Equality of opportunity for work experience? Computing students at two UK universities "play the game"

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Abstract

A recent UK Government commissioned study found concerning levels of unemployment among computing students from disadvantaged, black and minority ethnic backgrounds. The study highlighted that work experience was a factor in increased levels of graduate employment. As such, it is vital that students have equal access to such work experience. This study considers the availability of work experience to 140 computing students at two city centre UK universities. Data analysis considered socioeconomic background and ethnicity to determine if these influenced attitudes to work experience. While students' socioeconomic backgrounds and ethnicity had little influence on their interest in work experience, patterns of success in gaining work experience reflected worrying graduate (un)employment patterns, with those from disadvantaged, black or minority ethnic backgrounds less able to secure work experience. These findings have serious implications for university and government policies promoting work experience and highlight the need for national interventions.

Keywords

Work experience; computing; ethnicity; socioeconomic background; student placement.

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Introduction

Globally, higher education (HE) is becoming a High Participation System, as increasing proportions of each country's population go to university (Marginson 2016). However, there has not been a proportional increase in vacancies that traditionally require HE degrees; rather, graduates fill jobs that were previously non-graduate roles and employers look for more than a degree from prospective employees (Darr & Warhurst 2008; Farenga & Quinlan 2015). In 2009, the unemployment rate among computer science graduates was 18.1% compared with an all-subject rate of 10.0% (HESAb 2016). Although unemployment rates have declined, computing has remained the worst performing discipline. The UK Government commissioned a UK-wide review of computing graduate employment to identify discipline challenges (Shadbolt 2016), including computing graduates' comparatively slower move into graduate jobs (BIS 2016, 62). The review revealed a complex picture of university stratification, concerns about Black and Minority Ethnic (BME) graduates, and wide variations in employer expectations of both technical and soft skills (Shadbolt 2016). One of the recommendations of the report was to increase the availability of opportunities for relevant student work experience. In recent years, the numbers on traditional computing sandwich degrees (with one year placement) have declined. While reasons for this decline have not been fully explored, student funding models have played a part (Docherty, Jones & Sileryte 2015), together with a (probably related) reduced student demand for placement years (Ramirez et al. 2016). To meet Shadbolt's recommendation, new models for gaining work experience are required, taking into account both students' and employers' preferences, to ensure uptake and useful outcomes. However, we know little about students' attitudes to work experience, their approaches to gaining work experience, and the results of their efforts. This study was designed to ask undergraduate computing students about their attitudes and experiences and, by taking their contexts into account, reveal some of the challenges faced by individuals in approaching work experience.

Work experience, employability, and social mobility

There is a widely acknowledged demand for skilled computer science graduates (for example, Blackwood 2016, UKCES, 2015). So the relatively high graduate unemployment rates for computing (HESAb 2016) are something of a conundrum (Smith 2016). Efforts to explain the phenomenon include a recognition of the wide range of roles available to computing graduates, combined with the many and diverse skills expected by their employers (Fincher & Finlay 2016), as well as the off-shoring of technology industry jobs, especially in the UK context (Donnelly, Grimshaw, & Miozzo, 2011). Furthermore, it has been suggested that computing students may be more interested in gaining technical skills than acquiring diverse professional skills: for example, university staff in Fincher and Finlay's study (2016) observed that their students were instrumentally motivated by their love of computers and coding, rather than their career prospects.

Within the overlapping contexts of demand for computing graduates and relatively high rates of unemployment, work experience is consistently associated with improved employment prospects for computing students and graduates (BIS 2016; Docherty et al. 2015; Farenga & Quinlan 2015; Fincher & Finlay 2016; Shadbolt 2016). Silva, Lopes, Costa et al (2016) demonstrated that sandwich courses with internships significantly decreased graduate unemployment, compared to first-cycle degrees without integrated internships. There are many similarities in their study of Portugal with the UK context, including a recognition of contextual influences such as the stratification of Higher Education Institutions and corresponding impact on employability (Jackson 2014;

Marginson 2016; Spiegler & Bednarek 2013). In the UK, opportunities for work experience and their take-up by students are limited (Docherty et al. 2015). Students need to *actively compete* for placements and internships, while studying for their degrees and potentially working to support themselves financially, leaving some with significant challenges (Bathmaker, Ingram, & Waller 2013; Farenga & Quinlan 2015; Ramirez et al. 2016).

University provides potential resources for social mobility, especially for computing students (Darr & Warhurst 2008). However, all stages of this process are influenced by the students' backgrounds, including participation in university and work-based learning, level of award, and outcomes for graduates, such as future positions and pay (Bathmaker et al. 2013; Marginson 2016; Social Mobility Advisory Group 2016). Smith, Smith and Caddell (2015b) found that, while students valued the experience of work placements more than the pay per se, many of the students in their study would not have been able to take on unpaid placements. Indeed, unpaid internships were identified as a threat to equality of opportunity and universities should be mindful of this when considering fair access.

As a subject discipline in higher education, computer science is taught in the majority of universities, both established and modern, and is generally successful at attracting students from under-represented groups. Computing courses include students from Low Participation Neighbourhoods (LPN) at 14% (compared with 10% for all STEM subjects) and Black and Minority Ethnic (BME) at 37% (compared with 32% for all STEM subjects) (Shadbolt, 2016). This discipline attractiveness to diverse groups is a reason to celebrate; but also a reason to consider whether, once recruited to a university course, there is equality of opportunity, leading towards a graduate job.

Habitus, capitals, and playing the game

Following Bathmaker et al. (2013), Burke (2015), and Farenga and Quinlan (2015), this study was underpinned by Bourdieu's concepts of *habitus*, *capitals*, and *playing the game* (1977). These provided frameworks to explore and describe the influence of students' backgrounds on their propensity to gain work experience, while they are at university, including their confidence (and support) in negotiating work experience processes and markets. With the concept of *habitus*, Bourdieu aims to describe an individual or group's social context, while encompassing both structure and (potential) agency (1977). Burke understands habitus as the "norms, values and dispositions directing agency or practice" (2015, 67). Habitus has been interpreted as a structure that determines our actions and Bourdieu has been criticised for emphasising the influence of structure over agency (Bathmaker 2015). However, Bourdieu's parallel concept of *the game* demonstrates that, while habitus influences people's options and dispositions, it is built on their actions, over time. Bourdieu adopted this game metaphor to reflect a social kind of competition, where an understanding of the rules and useful strategies for success are gradually acquired from close networks, such as family (Bourdieu, 1990). His concern is to provide a balance to ideologies that imply a level playing field in which individuals (and organisations) are equally responsible for their success or failure:

> "Those who talk of equality of opportunity forget that social games—the economic game, but also the cultural games (the religious field, the juridical field, the philosophical field, etc.) are not 'fair games'. Without being, strictly speaking, rigged, the competition resembles a handicap race that has lasted for

generations or games in which each player has the positive or negative score of all those who have preceded him, that is, the cumulated scores of all his ancestors" (Bourdieu 2000, 214–215).

The concept of habitus is increasingly used to discuss the influence of social class on people's paths through education and work; and the concept of playing the game is applied to the many activities students are expected to undertake, beyond their studies, to gain success in the graduate job market (e.g. Bathmaker et al. 2013; Bathmaker 2015; Brosnan 2017; Brown, Hesketh, & Williams 2004; Burke 2015; Farenga & Quinlan 2015; O'Shea 2016). In this study, student recognition of the value of work experience to them is taken to be an indication of understanding the rules of the game of graduate employment, where recognition includes attending preparatory workshops, submitting applications and attending interviews.

Capitals are resources for social mobility (O'Shea 2015) and "mobility within fields of power is contingent upon one's ability to deploy forms of economic, social and cultural capital" (Borlagdon 2015). Bourdieu describes four types of capital: economic capital; cultural capital (including education and cultural preferences); social capital (people and networks); and symbolic capital (prestige and legitimacy) (1985; Navarro 2006). Bourdieu developed the concept of capital, from Marxian ideas in which *economic* capital shapes society, to the more pluralistic, nuanced, and reflexive framework of capitals (Yamak, Ergur, Özbilgin, & Alakavuklar 2016). Bourdieu's concept of symbolic capital draws attention to the resources that support recognition of prestige, legitimacy, meaning, value and power (Navarro 2006; Yamak et al. 2016). Tomlinson (2017) argues that this framework supports investigations of the myriad resources (or deficits) that may support our paths through study to working life. With symbolic capital, there are clear winners and losers (Yamak et al. 2016). For example, the Social Mobility Commission (2016), studying career progression in investment banking, identify the importance of a "particular portfolio of economic, social and cultural capital, which is more available to young people from privileged backgrounds" (p iii), including "speech patterns, accent, behaviour and dress" (p84). This may be presented as "polish" (p 84) or "face fitting" (Smith & Smith 2016, 4). Employers, especially in times of insecurity, may be inclined to hire people that resemble their employees in order to maintain the status quo (Social Mobility Commission 2016, 108), in spite of equality legislation and evidence that diversity increases performance (Hunt, Layton, & Prince 2015). Unfortunately, a characteristic such as race or gender may be perceived as making an individual more or less suited to a role by a potential employer (or even university staff). Using data from 2013–14, HEFCE (2015) found that white graduates were more likely than graduates from almost all BME groups to go into employment after graduation. For example, they found an unexplained difference of over seven percentage points below the reference group for Chinese and black African graduates; and these gaps increase over time (HEFCE 2015, 29; Social Mobility Advisory Group 2016, 5)[1]. Thus suggestions that increased access to capitals in themselves would increase social mobility over-state agentic endeavour; the term "glass floor" (Waller 2011, 9) captures this seemingly impermeable barrier to change.

In the context of computing students, our overarching question is whether they recognise the game and have sufficient capitals to be effective players? Through graduate employment rates, it can be seen that work experience, including internships and placements, is central to this game. In this study, we try to get a modest idea of students' habitus and the capitals available to them, combined with their awareness of the employability game—the activities students are increasingly expected to do, beyond their studies, to gain "prized graduate positions" (Chillas, Marks, & Galloway 2015). The research questions to emerge, therefore, are: i) What are

student attitudes to gaining relevant work experience? ii) Do attitudes and experiences vary according to socioeconomic status and/or ethnicity? The aim of this pilot study was to explore how computing students experience access to work experience in two universities with computing departments of similar size. Both universities attract students from diverse backgrounds. Both universities have positive approaches to paid computing placements, including infrastructure in the form of placement staff and placement courses.

Methodology

Gathering data from students

Undergraduate computing students were surveyed at two post-1992 universities[2], one in Scotland (University S.) and one in England (University E.). Both universities have urban campuses and large computing departments. The survey instrument drew upon several studies, primarily conducted within University S, into student/graduate perceptions of employability initiatives (e.g. Smith, Berg, & Smith 2015a; Smith et al. 2015b; Smith, Smith, Taylor-Smith, & Fotheringham 2017). Following Bourdieu (e.g. 2000), the survey questions were also designed to gather information about the students' backgrounds and their understanding of the employability 'game' (Bathmaker et al. 2013).

Students were invited to participate by email, through in-class presentations, and at events. Students in later years were targeted, so that they would have relevant experience. A face-to-face survey (personal interview survey) method was chosen in order to gather responses to all relevant questions, avoiding respondents giving up, skipping questions, or misunderstanding crucial terms. In previous surveys, conducted by the research team, respondents had misinterpreted terms such as "work experience", "work-based learning", "placement", and "internship". This was evident through mismatches between a respondent's answers within the survey and seemed to lead to respondents omitting information about their own relevant experience. In this study, interviewers encouraged students to understand these terms widely and inclusively and to provide any relevant data. Interviewers also encouraged respondents to complete each survey as far as possible, including unpopular questions, such as asking students to describe their social class. The disadvantages of this method include potential interviewer bias, potential reluctance for respondents to answer sensitive questions, and time pressures. There is also a relatively high cost per respondent and geographical limitations, compared to paper or online surveys (Szolnoki & Hoffmann 2013, 58). In practice, the face-to-face survey methodology could only be implemented in certain situations and more flexible methods were adopted to fit the contexts in which the researchers encountered the students. These included students completing the survey under the guidance of researchers or completing the survey individually. Where possible the researchers checked through the completed survey with the respondent to identify any gaps or mismatches. Surveys were completed on paper. Various small incentives were provided to recognise the time the students contributed to the project.

Ethical procedures

The research fully complied with each university's ethical requirements. Specifically, each respondent was provided with written information about the study, including how their data would be handled. Respondents signed informed consent forms and these were immediately separated from the anonymised data. The questionnaire was reviewed by the Equality and Diversity Office at University E.

Results

Demographics

The gender balance in both sets of respondents was similar, with 18.6% of respondents of each university identifying as female. The percentage of women studying computing in the UK is 16.5% (HESAa). Comparison figures for full-time undergraduate computing students in 2016/17 are University E: 19%; University S: 15%. Most respondents were under 25, though University S respondents were a little older (42.9% over 25, compared to 11.4% of University E respondents). Reflecting the four year degree in Scotland, most University S respondents were in their 3rd or 4th year of study (31 and 32 respectively), whereas most University E respondents were in their 2nd year (49; 13 in 3rd year and 8 in 4th year). As shown in Figure 1, respondents' ethnicity reflected the relative diversity of the two universities: 92.8% of University S respondents were white, including 27.1% from Europe, beyond the UK; whereas over half the University E respondents identified non-white ethnic backgrounds, including 11.4% black African, 8.6% Asian Indian, and 7.1% Asian Chinese. The ethnic background options are based on previous Scottish Funding Council (SFC) categories.

Figure 1: Ethnic background
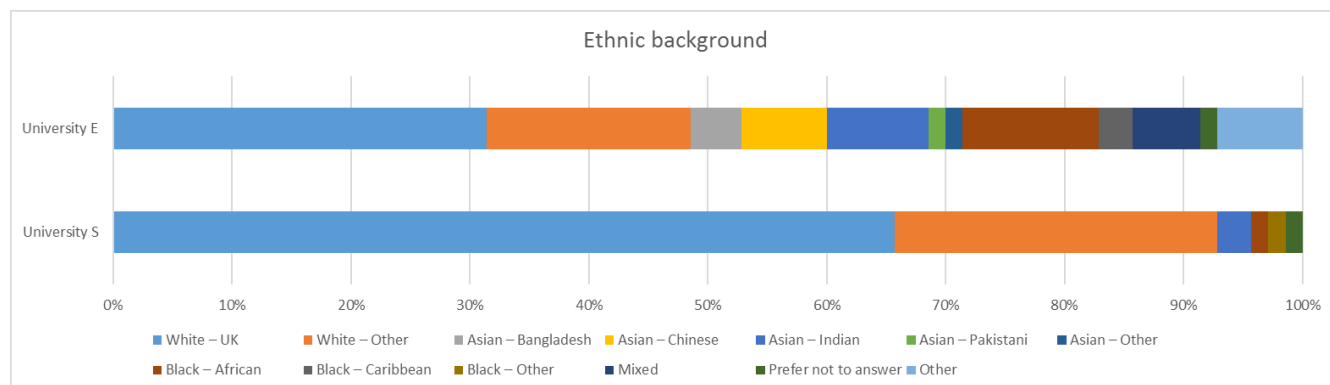
Students were asked their social class as free text, providing the examples working class and middle class, specifically: "How would you describe your class? (e.g. working class, middle class, etc.)". Table 1 summarises the responses. Just over half the students identified as working class, including more University E than University S students (65.7% compared to 50%). The students' self-identification was triangulated with their parents' higher education. For 58.6% of respondents, neither parent had attended university or polytechnic (according to their offspring); for 23.6%, one parent had attended; for 17.9%, both parents had attended. Reflecting the social class figures, fewer students from University E came from families where the parents had higher education than University S. Neither parent had attended HE for 65.7% of University E respondents and 51.4% of University S respondents. The relationship between social class and parents' HE was found to be significant, with a Pearson Chi Squared score of 0.01.

Table 1: Respondents' social class

	Working class	Working to middle class	Middle class	Middle to upper class	Blank or no comment
University S (n=70)	35 (50.0%)	5 (7.1%)	26 (37.1%)	1 (1.4%)	3 (4.3%)
University E (n=70)	46 (65.7%)	1 (1.4%)	16 (22.9%)	0 (0%)	7 (10%)
Total	81 (57.9%)	6 (4.3%)	42 (30%)	1 (0.7%)	10 (7.1%)

Students' agency and awareness of the game

Students were asked whether their degree course included a placement (optional or compulsory) and whether this affected their choice of university and degree. They were asked further about their motivations for choosing their degree and whether they recognised the importance of work experience at the beginning of the course and as their studies progressed. The responses to these questions help to build a picture of the students' awareness of their choices and activities at university as part of their career planning. Combining responses from both universities, 80.8% of respondents recognised that their course offered a compulsory or optional placement and only 5.7% did not know. However, this only influenced a quarter (26%) of respondents citing in their choice of degree programme and university. From multiple-choice answers, the students' strongest motivations for this choice were "of interest" (69.7%), "for a specific career path" (59.7%), "subjects were enjoyable" (33.8%), and "placement or work-related opportunities (20.8%). Options which indicated less agency in decision-making were distinctly less popular: only 4.3% admitted "parental influence" and only one person was motivated by "subjects were easy". The respondents were asked to rate their agreement with two statements about work experience: "When I started my course I knew that I wanted to gain relevant work experience" and "As my studies progressed, I came to realise that gaining relevant work experience would be useful". 73.6% agreed or strongly agreed with the first statement; 90.6% agreed or strongly agreed with the second statement. This increase in interest was further reflected by a move from agree to strongly agree: where 34.3% of students strongly agreed with the first statement, 59.9% strongly agreed with the second statement. This set of responses indicates that the students generally had a good awareness of how their choices and activities at university could or would impact on their future careers. This is in marked contrast to pictures of students with tunnel-vision focus on their studies (or their social life). These students were aware of the basics of the employability game.

To get an idea of where this awareness came from, respondents were asked about who they would go to for advice and who they received encouragement from. Students were asked to agree or disagree that they were encouraged to gain work experience by various university staff, family, friends, and other students. 76.1% agreed (including strongly agreed) that their lecturers encouraged them and 75% agreed they were encouraged by placement /careers staff; whereas 59.2% were encouraged by their family and the same for friends; 55.2% were encouraged by other students. Over half the students had looked for help or advice on making job/ placement applications (57.9%) and 61.6% of these had sought advice from placement and careers staff at their university; with 31.3% seeking advice from teaching staff and 33.3% consulting online resources; 33.3% had asked their parents and 23.2% had asked other family members. Respondents were also asked in free text about whose advice had been most valuable. The most popular frequent responses included references to placement and careers staff (27), teaching staff (22), parents and family (22), with 12 people citing industry connections, such as industry mentors and colleagues they had met during work experience. In this picture, both universities and families are supporting students to gain work experience, but the resources provided by the universities are proving more useful in this context.

The relevant resources provided by the universities were assessed by asking the students whether they had attended any events that might help them prepare for work experience. 37.4% had attended more than one event or undertaken an employability skills or professionalism module; and a further 23.7% had attended one event (or just answered "yes"). Respondents were asked which events they found useful. The most popular events (from

free text responses) were CV-writing (30 mentions) and mock-interviews (20). Other popular responses were employer networking events (10), mentoring scheme events (9), and placement fairs etc. (6). This short catalogue gives a reasonable overview of the employability activities currently provided by the two universities.

Influence of social class and ethnicity on applying for and gaining work experience

The data gathered that relates to habitus is the students' social class (via self-identification and parents' higher education) and their ethnicity. As the sample is relatively small, the sub categories of social class and ethnicity do not contain enough data to provide significant results. However, there did seem to be some differences in students' overall experience of the application process associated with gaining work experience according to their social class and ethnicity, which might become clearer in either a wider or deeper study. Students were asked various questions about their experiences, including the free text instruction "Please could you describe any work experience (e.g. placement or internship) since you started your course". Students were asked about: the perceived benefits or drawbacks of work experience; whether they had applied; and the application process and results (if applicable).

Table 2: Have you ever applied to get work experience relevant to your degree? Were you offered work experience?

	Applied for work experience			Offered work experience			
	n (applied/ not applied)	Yes applied	No did not apply	n (offered/ not offered)	Offered work exp.	Not offered work exp.	Other/ haven't heard yet
Both parents attended HE	25	16 (64%)	9 (36%)	14	9 (64.2%)	4 (28.6%)	1 (7.1%)
One parent attended HE	33	20 (60.6%)	13 (39.4%)	20	13 (65%)	4 (30%)	1 (5%)
Neither attended HE	82	53 (64.6%)	29 (35.4%)	50	26 (52%)	20 (40%)	4 (8%)
Working class	81	51 (63%)	30 (37%)	47	23 (48.9%)	19 (40.4%)	5 (10.6%)
Working to middle class	6	4 (66.7%)	2 (33.3%)	4	3 (75%)	1 (25%)	0 (0%)
Middle class	42	26 (61.9%)	16 (38.1%)	25	16 (64%)	9 (36%)	0 (0%)
Middle to upper class	1	1 (100%)	0 (0%)	1	1 (100%)	0 (0%)	0 (0%)
Blank /n.c. re class	10	7 (70%)	3 (30%)	7	5 (71.4%)	1 (14.3%)	1 (14.3%)
White	99	60 (60.6%)	39 (39.4%)	58	35 (60.3%)	19 (32.8%)	4 (6.9%)
BME	39	28 (71.8%)	11 (28.2%)	25	13 (52%)	10 (40%)	2 (8%)

Table 2 shows the same categories for answers to the questions "Have you ever applied to get work experience relevant to your degree?" and "Were you offered work experience, and have you started it/ completed it?" Both questions offered multiple-choice answers. The answers to the second question have been simplified, so that answers indicating that the student *has* been offered work experience have been collapsed into one category. This category includes: "Offered, but haven't started it"; "I've started it"; "I've completed it"; and "I've been offered it, but I can't do it". In the responses to these questions, students whose parents attended HE were no more likely than students whose parents did not attend HE to have *applied* for work experience (64% and 64.6%). However, students whose parents attended HE were more likely than students whose parents did not attend HE to have been *offered* work experience (64.2% compared to 52%). Students who identified as middle class were very slightly *less* likely than students who identified as working class to have applied for work

experience (61.9% compared to 63%); but much more likely to have been offered work experience (64% compared to 48.9%). BME students were more likely to have applied for work experience than white students (71.8% compared to 60.6%). However, BME students were rather less likely to have been offered work experience (52% compared to 60.3%).

Discussion

This study sought to reveal attitudes to, and experiences of, gaining work experience for undergraduate computing students at two universities. Of particular interest was whether there were different attitudes between students aligned to the characteristics of self-reported social class; those whose parents had been at university; and ethnicity. To consider students' attitudes to work experience the discussion is presented in three sections: recognising the role of work experience; knowing how to access work experience; and gaining work experience.

Recognising the role of placement

Recent critical research into student placements in the ICT sector has found that internships "are a mechanism by which already advantaged students maintain their privileged position" (Chillas et al. 2015, 12). For the two universities in the study, work experience was generally viewed by staff as a way of evening out the advantages in the labour market that graduates from elite institutions enjoy (Clark & Zuckas 2015). It is clear from the data that the benefits of work experience were understood by most students. Students at both universities realised work experience was important for career aspirations, for example to discover more about relevant ICT professions (Jackson 2014). Tomlinson considers students' interest in and understanding of the value and purpose of interactions with employers to be evidence of cultural capital (2017). There was evidence that academic and careers staff had contributed to explaining the benefits of gaining work experience—the "rules of the game" (Bathmaker et al. 2013)—to all students. Indeed, students recognised encouragement from a range of sources: lecturing staff, placement/ careers staff, and family were all sources of encouragement and this was consistent between the two universities; and with findings elsewhere (Greenbank 2011). However, levels of interest vary with context: for example, Doherty et al. (2015) and Ramirez et al. (2016) found that, in general, students preferred to complete their degrees early and start a graduate role rather than interrupt their studies to undertake work experience. In their study, Ramirez et al. (2016) also found that placements were seen as a distraction to study or on-campus socialising. The next consideration is, having some appreciation of the rules, whether (and how) students engage with the preparation and application processes.

Applying for work experience

Beyond recognising how work experience can support overall aims of a graduate career, some students knew more about how to apply for placement than others. Most students sought advice on making applications; however, this was more prevalent at University E (65.7% compared with 50%). Advice was sought in the main from placement / careers staff, especially at University E. As both universities have high profile placement offices this finding needed deeper exploration. It seemed that the industry-mentoring programme at University E was an additional factor in seeking advice on applications. In Carbone and Hamilton's Australian study (2016), students identified industry mentors as a way of improving their employment outcomes, for example, as being helpful in understanding the attributes companies are looking for in recruitment and employment.

While recognising the benefits, not all students attended events designed to prepare them for work experience. Lack of engagement has been observed elsewhere (for example, Sin & Neave 2016; Tymon 2013). Students have been found to avoid events where they believe there is a poor cultural fit (Clark & Zukas 2013), i.e. the sense that "this isn't for me". The events that were well attended represented specific, personalised services such as CV workshops and mock interviews. These are well-understood techniques with accessible and achievable aims. Tomlinson argues that these are opportunities "to harness embodied dispositions and behavioural competences" (2017, 345). However, in this study, the popularity of these activities could reflect that they were the specific examples given in the survey.

Students have been found to give up following unsuccessful applications, where they lack confidence and resilience (Doherty et al. 2015). The time taken to complete numerous application forms and intense recruitment processes have also been identified as a barrier (Smith et al. 2015a). From a student / graduate identity perspective, a lack of positive affirmation impacts on future approaches to applications (Holmes 2013). Those self-reporting as working or middle class were just as likely to have *applied* for work experience. This is an encouraging indication of broad recognition of (and compliance with) the rules of the game that are cited as leading to positive graduate outcomes. Similarly, students were equally likely to apply for work experience, whether their parents had been to university or not. This is also encouraging, as, elsewhere, a lack of access to capitals (including understanding the rules of the game) has been observed in those from lower socio-economic groups or those first in their family to attend university (Abrahams 2016; Bathmaker 2015; Morrison 2014). Previous studies have noted that students need economic capital to take advantage of placements, particularly in other geographical locations (for example, Chillas et al. 2015). The location of the two universities in large urban settings (and financial centres), with local access to technology companies, may be contributory factors. The impact of a university's geographical location was highlighted by Shadbolt (2016) in terms of graduate mobility, with some locations retaining their graduates but those graduates suffering relatively high levels of unemployment. Analysis of published data revealed that graduates from low participation neighbourhoods were less likely to be working away from their location of study; BME graduates were generally more mobile, with 15% re-locating to London following graduation, joining the 28% of BME students who studied in London before finding employment (Shadbolt 2016). It is not clear from the data provided in Shadbolt's report whether this was a preference or necessity. Further, students from more privileged backgrounds are more able and likely to choose a university away from their family home and wealthier universities can support different approaches to employability than lower status institutions (Brookes 2017).

Finally, minority ethnic group students were slightly *more* likely to have applied for work experience (67% compared with 61% of white students). This leads to a consideration of the next step towards a successful attempt to gain work experience: an offer.

Gaining work experience

In this study, the data indicates a bias according to the students' backgrounds (self-reported class; whether parents had attended university) in terms of success in gaining work experience. For example, those whose parents had attended HE were more likely to have been offered work experience. However, the survey did not capture information about the application process. It is likely that social capital is a factor in this finding.

Bourdieu defines social capital as "the aggregate of the actual or potential resources which are linked to possessions of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (1985, 248). As observed by Allen et al. (2013) for creative industry students, participants may have used contacts to explore or gain access to work experience, for example through their parents' social and professional networks. Hezlett and Gibson (2007) describe how social capital is mobilised in this context to create value from social ties. Bathmaker et al. (2013) observe that certain students can "more readily mobilise several forms of capital simultaneously, for example combining cultural capital in the form of 'what they know' with social capital in the form of 'who they know'" (p726). The social networks of graduate parents are more likely to contain graduates/ professionals with access to non-competitive paid and unpaid work experience combined with the economic capital required to take advantage of these opportunities (Abrahams 2016).

This study also found a difference when it came to ethnicity, with BME students less likely to have been offered work experience following an application (60.3% of White students were offered work experience, compared with 52% of BME students). Given the small sample size (84 students answered this question, reflecting the number who had applied for work experience), the comparison is not significant, but still worrying, as it reflects the graduate employment profile reported by Shadbolt (2016), where BME graduates had an unemployment rate of 17.3%, compared with 11.2% among white graduates. Furthermore, if in work, BME graduates in Shadbolt's review (2016) were more likely to be in non-graduate level employment (31% BME compared to 17% white). This is not only an issue for computer science. Wilton's (2011) study of management graduates post-placement found that "on virtually all measures of labour market attainment, minority ethnic graduates reported inferior outcomes compared to their white peers" (p96). Measures included job satisfaction, career satisfaction, degree-level employment and salaries. In a study of state schools, Wallace (2017) found black middle class pupils acquiring "dominant cultural capital" (p14) but still finding their advancement impeded. Previously, Morley (2007) had found that employers "frequently overlooked the context and equity implications of employability skills", finding employer notions of employability to be "underpinned by classed, gendered and racialised ideological subtexts" (p205). The published literature on outcomes for minority ethnic groups is extensive and beyond the scope of this paper. This study uncovered an appetite for work experience amongst BME students, but found them to be less able to access it. Further, more nuanced results would be expected from studies that supported analysis of ethnicity at a finer level of granularity, and the intersections of ethnicity, gender and socioeconomic backgrounds.

What next for universities, employers and government?

The pilot study paired two universities with similarities and differences and gathered responses from seventy students in each. Findings indicated that there is a danger that increased access to work experience could entrench existing disadvantage and exclusion , Before universities and employers act on the Shadbolt recommendation to increase work experience, the study should be repeated with a wider range of universities, including universities outside large cities and 'elite' universities, where attitudes may vary to those uncovered here (e.g. see Brooks, 2017). Certainly, further exploration of student attitudes to (and experiences of) work experience is essential if the Shadbolt recommendation for more access to work experience is to be realised and effective. Furthermore, higher education alone cannot solve this problem; HE is "necessary but not sufficient, one part of a chain of institutional effects" (Marginson, 2016, 431). While some work has been conducted (for

example, Smith & Smith 2016), a critical exploration of employer attitudes is also necessary to complete the picture.

Conclusion and recommendations

The driver for this research was a recognition by the UK government of a problem with unemployment amongst computing graduates, leading to the commission of the Shadbolt Review (2016). HE has been challenged to identify potential solutions to this problem and inform public policy, by initiating action in the university sector and with employers in the IT industry. There is already a well-established history of industrial placements and other work experience opportunities within the university sector, and this study provides further evidence that these opportunities are recognised and welcomed by students. As discussed, there are a number of competing factors that have resulted in a decline in the uptake of these opportunities in recent years, and the view expressed in the Shadbolt Report that reinvigorating work experience opportunities and activities would have a positive impact on graduate employment in computing is not challenged by this study. However, it is also clear from the study that the major issue is not student willingness to engage in work experience, but the availability of work experience opportunities, particularly for BME students.

In many ways, computing has been a success story in modern UK Higher Education, as it has consistently attracted the highest percentage of students from Low Participation Neighbourhoods (LPN) and BME students, suggesting that the subject is seen as an opportunity for advancement by many students. In reality, although computing graduates have a relatively high unemployment rate in graduate terms, for students coming from LPN and BME communities such unemployment rates are very low compared with their own communities, and the success rate of computing graduates in finding relevant graduate employment is of more relevance. This creates a confounding factor in considering this issue, since the perception of students from disadvantaged backgrounds may be quite distinct from government policy makers and university management. However, what is eminently clear from this research is that students coming from disadvantaged backgrounds do not possess the economic, cultural, social and symbolic capitals to compete equally in the graduate employment marketplace. Therefore, work experience opportunities *should* provide the mechanism by which the absence of these capitals can be mitigated and overcome (at least to some extent), assuming the students concerned are given equal access to such opportunities and employers continue to prioritise relevant work experience in their graduate recruitment decisions.

Within the two universities in the study, students were generally aware that work experience was beneficial as part of their degree study and they were prepared, where possible, to get involved in the necessary employability and application processes. They need to be welcomed by employers with recruitment approaches that value equality and diversity and view work experience as a chance for students to learn new technical and soft skills. However, with increased pressure on the placement 'market', there is a danger that employers will instead continue to raise their expectations that placement students will already be socially sophisticated, confident, and able to access the economic, social and cultural capitals that create winners and losers (Chillas et al. 2015) - often inappropriately referred to as "work-ready". Employers may also mistakenly accord these characteristics with students' apparent ethnicity. To expand access to work experience, universities need to develop their understanding of students' diverse forms of cultural capital and any barriers associated with students' ethnicity,

then work with employers to challenge the (often unconscious) bias inherent in recruitment, in order to open up work experience and placement opportunities. It is here that public policy has a role in promoting recruitment and employment procedures that are genuinely meritocratic, blind to ethnicity, gender, and socioeconomic background, and provide mechanisms to employment that encourage engagement rather than a hurdles race that eliminates anyone not fitting a predefined, and often flawed, profile. It is important to recognise that demonstrating an open, unbiased and meritocratic process for work experience opportunities is likely to increase the uptake of these opportunities by the very students the process is seeking to engage.

This study has drawn from existing research on economic, social, and cultural capital to demonstrate that the issues of unemployment amongst computing graduates have their roots in the success of the discipline in attracting students from lower participation and BME communities. A number of confounding issues arise: including student vs. establishment perceptions of employability; employer bias; employer expectations of work-ready interns and graduates; and the need to establish genuinely meritocratic recruitment and employment procedures. As indicated, there is a need to carry out further research, based on this model, at a range of universities, before moving forward on further work experience models. This research has opened up an area that was previously incompletely explored, and has developed some robust, empirical evidence to demonstrate that there is a problem to address. It has clearly demonstrated that, while the arguments for improving the work experience for students in HE proposed by Shadbolt are valid, the mechanisms need careful planning and consideration to ensure that there is equality of opportunity for all computing students, and that the industry develops a genuinely meritocratic model for recruitment and employment.

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