Growing Experience

A Review of Undergraduate Placements in Computer Science for the Department of Business, Innovation and Skills

Acknowledgements

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Executive Summary

The final quarter of 2013 saw the fastest increase in UK technology sector business for over four years, and 44% of UK technology firms were planning to hire more staff in 2014[1]. Despite this, the computer science graduates who are fundamental to this growth show the highest level of unemployment of all students six months after leaving university[2,3]. The reasons for this are complex, but time and again research and employers point to undergraduate work placements as an effective method for improving employment outcomes in computing. And yet the current supply of placements outstrips demand. This report seeks to understand this apparent paradox, to make sense of supply and demand, and to make recommendations for future research and policy.

We surveyed forty Higher Education Institutions (HEIs) across the UK about the quality and quantity of current computing placement activity, and explored in depth their views, working practices and their perception of the barriers to student uptake. To complement these findings, we sought insight from three major technology employers.

Key research findings

On average 26% of third year computing undergraduates – and 6% across all years – undertook a recorded work placement.

- The majority of placements were in the third year, one-year long and accredited.

- HEIs are aware that students also undertake short-term and vacation placements, and these are in increasing demand from students and employers, but they are rarely recorded by the university.

- Lack of student demand for the traditional sandwich course results in low take-up rates.

- Students drop out of placement years because they do not recognise their benefits, or they want to reach paid graduate employment as soon as possible.

- Complex recruitment practices are also a barrier to take-up.

- All HEIs are trying to grow take-up, but few have performance indicators about the relative effectiveness of their multiple strategies.

- Universities vary in the size and type of company they work with, but most agree that they want to grow the market in Small and Medium Sized (SME) sector placements, whilst recognising that this has significant resource implications.

- The employer to placement ratio is 1.3 students per company, which also puts a high burden on university administration.

- There is a significant tension between growing the quantity and diversity of placements, whilst retaining quality.

[1] www.kpmg.com/UK/en/IssuesAndInsights/ArticlesPublications/Documents/PDF/Market%20Sector/Technology/tech-monitor-uk.pdf
[2] Higher Education Statistics Agency (HESA), Longitudinal Survey of Destinations of Leavers of Higher Education (DLHE).
[3] UKCES (2012), Working Futures 2010-2020: Main Report.

In light of these findings, we propose the following course of action:

Recommendations

1. Best practice in placement activity will be actively marketed by the NCUB on its website.

2. To enable a fuller picture of placement activity and aid decision making in HEIs, the Higher Education Statistics Agency (HESA) should collect and publish additional and more granular information on different types of work placements.

3. Universities should aim to record all relevant work experiences; even those arranged by the student themselves.

4. To complement this survey of universities, and to gain a deeper insight into the potential for different kinds of work experience, the NCUB will work with others to commission a survey of computing undergraduates.

5. HEIs should seek to quantify the effectiveness of their student engagement strategies.

6. Academic and placement staff must collaborate more to dispel the belief that there is a conflict between academic achievement and work experience.

7. NCUB to work with others – especially the Tech Partnership – on workshops about potential new and innovative work experience schemes, and on how to develop the work-readiness skills of computing undergraduates.

8. Tech Partnership to work with NCUB and willing universities on developing higher volume placement programmes for small and mid-sized companies.

9. NCUB will collaborate with HEIs on piloting online brokerage solutions for work experience.

10. NCUB supports the government's decision to fund an independent review of Computer Science degree accreditation arrangements to improve quality and graduate employability[4]. The accreditation of a wider range of work placement lengths - beyond sandwich placements - should be seriously considered as a way to increase the placement options available to computing students and businesses without adversely affecting quality.

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[4] www.gov.uk/government/publications/our-plan-for-growth-science-and-innovation

(The footnotes below relate to the copy overleaf).

[5] Higher Education Statistical Agency (HESA), Longitudinal Survey of Destinations of Leavers of Higher Education (DLHE).

[6] UKCES (2012), Working Futures 2010-2020: Main Report.

[7] BIS Research Paper 143 (2013), Learning from Futuretrack: The Impact of Work Experiences on Higher Education Student Outcomes.

[8] High Fliers Research, The Graduate Market in 2014.

[9] These HEIs cover 38 per cent of computer science students in the UK in 2012-13 (all years). Although not a strictly representative sample, we sought to obtain as even a distribution of universities as possible by size, location and mission group, a breakdown of which can be found in the appendix. HEIs drew on various internal data sources to complete the questionnaire and therefore the accuracy of the data they have provided is largely dependent on their own internal processes for recording information on student numbers and placement activities.

Introduction

> **"YOU MUST GO ON A PLACEMENT. You gain crucial work experience in your chosen field and learn many new skills. It also increases your chances of employment after university."**
> *(Advice from a past placement student at Northumbria University)*

Despite strong demand from the computing and technology sector, and an increasing number of job vacancies, computer science graduates show the highest level of unemployment six months after leaving university of all students[5,6]. There are complex reasons for this, but without doubt placements are one effective method for improving employment outcomes for students across all disciplines. For example, undergraduates who undertook a placement were less likely to be unemployed six years after enrolment compared to their contemporaries[7]. Additionally, in a recent review of graduate vacancies, over half of the one hundred surveyed recruiters reported that applicants without previous work experience had little or no chance of receiving offers on their graduate schemes[8].

In light of this evidence, it is logical to argue that more and better placements for computing students would improve the immediate chances of these undergraduates securing a job. However, there is currently little evidence regarding the take-up or quality of placements in computer science, or of the other contributing factors that explain why the majority of computer science students do not take up placements. This report contributes to a better understanding of this problem by providing new evidence, from the perspective of Higher Education Institutions (HEIs), about computer science placements.

To build a rich evidence base and make effective recommendations for future research and policy we surveyed HEIs about the current quantity and quality of computing placement activity. In addition, we explored in depth their views and working practices. And to make sense of supply and demand we analysed the placement offer and the HEIs' perceptions of barriers to student uptake.

Forty HEIs from across the UK responded to our questionnaire[9], and for validation we held follow-up telephone interviews with twenty-five of them. In addition to this we conducted thirteen semi-structured interviews[10] from which we also drew case studies to showcase good practice. Finally, to complement these findings we sought insight from three major employers who provide placements for computing students. Bringing together all of the above, we offer insights into how universities view and manage the multiple stages of the journey to a successful placement – including sourcing employers, engaging students, supporting applications, ensuring that quality standards are met, and assessing success.

We were aware of significant data challenges, some of which we could only partially overcome. First, among the many different types of work experience, HEIs mainly collect information on students taking a full year or a sandwich course. And secondly, there are no formal definitions for different types of placements[11]. To mitigate data collection biases we focussed on a specific definition of a "placement"[12] – namely one organised by the HEI. Finally, to minimise the impact of institutional interpretation of what a computing student is, we restricted the analysis to those enrolled in the JACS[13] subject group "computer science".

Based on this data, the first part of this report explores evidence and findings on the supply of computing placements – what they look like and where they come from. This is followed by an analysis of student demand in Part 2, and finally, in Part 3, of how HEIs are guaranteeing the quality and value of computing placement experiences.

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[10] Interviews targeted placement staff and academics involved with placements at computer science departments in the HEI and where placements were managed centrally, interviews were held with the central career services staff.

[11] Report to HEFCE by Oakleigh Consulting Ltd and CRAC (2011), Increasing opportunities for high quality higher education work experience.

[12] Any type of work experience that has been organised through the university and undertaken by students during their university years, accredited or not, including but not limited to sandwich years, shorter work placements integral to a course, vacation internships, and other work related activities.

[13] HESA's Joint Academic Coding System

Part 1: Number and Type of Computing Placements in UK Universities

1.1 What is a computing placement?

During a traditional sandwich course an undergraduate is given the opportunity to spend their third year working in industry, before returning to complete their studies. Universities hold records of these types of placements and they contribute to the final degree classification. Although our respondents were asked to record all types of work experience, almost all took place in year three (96%) and were long term (94%) (see Figure 1).
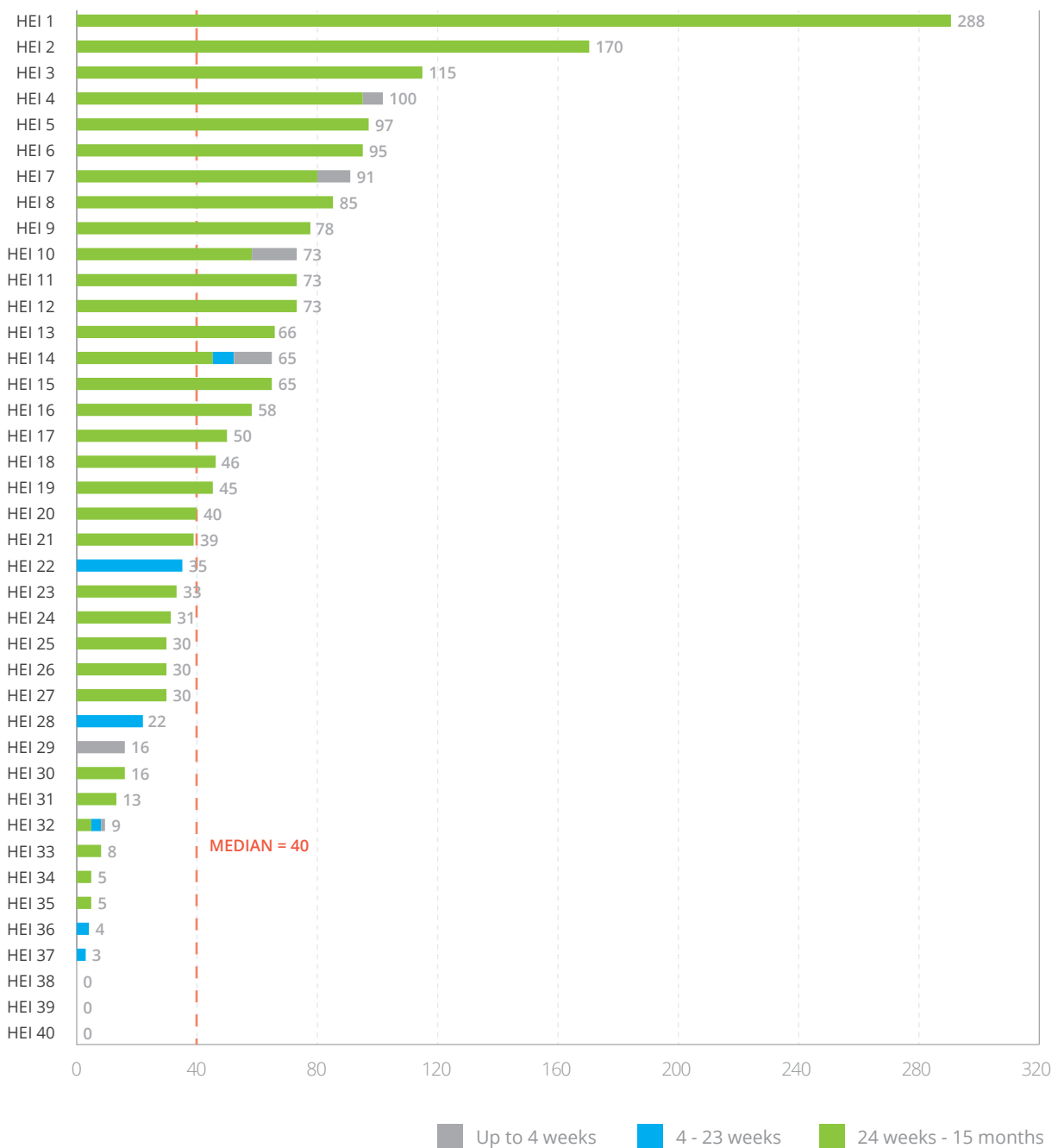

Figure 1: Total number of placements undertaken ranked by HEI and subdivided by placement length (data in appendix C)

I.2 How many computing placements are there?

According to our sample, on average 26% of third year computing undergraduates were out on placement in 2012-13 (See Figure 2).* Some HEIs were obviously remarkably successful with their programmes, but most were below half and some really struggled.
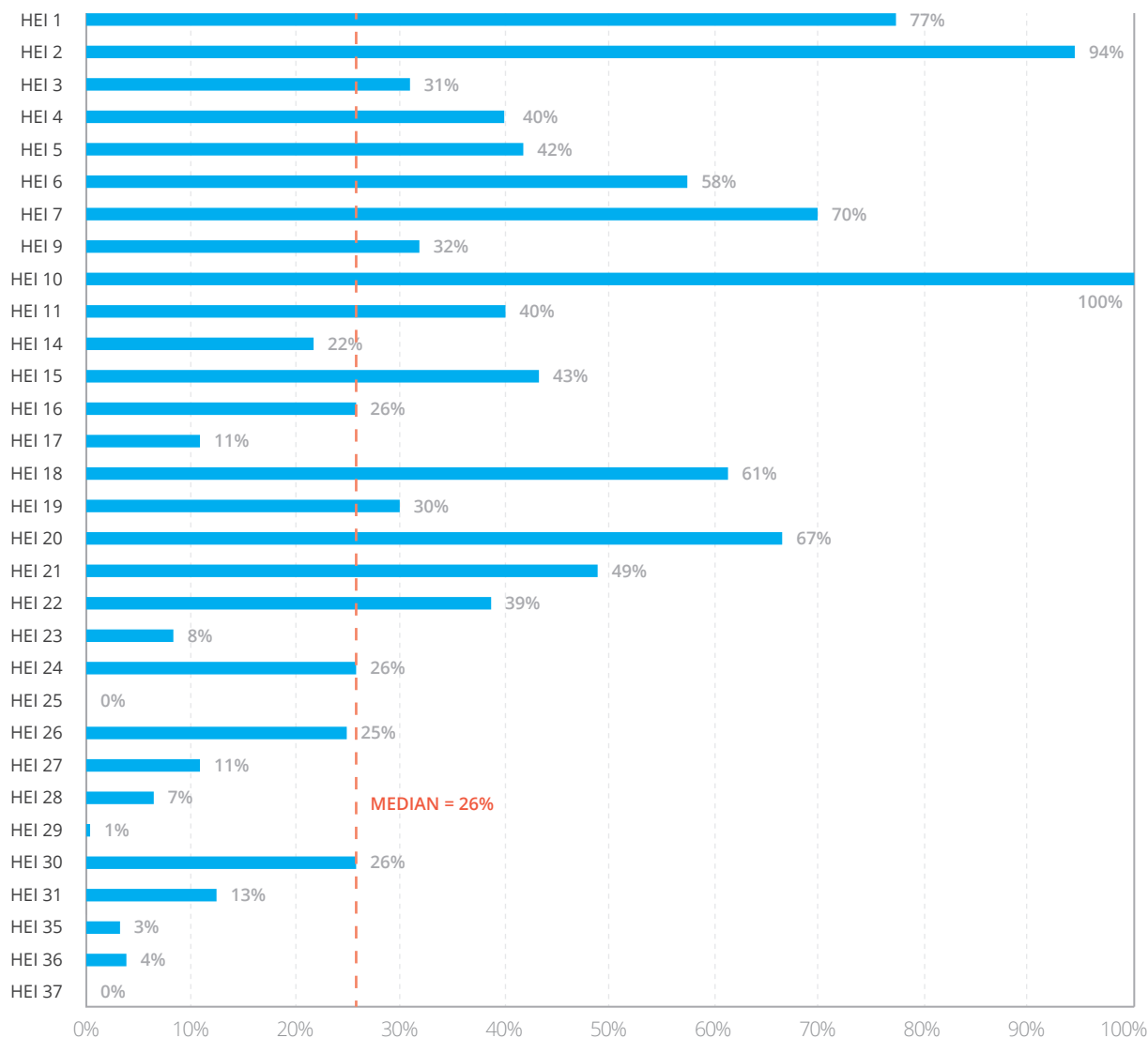

Figure 2: Number of Year 3 computing placement students in proportion to total number of Year 3 computing students (data in appendix C).

However, this data relates mainly to the traditional sandwich course. There is very little recorded work experience offered or accepted activity in other years. (See Figures 1-3 in Appendix B for number of computing placement students in proportion to total number of computing students by academic years 1, 2 and 4). So on average 6 percent of computing undergraduates (all years) undertook a recorded placement in 2012-13, the vast majority of which were sandwich placements[14] (right hand side of Figure 3). This correlates reasonably with the 4% recorded by the Higher Education Statistics Agency (HESA)[15].

* Due to skewness of the sample, median instead of mean has been taken as the average throughout this report.

[14] Four HEIs provided data from 2013-14. HESA shows the trend of 12 per cent growth in the acceptance to computer sciences subjects in 2013-14. Yet it does not have a significant effect on our sampled HEIs as placements were undertaken predominantly by third-year students, while the growth rate represents the higher number of year-one students.

[15] See www.hesa.ac.uk. According to HESA data, 22% of computer science undergraduate enrolments (all-year student numbers) included a course with a sandwich placement in 2012-13. However, the 'location of study' information recorded by HESA shows 4% of computer science students (all years) were actually on a sandwich placement in 2012-13.

The number of recorded placements in our sample varied from 288 to 0, with a median of 40. (See Figure 1 and left hand side of Figure 3). However, the ratio of placements to the total number of computing students shows lower variation across HEIs. HEI1 for example, is no longer an outlier when we control for potential demand. Furthermore, some universities that have smaller student numbers overall – such as HEI10 – are clearly more successful in their placement programmes than others, such as HEIs 11 and 12. (See right hand side of Figure 3).

HEI	Total number of placements	% of HESA population
HEI 1	288	15%
HEI 2	170	15%
HEI 3	115	11%
HEI 4	100	12%
HEI 5	97	9%
HEI 6	95	10%
HEI 7	91	12%
HEI 8	85	6%
HEI 9	78	10%
HEI 10	73	17%
HEI 11	73	6%
HEI 12	73	6%
HEI 13	66	15%
HEI 14	65	6%
HEI 15	65	12%
HEI 16	58	7%
HEI 17	50	3%
HEI 18	46	12%
HEI 19	45	3%
HEI 20	40	3%
HEI 21	39	11%
HEI 22	35	6%
HEI 23	33	2%
HEI 24	31	3%
HEI 25	30	3%
HEI 26	30	6%
HEI 27	30	2%
HEI 28	22	5%
HEI 29	16	2%
HEI 30	16	4%
HEI 31	13	2%
HEI 32	9	3%
HEI 33	8	2%
HEI 34	5	0.4%
HEI 35	5	1%
HEI 36	4	1%
HEI 37	3	0.4%
HEI 38	0	0%
HEI 39	0	0%
HEI 40	0	0%

MEDIAN = 40   MEDIAN = 6%

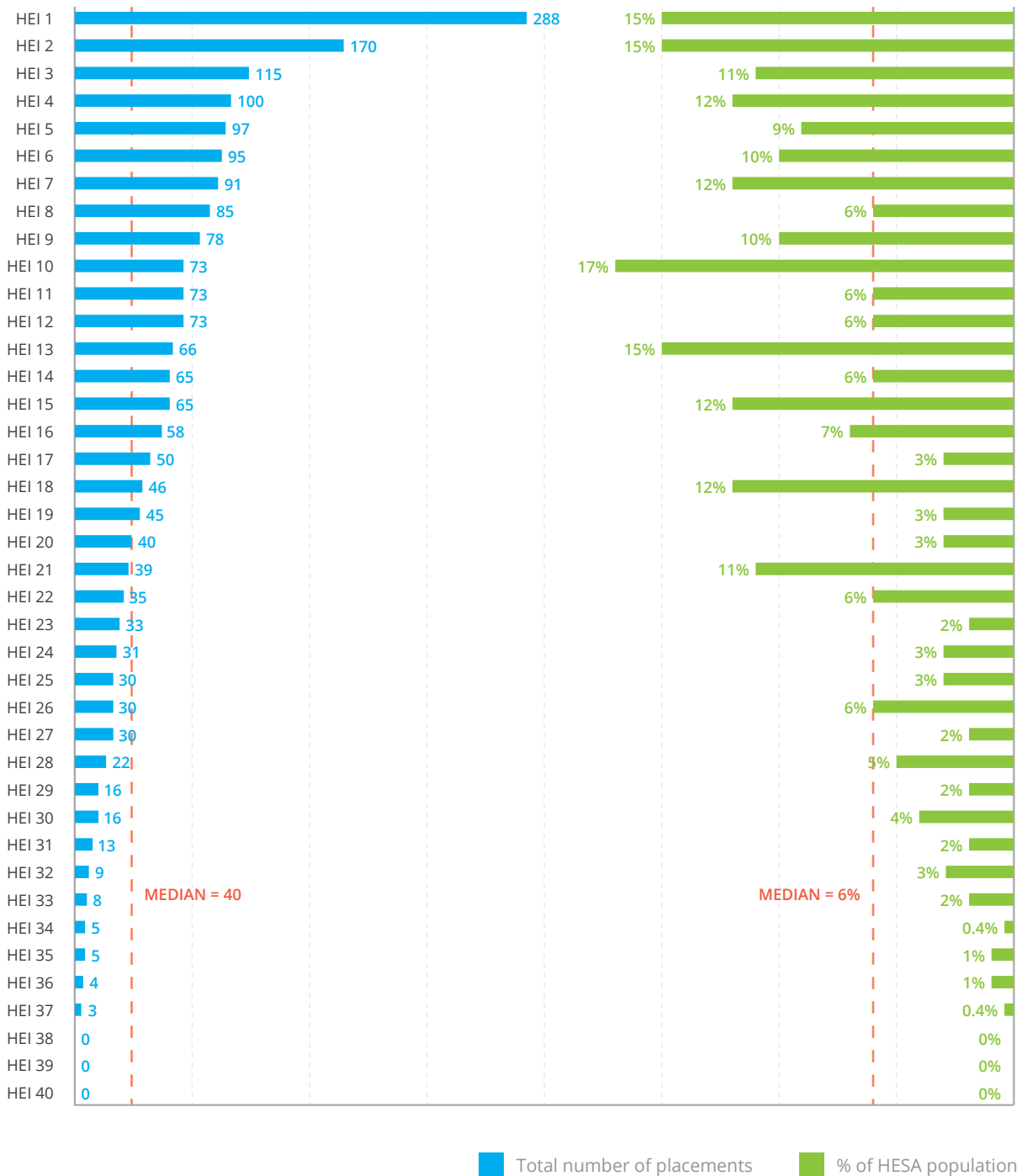■ Total number of placements   ■ % of HESA population

Figure 3: Comparison of HEIs ranked by number of placements, with HEIs ranked by placements as a proportion of HESA population (data in appendix)

I.3 Computing placement roles

As an accredited computing placement has to reflect course requirements, nearly three quarters of the jobs (73 per cent) undertaken under these placements were in software engineering and testing, or technical trades. The remaining quarter were in allied fields of technical creative, business functions and computing research. (See Figure 4).
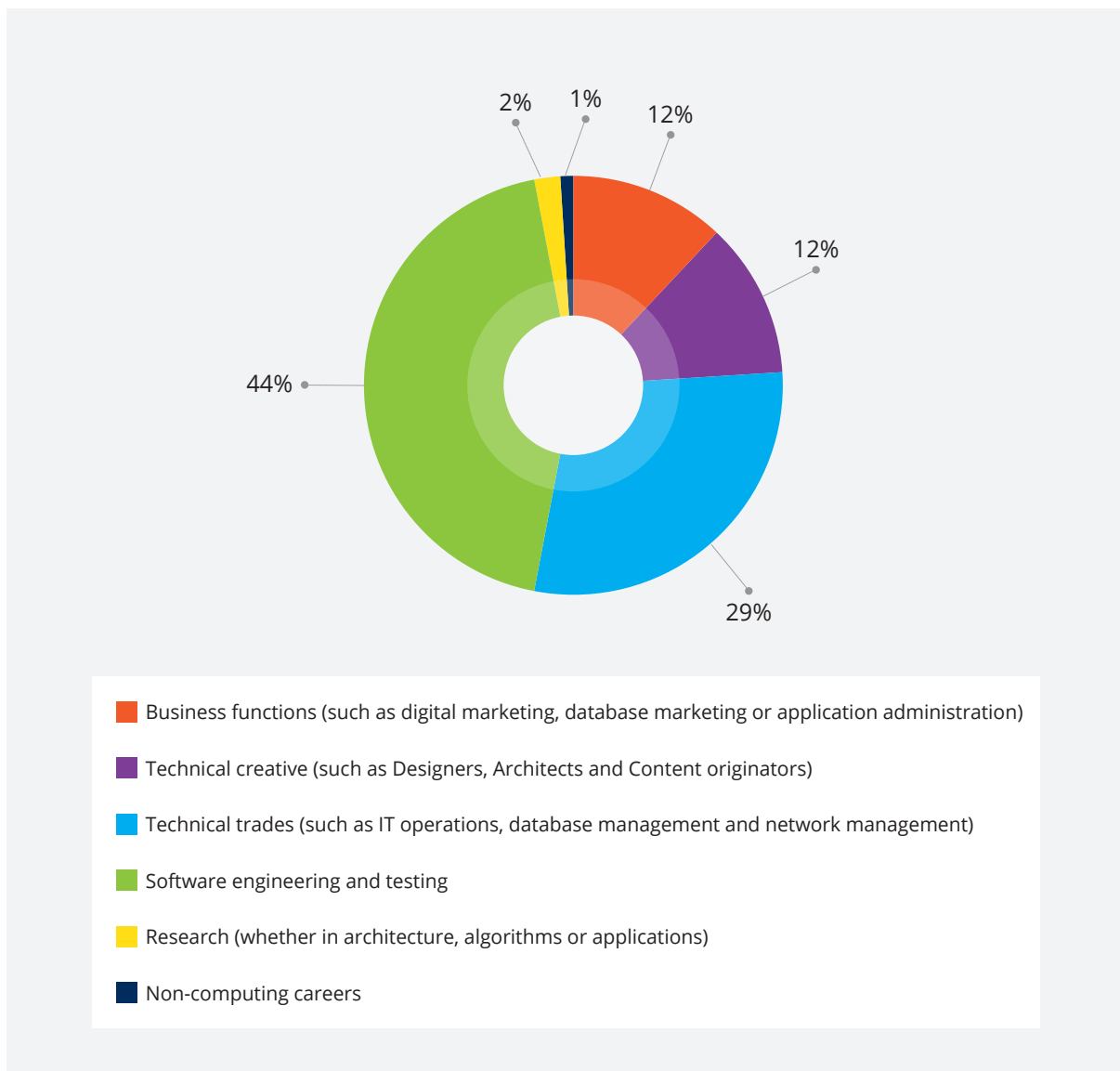

Figure 4: Placement roles (data in appendix C)[16]

Almost all of these placements (93 per cent) reportedly attracted at least the minimum national wage[17]. This is part of general university policy and in line with the government's commitment to include internships in their legislation[18]. We review the implications of this for supply and demand later in the report.

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[16] HEIs do not collect data on career categories. NCUB requested data returns on these categories based on desk research analyses about available computing career roles.

[17] See: www.gov.uk/national-minimum-wage-work-experience-and-internships.

[18] Cabinet Office policy paper (2011), Opening Doors, Breaking Barriers: A Strategy for Social Mobility.

1.4 Working with placement employers

The 40 HEIs in this survey worked with 1,454 employers, 84 per cent of whom were from the private sector, 13 per cent were public sector and 3 per cent were non-profit. Figure 5 shows most universities worked with more than thirty firms, and there was an average of 1.3 placements per company. This low ratio demonstrates that although universities are generally not seeking new opportunities, they are managing a large number of relationships to maintain their current supply. The complexity and cost of handling these high volumes of placement relationships has a clear impact on supply.
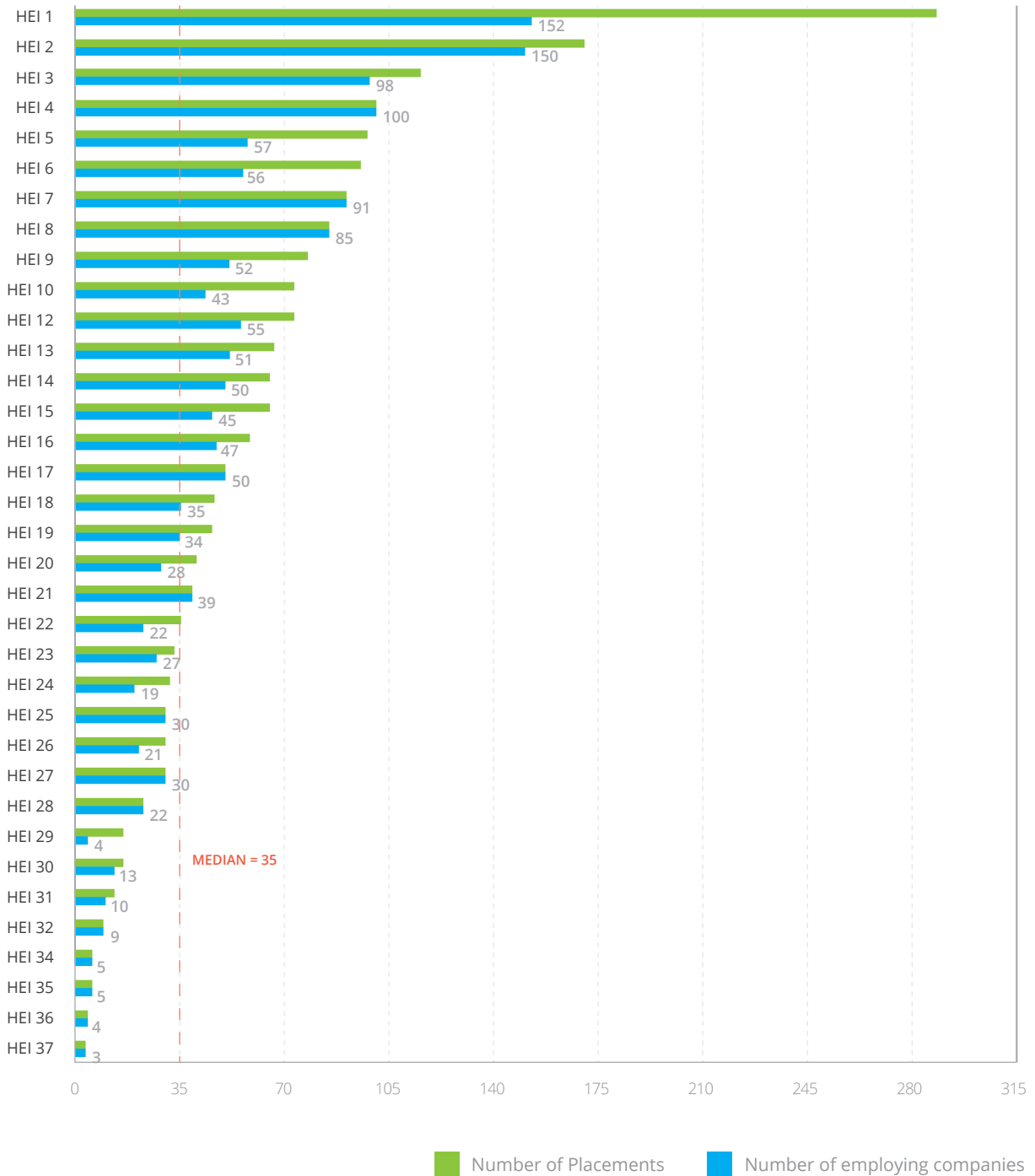

Figure 5: Placement companies (data in appendix C).

Employers have different recruitment strategies for placements. Some, particularly large national employers, advertise offers at multiple HEIs and accept students from other disciplines onto their schemes.

> **"We don't target a specific number of computer scientists versus anybody else, because we are looking for diversity and a broad spread of academic learning as much as we are looking for students who are able to perform as business people."**
> *(Emma McGuigan, Managing Director of UK/I Accenture Technology at Accenture)*

Universities also work with employers that they have an individual relationship with and that advertise specifically with them.

Between these two sources of supply, most institutions (32 out of 36) reported that they had an adequate number of computing placement opportunities to meet student demand, and furthermore that they ended the academic year with unfilled vacancies. Of the four universities reporting a shortage, three were for specific types of computing – gaming and graphics – and one said it had perceived a bias among big companies that only want to work with selected universities.

Because major employers make offers to multiple HEIs, individual institutions cannot fully assess their "unfilled" vacancies (which may actually have been filled by a student from another university or discipline). Given that no single body has a complete overview of supply, it is difficult to calculate the nature of oversupply in the market, and it would be equally difficult to guarantee supply if there was a surge in demand.

This complexity notwithstanding, HEIs are actively increasing employer relationships not just to meet student demand, but also to stay up to date with the latest developments in the field. Computing departments reported also seeking to increase engagement with small and medium enterprises (SMEs) – particularly those that are local – as part of institution-wide commitments to such companies.

An institution's placement opportunities usually stem from previous provision – i.e. repeat business. Yet occasionally they come from other sources too, such as employers involved in projects within the course curriculum, academic research contacts, or the university's alumni, as demonstrated in the case study from the University of Kent below.

CASE STUDY: The University of Kent's School of Computing
Building relationship with employers

Over the years The School of Computing at the University of Kent has built strong relationships with industry – regularly growing their number of placements organically.

The best example of this organic growth started seven years ago when a Kent computing alumnus, Rory Franklin, decided to introduce the Year in Industry programme to his graduate employer - digital content manager and distributer, ChilliBean. Having been a placement student himself, he knew the value of the placement scheme and recruited two University of Kent undergraduates into web development placements. One of these students was Matt Fairbrass, who was so enriched by his placement year that he introduced the scheme to his graduate employer, Clear Books, an online accounting software company. Here he recruited Kent students for web-based placements over two years. In parallel, ChilliBean continued to recruit students solely from the University of Kent's School of Computing. When Matt moved to a new organisation – strategy, design and technology consulting firm Lab49 – he introduced the School of Computing to their HR department and plans are now underway to initiate the programme for 2015-16. In the meantime, one of the former placement students at Clear Books returned as a graduate, and has subsequently recruited four placement students from Kent over the past two years.

In short, one Kent alumnus has generated 13 web-development placements (so far...).

1.5 Engaging companies of all sizes and from all regions

Although almost half of the computer science placements are in large companies, and although some universities are very focused on these kinds of relationships[19], most HEIs (especially the top five) actually worked with a diverse range of firms. (See Figure 6).
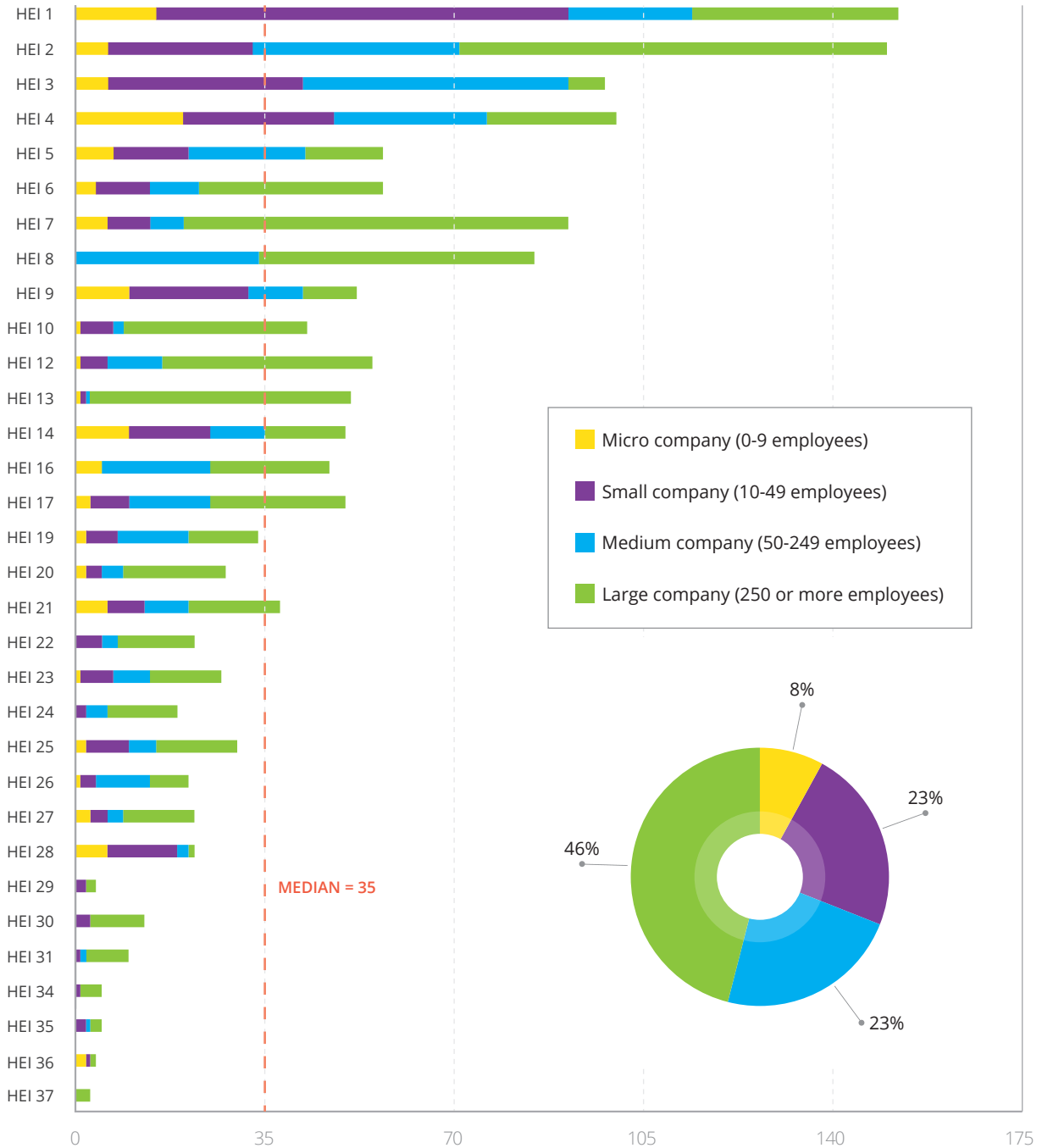
Figure 6: Placement employers by size by HEI (data in appendix C)[20]

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[19] This is in line with the CBI's education and skills landscape survey which found that placement opportunities are most widespread among the largest employers, and that just over half of firms with under 50 staff are providing internships schemes.
See: www.cbi.org.uk/business-issues/education-and-skills/in-focus/education-and-skills-survey.

[20] The majority of institutions do not hold exact information on company size. Figures used are estimates provided by HEIs.

Location and mission group both play a part in the type of employer with which a university engages. A higher proportion of placements with large companies are undertaken in HEIs located in London (Table 1), whereas institutions in the rest of the UK have relatively stronger connections with smaller and mid-sized businesses.

There are also clear differences in the types of employers looking to work with different types of institutions. The Russell Group universities in our sample, for instance, worked predominantly with bigger companies (Table 2).

Region	Total No. Companies	Average % across HEIs[21]			
		Micro (0-9 employees)	Small (10-49 employees)	Medium (50-249 employees)	Large (250+ employees)
London area (9 HEIs)	295	10%	15%	11%	63%
The rest of England (24 HEIs)	930	7%	21%	22%	49%
Wales, Scotland and Northern Ireland (7 HEIs)	229	7%	36%	17%	40%

Table 1: Proportion of companies by size in different HEI regions (data in appendix C).

Mission Group	Total No. Companies	Average % across HEIs			
		Micro (0-9 employees)	Small (10-49 employees)	Medium (50-249 employees)	Large (250+ employees)
Russel Group (5 HEIs)	131	1%	12%	6%	80%
Other pre-1992 (8 HEIs)	484	15%	26%	12%	48%
Post-1992 (19 HEIs)	839	7%	22%	25%	46%

Table 2: Size of employers by HEI Mission group (data in appendix)

There are significant differences in the engagement of large and small employers – notably the timing and length of recruitment cycles, and the nature of support required to offer placements. Larger companies start to recruit about one year before a placement commences. Smaller companies tend to advertise later in order to fit in with shorter work cycles, to avoid being overshadowed by big recruiters, and even as an alternative to recruiting a full-time employee. Regardless of an employer's motivation, universities report that the best qualified students tend to secure placements earlier, and smaller companies are less likely to attract high quality candidates. This is potentially a major finding when it comes to considering access to talent by different employers offering placements.

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[21] Weighted average.

Larger companies generally commit to formal recruitment and induction processes for students, and they pay a salary.

> **"Bigger companies have a formal procedure for recruiting students and the appropriate infrastructure in place to support placement students. Usually, you wouldn't find this in small and medium companies because of the resources needed. In terms of the feedback we get, students that have been based in a small organisations often feel that they would have benefited more if they had a more structured induction process."**
>
> *(Member of an HEI central careers service)*

Most universities agree that small and medium sized companies could be an underutilised source of supply. In the private sector in 2013, nearly six out of ten "information and communication" employees and three quarters in "professional, scientific and technical" activities were employed by SMEs[22]. HEIs are reported to be increasingly targeting these firms. To compensate for the lack of infrastructure among SMEs, universities frequently commit their own resources to small, local providers with which the HEI has a close relationship, and who do not have well established recruitment processes. These include:

- Collating the applications for a particular vacancy and forwarding them to an employer.

- "Recruitment agency" type assistance where they select the most suitable students and supply their CV's to the employer.

- Arranging, and in some cases hosting interviews at the university. This is also valued by students as they do not have to travel.

- Providing a member of university staff for the interview panel to support companies that are inexperienced in the recruitment process. Students also benefit from this, as the university staff can provide detailed feedback for the interviewees.

Several HEIs used public funding schemes aimed at SMEs to administer the recruitment process, and which sometimes pay students on behalf of smaller companies. A good example is the way that Edinburgh Napier University used investment from the Scottish Funding Council (SFC) to develop an SME programme.

As the case study overleaf shows, not all placement activity takes the form of the traditional sandwich and year-long role we have been reviewing so far. We now therefore turn to an assessment of different type of work experience for computing undergraduates.

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[22] See: www.gov.uk/government/uploads/system/uploads/attachment_data/file/254552/13-92-business-population-estimates-2013-stats-release-4.pdf.

CASE STUDY: Edinburgh Napier University's School of Computing

Short placements designed to increase engagement with SMEs

With the largest number of computing sandwich placements in any university in Scotland, the School of Computing at Edinburgh Napier University has long experience of running a successful placement programme. The School of Computing has used the additional resource available through the Graduate Employability Project (GEP), initiated in 2013 and funded by the Scottish Funding Council (SFC), to develop and promote short-term and part-time placement opportunities for students, both credit bearing and non-credit bearing.

The focus on short-term placements reflects a priority for the University as a whole to better engage with small-to-medium sized enterprises (SMEs). Given that SMEs dominate the technology sector in Scotland, the School of Computing believes that this focus will bring multiple benefits into the future.

While universities typically find it easy to develop and maintain a relationship with larger employers, SMEs tend to be less visible and have requirements that can be harder to define. SMEs (along with micro-businesses and start-ups) often place a priority upon short-term needs such as coping with sudden business expansion or covering staff holidays, as well as upon specific skills that might be lacking in their current personnel. Therefore the key element is a reactive approach through a single point of contact that can respond to queries and begin discussions immediately. A new Faculty Placement Office was established through the GEP to do this. It is both student- and employer-facing, and acts as central hub and clearing house for all opportunities for students to work with employers on short-term placements. They work with the employer to ensure that employer requirements translate well into placement roles and manage expectations on both sides.

I.6 Short and long-term computing placements – the benefits and issues

Ten of our respondents offered short-term work experience, four of which were accredited. For example, at Imperial College London, short placements are integrated into the masters computing courses (see case study at the end of the chapter).

A small number of recorded placements were taken during vacations (4 per cent), or were under the 24 weeks long HESA cut-off (6 per cent). Furthermore, universities are aware that short-term, non-accredited placements are being undertaken by students, but no systematic record is made of these. Although these placements were advertised to students, typically through the HEI's central careers services, only 15 of our 40 respondents kept any record. And where they did, the information is incomplete because universities rely on students voluntarily reporting the experience. Despite this complexity, there appears to be a growing interest among institutions in offering these types of placements.

Some of the reasons offered are:

- They provide flexibility for both the student and employer.

- Students can get involved in several different projects, and use this variety in their CVs.

- Employers can use a short-term placements as an extended interview to select sandwich year students.

However, despite these benefits, HEIs continue to focus their accreditation on long-term placements as the source of the greatest benefits to students and employers. HEIs reported that such placements:

- Suit the student's expected learning curve, as it takes a couple of months before students can be given real project work, and about six months before they start adding value to businesses.

- They create more opportunities for students to develop transferable skills and to get a greater exposure to real work environments.

- They are preferred by employers because it gives them an opportunity to have a year-long "interview" with a potential graduate employee.

- They are undertaken after a student's second year, by which point the technical skills the student has acquired better suit the employers' expectations.

"Shorter placements don't give enough time to actually get into the mentality of work. If you are there for a year, you are full-time employee of the company and you hopefully begin to think like a normal employee of the company. Whereas if you are doing a summer placement, you don't think that way."
(Academic tutor)

Our surveyed employers vary in their views. For some, there was no question that a Year in Industry is the best option.

"Year-long placements are a lot more tangible because you can get some real results from the student. It takes a few months for them to understand the business, get used to the tooling, and the dynamics of the team they are working in. The summer placements don't really function that well."
(Dr Alison Vincent, Chief Software Development Officer at CISCO)

Other employers do offer shorter placements[23] and value a range of opportunities:

"I don't think we should discount short-term placements as not being helpful. We benefit from having a variety, because not all young people want to commit a whole additional year for a placement. As the organisation offering placements you have to be very thoughtful, take a more holistic view on placements, and think about the objective."
(Emma McGuigan, Managing Director of UK/I Accenture Technology at Accenture)

All the universities in our survey indicated that they would like to increase the number of short-term placements. However, they also said they would need to carry out a detailed analysis of the additional resources required in both organising and recording these before they could commit to greater volumes. This suggests that a greater supply of short-term placements is held back by a lack of resources rather than a belief that they are less valuable. However, despite this broad-based enthusiasm from HEIs to offer placements, and a strong commitment from many to grow the volume, there remains a major problem with student demand. Next, we examine why.

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[23] Two-thirds of employers that responded to the High Fliers Survey said they provide paid vacation internships for penultimate year students. www.highfliers.co.uk/download/GMReport14.pdf.

CASE STUDY: Imperial College London's Department of Computing
Compulsory four to six-month placements

Students enrolled on four-year mechanical engineering (MEng) degree programmes are required to take a compulsory placement in the summer term of the third academic year. For the MEng computing students, the industrial placement is six months in duration running from the first week in April to the end of September, while MEng mathematics and computer science students complete a four-month placement running from the first week in June to the end of September. This timeframe allows students to gain work experience without extending their time at university.

'The first three years provide the foundation for our students to be able to perform well on their placements and the fourth year gives them advanced research level skills that will be useful in both academic and industrial environments. Timing this to coincide with the summer holiday ensures that students do not need to be away from their studies for an entire year. We find this amount of time is absolutely sufficient for the students to complete a suitably challenging project whilst in industry'.

Part 2: Demand for computing placements

University respondents believe that student demand for computing placements is limiting take-up and to understand this we asked HEIs about recruitment, the application process and support.

2.1 Dropping out

A student can enrol in a degree with a sandwich year, but then drop the Year in Industry option at any point up until the end of their second year. According to our respondents, it is common for computing students to drop out – mainly because of academic commitments and financial pressures. They report that computing students prioritise academic work, believing that staying at university is preferable to a placement when it comes to developing their technical skills.

Even those students who recognise the importance of doing a placement can disengage as pressures on their time increase.

> **"I have students telling me that they would like to do a placement, but they have five deadlines for the following week and simply do not have time to do placement applications. So some of them become less engaged during certain academic periods, and sometimes those periods are crucial."**
> *(Academic placement tutor)*

Respondents also said that students are rejecting sandwich placements in particular because they want to graduate as soon as possible to start paid employment. This is partly because students still have to pay tuition fees during the placement year, despite most HEIs discounting the fee. To remedy this, a quarter of HEIs in our sample plan to stop charging. One institution has completely removed the tuition fee and as yet has not seen a significant improvement in uptake which suggests that the fee does not fully explain dropout rates.

Payment for any type of placement is clearly important to students and research on e-Placement Scotland's part-time scheme showed that unpaid work experience is no longer a viable pursuit for the majority of computing students[24]. However, according to our survey the biggest financial influence was the salary difference between a graduate job and a placement: students are eager to not delay taking a higher paid role by adding a placement year to their degree.

2.2 Increasing student interest in placements

All universities have a range of engagement activities to grow take-up, and half of the institutions feel that student interest has improved over the past years as they became more aware of the benefits of placements.

> **"As there is more pressure put on employability, students get more pressure from university, parents and peers, which has helped to increase engagement in placements."**
> *(Placement staff member)*

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[24] Smith, C., Smith, S., Irving, C. (2013) Can pay? Should pay? A comparison of outcomes for paid and unpaid work opportunities for employers and students' http://journals.heacademy.ac.uk/doi/pdf/10.11120/stem.hea.2013.0025.

Some of the initiatives include:

- A placement module for second year students to inform them about opportunities and help them understand how the skills acquired at university can be applied in employment. These sessions include visits from companies that allow students to meet potential employers, helping them to also develop a better understanding of the skills that employers are looking for and how they can be gained from placements.

- In addition to advertising placement vacancies on the departmental or central careers website, HEIs also email students about new openings, and are increasingly using social networks to promote opportunities.

- Engagement events where past placement students give presentations and share their experiences with potential placement students. The case study below, from Northumbria University, not only illustrates how the institution uses such an event to engage past with prospective placement students, but the student testimonial also demonstrates how some students clearly understand the benefits of a placement.

CASE STUDY: Computer Science and Digital Technologies Department at Northumbria University

Increasing computing placement take-up

The department holds a regular poster fair during induction week, where returning placement students present a placement poster to encourage other students to take up computing placements. The posters, designed by students, feature information on the placement tasks that they undertook, the skills they learned, their main achievements and the challenges that they encountered during their placement.

> **"YOU MUST GO ON A PLACEMENT. You gain crucial work experience in your chosen field and learn many new skills. It also increases your chances of employment after university."**
>
> *(Advice from a past placement student's poster)*

A common trend is to target first year students. This is in response to the long recruitment cycles of larger companies, and recent employer surveys show an increasing number now offer work experience to first-year undergraduates. Furthermore, a quarter offer paid internships and a third of employers run introductory courses, open days and other taster experiences for first years[25].

In addition to raising awareness and encouraging these students, closer collaboration between academic and placement staff may also be needed to engage students who are concerned that a placement may have a negative impact on their academic studies.

However, despite this plethora of activity there is no systematic research to benchmark the success of one approach over another. This is an area for further study.

2.3 The placement application process

Demand may be suppressed by the sheer complexity of applying for a placement. In the majority of cases, the application is via a company's recruitment process and the university is seldom involved. Over half of applications are completed online through employer websites, and the procedure is becoming more demanding

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[25] The High Fliers Research (2014) The Graduate Market in 2014.

and may involve multiple stages and activities. Because employers use placements to identify potential graduate employees, the placement providers we interviewed all said they have structured multi-stage procedures – including online competency tests, group exercises and interview panels. This confirms the results of a number of surveys which also indicate that large companies are using placements to recruit future graduates[26].

Universities have also observed a similar trend in smaller companies, illustrated by the following University of Ulster case study.

CASE STUDY: University of Ulster Faculty of Computing and Engineering
Placements as part of a Career Path

Kainos, a local software company introduced a summer scheme to identify and promote developer talent. The first part of the scheme, AppCamp, is a two-week training course which aims to enhance the student's technical knowledge and also provide them with an understanding of what is involved in application development from both a management and enterprise perspective. At the end of the two-week period, each student pitches an individual App idea to a "Dragon's Den" panel, and up to six of the best ideas then go forward for a further six weeks of development, under the guidance of Kainos staff.

An Ulster student, Kyle Davidson, was selected for AppCamp and his App idea advanced successfully to the second stage of development. The resulting application, MakeSense, supported the creation of educational tutorials for use by those with Autism, incorporating pictures, sound, videos and other multimedia. MakeSense received an award from Kainos that year for the Most Socially Aware application.

Following the AppCamp, Kyle was offered a placement with Kainos for the following year and at the end of his placement Kyle was offered a permanent job as a Software Engineer. Indeed all of the AppCamp participants had placement offers and subsequently went on to work for the company.

The complexity and rigour of the application process explains part of the low take-up rates. But other variables play their part. For example, HEIs report that computing students lack confidence, and that many students become discouraged and withdraw from the process. One HEI observed that computing students in particular lack the soft skills needed in the placement application process, particularly the ability to understand and explain the relevance of their technical skills to employers.

> **"[Computer science] students are very adept to explaining what they can do in academic terms, but applying it in the world of work is where they struggle".**
> *(Placement staff member)*

Although universities have a role to play in supporting students with their applications, HEI respondents also stressed that they encourage students to apply independently because it helps them develop the skills they will need in future applications for graduate jobs.

This appears to create a difficult situation for HEIs that have to balance the benefits of encouraging an independent application against the risk of losing the student because of its complexity. Two of the three interviewed employers noted that they often have to extend the application deadlines specifically for their technology and software engineering placement vacancies, due to the low number of applications for these roles. This implies that a significant proportion of computing students are either giving up quickly after an initial failure or simply not applying at all.

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[26] See, for example, the CBI's education and skills survey: www.cbi.org.uk/business-issues/education-and-skills/in-focus/education-and-skills-survey.

Furthermore, encouraging independent applications means HEIs cannot track student application numbers, and therefore do not know how many placement candidates they lose, and at what stage. Without such records it is not possible to focus support at targeted points in the process. A few institutions have tried to find ways to gather information by:

- Contacting large companies to ask for feedback on the performance of their students. This has helped to identify the areas where their students struggled, and enable enhanced support in the online applications process.

- Creating an in-house system to keep records of student academic performance and extra-curricular activities, allowing the placement team to match student profiles with vacancies and notify students about the most relevant placements. This also allows them to track the number of applications to each vacancy and therefore promote less popular vacancies. Similarly, the universities can track the students who struggle with placement applications and offer additional support for those students.

The majority of institutions supported students in a variety of different ways during the application process, and all emphasised the importance of having a dedicated resource to do so – whether within the computing department or the central careers service. HEIs that have more than one dedicated placement officer within the computing department said they were able to provide more effective, personalised support. The following case study from Lancaster University illustrates how a combination of both personal support and online solutions are assisting students in successfully securing a placement.

CASE STUDY: Lancaster University Faculty of Science and Technology
Enabling students to secure summer placements

Lancaster University launched its Faculty of Science and Technology Internship Programme during the academic year 2012-13 and is now in its third year of successful operation. The faculty's employability team is actively involved in the internship application process to maximise the take-up of the opportunities that that have been made available to their students.

Faculty students, including those studying computing, are encouraged to sign up to the programme and, once registered, potential interns are invited to complete their online CV. A short video clip is available for each section, containing advice to support the creation of a robust and high quality CV. All registrants are invited to workshops to help create their CV and make strong applications for vacancies advertised on the site.

Students are automatically emailed each time a new vacancy is advertised and information is also sent out via the internship Facebook page. Each vacancy has received departmental approval in respect of both the level of the work proposed and it's achievability in the timescale.

If potential interns are invited to interview for vacancies, interview preparation workshops or mock interviews are also offered. Following interview, all applicants are given feedback about their applications and appropriate support offered to improve if necessary. The Student Employability Manager arranges all interviews, liaises with candidates and sits in on most interview panels in order to ensure that a robust recruitment process is followed.

As this example shows, online methods of support for students may yield fruitful ways forward. Another new approach to using technology is that of e-Placement Scotland, where funding from the Scottish Funding Council under the 'Learning to Work 2' programme has enabled an online hub and matching service to be established that has created 870 paid placements in a little over two years (see case study overleaf). Online hubs may be a valuable method of increasing demand and should be explored in depth and in detail by HEIs and policy makers.

CASE STUDY: e-Placement Scotland
Creating paid, quality work-placements through an innovative university and trade body relationship

While relevant work experience is widely regarded as having a significant impact on graduate employability, building and sustaining relationships with employers to produce paid placements requires on-going effort and outreach, and is often seen by universities and colleges as costly and difficult. Some students are able to source their own placement opportunities through family, social or business networks, but others may not be able to draw on such contacts and can be effectively excluded from opportunities.

Recognition of this context underpinned the formation of e-Placement Scotland, established in 2011 through the Scottish Funding Council. The project has exceeded initial targets and delivered a national programme for paid placements that is accessed by computing students across all of Scotland's universities and colleges. As of June 2014, 870 paid placements had been created, 53% with SMEs (including a small proportion of micro businesses and start-ups) and of various lengths, according to employer needs (58% 3 months, 24% 6-12 months, and 18% 3-6 months).

e-Placement Scotland's ability to create paid, quality, work placements hinges upon an innovative university-trade body relationship. Edinburgh Napier University and ScotlandIS, the trade body for Scotland's ICT industry, came together along with e-skills UK to create an effective operating partnership. ScotlandIS leads on promoting the project to the ICT employer base, which included using a full-time Employer Engagement Champion, and this has ensured a joined-up approach that engages with employer expectations in that sector. Edinburgh Napier University leads the work to build strong relationships with course leaders across the Scottish university and college sectors, to ensure that computing departments are able to position themselves to take best advantage of e-Placement Scotland for their students, complementing their own placement operations.

A hub website, based upon industry-standard recruitment software is used to manage the supply of placements. This is a single point for employers to create quality placements which can be advertised to all students, and is one of the original features of the initiative. Additionally, the sector-based approach allows identification of specific skills gaps – both technical and soft skills – which can be matched with student profiles. Candidate matching has proved to be an effective way of encouraging applications from students, who may not have otherwise realised that they had the relevant skills being sought by employers, and the employers have been overwhelmingly impressed by what their placement students can achieve for them, which is in turn helping to challenge negative rhetoric about students' work-readiness.

Part 3: Placement quality

Although it is difficult to quantify whether the quality of the placement experience is preventing computer undergraduates from taking them up, any future actions to increase quantity must surely do so without losing quality. According to our respondents, the best indicators of a good quality placement are improved academic achievement, personal development and career awareness (for the student), and long-term employer engagement (for the university).

3.1 Placement benefits

Many universities report that students learn skills that help them perform better in their degree after returning from a quality placement – a view supported by existing literature[27].

> **"Students come back with a more professional approach to learning, planning and preparing".**
>
> *(Faculty placement team member)*

Students also return with increased confidence in their abilities to cope with, for example, change and complexity.

> **"A good placement will also teach them what to do when things go wrong, and give them those tools and coping mechanisms. So when they go to graduate jobs it is not the first time they come across those things."**
>
> *(Faculty placement team member)*

And they learn skills not taught at university.

> **"The key is – are they learning something that they wouldn't learn here? If they are, then it is worth doing this".**
>
> *(Academic placement tutor)*

Finally, they develop a better understanding of how to get a job and develop their future career, as shown by the case study from Aston University overleaf.

Universities believe that students gain skills from a quality placement that are valued by graduate recruiters – namely, a better understanding of the industry as a whole and of the role of computing in different businesses, as well as an experience of working with clients. This is supported by feedback from one of the employers:

> **"Placement students develop a better sense of teamwork and of the collaborative side of work. The reality of computer science today is that the skills (needed) in the industry are not so much writing a code yourself, it's knowing how to build bits and put them together to create something that the client needs."**
>
> *(Dr. Alison Vincent, Chief Software Development Officer at CISCO)*

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[27] Driffield, N.L., Foster, C.S. and Higson, H.E. (2011) Placements and degree performance: Do placements lead to better marks, or do better students choose placements? Association of Sandwich Education and Training, Leeds.

CASE STUDY: Aston University
Improving student performance through placements

Mia* was in her second year of the Aston BSc Computing Science programme in 2011. Her average module score was 57 per cent and if she had continued with the same results, she would probably have got a 2:2 honours degree. After her second year, she started a 10-month placement at a major UK-based multinational IT and management consultancy company, where she undertook several projects with them during her placement, starting as a tester and quickly becoming a business analyst. She performed extremely well and her placement was extended by a further 2 months. Her overall mark for her placement year was 74 per cent, and she went on to graduate with a first class degree, having undertaken a final-year individual project with the placement company acting as her client, which received a mark of 80 per cent.

Summarising her placement experience, Mia reported:

"Overall, I would say that any improvement on my final year grade would be down to what I learned during my placement year, as I had an improved work ethic, more realistic time management skills and I could see what I was working towards a lot more clearly."

A particular benefit cited by Mia was doing a presentation for her academic tutor:

"During my second academic visit I had to do a presentation. This was helpful because I feel as though in computer science degrees we don't get as much experience in presenting, and it's an area that I am not comfortable with. So this was useful practice for final year demos and for my professional career. It was also useful because I got to think about my placement from a very high-level point of view, which is something we don't get too much experience in as everything is very low level and detailed."

 *Name has been changed to maintain anonymity

3.2 The role of HEIS in ensuring quality placements

Although HEIs have a formal point of reference and guidance from the Quality Assurance Agency[28], we asked them what practices and processes they consider to be the most influential for achieving a quality experience that exceeds the standard requirements.

Universities play an important part in assuring the quality of the placement before it is advertised. Typically, it is the responsibility of academic staff to review the job description provided by the employer and decide whether it is appropriate to be credit-bearing. Half of the surveyed HEIs consider it essential for the placement to involve an element of programming or software development, while others are more flexible because they see benefits in students occupying less technical roles.

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[28] Provided by the Quality Assurance Agency's Code of Practice for Work-based and Placement Learning: www.qaa.ac.uk/en.

However, HEIs responded by saying that even if a job role meets the HEI's requirements, the most effective way to ensure benefit is for the student to carry out real work that adds value to the employer. The case study below from the University of Aberystwyth illustrates this.

CASE STUDY: University of Aberystwyth Department of Computer Science
Student reflection on a 13-month placement in a software development company

Although I was on a placement at the company, within weeks of joining I was being treated like a full-time member of the team and by the end of my year, I was a full-time consultant with people across the entire company asking me about solutions to problems or for assistance. My work contributed to a core product solution that will be sold to customers. I also have bespoke work on at least a hundred customer sites and a strong understanding of technical solutions that go from sales order processing and logging to customer management, email marketing, and e-commerce solutions.

My industrial year has given me the opportunity to learn a wide range of new skills and develop skills that I already had, but in a professional capacity. My involvement in so many solutions and all of the products and third party software that the placement company sells has given me such a breadth of knowledge of technical and applications environments as well as of customer interaction and engagement.

Not only have I dealt with customers regarding software, but I have had to discuss issues and problems and take some nasty phone calls. I have a confident understanding of how to deal with them and as I wish to go into the customer and management sector of the software industry I have gained incredibly valuable experience and evidence.

My industrial year has given me experience, understanding and skills that are invaluable towards my future. To top off a fantastic year, I have been offered a full time job at the company after my degree on a competitive salary and in a position which will evolve. I have also been given a part time role while I finish my final year as a paid technical consultant.

For a student to be well integrated into a company and treated as an employee requires dedicated and committed resource within the business. Someone has to take responsibility for the day-to-day supervision of students and act as the contact point for the institution. In fact, HEIs stated that the amount of support given to a placement student from the employing company is directly proportional to the quality of a placement experience. As we noted earlier, this is a challenge for small and mid-sized companies and must be taken into account in any attempt to increase the volume of placements – both long and short-term.

Although an HEI has limited control over the support an employer provides during a placement, they seek to influence this by setting clear objectives for both the student and the company. Both parties are usually required to sign a placement contract that defines their responsibilities and the institution's, as well the rights and responsibilities of the student. HEIs check that the placement meets formal requirements, such as duration, as well as national legislation, health and safety, and insurance cover. Placement staff try to visit all potential employers and make direct contact with them before this contract is signed. Without this mutual understanding, problems may arise:

> **"There were cases where companies had unrealistic expectations, particularly small companies that didn't have placement student support and even complained to university about the quality of students."**
> *(Academic placement tutor)*

Some universities require the placement provider to have an existing IT department with at least one permanent employee more experienced than the student to avoid the latter becoming "a help desk" for the company.

"We put particular importance on finding opportunities that entail challenging projects and are not 'bug fixing'."
(Academic placement tutor)

During the placement, the university's placement officers are in regular contact to deal with any problems that arise. In addition, the majority of HEIs provide an academic member of staff to visit the student at their place of employment. This is compulsory for an accredited placement, where each student has a dedicated tutor. While the primary purpose of the trip is to monitor the academic content of the work, a quarter of HEIs and businesses also recognised that they enable long-term partnership building and information sharing.

"It is interesting to myself to see what's happening in the industry, what technologies they are using and the trends happening in the industry".
(Academic placement tutor)

A number of HEIs however felt that these visits are time consuming and require a considerable degree of commitment from academics. At one HEI, these trips are made by specialist non-academic HEI staff with experience across different disciplines.

3.3 Distinct quality indicators

Some HEIs consider further employment of the placed student to be the ultimate indicator of quality – either through a permanent graduate job, or by continuing to work part-time for the company alongside their study. However, several HEIs believe that this needs to be modified to take into account projects that may have a fixed period or funding, which can mean that despite the placement being a good experience, neither the student nor the employer has the ability to continue together.

Also, this indicator is hard to measure because HEIs do not keep records of whether students have been offered positions by their placement employer. While recognising universities currently do not have the systems in place to record this information, it would be beneficial for them to consider how this could be implemented, as many HEIs report anecdotally that student placements often lead to graduate jobs. However, they do track extended relationships with companies through repeat placement provision, which indicates agreement that a good quality experience has occurred.

Placement evaluations from both the student and employer provide another indicator. All HEIs collect student feedback, and a final written report is a compulsory element of an accredited placement. Some HEIs also ask employers for comment, and this, along with the student and academic's visit reports, are used to make the decision on the student's final placement grade. One placement team utilised company feedback to target weaker students and address their employability skills, and we recommend other institutions reflect on methods of so doing.

Employers valued the invitation to provide comment and cited staff visits as an effective method of communication.

"...if they have a placement officer who comes and visit their placement student, that's a really great opportunity for us to feedback to the HEI on how the student is doing, as well as on our company's relationship with the HEI. It varies between HEIs; some placement students are visited once or twice per year but there are some who are never visited."
(University Attraction Manager at a leading global technology employer)

The case study overleaf from Huddersfield University illustrates how the service that HEI staff provide to ensure a quality placement goes beyond just enforcing legal regulations.

CASE STUDY: Huddersfield University School of Computing and Engineering
Providing a quality service

To enable the school to maintain its reputation and the quality of its service, it is essential that it provides an integrated placement service to companies. However, the university's success is built not just on the highly refined and rigorous processes but also on the level of care and support provided by the placement unit, visiting tutors and personal tutors.

This starts with a process of informal discussions and information gathering, followed by more formal discussions with the company regarding its aspirations for the placement, the type of students it is seeking, specific post requirements, advertising dates, salary and benefits together with a wide range of other details required to ensure that the highest calibre and best matched students are available for selection by the company. Having selected the student, the company is provided with clear documentation and checklists so that they have everything in place for a smooth placement experience, including information on who to contact and what to do during the entire placement cycle.

There are no comparable quality assurance or assessment processes for unaccredited placements. Some HEIs provide advice and help students and employers set objectives, but they do not officially monitor quality and academic staff are not involved. This suggests the link between accreditation and the HEIs' commitment to ensuring quality must be taken into consideration if volume is to be increased or accreditation regimes changed.

Conclusion

This report provides clear evidence that work placements would improve the employment record of computer graduates in the UK, but that rapid and concerted action is needed to expand, develop and innovate in the creation and accreditation of placements.

Universities deploy a wealth of effective practices to support work placements for undergraduates, and these have advantages beyond the work experience in building and maintaining partnerships with industry. Despite these efforts universities face low demand among undergraduate students in computer science, particularly in relation to sandwich placements.

Faced with an increasing demand for shorter placements from students and employers, our recommendations encourage the sector to focus on increasing demand and monitoring take-up and impact of all placements. Special attention ought to be given to the increased resources involved in engaging more SMEs, and the tension between the quantity and quality of work experience.

Appendices

Appendix A: HEI questionnaire

The primary emphasis of this questionnaire was to develop a better understanding of the quantity and range of placements undertaken by full-time computing students during undergraduate (UG) studies.

For the purpose of this study, a placement is defined as a period of work where the HE institution plays some role in organising the work experience and/or supports the students' learning from the work experience in some way. This includes but is not limited to sandwich years, shorter work placements integral to a course, vacation internships, and other work related activities. This questionnaire excludes employer linked project work where the student is not placed in the work place and work place visits/shadowing where the student is not expected to carry out work-related tasks.

The questionnaire consists of 10 questions and is divided into 4 sections: (1) Placement activities at your department; (2) Types of employer; (3) Range of placement activities; (4) Participation of students. Please use student data from the 2012/13 academic year, or else the latest academic year available and change the year accordingly.

NCUB will be responsible for holding the data provided by institutions on placements and keeping this confidential. Any data passed on to external parties will be anonymised and there will be no public dissemination of the results on a university-by-university basis.

Placements

1. **Please specify the number of placement opportunities offered and undertaken by full-time computing UG students at your department.**

   a. Total number of placement opportunities that were offered to computing students at your department[29]

   b. Total number of placement opportunities that were offered exclusively to computing students at your department[30]

   c. Total number of placements undertaken by computing students[31]

   d. Total number of placements undertaken as a compulsory part of a computing degree[32]

2. **Please specify terms used at your department to define these placements.**

Employers

3. **Please specify the number, type and size of employing organisations in which placements were undertaken? (if you do not know the exact data, please give an approximate proportion of employing organisations).**

   a. Total number[33]

   b. Number by type[34]: Private, Public sector and Non-profit

   c. Number by size[35]: Micro company (0-9 employees), Small company (10-49 employees), Medium company (50-249 employees), Large company (250 and more employees)

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[29] Responses to this question were incomplete and inconsistent and were therefore omitted from the analyses.
[30] Responses to this question were incomplete and inconsistent and were therefore omitted from the analyses.
[31] Responses in Table 1 (Appendix C)
[32] Responses in Table 2 (Appendix C)
[33] Responses in Table 8 (Appendix C)
[34] Responses in Table 9 (Appendix C)

4. **Please specify the number of placements undertaken by computing careers (if you do not know the exact data, please give an approximate proportion of placements undertaken)[35].**

a. Business functions (such as digital marketing, database marketing or application administration)

b. Technical/creative (such as Designers, Architects and Content originators)

c. Technical trades (such as IT operations, database management and network management)

d. Software engineering and testing

e. Research (whether in architectures, algorithms or applications)

f. Non computing careers

Types of placement activities

5. **Please specify the number of placements undertaken by duration[37]: 24 weeks - 15 months, 4 - 23 weeks, Up to 4 weeks.**

6. **How many of the placements undertaken were accredited[38]**

7. **How many of the placements undertaken were full-time[39]**

8. **How many of the placements were undertaken during vacation[40]**

9. **How many of the placements undertaken were paid[41]**

Students

10. **Please complete the table below with information on full-time UG students within your department that undertook placements in 2012/13[42].**

Year	Total number of students enrolled on computing courses	Number of applications for placements received	Number of students on placements	Number of students on compulsory placements
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				

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[35] Responses in Table 10 (Appendix C)

[36] Responses in Table 7 (Appendix C)

[37] Responses in Table 6 (Appendix C)

[38] Responses in Table 4 (Appendix C)

[39] Responses in Table 6 (Appendix C)

[40] Responses in Table 3 (Appendix C)

[41] 93% of computing placements were reported as being paid

[42] Responses in Table 5 (Appendix C)

Appendix B: ADDITIONAL FIGURES
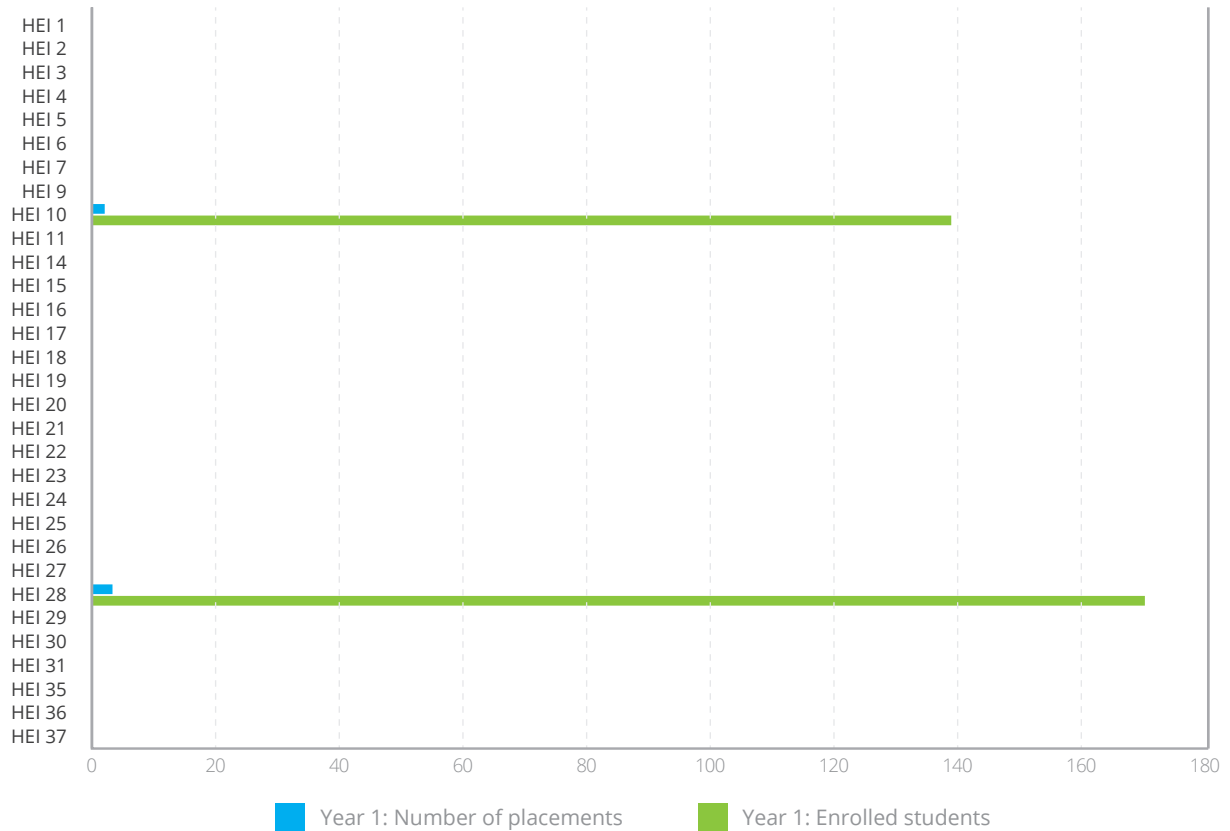
Figure B.1: Number of computing students enrolled on year 1 and the number of placements undertaken
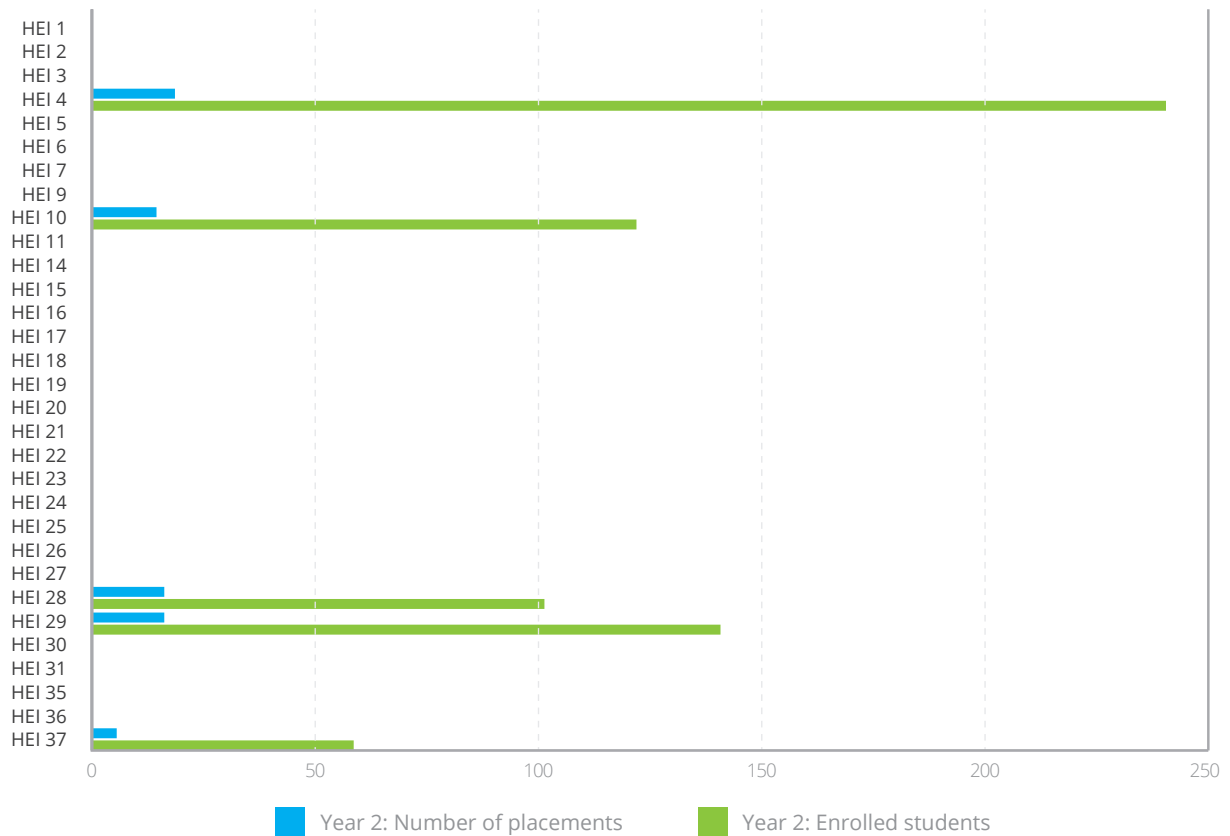
Figures B.2: Number of computing students enrolled on year 2 and the number of placements undertaken
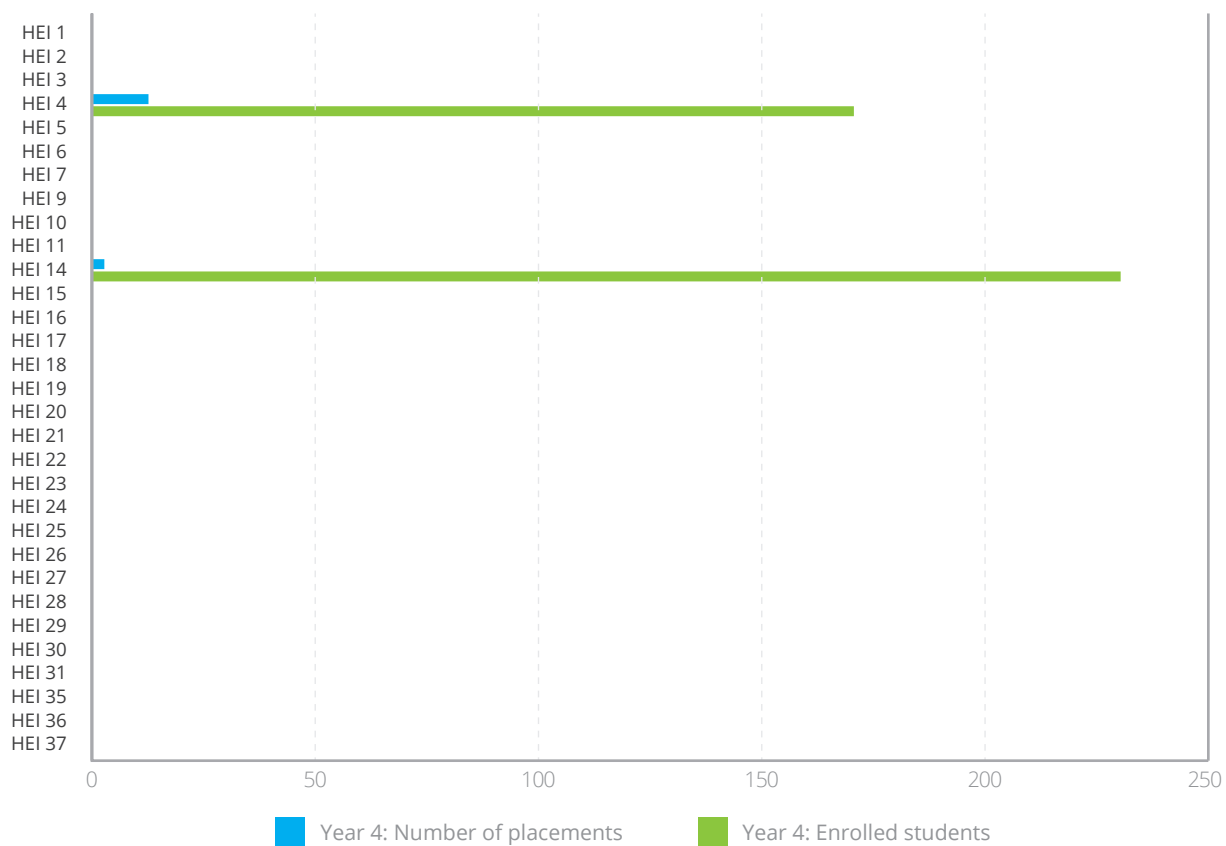
Figures B.3: Number of computing students enrolled on year 4 and the number of placements undertaken

Appendix C: DATA TABLES

HEI	No. of Placements	% of HESA population	HESA data on student enrollment
HEI 1	288	15%	1885
HEI 2	170	15%	1125
HEI 3	115	11%	1060
HEI 4	100	12%	830
HEI 5	97	9%	1050
HEI 6	95	10%	970
HEI 7	91	12%	790
HEI 8	85	6%	1410
HEI 9	78	10%	770
HEI 10	73	17%	430
HEI 11	73	6%	1060
HEI 12	73	7%	1045
HEI 13	66	15%	455
HEI 14	65	3%	1150
HEI 15	65	12%	555
HEI 16	58	7%	855
HEI 17	50	3%	1785
HEI 18	46	12%	400
HEI 19	45	3%	1565
HEI 20	40	3%	1410
HEI 21	39	11%	365
HEI 22	35	1%	590
HEI 23	33	2%	1590
HEI 24	31	3%	1065
HEI 25	30	3%	995
HEI 26	30	6%	490
HEI 27	30	2%	1335
HEI 28	22	5%	440
HEI 29	16	2%	830
HEI 30	16	4%	390
HEI 31	13	2%	570
HEI 32	9	3%	285
HEI 33	8	2%	455
HEI 34	5	0%	1165
HEI 35	5	1%	515
HEI 36	4	1%	385
HEI 37	3	0%	765
HEI 38	0	0%	460
HEI 39	0	0%	460
HEI 40	0	0%	195
TOTAL	**2102**		
MEAN	**53**	**6%**	
MEDIAN	**40**	**6%**	

Table 1: Number of placements compared to total computing student population

HEI	Optional	Compulsory
HEI 1	0	288
HEI 2	170	0
HEI 3	0	115
HEI 4	63	37
HEI 5	0	97
HEI 6	0	95
HEI 7	0	91
HEI 8	85	0
HEI 9	78	0
HEI 10	73	0
HEI 11	73	0
HEI 12	73	0
HEI 13	66	0
HEI 14	65	0
HEI 15	65	0
HEI 16	58	0
HEI 17	50	0
HEI 18	46	0
HEI 19	45	0
HEI 20	40	0
HEI 21	39	0
HEI 22	0	35
HEI 23	33	0
HEI 24	31	0
HEI 25	30	0
HEI 26	30	0
HEI 27	27	3
HEI 28	22	0
HEI 29	16	0
HEI 30	0	16
HEI 31	13	0
HEI 32	4	5
HEI 33	8	0
HEI 34	5	0
HEI 35	5	0
HEI 36	4	0
HEI 37	3	0
HEI 38	0	0
HEI 39	0	0
HEI 40	0	0
TOTAL	1320	782

Table 2: Compulsory and Optional Placements

HEI	Undertaken during term time	Undertaken during vacation	Total no. of placements
HEI 1	288	0	288
HEI 2	170	0	170
HEI 3	115	0	115
HEI 4	95	5	100
HEI 5	97	0	97
HEI 6	95	0	95
HEI 7	91	0	91
HEI 8	85	0	85
HEI 9	78	0	78
HEI 12	73	0	73
HEI 11	73	0	73
HEI 10	58	15	73
HEI 13	66	0	66
HEI 15	65	6	65
HEI 14	59	0	65
HEI 16	58	0	58
HEI 17	50	0	50
HEI 18	46	0	46
HEI 19	45	0	45
HEI 20	40	0	40
HEI 21	39	0	39
HEI 22	1	34	35
HEI 23	33	0	33
HEI 24	31	0	31
HEI 25	30	0	30
HEI 26	30	0	30
HEI 27	30	0	30
HEI 28	0	22	22
HEI 29	16	0	16
HEI 30	16	0	16
HEI 31	13	0	13
HEI 32	5	4	9
HEI 33	8	0	8
HEI 34	5	0	5
HEI 35	5	0	5
HEI 36	1	3	4
HEI 37	1	2	3
TOTAL	**2011**	**91**	

Table 3: Vacation Placements

HEI	Unaccredited placements	Accedited placements
HEI 1	0	288
HEI 2	0	170
HEI 3	0	115
HEI 4	12	88
HEI 5	0	97
HEI 6	0	95
HEI 7	0	91
HEI 8	0	85
HEI 9	0	78
HEI 10	15	58
HEI 11	0	73
HEI 12	0	73
HEI 13	0	66
HEI 14	12	53
HEI 15	0	65
HEI 16	0	58
HEI 17	0	50
HEI 18	0	46
HEI 19	0	45
HEI 20	0	40
HEI 21	0	39
HEI 22	0	35
HEI 23	0	33
HEI 24	0	31
HEI 25	0	30
HEI 26	0	30
HEI 27	0	30
HEI 28	22	0
HEI 29	15	1
HEI 30	0	16
HEI 31	1	12
HEI 32	0	9
HEI 33	0	8
HEI 34	0	5
HEI 35	0	5
HEI 36	0	4
HEI 37	2	1
HEI 38	0	0
HEI 39	0	0
HEI 40	0	0
TOTAL	**79**	**2023**

Table 4: Placement Accreditation

HEI	Year 1	Year 2	Year 3	Year 4
HEI 1	0	0	288	0
HEI 2	0	0	170	0
HEI 3	0	0	115	0
HEI 4	0	18	69	13
HEI 5	0	0	97	0
HEI 6	0	0	95	0
HEI 7	0	0	91	0
HEI 8	0	0	85	0
HEI 9	0	0	78	0
HEI 12	0	0	73	0
HEI 11	0	0	73	0
HEI 10	2	13	58	0
HEI 13	0	0	66	0
HEI 15	0	0	65	0
HEI 14	0	0	63	2
HEI 16	0	0	58	0
HEI 17	0	0	50	0
HEI 18	0	0	46	0
HEI 19	0	0	45	0
HEI 20	0	0	40	0
HEI 21	0	0	39	0
HEI 22	0	0	35	0
HEI 23	0	0	33	0
HEI 24	0	0	31	0
HEI 25	0	0	30	0
HEI 26	0	0	30	0
HEI 27	0	0	30	0
HEI 28	3	15	4	0
HEI 29	0	15	1	0
HEI 30	0	0	16	0
HEI 31	0	0	13	0
HEI 32	0	1	8	0
HEI 33	0	0	8	0
HEI 34	0	0	5	0
HEI 35	0	0	5	0
HEI 36	0	0	4	0
HEI 37	0	2	1	0
TOTAL	5	64	2018	15

Table 5: Placement Year

HEI	24 weeks - 15 months	4 weeks - 23 weeks	Up to 4 weeks
HEI 1	288	0	0
HEI 2	170	0	0
HEI 3	115	0	0
HEI 4	95	5	5
HEI 5	97	0	0
HEI 6	95	0	0
HEI 7	80	11	0
HEI 8	85	0	0
HEI 9	78	0	0
HEI 10	58	15	0
HEI 11	73	0	0
HEI 12	73	0	0
HEI 13	66	0	0
HEI 14	45	8	12
HEI 15	65	0	0
HEI 16	58	0	0
HEI 17	50	0	0
HEI 18	46	0	0
HEI 19	45	0	0
HEI 20	40	0	0
HEI 21	39	0	0
HEI 22	1	34	0
HEI 23	33	0	0
HEI 24	31	0	0
HEI 25	30	0	0
HEI 26	30	0	0
HEI 27	30	0	0
HEI 28	0	22	0
HEI 29	1	0	15
HEI 30	16	0	0
HEI 31	13	0	0
HEI 32	5	3	1
HEI 33	8	0	0
HEI 34	5	0	0
HEI 35	5	0	0
HEI 36	1	3	0
HEI 37	1	2	0
TOTAL	**1971**	**98**	**33**

Table 6: Placement Length

HEI	Business functions (digital/ database marketing, or app admin)	Technical/ creative (Designers, Architects and Content originators)	Technical trades (IT operations, Database mangmnt and network	Software Engineering and Testing	Research (whether in architectures, algorithms or applications	Non computing careers
HEI 1	6	35	43	201	3	0
HEI 2	0	36	54	90	0	0
HEI 3	32	25	15	18	2	6
HEI 4	27	10	27	34	0	2
HEI 5	10	14	49	24	0	0
HEI 6	19	14	33	29	0	0
HEI 7	0	0	0	91	0	0
HEI 8	0	0	80	5	0	0
HEI 9	16	16	23	23	0	0
HEI 10	13	3	11	43	0	3
HEI 11	22	3	32	16	0	0
HEI 12	Information N/A					
HEI 13	Information N/A					
HEI 14	6	4	15	14	6	15
HEI 15	Information N/A					
HEI 16	9	3	23	23	0	0
HEI 17	0	3	20	20	7	0
HEI 18	Information N/A					
HEI 19	17	1	8	19	0	0
HEI 20	8	10	12	8	2	0
HEI 21	3	10	15	10	1	0
HEI 22	0	0	0	34	1	0
HEI 23	8	8	8	9	0	0
HEI 24	0	0	13	17	0	0
HEI 25	5	0	10	15	0	0
HEI 26	6	6	6	6	6	0
HEI 27	0	9	5	15	1	0
HEI 28	4	7	7	4	0	0
HEI 29	1	0	15	0	0	0
HEI 30	0	0	5	8	3	0
HEI 31	2	0	6	5	0	0
HEI 32	0	0	0	8	1	0
HEI 33	Information N/A					
HEI 34	0	0	0	5	0	0
HEI 35	0	2	1	2	0	0
HEI 36	1	0	0	2	1	0
HEI 37	0	0	0	1	2	0
TOTAL	**215**	**219**	**536**	**799**	**36**	**26**

Table 7: Placement roles

HEI	No. of employing companies
HEI 1	152
HEI 2	150
HEI 3	98
HEI 4	100
HEI 5	57
HEI 6	56
HEI 7	91
HEI 8	85
HEI 9	52
HEI 10	43
HEI 11	55
HEI 12	Information N/A
HEI 13	51
HEI 14	50
HEI 15	45
HEI 16	47
HEI 17	50
HEI 18	35
HEI 19	34
HEI 20	28
HEI 21	39
HEI 22	22
HEI 23	27
HEI 24	19
HEI 25	30
HEI 26	21
HEI 27	30
HEI 28	22
HEI 29	4
HEI 30	13
HEI 31	10
HEI 32	9
HEI 33	Information N/A
HEI 34	5
HEI 35	5
HEI 36	4
HEI 37	3
TOTAL	1542

Table 8: Number of placement companies

HEI	Private	Non- profit	Public sector
HEI 1	108	6	38
HEI 2	135	5	10
HEI 3	69	1	28
HEI 4	82	6	12
HEI 5	48	0	9
HEI 6	50	2	5
HEI 7	91	0	0
HEI 8	71	0	14
HEI 9	42	6	4
HEI 10	37	2	4
HEI 11	49	1	5
HEI 12	Information N/A		
HEI 13	46	3	2
HEI 14	30	5	15
HEI 15	Information N/A		
HEI 16	42	1	4
HEI 17	44	3	3
HEI 18	31	2	2
HEI 19	28	0	6
HEI 20	25	1	2
HEI 21	38	0	1
HEI 22	22	0	0
HEI 23	25	0	2
HEI 24	15	0	4
HEI 25	18	2	10
HEI 26	18	0	3
HEI 27	24	0	6
HEI 28	22	0	0
HEI 29	3	0	1
HEI 30	13	0	0
HEI 31	10	0	0
HEI 32	5	1	3
HEI 33	Information N/A		
HEI 34	5	0	0
HEI 35	3	0	2
HEI 36	4	0	0
HEI 37	1	2	0
TOTAL	**1254**	**49**	**195**

Table 9: Employer Sector

HEI	Micro (0-9 employees)	Small (10-49 employees)	Medium (50-249 employees)	Large (250+ employees)
HEI 1	15	76	23	38
HEI 2	6	27	38	79
HEI 3	6	36	49	7
HEI 4	20	28	28	24
HEI 5	7	14	22	14
HEI 6	4	10	9	34
HEI 7	6	8	6	71
HEI 8	0	0	34	51
HEI 9	10	22	10	10
HEI 10	1	6	2	34
HEI 11	1	5	10	39
HEI 12	Information N/A			
HEI 13	1	1	1	48
HEI 14	10	15	10	15
HEI 15	Information N/A			
HEI 16	0	5	20	22
HEI 17	3	7	15	25
HEI 18	Information N/A			
HEI 19	2	6	13	13
HEI 20	2	3	4	19
HEI 21	6	7	8	17
HEI 22	0	5	3	14
HEI 23	1	6	7	13
HEI 24	0	2	4	13
HEI 25	2	8	5	15
HEI 26	1	3	10	7
HEI 27	3	3	3	13
HEI 28	6	13	2	1
HEI 29	0	2	0	2
HEI 30	0	3	0	10
HEI 31	0	1	1	8
HEI 32	Information N/A			
HEI 33	Information N/A			
HEI 34	0	1	0	4
HEI 35	0	2	1	2
HEI 36	2	1	0	1
HEI 37	0	0	0	3
TOTAL	115	326	338	666

Table 10: Employer Size