain course included:

- Course content and its fit with career ambitions or interests
- The flexibility of the course structure (such as the option to specialise in modules or topics)
- Inclusion of a work placement or work experience option
- HEI reputation and first impressions of the HEI/course (from reading the prospectus or attending an open day, for example)
- HEI ranking and credibility
- The facilities available and/or the technology used at the HEI
- Knowing people who had been to or were currently at the HEI, or having been there themselves.

3.16 While the more proactive graduates generally did not research every aspect when choosing their choice of course and HEI, and were not able to fully anticipate all factors that would enable them to find work effectively after graduation; they were certainly better placed than several individuals who, by limiting their choice or even simply 'defaulting' to their nearest HEI, restricted their access to certain opportunities – especially those regarding the availability of work experience (discussed in the next chapter). This was more likely to be the case for graduates based in regions away

from centres of industry such as the west or north east of England. James' case study **(detailed case study 3)** is a good example of this (see chapter 4).

3.17 Most graduates had got into their first choice of HEI and / or course. A minority had achieved lower grades than expected and therefore had limited choice of where to study.

Accreditation

3.18 The vast majority of graduates interviewed appeared to have undertaken a BCS accredited course[8] - however, fewer than half were aware that computer science courses could even be accredited.

3.19 A handful of graduates had considered accreditation when selecting their course because they thought it would improve their overall employability. Overall though, accreditation did not appear to have any significant influence on graduates' decisions to study a particular course, and those unaware of accreditation at the time of course selection did not think it would have made any difference to their decision once it was explained. Among graduates who had not taken an accredited course, none felt this was something that had held them back or something they would change in hindsight.

3.20 Female graduates interviewed were more likely to have been aware that their course was accredited than male graduates – however there was no gender difference in the influence of accreditation on course selection, with this having little impact for both male and female graduates.

"I've never met an employer - or been for an interview - who's mentioned the fact that I'm not a member [of the BCS]. None have asked about the course being accredited. It doesn't seem to matter a whole lot."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

"I'm not sure what sort of benefit it had over not being accredited. I wasn't told the difference".

Male, Not in work at 6 months; in work at 3.5 years, BME, Other region, Non-sandwich course

3.21 Course content was more important to graduates as a factor influencing course choice than accreditation.

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[8] Based on a comparison of HEIs attended with Unistats' summary of computer science course accreditation in 2015/16.

Benefits of hindsight – choosing to study computer science

3.22 Generally graduates were happy with their decision to study computer science and their selection of HEI and course, as they felt their expectations had been met.

3.23 Graduates interviewed had expected their course to equip them with technical knowledge and soft skills which would enable them to get a job in the IT industry. This expectation was often based on research and had informed course choice. It was held regardless of whether graduates had a targeted career path or simply a general desire to work in IT.

3.24 However, for a small minority (around one in ten graduates), expectations were not met. In hindsight these graduates would have changed their course choice, instead specialising and developing expertise in a particular topic area such as programming, coding, animation or web-based modules. A few would have chosen a different course entirely; in these cases graduates expressed dissatisfaction with course content (topics not covered in enough detail, aspects of the course considered outdated, or were not taught the skills thought to be in demand by employers).

3.25 These suggested changes were identified by graduates in hindsight, for example some realised during their studies that particular aspects of computer science were of interest. In other cases, graduates' views on the difficulties of entering the labour market were formed post-graduation (where previously they had been confident of their employment prospects).

3.26 Overall, there is an indication that research into course content, structure and employability prospects at the point of choosing is linked to graduate expectations being met and positive career pathways.

4. Learning experience

4.1 This chapter examines graduates' **views of their course**, explores the types of **skills covered** and the skills graduates believe could/should have been developed to a greater extent. This chapter also explores the nature of work placements and examines the **impact they have had on individuals' employability**.

Course content

4.2 Broad / generalist courses were favoured by almost all graduates interviewed – particularly those without a career in mind – over courses specialising in an area of computer science. For the most part, this was a conscious decision; graduates felt it would be more beneficial to employment prospects to study a variety of modules and develop a general knowledge of the subject, as opposed to developing knowledge in one aspect. This also fits with the general interest in computer science many of the graduates had.

4.3 However, in hindsight some graduates felt that studying a broad course had disadvantaged them by not teaching topics in depth, thereby not sufficiently equipping graduates with the technical knowledge needed for a computer science-related job.

"[The course did] a little bit of this and a little bit of that and not doing it in enough depth…if I'd been given the information and the practice then I would have been able to become accomplished in those aspects but it was too general."

Female, Not in work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

4.4 Those who studied a course with a narrow or specialist focus did so because it supported their career plans at the time – opting to study web development, or network administration for example.

4.5 The technical skills taught varied course by course. Some commonly mentioned skills included programming, coding, animation, gaming website design, Java, software engineering, networks / systems and database work. A number of graduates stated that their course had only covered one programming language in detail which they had found to be insufficient or different to the programming languages used by industry employers when starting work. Teaching outdated technologies and skills was also identified by some graduates as a weakness of their course. Computer equipment, technical facilities, software operating systems, programming content and other areas of technical focus were all mentioned by graduates in the context of outdated aspects of their course. Being taught coding and programming at too basic a level, was also identified as an issue by a few graduates.

"The things we were learning about weren't necessarily still as relevant as they were probably when they planned the course."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

"There could have been more skills relevant to computing in the real world - like actual practical uses of databases and use of more modern programming languages like Python."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

4.6   Opportunities to learn softer skills were available for most of the graduates interviewed. Presentation skills and team working were identified as the most common, as well as project management, time management, communication, reporting, general workplace skills and business or commercial awareness skills. While a few graduates said they had opportunities to develop soft skills through specific modules on employment and employability, most suggested they were generally expected to 'pick up' soft skills i.e. provision was less formally structured.

4.7   A small number of graduates did not consider themselves to have been taught soft skills at all as an element of their course. Some explicitly commented that they did not think it had been necessary to have been taught soft skills for the types of jobs they would be doing and therefore did not consider it to be a weakness of the course that soft skills were not taught. However some recognised that they found it difficult to demonstrate team working skills which employers wanted because so much of their course had involved programming / coding in isolation, with minimal group work.

"The only [soft skill I gained on my course] I could possibly say is teamwork. But that is a baseline expectation – something you should have developed from since school etc."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich

Graduate views on course content

4.8   Most were satisfied overall with the content and quality of the course studied, stating that it had met expectations and covered interesting or relevant topics in preparation for working in the IT industry. Some graduates were also complimentary of supportive lecturers.

4.9   However, some graduates who had felt satisfied with the course at the time of study had changed their opinion after gaining industry work experience. These graduates had since decided that the course had not adequately prepared them for work, and that the content taught was not aligned with employer requirements or expectations. This was usually the case for graduates who had done little research into the course or had a limited understanding of what computer science involved at the point of choosing, highlighting again the importance of making a well-informed decision when selecting a course for study.

4.10 The link between prior research and overall satisfaction with the course is clearly demonstrated in **detailed case study 1 (Bryan)**. Here the graduate researched extensively and proactively into their HEI and course selection, and felt "ecstatic" about the overall content and quality of their course, and confident in their ability to get a job in any industry.

Case Study 1: Bryan.
Group 1 (in work at 6 months; in work at 3.5 years), Male, Non-BME.

UCAS Tariff Quartile 3, No Sandwich Year, Full-Time Course

- Bryan has worked in a series of roles in the area of User Interface and User Experience Design. These roles have been upward-progressing and have all fitted well into his broader career plans.
- He now visits universities to give lectures to students about careers.

Bryan provides a good example of how a proactive approach at all stages – from fully researching a course, seeking careers advice early on and focusing throughout the process on the skills needed for his desired career – can lead to positive employment outcomes.

University choice: Bryan researched different courses and universities before applying, paying particular attention to graduate employment rates. He also did his own research and spoke with his Sixth Form tutors. By the end of his course he was 'ecstatic' with the course's quality and content and left feeling 'very confident' that he could get a job regardless of the field.

Most of the universities that I applied for had high graduate employment rates. I got most of the information from the universities themselves. I visited quite a few different ones. A lot of them provided quite rich information about what their graduates were going on to achieve.

Looking for a job: He started looking well before graduating, making good use of a variety of sources: university careers service, Reed, LinkedIn, family/friends, local newspapers, job fairs, and employer websites. Coming up to graduation he could not decide whether to pursue further study or employment but kept his options open by applying for both (ultimately he entered into employment).

I wasn't 100% what I wanted to do in terms of being a professional or going into higher education. So I went down the route for both. For me there was no choice to be made until I had a job offer and a place in higher education.

Developing skills after graduation: Since graduating Bryan has engaged in personal study (online courses) to develop his technical skills. This has had a positive impact on his ability to carry out his job. He has progressed softer skills such as presenting and public speaking, getting involved with giving lectures to and mentoring university students.

I've done a lot of online courses. I've learnt different computer languages and about computer architecture, cloud computing, and visualisation. I've just aimed to add to my own personal knowledge … It's fed back into my working life: because I work in design, having that knowledge when I work with developers helps immensely.

His advice for future graduates: *"Be proactive - even at university you've started your career. It's up to you to find out what's out there because universities will give the information if you look for it."*

Figure 4.1. Detailed Case Study 1 – Bryan

4.11 Other areas of dissatisfaction expressed by some graduates included:

- Course content or technology used being outdated

- A narrow focus on one programme or system, little used by industry

- Taught course content not matching the course description

- Poor or varied teaching quality

- Early parts of the course covering similar ground to A Level

- An unstructured or poorly organised course (this sometimes also extended to the work placement)

- Rigid course structure offering limited opportunity to develop expertise in areas of personal interest

- Lack of flexibility to accommodate personal circumstances (such as ill health or family responsibilities).

"They did not have proper people to teach, they had one guy who was doing a PhD and they relied heavily on him – once that guy left they didn't have anybody to teach us."

Male, In work at 6 months; not in work at 3.5 years, BME, Midlands and East of England, Non-sandwich course

"If I'd been given the information and the practice then I would have been able to become accomplished in those aspects but it was too general."

Female, Not in work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

"The course was too broad and not deep enough."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich

"There wasn't very much opportunity for people who had [a specific] interest to digress. It was very much fixed on what they wanted you to do. People who had an aptitude weren't able to progress and do extra things to try and develop themselves more."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

4.12 Views on the relevance of course content to computer science employers were mixed. Most graduates interviewed were satisfied that their course had provided them with basic technical skills and a foundation of computer science knowledge. However, not all agreed that this was sufficient to get a computer science related job; a number of graduates felt that employers are seeking more specialist skills, practical industry knowledge or knowledge of particular software programmes, which their course did not cover.

"It covered a lot of the bases especially in computer sciences and the jobs where that would be needed."

Female, In work at 6 months; in work at 3.5 years, Non-BME, Midlands and East of England, Non-sandwich

"We had a good focus on teamwork and presentation skills, but not much on the commercial side. We didn't have anyone who worked in business... There was no one who had an experience of working in a software development role… There wasn't enough focus on getting the awareness of things you need to be able to do in the world of work."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

4.13 The graduate in **detailed case study 2 (Ola)**, for example felt that the poor teaching quality of her course had resulted in a lack of technical skills and knowledge required by employers, and had impacted on her ability to get a job in the IT industry.

Case study 2: Ola
Group 3 (not in work at 6 months; in work at 3.5 years), Female, BME

UCAS Tariff Quartile 4, No Sandwich Year, Full-time Course

- After graduating, Ola went through a period of unsuccessfully applying for jobs as a Business Analyst.
- Following this she went back to university to study Mental Health Nursing, the area in which she is currently employed.

Ola is an example of a graduate who left university feeling that they did not possess the sufficient technical skills to secure employment in a computer science related field. However, unlike others, she did not address this gap though further training and as a result she struggled to gain employment in a computer science related career.

Ola left university with what she felt were gaps in her technical skills knowledge. She puts this down to the poor quality of teaching on her course and too much focus being placed on theory rather than practice. However she did think the course prepared her well in terms of softer skills.

Everything was in the classroom – there was too much focus on the theory rather than the practical side of things. The job I was going for required better practical skills.

She felt this lack of technical skills was preventing her getting Business Analyst positions. In one application process for example, she was tested on a software programme (Java) with which she was unfamiliar and as a result failed the test

My technical skills were lacking. In one job application I was tested on a programme (Java, I think) and I'd never used it before. So I failed with that one.

Ola did not take steps to develop her computer-related skills in response to this skills shortage.

This resulted in a period of unemployment and ultimately in her changing career path to Nursing.

Figure 4.2. Detailed Case Study 2 – Ola

4.14 Satisfaction with the relevance of their course to computer science employers was most common among those graduates whose course had covered specific topics and / or issues in detail.

4.15 Dissatisfaction with the relevance of their course for computer science-related jobs was predominant among graduates in the sample who had done limited or no research into course content or who did not have a career in mind at the point of choosing; or where location was the strongest motivating factor for course selection.

4.16 Satisfaction levels also differed among graduates whose course had included targeted employability modules, with some feeling this was helpful and others that the content was too generic to be relevant to the types of career they were targeting.

4.17 Sandwich courses and work placements were highlighted as especially useful in developing employable skills by almost all graduates interviewed.

"Without doing the year in industry I don't think I would have as much confidence in starting a new job. It definitely helped."

Female, Not in work at 6 months; in work at 3.5 years, BME, location unknown, Sandwich course

4.18 Turning to employability prospects in general, this study found that most graduates felt that their course had provided them with opportunities to develop transferable skills and knowledge - such as boosting confidence, providing experience of team working, broad commercial or business skills and knowledge - to enter any industry. This was often linked to the broad nature of most graduates' courses. Softer skills were considered more transferable across industries than technical skills, though some transferable technical skills – such as programming and numeric skills – were identified.

"[While my course] probably equipped me to do Computer Science more specifically, I'm not sure how transferable a lot of the skills would be. The industry ones would be, but not the technical ones."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

4.19 Graduates who did not think their course had provided them with skills for work in any industry had studied courses with a narrow or specialised focus. A few mentioned a lack of work experience opportunities as another reason.

Work experience & sandwich placements

Type or work experience / placements undertaken

4.20 In most cases, work experience or placements were reported to have been organised by the graduate themselves rather than by the HEI. In a handful of cases students had organised their own placement but had used HEI resources or facilities to do so - for example one student had found a job advertised on the careers section of their HEI website.

4.21 For the most part, those who had undertaken a work placement/experience had been proactive in their approach – either through it being a key criteria at the point of course selection or through organising the placement themselves, by identifying prospective employers and the type of role they were seeking.

4.22 Some students, while having a placement organised as part of their sandwich course, actually considered themselves to have organised the placement. This was presumably because they were responsible for the logistics of setting the placement up.

4.23 The type of work experience / placement undertaken varied. A number related to teaching, where graduates were targeting this career path and looking to go on and study for a PGCE. Placements in technical support roles were also fairly common.

4.24 A handful of graduates, as part of their sandwich course, took on a year's placement in large international organisations. These included roles in JP Morgan as a database analyst, a support desk technician at Thomson Reuters, a sandwich year at IBM, and 13 months at the Ministry of Defence.

4.25 Graduates were broadly happy with their experience, though a few mentioned difficulties with outdated technology or a lack of support from the employer organisation.

4.26 In all cases the value and importance of the work experience / placement was emphasised, whether in terms of skills development, general exposure to the workplace, or preparation for work.

"[My work placement] gave me a real view of the work I needed to do in the computing and maths world. And it gave me experience of doing presentations with people, working as part of a team, and the time planning to manage real projects - including when things didn't go well. I did some report writing as well."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

Impact on skills and employability

4.27 Soft skills development was highlighted by most graduates as a key impact of their work experience / placement. Opportunities for teamwork, project management, networking and events attendance, presenting, gaining experience in an office environment and learning about the industry were all cited as areas of development.

4.28 Graduates were less clear on the impact of the work experience / placement on their technical skills development, with some identifying no direct benefit.

"[The placement] probably didn't add a whole lot in [specific technical areas]. It probably taught me most in terms of interacting with other professionals, rather than just university students. It gives you a confidence and a relaxation when you get into the office environment."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

4.29 All graduates viewed their work experience / placement positively overall and felt that it had vastly improved their employability through:

- Providing the opportunity to demonstrate to future employers experience in practical application of the skills and knowledge learnt on the course

- Helping to set them apart from other graduates

- Improving confidence when applying for jobs or going for interviews in the future

- Providing an insight into employer expectations of technical skills.

"It was essential to get those kind of skills from a real place of work. It gave me excellent employability as it had demonstrated that I'd had experience before, and it helped to finish my degree better."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

"[The work placement] was unbelievably important, I don't think I would be in the job that I am now if I didn't have that year."

Female, In work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

"The one year there was probably more valuable than the two years at the university."

Male, In work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

"[The work experience] was probably the thing that will benefit us the most because it instantly puts us a step ahead of other graduates [who] have just done a three year degree."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

Reasons for not undertaking computer science-related work experience or placements

4.30 Most of those who did not undertake work experience had made an active choice not to. A number of graduates admitted they had not realised the importance or value of gaining work experience at the time and therefore had not applied for a placement. Some had chosen to prioritise their studies over work experience or were keen to complete their studies before entering the labour market.

4.31 Other reasons given for not undertaking a relevant work placement included a lack of awareness that this was an option, insufficient time to complete applications and missing deadlines (usually because graduates had been unaware of the work experience option until a late stage), and competition for a limited number of available placements. A few mentioned that they had not wanted to be 'left behind' if friends were not doing placements. One graduate who was awarded a placement chose not to take it up as the location was considered too far away.

4.32 The importance placed on location convenience by graduates is similarly demonstrated in **detailed case study 3 (James)**, where not only was HEI selection primarily based on location, but also the choice to not take up a work placement. In this case, the importance placed on location has had negative knock-on impacts to the graduate's employability prospects – the graduate considers their lack of work experience, soft skills development and confidence (which they feel would have been improved through a placement) as the main barriers for not having had consistent employment since graduating (James had held one job since graduating at the time of interview which he was in 3.5 years after graduating. Unfortunately for James, this role came to an end after just a few months).

Case study 3: James:
Group 3 (not in work at 6 months; in work at 3.5 years), Male, Non-BME

UCAS Tariff Quartile 3, No Sandwich Year, Full-Time Course

- Except for a three-month period of employment which ended when he was sacked, James has been unemployed since graduation
- His efforts to secure a job have been unfocussed and inconsistent.

Although an extreme case, James exemplifies many of the difficulties that computer science graduates can face. At all stages, issues of a lack of confidence and soft skills, and an unwillingness to move away for university, work experience placements or full-time employment have hindered his progress.

James chose to apply to the university he did primarily because it was local. He also chose not undertake a work experience placement during university because it was not local, something he now regrets.

I didn't consider employment prospects when choosing my course. I just went there because it was the local university… I thought sciences might be a bit too hard at university so I thought I'd study computer science

James believes not doing a work experience placement has had a significant knock-on impact: he thinks a lack of experience is one of the things that has put potential employers off, and he believes it would have improved his confidence and given him 'real-world' experience.

I would possibly make it my goal to get work experience for a year and force myself to do it

A lack of confidence and soft skills are James's biggest barriers. For instance, he regrets not networking more at university.

I wish I had networked more with lecturers and other students. It's important to hear about jobs through other people

His advice for future graduates: make it your goal to get work experience for a year. Network as much as you can, with lecturers and other students (particularly as you hear about jobs though other people). Be prepared to move away from home for university, it helps improve your confidence.

Figure 4.3. Detailed Case Study 3 - James

4.33 Overwhelmingly, this study found that graduates who had not taken up a work placement in hindsight felt that they had missed out on a valuable opportunity to boost their employment prospects, make industry contacts, and develop the skills and knowledge learned on their course. All held the view that their chances of finding a job after graduating would have been significantly improved through work experience.

4.34 There were a small number of graduates who had wanted to do a work placement but were unable to. In a few cases this related to employer offers falling through, or not being made aware of the option to do work experience until it was too late or not at all. In these latter cases graduates held the HEI responsible for missing out on the opportunity.

4.35 There were no discernible differences in the reasons given by male and female graduates' for not undertaking work experience.

Careers advice

Sources of careers advice

4.36 Sources of careers advice can be divided into two broad 'types': formal sources such as advice services provided by the HEI, employability modules taught as part of the course, or guest speakers from industry; and informal sources such as speaking to friends, family, lecturers and other contacts.

4.37 Most graduates interviewed had received some form of careers advice whilst studying, whether formally or informally.

4.38 For the most part, graduates in this study took a fairly passive approach to careers advice. Few had actively sought out or used the formal sources available, but had received advice as part of their course. A small number of graduates had attended careers fairs and used university services.

4.39 Conversely, most graduates were proactive in seeking informal advice – speaking to lecturers, friends and family, and using their network of contacts. Overall this was considered more useful than attending advice services or careers fairs. Guest speakers from industry were also identified as valuable sources of information.

Impact of careers advice

4.40 Most graduates interviewed thought that careers advice had little impact overall on their decision of which types of job to apply to.

4.41 Opinion on the usefulness of formal careers advice services offered through the HEI was varied – some felt it was not especially relevant or targeted to their needs, while others felt it was very helpful. In the latter case, this was mostly when careers advice was linked to the course or provided through targeted modules, i.e. integrated rather than being a generic service, or provided practical advice and tips on CVs, job applications and interviews.

4.42 Some mentioned that while careers advice had been available at their HEI, they had chosen not to use the service, and within this group a small number of graduates had felt that they did not need it.

4.43 However most graduates who had not taken up careers advice at the time, in hindsight thought it would have been useful to them. They felt that more could have been done to make them participate in formal careers advice services and that it was the HEI's responsibility for ensuring the service was taken up by students.

4.44 Advice through informal discussions and speaking with friends, family, lecturers, or hearing guest speakers had some impact on graduates' decisions. However this was mostly in terms of helping graduates to familiarise themselves with the industry or pick up practical tips, rather than being directly linked to job and career choice.

"I went on an 'interviews and assessment' day course that gave me no knowledge of how to deal with an assessment centre. It just dealt with how to write a very primitive CV and how to answer questions on verbal reasoning. It didn't have any input from actual assessors. It was far too generic, based on the whole university's range of students. It didn't provide any detail at all."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

"[Advice from lecturers] gave me more information on what the degree can lead into. It helped decide the right direction of what jobs I should apply for."

Male, Not in work at 6 months; in work at 3.5 years, BME, South, Non-sandwich course

5. Seeking work

5.1   This chapter explores graduates' experiences of seeking work after graduation –
including the barriers they encountered, their perceptions of what employers are
looking for, and any steps taken to improve their employability.

5.2   HESA data indicates that computer science graduates are five percentage points
more likely to be unemployed 6 months after graduating than other graduates overall
(11% of 2013/14 computer science graduates; 5% of other 2013/14 graduates). This
is a significant difference but represents only a small minority of computer science
graduate that are 'holding back' the cohort overall below average levels of
employment. As this study (and 2008/09 DLHE longitudinal findings) suggest,
employment levels among computer science graduates increase closer to the
average over time – it is therefore possible to extrapolate that there are issues for a
minority of computer science graduates, specifically with the pace at which they
progress to employment.[9]

Starting to look for work

5.3   Reflective of their different individual circumstances and intentions in the build up to
and period after graduation, graduates took various approaches to job hunting. For a
handful of graduates, the transition was seamless as they were able to continue in
jobs they held during their course – these tended to be unrelated to computer
science as they were roles primarily intended to help support the individuals through
university. These graduates typically started looking for computer science-related
work around a year or so after graduating.

*"It was at a time when I thought . . . well, people are still saying there's not a lot of
jobs out there – so I just carried on [to become manager of the specialist beer shop I
was already working in whilst studying]"*

***Male, In work at 6 months; not in work at 3.5 years, Non-BME, Midlands & East
of England, Non-sandwich course***

5.4   A number of graduates sought to continue studying after completing their
undergraduate computer science degree and so did not begin looking for work for
some time after graduating. Graduates' postgraduate learning (and other steps taken
to increase their skills and knowledge) is explored in more detail later in this chapter.

5.5   The majority of graduates, though, did seek to enter employment after graduation,
but there was variation in terms of the point at which they began their job search
activity. Most started looking for jobs well before graduation – in most cases around
six months in advance, and as much as a year in advance in other cases. The main
reason for starting this activity early was quite simply to be able to start a job, and

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[9] 'Destinations of Leavers from Higher Education Institutions: 2008/09 Longitudinal Survey – Introduction'
available at: www.hesa.ac.uk/dlhelong0809_intro

therefore start earning, as soon as possible after graduating. Other reasons given included:

- Perception of high competition for jobs – particularly after graduation when the market could be flooded by new graduates

  "It's a competitive industry. There's going to be an influx of people with the same skillset coming into the market at the same time – so if there's any advantage you can give yourself…'

  Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Non-sandwich course

- Believing that employers want early applications

  "Many employers have graduate schemes where you need to have your application submitted by January/February time"

  Male, Not in work at 6 months; in work at 3.5 years, Non-BME, Midlands & East of England, Sandwich course

5.6 Other graduates were split between those who began looking for jobs as soon as their course ended / as soon as they graduated; and those who put off entering the job market for a period of time (for various reasons).

5.7 Those who began looking for jobs upon completion of their degree generally gave the explanation that, prior to then, they had simply been too tied up in their studies – for example completing final assignments and / or their dissertation – to be spending time looking and applying for jobs.

  "I couldn't think about that at the time – my stress levels were so high! I couldn't focus on anything else…I was under such pressure."

  Male, Not in work at 6 months; not in work at 3.5 years, BME, South, Non-sandwich course

5.8 Graduates who left it longer before starting to look for work were definitely in the minority. A couple cited personal / family problems that prevented them from looking for work (or any other relevant activity such as further training).

5.9 Of the remainder there was a split between those who, in hindsight, described their activity (or lack of) after university as 'lazy'; and those who deliberately took time off after the demands of their degree to – for example to go travelling – before entering the world of work.

  "Laziness…I'd been in education for…you know…that amount of time and thought…okay why not?"

  Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

"I don't think I started applying for jobs 'late' – I started as soon as I got back from travelling."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

Roles targeted

5.10 Virtually all graduates in this study looked for work relating to computer science after graduating (or after their further study). There was a fairly even split between those who targeted very specific roles – often graduate roles – and those who searched for computer science roles more broadly.

5.11 Specific roles mentioned by graduates included:

- Usability and software development
- Web development
- Forensic CS roles
- Consultancy / project management / business analyst (CS-related)
- Animator roles
- Programming

5.12 For the broader searches, graduates either mentioned a number of the roles mentioned above or more open roles such as:

- General IT jobs – "Anything in IT"
- Any graduate schemes relating to computer science
- Junior level computer science
- Technical support

5.13 Graduates who began their degree with a specific career path in mind were more likely to target specific roles than those who hadn't. However, the jobs they started looking for weren't necessarily the same as those they originally had in mind. For example, the games industry was a big pull for several graduates at the time of beginning their course – but only around half of these individuals ended up applying for jobs in the games industry.

5.14 What this does illustrate is a certain mind-set among these individuals who appear to have always been considering their options and their career path.

5.15 Virtually all graduates interviewed went online to look for jobs – most commonly they looked at generic job search sites such as Reed, Monster, Guardian Jobs etc. Only a handful reported using industry specific sites such as TechCrunch or Games Industry Biz website.

5.16 University careers services and university-hosted job fairs were mentioned by many – but several graduates found these to be too generic.

"I tried to use job fairs but they were far too busy and the information wasn't really relevant – too focussed on generic graduates or all graduate areas and it was difficult to speak to somebody"

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

5.17 A handful of graduates approached employers directly, typically having reviewed their website to ascertain if their business activity was relevant and whether they were recruiting.

5.18 Only a minority of graduates made use of industry contacts they had picked up during their studies to signpost them to employers or roles to apply for. This was the case even among graduates whose course had involved a sandwich placement. As this chapter will explain, sandwich placements were highly influential in helping graduates gain employment because of the relevant work experience skills developed (rather than providing a subsequent route into employment through any industry contacts or networks developed).

5.19 The general consensus among graduates was that it was easy enough to find jobs to apply for – this was the case for those searching more broadly and for those searching for specific roles.

"Found it fairly easy to find roles, there were many appropriate roles. I found plenty of vacancies at the time."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

5.20 Graduates who found it difficult to find roles to apply for tended to be those who restricted their searches to the local area, which tended not to have an abundance of appropriate employers. As would be expected these cases tended to be away from major cities and centres of industry – for example around the North East and South West of England.

"I wasn't looking across the whole of the UK. I was only looking for jobs where I could stay at home."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

5.21 However, whereas finding job opportunities was easy for the majority of graduates, securing a job was far less simple – as was even getting an interview at all. Around half of graduates changed their approach to job hunting after a period of time due to a lack of success in securing the kind of role they had originally set out looking for.

5.22 Those graduates who struggled to find roles due to their location often ended up looking further afield – typically to London and the South East.

"A major barrier was that I initially only looked for jobs in the North West – I had to broaden my search because there just weren't enough vacancies."

Male, Not in work at 6 months; in work at 3.5 years, BME, North, Non-sandwich course

5.23 Several graduates who had originally targeted quite specific roles felt they had no choice but to broaden their search to other aspects of computer science.

"In the beginning I was looking for a specific role e.g. junior project management / junior business analyst roles – graduate [level] positions. I wasn't too sure on job title but knew the activities. When I wasn't getting those roles I started looking for support roles. Six months later that's when I got my support role."

Female, Not in work at 6 months; in work at 3.5 years, BME, South, Sandwich course

5.24 Many of these graduates had originally targeted large, well-known employers' graduate schemes which had extensive application forms and processes. These individuals felt that overall applying for (and not obtaining) these jobs was detrimental to their prospects and in hindsight felt they would have been better off applying for jobs with smaller employers where they might have had more success.

5.25 In more extreme cases, there were several graduates who felt compelled to turn their attention to jobs entirely away from computer science because they felt that they would have no success pursuing the types of roles they initially sought.

"I had to lower my ambitions – very much so – I started looking for just any admin job, I just applied to any company. I don't regret it as I've learnt a lot of skills and I had to do it to make money."

Male, Not in work at 6 months; not in work at 3.5 years, BME, South, Non-sandwich course

Barriers to finding work

5.26 Graduates were asked what the barriers they faced in trying to enter employment after graduating were – which would explain the difficulties they reported and the changes they had to make to their job search activities outlined above. These barriers mentioned by graduates were reflective of their experiences searching and applying for work, and, where relevant, the feedback they received from employers as part of this process.

Work experience

5.27 The most commonly cited barrier – mentioned by more than half of graduates interviewed and the vast majority of those whose course had not involved a sandwich placement – was that they lacked relevant work experience. As detailed in the previous chapter on graduates' learning experience, those who had taken a sandwich year in industry, or some other form of relevant work placement, felt these

had been invaluable in increasing their employability – whereas those (the majority of graduates) who had not taken such a placement tended to feel they had missed out.

"In a sea of graduates, the work placement was the only thing that made me stand out."

Female, In work at 6 months; in work at 3.5 years, Non-BME, South, Sandwich course

"[The work experience] was more valuable than the course itself. I learned practical stuff, hands-on. I learned what was required in the work environment in IT, and I was hands-on every day."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, Midlands and East of England, Sandwich course

"I wish I'd done work experience while I was at university because I know how hard the ramp up on my first year was, it would've been easier if I'd done the work experience. The knowledge gap and the skills gap were not huge, not stopping me getting the role, I just think I could have hit the ground running."

Male, In work at 6 months; in work at 3.5 years, Non-BME, Midlands and East of England, Non-sandwich course

5.28 Graduates who left university without industry experience reported that they struggled to demonstrate their skills to prospective employers – lacking the evidence that those who had industry experience were able to provide. Graduates felt that this prevented them from being considered by employers for roles they applied to, or for not getting past the early stages of recruitment (e.g. an initial telephone interview)

"There were several 'call-back' initial telephone interview stages…I had a sense from the initial questions they asked – rather than any feedback from the employer – that they wanted someone who already had that work experience from their time at university."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

"The only thing that really needed to be improved was my work experience. It was an issue and they mentioned it."

Male, Not in work at 6 months; in work at 3.5 years, BME, South, Non-sandwich course

5.29 A couple of graduates described this as a 'catch-22' situation – summarising succinctly the experience of many of their peers:

"Employers seemed happy with my qualifications, but I think they chose to interview people with work experience – which was difficult for me coming straight out of university. It's that classic catch-22…"

Male, Not in work at 6 months; in work at 3.5 years, BME, North, Non-sandwich course

"You can't really get a job without experience. A lot of the time employers won't even get to look at your portfolio because they will see your CV and be put off by the lack of experience."

Female, Not in work at 6 months; not in work at 3.5 years, Non-BME, Midlands and East of England, Non-sandwich course

Technical skills

5.30 Several graduates felt that a lack of certain technical skills was a barrier to them getting a job – mostly in terms of knowledge and experience of different programming and coding languages. Several graduates received this feedback from employers – where they had got as far as the interview / assessment stages. It is noteworthy that most of the graduates who were informed by employers – or inferred from a lack of feedback - that their technical skills were lacking had been seeking graduate or entry-level positions (relating to computer science) – and so many / most found their lack of success frustrating.

5.31 This links back to several graduates' views of their course content – detailed in the previous chapter – that the technical skills they were taught were not the most appropriate for finding work.

5.32 On the other hand, as mentioned earlier, graduates who applied for specific roles which complemented their own skill set saw better employment outcomes than others. This suggests that different tactics (and skills) might be required when applying for more generalist roles, as opposed to more technical roles and graduates need to know how to adapt accordingly.

Soft skills

5.33 A lack of soft skills was also mentioned by a small but significant minority of graduates as being something that held them back. As detailed in the previous chapter, most graduates' courses contained elements designed to improve their soft skills and the types of soft skills these graduates felt they were lacking are not the kind easily taught. These graduates felt that they lacked confidence and 'real world experience' and employers picked up on this during interviews and held it against them. **James (detailed case study 3)** is a good example of this.

"A lack of confidence in the real world and a lack of confidence in how the skills I'd learned on my course could be applied to work."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

5.34 Graduates who felt that a lack of technical and / or soft skills had held them back from gaining employment in computer science after graduating had, without exception, taken a course that did not feature a sandwich placement (or other form of

work experience). This again underpins the value of sandwich placements and relevant work experience. Graduates who had relevant work experience through a sandwich placement were less likely to feel they faced any barriers to securing work at all and felt unaffected by the three main barriers other graduates faced – namely a lack of relevant work experience, technical skills and soft skills (relating to confidence and 'real world experience').

5.35 Unsurprisingly then, when graduates were asked to consider what was behind the lower levels of employment experienced by computer science graduates generally, a lack of work experience was the most commonly mentioned theme. Within this, several graduates felt that universities weren't doing enough to prepare graduates for work in terms of commercial skills and business acumen – which would most readily be picked up via relevant work experience (e.g. a sandwich placement).

"It feels to me like there's a fundamental problem with how computer science is delivered at universities and that the courses are set up for people who want to go into programming and sit in a dark room and not have any interaction with the outside world. Universities should make students aware of how computer science operates in the business world – provide more of a business focus."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, Midlands and East of England, Sandwich course

Other barriers to finding work

5.36 As mentioned, geography was considered to be a barrier by a handful of graduates – typically those living and / or looking for jobs further away from centres of industry and where computer science employers are located. Several graduates mentioned that competition from other applicants and the pervading economic conditions were barriers to entering work (which, while worth noting, are less relevant in terms of understanding the issues facing computer science graduates).

5.37 A number of graduates suggested that computer science courses attract a certain type of individual - who has a strong interest in and extensive knowledge of computing but lacks the social skills and confidence to finding work easily: i.e. the perceived stereotype of the 'Computer Scientist'. In a couple of cases, graduates clearly included themselves in this bracket:

"The kind of person who would do a computer science is less equipped to do a job because of the person they are – Like me I guess. Much more nerdy and not as confident. Whereas if you're doing a degree in English you're a different type of person I think."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

5.38 In other cases, graduates were clearly speaking about others they had met on their course:

"They're in their own little world I mixed with a lot of them at university and they don't have lot of social skills especially the gaming students, there are a lot of geeks and they need to be able to talk to people and that's why they're not doing so well in interviews"

Female, Not in work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

5.39 A handful of graduates felt that their relatively low levels of attainment in their degree and / or prior to their degree held them back and made their applications easily ignored by employers – or rejected in favour of another applicant with a higher grade or higher UCAS points. In a minority of cases, graduates who attended universities with higher UCAS entry tariffs felt that the name and reputation of the university had portrayed them in a positive light to employers.

"I really think that having the [Russell Group University] degree got me the interview – any additional skills were a bonus."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

5.40 Course accreditation was not seen by graduates (whose degree was accredited) as being an important factor for employers. Instead, the main points detailed already – work experience, technical and soft skills around confidence and 'world experience' – were seen as being of far greater importance.

"I've never met an employer - or been for an interview - who's mentioned the fact that I'm not a member. None have asked about the course being accredited. It doesn't seem to matter a whole lot."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, North, Sandwich course

Possible graduate misconceptions

5.41 Among a small but significant minority of graduates there was a perception that they would have few problems finding work as they would be highly sought after by employers. Amongst some of these graduates, this created a level of complacency in their approach to searching for a job. Some graduates were surprised to find that the reality of finding a job post-graduation was much more challenging than they had imagined it would be – especially in light of information known about the computer science industry's need for qualified individuals.

"It doesn't make any sense [why computer science graduates struggle to find work] - I'd read and heard that there is a skills shortage [in the industry]."

Male, In work at 6 months; in work at 3.5 years, BME, South, Sandwich course

"I blame myself mostly but there was a change in demand and an increasing of expectations."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Non-sandwich course

5.42 This complacency was evident in these graduates' approaches to job applications. Several adopted a 'blanket' approach and did not tailor their CV and application forms to specific roles. Many were under the impression that their skill set and computer science experience alone would be enough to secure the role. Accordingly, many were forced to re-think their approach to job searching.

5.43 A handful of graduates – notably those who had not undertaken work experience as part of their course – felt that they had been held back by not having an existing network of industry contacts, which they might have acquired through something like a sandwich placement.

"Having the contacts would have been helpful for me – the contacts in media or in the wider industry."

Female, Not in work at 6 months; not in work at 3.5 years, Non-BME, Midlands and East of England, Non-sandwich course

5.44 However, feedback from the vast majority of graduates who had undertaken work experience suggests that any contacts, or 'network' acquired through their placement was of far less importance than being able to evidence industry experience to prospective employers. Indeed, as mentioned earlier in the chapter, very few of these graduates made use of any such network when applying for jobs.

Improving skills and employability

5.45 The majority of graduates interviewed had taken some form of action to improve their skills and / or employability since graduating from their computer science degree. These actions were wide ranging in their focus, formality and in terms of the cost, time and effort involved.

5.46 A small but significant minority had gone on to computer science-oriented post graduate study. Examples included master's in Cyber Security and Management, master's in Information Systems Management, and PhDs drawing on computer science knowledge and experience.

5.47 For some, the motivation for taking these courses was to ultimately work in academia (using their computer science skills). For others their post-graduate studies were intended to set them apart from other computer science graduates and / or enhance their image and employability in employers' eyes.

"I applied for job after job and for many of them I was not even on the approved university list so I went and did a master's…".

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, Midlands & East of England, Sandwich course

5.48 The handful of individuals who had completed post-graduate study in computer science at the time of interviewing were unanimous that their further study had succeeded in increasing their knowledge and skills levels – but opinions were split about whether this further study had or would tangibly increase their employability as intended.

5.49 Positively, the individual who felt they had been held them back because their HEI was not on the 'approved list' had greater success in job applications after completing their master's degree and was in a permanent job role relating to computer science at the time of interviewing.

5.50 A handful of graduates had undertaken formal training since graduating that did not have computer science content – these were, though, generally intended to increase their employability within the computer science arena. Examples included a master's in Business Studies and shorter project management courses such as PRINCE 2 and SCRUM. In the main, these types of training were undertaken independently by graduates – i.e. they were not employer supported.

5.51 In a small minority of cases, these shorter project management courses were taken to supplement computer science related postgraduate study in order to enhance the individuals' profile in terms of being work-ready. This links back to themes already covered – in particular the value of work experience in evidencing graduates' capabilities and employability; and the criticism given by several graduates that their undergraduate course did not provide them with business acumen.

5.52 On the more informal side of things, several graduates reported self-learning of various different skills and techniques, generally through online tutorials or informal courses. This was often a reaction to the identified skills shortfalls detailed earlier in this chapter. Subjects covered included:

- Computer architecture
- Cloud computing
- Visualisation
- VOIP technology
- Technical networking
- Programming languages – SQL, Java, C#, Python

5.53 Graduates who undertook this more informal self-learning tended not to have taken additional formal learning (postgraduate degrees and recognised project management courses). In the majority of cases, these skills were developed in order to enhance performance and / or progress within a job role rather than help get a (new) job.

6. Employment outcomes

6.1   This chapter discusses employment outcomes, describing the types of jobs which graduates obtained after completing their course, and the extent to which these were / are related to computer science, and whether they are part of a long term career plan. Specific focus is given to understanding what is driving the relative improvement in computer science graduates' employment outcomes from six months to three and a half years after graduation, with detailed case studies focusing on individuals in both positive and negative situations. The chapter concludes by discussing graduates' overall satisfaction with their career path to date, and what they would do in hindsight to find employment.

Overview of (and variability in) employment outcomes

6.2   Reflecting the wider sample profile, virtually all graduates that were interviewed were in work at the time of being interviewed and in the majority of cases this work was full time and permanent. Amongst these, most are in professional roles, with a small minority being paid to undertake further study whilst working. Most graduates are happy to stay with their current role, largely because it makes good use of and develops the technical skills they learnt whilst on their course, and because it offers good opportunities for career progression. Few had drastically changed their career path since graduation, and those who had found employment without any significant difficulty.

6.3   A small minority of graduates were unemployed at the point of being interviewed. However, it was common for this sample of computer science graduates to have experienced unemployment at least once since they graduated from their course, with nearly two thirds of graduates mentioning periods of unemployment.

6.4   Nevertheless, the majority of graduates experienced only short-term unemployment in the immediate period following their course. Multiple periods of unemployment were rare, with half experiencing unemployment only once. Periods of unemployment tended to range from a couple of months to the entire three and a half years since graduating (although there were few cases of this persistent unemployment, and these tended to be linked to graduates' personal issues). Longer term unemployment (over 6 months) was most common amongst graduates without relevant work experience, and amongst those who started searching for a job at the point of their graduation or in the immediate period after it.

Employment outcomes achieved

6.5   On the whole, graduates' employment outcomes are positive, with most involved in the study finding paid jobs which use their computer science skills to at least some extent, and a large majority of jobs being permanent and full-time. A significant proportion of roles tended to be in teaching, analysis, security and software development, with many graduates commenting that they would be happy to stay in their line of work for the foreseeable future.

6.6 Around one third of graduates interviewed had one job since graduating, with a small number being promoted within their organisation, taking on greater management responsibility and (in some cases) a more client-facing role.

6.7 A small minority of graduates interviewed had four or more jobs since graduating. This is slightly more concentrated amongst graduates from Group 2 (in work at 6 months; not in work at 3.5 years), although there are no discernible reasons as to why this is the case. Across all graduates, however, it was more common to have between two and three jobs. The initial jobs undertaken by graduates tended to be 'interim' temporary and / or part time positions which made limited use of their computer science skills.

6.8 Graduates with multiple jobs progressed towards more relevant work in 'professional roles' over time. Graduates who did not initially gain employment reflected back that they felt they had technical skills after graduating but they were missing evidence of business acumen and softer skills in the workplace (linking back to the importance of having work experience on a CV as a means of evidencing work readiness to employers).

6.9 As such, graduates reported that they commonly undertook initial 'low level' roles (e.g. administrative, office-based ones) to build this experience, and to demonstrate in future applications that they had combined both the technical side of their computer science course with softer skills that they had developed in the workplace. **Jade (detailed case study 4)** was one such graduate who followed this strategy, moving the focus of her search away from roles which were closely related to her placement year, instead looking for computer science graduate scheme roles, followed by graduate scheme roles more generally.

6.10 This was a mostly successful strategy, with graduates eventually gaining roles which were more strongly related to computer science, and which made full use of their skills. Graduates in this situation are happy to stay in the same line of work, as roles often fit within a career plan or because they can be used as a springboard to develop careers further with good chances of promotion.

6.11 There is little evidence to suggest that once in employment graduates receive much / any formal or structured training in the workplace (either in terms of technical training or 'softer' workplace skills) – a key concern given that many graduates considered keeping skills up to date a barrier to securing a job in the first place. Any skill development is usually done so through informal on-the-job training.

6.12 There was little difference between the skills development reported by graduates working for (or who had worked for) larger and small employers respectively (although this was not explored fully in the topic guide). Graduates that were in more 'technical roles' were less likely to report that they received training compared to those in 'customer focused' ones. Those in 'technical roles' felt that they had started their jobs better prepared and ready for their line of work. The sense was that graduates in 'technical roles' were more likely to have targeted their applications towards a particular type of work, and applied for roles which suited their skills set – as a consequence they put forward that they were less likely to need further skills training.

Case Study 4: Jade
Group 1 (in work at 6 months; in work at 3.5 years), Female, Non-BME

UCAS Tariff Quartile 3, Sandwich Year, Full-Time Course

- During her degree Jade had a placement year at a major bank which she organised herself. She found this to be the most useful part of her degree experience by far.
- Currently she works as a Compliance and Risk Analyst – she is happy with this position and its prospects.

Jade is an example of a graduate who, after a period of unsuccessful applications, broadened their search (often moving away from computing jobs). In Jade's case, she had a five month spell of unemployment after graduation.

At first Jade looked for roles that were closely related to the one she'd had during her placement year. She then looked for graduate schemes that were broadly related to I.T. followed by any graduate schemes. After being unsuccessful in applying for all these types of jobs, she then targeted any job broadly related to computer science. She admits that failing this she was prepared to target 'anything at all'.

I wanted to do exactly what I did on my sandwich year but those roles didn't exist in graduate schemes. So I just applied to lots of graduate schemes that were broadly related to my degree … I got a lot of knock-backs. Then I thought 'OK, I'll just apply for any graduate scheme just so I can be on a graduate scheme'. But then I had to accept I might not get onto a graduate scheme so eventually it was: 'let's just find a job now'.

She puts the difficulties she experienced partly down to the I.T. and Business Course she did at university. It was too general, in her opinion, leaving her with neither the sufficient computing skills needed for IT jobs nor the required business knowledge for jobs in that area.

The I.T.-type graduate roles felt a lot like engineering or technical roles which I didn't have the skills for. I didn't have the business skills to do the business-type graduate schemes. I felt caught in the middle of the two. I put that down to the course.

In her view the fact she had done a placement year at the bank was crucial. Employers cared little about her course. Without it she thinks she would have found it even harder than she did to secure work at least broadly related to computing.

Figure 6.1. Detailed Case Study 4 – Jade

Career progression

6.13 This study found that graduates often face an initial hurdle of getting into employment. Many graduates interviewed had taken 'interim jobs' in the immediate period after graduation, typically to gain tangible experience in a working environment and to earn money. These 'interim jobs' are typically based on part time and temporary contracts, are low paid and lack clear career progression. Graduates eventually find themselves in jobs which make use of their skills to at least some extent, combining the technical skills they learnt whilst on their degree with the softer workplace skills developed whilst in these 'interim jobs'.

"I [went] from accounting roles to looking for any job which was paid – like retail, and non-accounting, non-graduate roles... because I didn't want to be out of work."

Male, Not in work at 6 months; in work at 3.5 years, BME, South, Non-sandwich course

6.14 Given that most computer science graduates find themselves in positive situations at three and a half years after graduation (e.g. on a career path which makes use of the skills developed on their degree to at least some extent), the most difference to employment outcomes can be made when graduates take their initial first steps into employment.

6.15 Providing graduates with advice and guidance on available careers at graduation (or preferably before it), and how to go about accessing them, may limit the extent to which they rely on these 'interim jobs' to build the necessary experience to enter into their chosen careers. Bryan's **(detailed case study 1)** experience typifies this, showing that accessing advice and support early on in the search for a job gives graduates a clear direction to focus their search, and the knowledge of where to look to find appropriate jobs.

6.16 A small number of graduates have changed career direction entirely (entering into careers such as mental health nursing, teaching and accountancy), and for them, a computer science degree has become less and less relevant over time. Although their reasons behind the change in their career were varied, graduates chose to move away from the computer science industry with a specific career in mind. As in Ola's case **(detailed case study 2)** employment outcomes are still as positive compared to graduates who pursue a career which is more closely linked to their degree. Those who have changed career direction still feel like they are making positive progress within their career, although they attribute this to more to personal effort rather than the skills learnt whilst on their degree.

6.17 Graduates who targeted a specific career at the point of choosing their course tended to (quickly) find jobs which make both good use of, and which develop, their computer science skills. Whilst these jobs are not always in the areas that gradates initially saw themselves going into, most are happy to stay in them. Graduates felt that focusing on a career at such an early stage meant they were more proactive in their job search at university. This gave them sufficient time ahead of graduation to look for jobs in their main area of interest, or broaden out their search if they were finding this difficult.

6.18 In contrast, the effect of targeting a specific HEI and its impact on later career progression is more mixed. There are few cases where targeting a particular HEI resulted in improved employment prospects, however, it is clear that targeting a HEI for personal reasons and / or reasons of convenience (e.g. location) does not guarantee better employment prospects. Indeed, graduates who chose their HEI for these reasons commonly took multiple 'interim jobs' in the period after graduation, and found it more difficult to pursue a clear career path.

6.19 As highlighted earlier, there is a strong link between work experience and later career progression, with graduates who have undertaken some form of work experience finding it significantly easier to gain employment. As highlighted by James **(detailed case study 3)**, a lack of relevant work experience is for many, a significant barrier to gaining employment. The careers of those who have done work experience ahead of graduation almost always follow a positive direction. Again, most are happy in their line of work or feel that they are in the right area to progress their career (with the most successful graduates working in analysis and / or software development at a graduate level).

6.20 Effective careers advice also has a positive impact on later career progression. Those with less positive career outcomes admitted to having been unsure about what was 'out there' and what path they could take. Whilst some had not used careers advice services whilst on their course (even though it was available), commenting that it had not been 'pushed', others felt the service could have been made more accessible, e.g. with longer opening hours.

6.21 Enthusiastic, dedicated careers advisors, and courses with a strong focus on employment outcomes, can have a significant effect on graduates' employment outcomes. Graduates who had the clearest sense of direction for their career were frequently those who had worked with engaged and enthusiastic careers advisors, who encouraged work placements as a priority. This was particularly true amongst students on sandwich courses, whose departments took it upon themselves to organise work placements. Students who are directly told about the importance of work experience and how to access careers information are the ones who experience the most success after graduation.

"Our university was very heavily geared towards making sure we were employable, and they put on a lot of stuff to make sure of that."

Male, Not in work at 6 months; in work at 3.5 years, Non-BME, South, Sandwich course

Graduates' progression from unemployment at six months to employment at three and a half years

6.22 Graduates in the study did a number of things in order to progress from unemployment at six months to employment at three and a half years after graduation. These typically included:

- Changing career path or adopting a more systematic approach to their job search (including increasing the volume of applications sent and increasing the variety of jobs applied for);

- Taking entry level 'interim jobs' which would develop their skills and prove experience of working in an office environment;

- Developing 'soft skills' outside of employment (such as volunteering); and

- Undertaking further study, including advanced qualifications (e.g. master's and PhDs and professional certificates) and / or independent study (e.g. online courses to learn new programming languages and / or reading industry publications and attending industry events).

6.23 The strategies that graduates adopt to find work after a long period of unemployment are not drastically different to those adopted by graduates who find a job immediately after completion of their course. This study found that the difference is that the graduates who are initially unemployed take longer to realise the key steps they should be taking than their more successful classmates. Combined with an increased emphasis on gaining relevant work experience whilst doing their course, it is clear that making graduates more aware of their career options at an earlier stage could have a significant impact on their career progression.

Hindsight – career activities

6.24 The majority (around two thirds) of graduates interviewed are satisfied with their career progress to date. The main reasons for this are: working in an area of personal interest; having clear opportunities for (quick) career progression; working with the latest and fastest evolving technologies; having access and funding to further qualifications and training, and being in a career which has good wage-earning potential.

6.25 Of the minority of graduates who were dissatisfied with their career progress, common reasons include: persistent unemployment and a general lack of progress in their chosen career path; working in a different industry to the one they initially wanted to be employed in; being prevented from higher level jobs due to a lack of advanced qualifications and training; and being in a job or career which is either completely unrelated to or which does not use the skills learnt on their degree.

6.26 Graduates outlined a number of things that they would do differently in hindsight, should they look for employment again. Graduates' main actions are outlined below, again in order of their relative importance.

- **Be proactive and be organised**. Graduates felt they should start looking into employment and careers earlier on in their course, and that they should follow a more structured and targeted approach (particularly to accommodate time to complete longer applications for larger graduate schemes, and their deadlines). Bryan's **(detailed case study 1)** approach to finding employment, using a wide range of careers resources, exemplifies the significant impact that a proactive approach can have. In hindsight, graduates realised that a proactive approach is most effective, particularly as not every university or course can guide students through the job search process.

  "Don't expect universities to give you everything you need. Some of it is your responsibility: external accreditation, external seminars, networking events."

  Male, Not in work at 6 months; in work at 3.5 years, Non-BME, Midlands and East of England, Sandwich course

  "You think oh, I don't need it. I'll be fine once I've graduated. In hindsight [seeking careers advice] would have been very helpful."

  Male, In work at 6 months; not in work at 3.5 years, BME, South, Non-sandwich course

- **Seek careers advice early on**. Graduates felt that they should ideally take career considerations and employment opportunities into account at the point at which they choose their course, or failing that, early on in their first year. Graduates commented that they would have spent more time researching their careers options and interviewing skills (e.g. by accessing their university careers service, and attending relevant careers events and by talking to previous graduates or experts in industry).

  "Try going for something specific because it really helps. Try and decide within the first year and plan what you're going to do for your next two years. That's why I'm in this predicament because I didn't really plan what I wanted to do until the very end."

  Male, Not in work at 6 months; not in work at 3.5 years, Non-BME, North, Non-sandwich course

  "[Think] about the future before the future gets to you."

  Male, In work at 6 months; not in work at 3.5 years, Non-BME, South, Non-sandwich course

- **Keep developing technical skills**, so as to make sure that they are relevant to the workplace. Graduates who felt that this was important cited instances where they would have learnt new programming languages and pursued online learning outside of their course to make sure they had developed specialist skills which were sought after by employers. Graduates commented that learning 'something extra' would have helped them to stand out to employers in the application process.

"After you don't programme for a while it is not as fresh in your mind. A lot of computing and interviewing processes require you to have these things fresh in your mind."

Male, In work at 6 months; not in work at 3.5 years, Non-BME, Midlands and East of England, Sandwich course

- Related to this, graduates felt they should **place emphasis on developing 'soft skills' outside of their taught cours**e. In these instances, graduates thought they should have prioritised securing work experience, particularly through choosing a course with a built-in sandwich placement, or a university with strong links to employers. In addition to this graduates felt they should have placed greater emphasis on the development of 'soft-skills' through extracurricular activities such as volunteering and freelance work, particularly as skills and experience picked up during these activities can be added to portfolios and CVs, demonstrating the key competencies that employers are looking for.

"Whether it's voluntary or paid it doesn't matter, get something - get something you can put on your CV to say you've worked somewhere before for a period of time in the field that you want to work in."

Male, In work at 6 months; in work at 3.5 years, BME, South, Sandwich course

- Finally, graduates felt they should **be open minded about the types of jobs that they apply for**. Several graduates felt that focusing solely on large graduate schemes was a mistake, particularly as smaller employers can offer more hands-on experience and responsibility at an earlier stage. Instead of well-paid graduate schemes, entry level jobs can act as a good way to build skills and experience quickly, enabling fast progression within the computer science industry.

Summary

6.27 Many of the computer science graduates interviewed expected a relatively easy and simple transition into employment, whereas in reality this is often not the case. Graduates with the expectation of easy employment were not as proactive in searching for a job ahead of finishing their course, instead believing that the technical skills developed whilst on their degree are, alone, enough to secure a job. A general lack of relevant work experience and graduates' lack of 'soft skills' (including their personality traits) adds to their difficulties in securing employment.

6.28 Results suggest that graduates who do not immediately find employment after finishing their course eventually realise by themselves what they need to do in order to be successful, without seeking much further help from others. Principally, they spend the intervening time after graduating developing their 'soft' and 'work-based' skills through 'interim jobs' and / or change their approach to job applications. In most cases, this means computer science graduates are in a job three and a half years later which is related to their degree and skillset to at least some extent.

6.29 Graduate transitions from unemployment at six months to employment three and a half years later are mostly driven by graduates taking the necessary steps that they feel they should have undertaken whilst on their course. The delay in doing so is largely a result of a misguided perception that computer science graduates are in demand and that they will have a relatively smooth transition into employment.

6.30 However, results suggest sector work is needed to help undergraduates with their career / job search whilst they are still on their courses. At this point computer science students should be made more aware of, and start thinking about, their employment prospects, enabling them to pursue a well thought out strategy which equips them with necessary skills for the workplace and which allows them to successfully gain employment.

7. Conclusions

7.1 The findings suggest that the overarching issue for the computer science graduates interviewed is not that they don't eventually achieve positive employment outcomes – because virtually all were in work at the time of interviewing - but that they are relatively slow to move into work (which is broadly corroborated by LDLHE survey findings). This report highlights how CS graduates could move more quickly in to work.

7.2 **Course accreditation has limited influence on learning choices or employability prospects**. Overall accreditation did not appear to have any significant influence on graduates' decisions to study a particular course, and those unaware of accreditation at the time of course selection did not think it would have made any difference to their decision once it was explained. Graduates did not believe that employers considered whether their course had been accredited important relative to other factors (especially work experience) when applying for jobs.

7.3 **Computer Science graduates benefit from making better informed learning choices earlier on in their career**. Overall graduates who were more proactive, and who spent time carefully considering their university and course choices (basing them on a wide array of factors, including HEI employment prospects and course content), tended to view their higher education experience more positively and moved into employment more quickly. This was in contrast to those who had been more restrictive in their selection criteria and based their choice more around the proximity and/or convenient location of the university - which was a commonly cited criterion among this sample of graduates.

7.4 **Graduate views were mixed as to how well their computer science course had prepared them for the world of work especially in the context of developing the right and relevant technical skills**. Most graduates felt that their course had provided them with the chance to develop soft skills, although the extent and quality of these opportunities varied. Graduates who struggled to find employment upon entering the job market often reported not having the relevant specific technical skills that employers want (including knowledge and experience of different programming and coding languages) – although there is some indication that graduates who targeted roles to best match their technical skill set saw more positive outcomes than those who did not.

7.5 **Computer science graduates who undertook work experience (especially sandwich placements) fared better than those who did not**. Work experience was reported to have enhanced technical and soft skills, and – more importantly – allowed graduates to show employers that they had relevant experience and skills and were work ready. Without relevant work experience, many found it hard to stand out to employers and this held them back in the first instance. Those that undertook work experience as part of their course often emphasised how much this helped in gaining employment after graduating.

7.6 **Those that did not find the work they were looking for soon after finishing their course tended to develop different strategies to move into work**, principally by developing their 'soft' and 'work-based' skills through 'interim jobs' and / or broadening their approach to job applications. Many graduates interviewed had taken some form of action after completing their course to improve their chances of securing employment e.g. postgraduate study, formal training in business and project management or self-learning online. As mentioned, virtually all graduates were in work 3.5 years after graduating (and at the time of the interview) and most were in professional roles with many graduates being happy to stay in their line of work for the foreseeable future.

7.7 Although it is not possible to draw direct conclusions on the extent to which these results are applicable to other subject areas, or the degree to which they are currently lacking, it seems likely that **opportunities for quality work experience, early career planning, research into the course applied for, and the development of softer and / or commercials skills provide benefits generally for graduates entering the labour market**.

7.8 **Overall, results suggest that graduates would have benefited from more extensive support to focus on their career aims/ job search whilst on their courses**. Graduates should be encouraged to give greater consideration to specific types of roles within computer science that they are interested in, which employers and which sectors offer these opportunities, what skills these employers seek, and which ones they personally need to develop at the point of studying their computer course. The importance and benefits of relevant computer science work experience while on the course needs to be emphasised as a key means to:

- gain experience of the workplace
- develop skills which employers value and;
- build confidence and soft skills more widely.