
Employability of graduates in the Scottish construction industry

Report on the findings of research commissioned by the Scottish Civils
Training Group with funding assistance from CITB

10 June 2019

Alan Kirkwood

Alan Kirkwood, Chairman SCTG

Saffron Grant

Saffron Grant, Built Environment
Support and Training Ltd

Executive summary

Following feedback from the construction industry, the Scottish Civils Training Group (SCTG) initiated research into current degree level qualifications provided at Scottish universities and the early training and support provided for graduates by employers. The aim of the research is to understand if there are any skills gaps which need to be addressed.

Over recent years developments have been made in the provision of educational qualifications which support and feed into the Scottish construction industry, resulting in new modes of study such as Graduate Level Apprenticeships. However, conventional degree programmes still play a major part in providing appropriately educated candidates to the industry, so this research focusses on that particular route into a career in construction.

This research was carried out via meetings, conversations and informal discussions with stakeholders (university lecturers, representatives from Skills Development Scotland and the Scottish Qualifications Authority) as well as through a survey for students of Civil Engineering related and Construction Management degree level courses, graduates and construction industry employers including those who work closely with graduates day to day.

The key findings are that there is good convergence between the perceptions of students, graduates and employers on the skills which Civil Engineering graduates are lacking when they complete their degree course. The skills which are perceived to be lacking include (to varying degrees) the following:

- surveying and setting out
- commercial and contractual awareness
- use of CAD and other relevant software
- health and safety
- knowledge of construction processes
- Building Information Modelling
- working with drawings
- problem solving
- working under pressure and dealing with difficult people
- taking off quantities

This research was not intended as a means of definitively pinpointing specific issues, but as a broad initial overview intended to highlight areas which need to be addressed or warrant further exploration. It has been successful in achieving that outcome.

Based on this initial research a number of possible measures listed later in this report include development of resources for universities, students, graduates and employers, initiatives and areas for further research.

Other issues which may need further exploration or debate include whether Civil Engineering degree courses and graduate training schemes (such as ICE and CIOB) are too focussed on the needs of consultancy- based graduates and do not meet the needs of those working for a Contractor and whether employers have unrealistic expectations of universities and could (or should) do more themselves to support graduates and create an environment where they can flourish and achieve their full potential and effectiveness.

Recommendations

The next phase of the project is to prioritise the possible measures below and determine which measures are to be developed further. SCTG welcomes all views and further suggestions. Please contact info@scottishcivilstraining.co.uk. Possible measures for further considerations include:

1. Resource packs for universities e.g. packages of drawings in hard copy, PDF and DXF format along with worksheets.
2. An initiative to help universities get access to surveying equipment and relevant software
3. Guidelines and/or training for lecturers on delivering Engineering Surveying modules (and resource pack to support the module) and software to enable it to be effectively incorporated into the curriculum
4. An initiative to connect final year students with opportunities to incorporate live projects/ industry expertise into their final year projects
5. Source, train and support a pool of high- quality guest lecturers from industry who can deliver lectures to universities
6. An initiative to increase the number of students taking part in work-placements and site visits as part of their degree.

7. An online community and resource where students and graduates can ask questions to each other and to more experienced engineers. To also have access to educational videos of subjects which are difficult to teach in classrooms
8. Develop a resource pack for industry containing Guidelines on how company inductions can be optimised to get the best out of graduates & Information about how companies can create an environment in which graduates feel well supported and mentored including the Development of a range of practical training courses for graduates
9. A competency scheme for site-based graduates to either supplement or as an alternative to existing professional training schemes which will include implementation of a strong mentoring culture & Development of an industry handbook for site-based graduates

About the Scottish Civils Training Group

This research was commissioned by the Scottish Civils Training Group (SCTG). The group has been set up to improve the quality of education & training, safety and efficiency, coordinate members views, promote innovation and address best practice and build ability throughout the civil engineering sector in Scotland.

The focus of the Group is to discuss and pursue good practice, identify shortfalls in training, provide the latest information on availability of training and grants, and to promote and encourage new entrants into the industry.

The SCTG acknowledges that the workforce requires lifelong learning in addition to trade specific and Health and Safety Training. The Committee meets quarterly and provides up to date information on industry, training and available funding to all members.

The aims and objectives of the SCTG are to:

- Survey member companies annually to determine their training needs
- Develop and deliver Civil Engineering training programmes
- Negotiate discounted rates for members and offer reduced cost courses where possible
- Become the national Civil Engineering training group working Scotland wide
- Increase the membership of the training group
- Increase the number of Training Providers offering training to the group
- Increase the range of Civils training available in Scotland
- Work with the Civil Engineering sector's major clients e.g. utility providers, road authorities etc

- Meet CITB Funding Targets
- Bid to CITB for funding to help qualify the workforce
- Become an influential partner to set qualifications and training standards for our sector

Membership of the SCTG is open to all Civil Engineering companies in Scotland. Members can access heavily subsidised high-quality training, attend regular networking opportunities, be kept up to date about available funding and new and innovative training and help to improve the industry by contributing to discussions and debates. Membership is £50 + vat per annum. New members are welcome. Details of how to join can be found at <https://scottishcivilstraining.co.uk/members/joining/>

Background to the research

Following feedback from the industry, the SCTG identified a need to research into current degree level qualifications and training provided at Scottish universities. The research was prompted by a combination of:

- A management and supervisory level survey to member companies
- Feedback from training course delivery where graduates were found to be lacking in core skills
- Minuted discussions at SCTG committee meetings during 2017.

The initial aim of the research was to investigate current teaching practice in universities and compare and contrast activities currently carried out on site by civil engineering contractors.

The long-term goals of the SCTG for 2018 – 2020 are to utilise the initial research gathered, along with input from other organisations to become an industry partner to shape, influence and improve current civil engineering teaching and training provision.

Scope of the project

The courses considered in the research were Civil Engineering (and variations thereof) and Construction Management.

The initial plan was that all universities in Scotland offering the relevant courses would be asked to input, however after in-depth discussions with lecturers at three universities, it became apparent that they all were facing similar challenges and it was deemed that there would be little benefit in having the same conversations with all universities.

Stakeholders invited to contribute were:

- Universities
- CECA
- SCTG members
- Skills Development Scotland
- Scottish Qualifications Authority
- Graduates
- Those working closely with graduates

Methods of research

The research methods included surveys sent to students, graduates and those who employ or work closely with graduates, and informal discussions with university lecturers and representatives of the Scottish Civils Training Group (SCTG), Skills Development Scotland (SDS) and Scottish Qualifications Authority (SQA).

Results of the survey

Survey overview

The survey was completed by 51 employers (including people working closely with graduates), 19 graduates and 8 students.

Of the employers, there was a spread of job roles and a spread of company sizes. Most of the responses came from those based in the central belt.

Of the graduates, only one had studied Construction Management and the rest had studied Civil Engineering (or a variation) so it can be assumed that the findings of this research relates to Civil Engineering related courses. The spread of experience was from 0-5 years. Most had studied part time. A had third completed a work placement as part of their studies. All are currently in a role

relevant to their studies. For most of them, their first graduate position was with a company employing 250-500 employees with an equal spread across other company sizes.

Of the students, their current year of studies ranged from year 1 to year 4.

The results of the survey can be found in the appendices of this report.

Further exploration needed

The aim of the survey was to shed some light on the perceived skills gaps and the challenges faced by industry and the universities. The survey has highlighted some areas which warrant either further discussion or further exploration. Rather than providing definitive answers, the possible issues are presented below as questions:

- **Employers expectations of universities** - Do employers have the right level of expectation of universities? Can they reasonably expect graduates to leave university with confidence in practical skills such as setting out and surveying? Can they expect them to start out with commercial and contractual awareness? Are employers and universities both expecting the other to fill certain gaps?
- **Site visits** - Is it the role of universities to organise site visits for students? Or should employers be more proactive? Or should it be the student's personal responsibility? Are only high-profile sites deemed as interesting? There are hundreds of small/ medium/ typical sites around each town and city that would be of educational value? Could there be a central organiser? Instead of universities organising their own site visits, should the industry arrange site visits that students and graduates of all universities could attend? e.g. once a month? Is this already done through the ICE? If so, is there enough awareness? Could a certain number of site visits over the course of the degree be made mandatory? Could it be incorporated into a student project or coursework?
- **Existing training provision** - Are employers aware that training already exists to meet some of their needs? For example, one of the skills deemed to be most lacking is surveying and setting out. There are frequent courses available in Glasgow, but only about 10 graduates per year attend the training in Scotland. Is it because they don't know that it exists? Or do they know that it exists but don't feel it would make any difference? Are decision makers unaware of the skills gap? Or do they resent the cost of the training because they think that graduates should already have these skills? Perhaps graduates and their managers feel the training is needed, but training managers and decision makers don't understand the importance/ ROI? Does it solve their problem/ meet their needs when they use it? If other

training was developed to fill other gaps, would there be sufficient uptake to make it worthwhile? Or would it be wasted because although there is a gap in graduate skills, employers are unwilling to take action to address it?

- **The role of the SCTG** – What can SCTG do to address the gaps? How can membership of the training groups be increased? Raise awareness? Is there a need for more funding to promote its existence? How can engagement be increased?
- **Practical skills** - Do universities place a high enough value on the practical skills needed for working for a Contractor? Are university decision makers aware of the importance of the practical skills?
- **Joint Board of Moderators (JBM)** – JBM dictate what course content needs to be covered taking into account the requirements of professional bodies. What is their role in addressing any gaps? Are they steering things in the right direction? How can SCTG/ industry engage with JBM? Are they open to discussion?
- **Existing professional training schemes** – Do they meet the needs of site-based graduates? If they don't meet the needs of all graduates and employers, is there scope for an alternative or supplementary scheme?
- **Dealing with difficult people** - Are employers aware of costs (financial and indirect) associated with graduates not being equipped to deal with difficult people – stress, anxiety or unhappiness for the graduate, reduced productivity, avoidance of certain situations, graduates leaving their job or the industry. Are employers aware that dealing with difficult people is a skill that can be taught in a structured way?
- **Industry experience of lecturers** - Do lecturers have adequate recent and/or relevant industry experience? Is the PHD focus for lecturers disadvantaging students/ graduates and the industry rather than helping it?
- **Work placements** - Are they easy enough to find? What are the barriers to employers offering work placements? Does it cost them time/energy/money? What are the costs? Recruitment? Finding a suitable site? Training them? Managing them? Paying them? Could there be a subsidy for employers? Could there be a fund for students to enable them to take unpaid work placements? Could/ should universities play a role in ensuring students obtain a CSCS card early in their course? What are the barriers and how can they be removed?
- **eLearning** - Are universities making optimum use of eLearning? Could better use be made of classroom time? What barriers to universities embracing eLearning? Traditional/ conventional mindset? Does being a university lecturer appeal to a certain fixed mindset? Is there a lack of diversity of thinking?

- **Diversity** – How does the lack of diversity impact on training/ skills? How does it impact on job satisfaction and retention? How does it impact on career development?
- **Practical lessons** - Is an average of 8.4 hours per year spent in practical lessons adequate for construction related courses? Do practical lessons add value to the course? Some students had zero practical classes per year. Where does the responsibility lie for practical training? With the universities? Or with employers?
- **Quality of teaching** - What is the impact of the quality of lecturer's communication skills on the student's education? Is it a small or large factor in whether they feel well prepared for their career and obtain the relevant skills (as distinct from obtaining a degree)? Is poor lecturing and lack of engagement a significant problem which should be explored further? Or is it good on the whole with a few exceptions (which is a subjective matter).
- **Software** - Should there be more focus on software in general? 70% of graduates said the full range of relevant software was not adequately covered. Should survey software be included in courses? Only 1 graduate said it was included in their course.
- **Areas lacking (graduates' perspective)** – Surveying and setting out, commercial and contractual awareness, use of relevant software, health and safety, construction processes, BIM, management of construction processes, working with drawings, understanding what the job consists of. 48% of graduates do not feel their course prepared them well.
- **Areas lacking (employers' perspective)** – Interpreting drawings, surveying and setting out, taking off quantities, health and safety awareness, knowledge of the construction process, commercial awareness, contractual awareness, CAD and survey software, problem solving, working under pressure, dealing with difficult people, GNSS equipment,
- **Focus on design** – Do courses focus more on the needs of consultancy- based graduates? Many graduates and students feel they do.
- **Company inductions** – What constitutes good practice for company inductions. What elements could help graduates feel better supported? E.g. opportunities to meet other graduates?
- **Mentoring** – Is there a strong enough mentoring culture in the construction industry? Do mentors have the right skills for mentoring? What positive effect could a better mentoring culture have on the industry as a whole? Greater productivity/ output? Better retention? Reduction in stress/ sickness absence?
- **Supporting graduates** – How can graduates feel better supported? What is the relationship between this and productivity/ motivation/ retention/ career development? 50% didn't feel

well supported in their first year of work. What is the knock-on effect of not feeling supported on the graduate themselves, their effectiveness and on the industry?

- **Memberships of professional bodies** – What is the relationship between whether companies will pay for membership of professional bodies and other factors such as graduate’s motivation. 44% say that their company will not cover the costs of them joining any professional bodies. 38% don’t know how many memberships their company would pay for. Is this a sign that professional development is not valued by Contractors? Is this reflected in other types of training? Does this message impact negatively on motivation/morale? I believe most consultancies do pay for membership. 50% said that their company doesn’t offer any structured training scheme for graduates.

Universities perspective

Through informal discussions with university lecturers, the following issues have been identified:

- High cost of equipment (lab equipment, surveying equipment, software)
- Lack of funds due to capped fees and reduced government funding
- Low uptake from students when extra- curricular activities such as site visits are arranged
- Unreasonable workload for lecturers due to staff cuts
- Impact on timetable of fieldtrips for modules such as surveying (any other modules affected by this?)
- Necessity to cover the curriculum leaves little time for non-mandatory activities such as construction site visits
- Some universities comply with widening access targets so have students from a wide range of backgrounds and varying ability, whilst some do not meet the targets and have student’s with higher exam results.
- Lack of employers offering work placements
- Lack of resources for universities to make connections and encourage employers to offer work placements
- Some lecturers who have been in academia for a long-time are lagging behind on hands-on experience with new technologies and software
- Particular difficulties in delivering the surveying module – It is slightly different from other modules in that it is not just knowledge based so you cannot learn it just for the purpose of delivering it to students. Experience and skill are needed. Also, suitable room availability, outdoor space, cost of equipment, range of equipment, inefficient use of 2-hour slots for

practical classes, timetabling difficulties and cost challenges for field trips, lack of up-to-date text book about modern equipment.

- Fewer lecturers with relevant industry experience. The Joint Board of Moderators (JBM) pressing for lecturers to have a PHD. A new pattern for students graduating with Bachelors, then Masters, then PHD, then becoming a lecturer but with no industry experience.
- The fact that priority must be given to a lecturer's academic qualifications rather than communication skills. Some lecturers may be highly qualified, but poor at engaging students in the learning
- Challenges in attracting suitably qualified lecturers who have industry experience (remuneration is not attractive compared to being in industry)
- Some students joining either after completing Highers or HNC/HND are lacking in some skills which they should be expected to have

Appendix A – Survey Results (Students)

SURVEY RESULTS – STUDENTS

Which university do you attend? (8 responses)

University	Number
Abertay University	0
Dundee University	0
Glasgow University	1
Glasgow Caledonian University	2
Edinburgh Napier University	0
Edinburgh University	0
Herriot Watt University	0
Robert Gordon University	1
University of Aberdeen	0
University of Strathclyde	2
University of the Highlands and Islands	1
University of the West of Scotland	1

What is the title of your course? (8 responses)

Course title	Number
Civil Engineering	4
Civil and Environmental Engineering	1
Environmental Civil Engineering	2
Construction Management	0
Civil Engineering Construction Management	0
"Construction and the Built Environment"	1

At what level do you intend to exit your studies? (8 responses)

Level	Number
On completion of BEng or BSC	6
On completion of MEng or MSc	6

What year have you completed? (8 responses)

Year completed	Number
"Currently in year 1"	1
Year 1	2
Year 2	1
Year 3	4
Year 4	0

What is your mode of study? (8 responses)

Mode	Number
------	--------

Full-time	3
Part-time	2
Distance learning	0
Graduate Apprenticeship	3

Are you currently in employment in addition to studying part-time? (5 responses)

Answer	Number
Yes	5
No	0

What is the nature of your employment?

Nature	Number
Relevant to my chosen career path	5
Not relevant to my chose career path	0

Type of employment - Is your employment: (5 responses)

Description	Number
Site based for a Contractor	2
Office based for a Contractor	0
A mixture of site based and officebased for a Contractor	2
On the Client side (e.g. local authority, housing association or utility provider)	0
Consultancy based	0
"None"	1

Work placement - Which of the following best describes you? (3 responses)

Description	Number
I am currently taking part in an industrial work placement	0
I have already completed an industrial work placement	0
I have not yet completed an industrial work placement, but intend to before I complete my course	3
I have not completed an industrial work placement, and to do not intend to	0

Type of employment – What is/was the nature of your industrial work placement? (3 responses)

Description	Number
Site based for a Contractor	2
Office based for a Contractor	0
A mixture of site based and officebased for a Contractor	1
On the Client side (e.g. local authority, housing association or utility provider)	0

Consultancy based	0
"None"	0

How long is/was your work placement? (3 responses)

Duration	Number
Less than a month	0
1-3 months	3
4-6 months	0
7-12 months	0
More than 12 months	0
Continuous/ open-ended	0

How do you think your work placement will affect your job prospects on graduation? (3 responses)

Answer	Number
I have been offered a job with my placement employer when I graduate	1
It will have a significant influence on my job prospects on graduation	1
It will have some influence on my job prospects on graduation	1
It will not have any influence on my job prospects on graduation	0

How is time spent in university? (7 responses)

	Smallest answer	Largest answer	Average
Traditional format lecture (i.e. with the lecturer presenting information verbally or with visual aids such as PowerPoint, a whiteboard or a flip chart)	0	12	5.6
Traditional format tutorial (i.e. working through solutions to problems with a lecturer there to help you)	0	4	1.6
Working together with other students on a group project	0	40	8.2
Working independently on your personal contribution to a group project	0	15	4.6
'Focused' hours do you spend on course work	0	20	7.3
In a typical week, how many hours do you spend on voluntary study such as personal reading or watching relevant documentaries?	0	5	2

In your last full academic year, how many hours did you spend in practical lessons or labs (e.g. preparing concrete mixes, strength testing materials or using survey equipment)? (Include hours spent carrying out these activities whilst on field trips but do not include site visits)? (7 responses)

Ranges from 0 to 25 hours and averaged 8.4 hours.

In the previous academic year, how many live construction site visits did you attend, which were organised by your university? (7 responses)

Ranges from 0 -3 with an average of 0.6 visits. 5 of the students attended zero.

How much experience do you feel you have had on the following? (7 responses)

Topic	Plenty of experience	Not enough experience
CAD for creating 3d drawings	1	4
CAD for creating 2d drawings	1	4
Spreadsheet for cost projections	0	5
Spreadsheets for design calculations	1	4
Programming software	0	5
Survey software for extracting co-ordinate information	1	4
Building Information Modelling	0	5

Do you feel you have had adequate access to (7 responses):

	Yes	No
Software licenses to install on you own computer	6	1
University computers with the software you need	6	1

Which of the following have you used in your course so far? (7 responses)

Software	Number
Microsoft project	2
AutoCAD	4
Survey software such as LSS, n4CE, TBC, Magnet, Starnet or LISCAD	1
Structural design software	4
Hydraulic design software	1
Geotechnical design software	1
BIM software (BIM)	1

Do you feel your course adequately covers the full range of software packages you anticipate you will need once you finish your course and start employment (or already encounter if you are a part-time student working in a relevant role) (7 responses):

Answer	Number
Yes	6

No	1
----	---

What software packages would you like to see included in your course?

“N4ce and civil 3d”

“AutoCAD”

“Programming”

“Don’t know”

“BIM and use of GPS”

“Bim”

“All relevant software should be covered a lot more. Especially CAD and Revit. I’m currently going to interviews feeling unprepared for the world of work.”

What software packages are currently included in your course, but not in sufficient depth? (7 responses)

Software	Number of students
AutoCAD	2
N4ce	1
AutoCAD Civils 3d	1
CAD	2
Revit	1

How much experience of reading actual construction drawings (from real projects) has your course given you? (7 responses)

Drawing type	Plenty of experience	Not enough experience
Drawings in general	3	4
A1 or A0 paper drawings	0	7
Full sets of drawings for a project	0	7
Steel reinforcement drawings	1	6
Road construction drawings	1	6
Buildings	0	7
Structures e.g. bridges	0	7
Manholes and drainage	1	6
Foundations	1	6
Piles	1	6

How much experience do you feel your course has given you so far in setting out and site surveying? (7 responses)

	Plenty of experience	Not enough experience
Taking basic level surveys using a level	1	6
Creating temporary benchmarks	1	6
Checking that equipment is working correctly	1	6
Creating accurate control points	2	5
Setting out levels	2	5
Setting out positions using a total station	2	5
Using a tape measure to measure existing features	0	7
Using a tape measure to set out positions	0	7
Extracting setting out information from real life construction drawings	1	6
Using the different functions in the total station	0	7
Use of GNSS equipment	1	6
Understanding the capabilities and limitations of total stations	1	6

Which of the following do you feel confident in? (7 responses)

Topic	Number
Health and safety	5
ICT/ Relevant software packages	0
Relevant maths e.g. design calculations	5
Commercial aspects	2
New and innovative construction technologies	1
Setting out and surveying	6
Geotechnical design	4
Hydraulic design	0
Highways design	2
Construction contracts and their relationship with your initial duties	4
Construction processes (the finer details)	2
Use of design codes	2
Structural steel design	2
Reinforced concrete design	2
Management of construction projects	3
Management of the design phase of construction projects	0
Environmental impact of the construction process	3
Environmental impact of finished construction projects	3
None of the above	0
<i>'Only due to on site experience'</i>	1

Which of the following do you feel confident in? (7 responses)

Topic	Number who agreed (5)
Verbal communication skills	6
Report writing	4
Written communication such as emails	6
Listening skills	5
Leading a team	5
Working as a team	7
CV writing	1
Interview skills	1
Dealing with difficult people	4
Presentation skills	2
Public speaking skills	0
Handling large amounts of complex information	3
Working with minimum supervision	7
Working independently without opportunities to ask questions	3
Interpreting and working with hard copy construction drawings	5
Interpreting and working with electronic drawings	3
None of the above	0
<i>'Only due to on site experience'</i>	1

Do you feel well prepared to start working in the construction industry? (7 responses)

Answer	Number
Yes	4
No	2
Not yet, but I believe I will by the time I graduate	1

Can you give any details about why you do not feel well prepared to start working in the construction industry?

"Only started 6 months ago"

"I believe I am at an early stage of my university career and there are many things I haven't covered. I think with a few more summer placements I will gain the majority of skills that I need"

"Complete lack of cad and software knowledge"

What is your intended career direction? (4 responses)

Career direction	Number
Site based for a Contractor	2
Office based for a Contractor	0

A mixture of site based and office based for a Contractor	2
On the Client side (e.g. local authority, housing association or utility provider) Consultancy based	0
I don't know yet	0

Which of these career options do you feel your course has prepared you well for? (8 responses)

Career direction	Number
A construction site based role working for a contractor	6
An office based role working for a Contractor	1
A role on the Client side (e.g. Local authority, housing association or utility provider)	2
An office based consultancy role	3
None of the above	0
<i>'University is more based towards design rather than site work'</i>	1

How do you feel about the quality of teaching at your university? (8 responses)

Answer	Number
All my lecturers have excellent lecturing skills and keep me engaged	2
Most of my lecturers have excellent lecturing skills and keep me engaged	2
Few of my lecturers have excellent lecturing skills and keep me engaged	4

What is the predominant teaching delivery style you have experienced so far? (8 responses)

Answer	Number
Traditional format lecture (i.e. with the lecturer presenting information verbally or with visual aids such as PowerPoint, a whiteboard or a flip chart)	4
Lecture with class engagement e.g. the lecturer presents for a while and then splits the class into smaller groups to do exercises	1
Traditional format tutorial (i.e. working through solutions to problems with a lecturer there to help you)	0
Students carry out personal reading and then classroom time is used for exploring the subject in more depth via class discussions/ group work based on the learning	1
Students watch videos provided by the Lecturer and then classroom time is used for exploring the subject in more depth via class discussions/ group activities/	0
Self-guided study and coursework submission with very little contact time with the lecturer	2

Which of the following teaching delivery styles do you personally find most effective?

Answer	Number
--------	--------

Traditional format lecture (i.e. with the lecturer presenting information verbally or with visual aids such as PowerPoint, a whiteboard or a flip chart)	0
Lecture with class engagement e.g. the lecturer presents for a while and then splits the class into smaller groups to do exercises	0
Traditional format tutorial (i.e. working through solutions to problems with a lecturer there to help you)	4
Students carry out personal reading and then classroom time is used for exploring the subject in more depth via class discussions/ group work based on the learning	1
Students watch videos provided by the Lecturer and then classroom time is used for exploring the subject in more depth via class discussions/ group activities/	1
Self-guided study and coursework submission with very little contact time with the lecturer	2

What teaching delivery style would you like to see more of? (8 responses)

Answer	Number
Traditional format lecture (i.e. with the lecturer presenting information verbally or with visual aids such as PowerPoint, a whiteboard or a flip chart)	0
Lecture with class engagement e.g. the lecturer presents for a while and then splits the class into smaller groups to do exercises	1
Traditional format tutorial (i.e. working through solutions to problems with a lecturer there to help you)	4
Students carry out personal reading and then classroom time is used for exploring the subject in more depth via class discussions/ group work based on the learning	0
Students watch videos provided by the Lecturer and then classroom time is used for exploring the subject in more depth via class discussions/ group activities/	3
Self-guided study and coursework submission with very little contact time with the lecturer	1

Which of the following videos, which would be smart phone friendly and which you could watch in your own time, would be valuable to your learning and your readiness for industry?

(8 responses)

Video	Number
Showing and explaining various construction activities on site e.g. pouring concrete, steel fixing, structural steel, manhole construction etc	5
Step-by-step video tutorials for software such as CAD, Microsoft Project, Microsoft Excel	8
Step-by-step video tutorials for using surveying equipment correctly	6
Step-by-step video tutorials for all the basic maths needed (including what you have already covered in higher maths and at HNC/HND)	6
Step-by-step video tutorials for worked examples e.g. mechanics, geotechnology hydraulics	8
Interviews with people in industry explaining their job roles and challenges they face	4

Strategies for solving technical problems	5
Video tutorials on how to interpret different types of construction drawings including common symbols and abbreviations	5
Case studies about contractual disputes	5
Video about Building Information Modelling	6

How do you feel about your course? (8 responses)

Statement	Number
I am enjoying it and I am excited about my chosen career	4
Some bits are interesting, some bits are boring	0
I don't enjoy the learning but I believe that it will get more interesting once I am in relevant employment	4
I don't enjoy the course and I don't intend to pursue a career in the construction industry	0

Do you feel your university has strong links with employer? (8 responses)

Answer	Number
Yes	6
No	2

What do you particularly value about your course? (7 responses)

"The support from lecturer's. Although we are doing the course via distance learning, I do feel very supported and know I could contact my course leader or module specific leader for assistance when required"

"Recognised qualification"

"Lecturers are approachable"

"Nothing – learn more working with employers"

"Friends"

"I enjoy the range of subjects. I value the opportunities and job prospects that come at the end of the course. I chose this course because I knew there would be variety and potentially an exciting career path"

"Small class sizes"

Has your course fallen short of your expectations in any way? (8 responses)

Answer	Number
Yes	5
No	3

How has your course fallen short of your expectations? (5 responses)

“Very little in practical activities. Surveying isn’t covered in part time course but is required for a lot of jobs”.

“It doesn’t relate to an on site role”

“More theoretical than I expected”

“Some lecturers are less engaging and hard to understand”

“Terrible standards of teaching lead to students having to “decode” lecture notes. Often feels like the course leads more to academia than to engineering career”

What changes would you make to your course? (6 responses)

“Increase in on campus days. To allow people to further discuss the course content”

“More practical tasks. Introduce surveying to part time”

“Either split the course into a site based course and an office / design based course. Teach students how to read drawings and use autocad with relation to practical site tasks. Have lectures that actually have site experience”

“More tutorials”

“Less examination and more fieldwork/ coursework”

“Have more of the staff come from industry backgrounds”

Do you have any general thoughts, comments or observations about your course, which may be relevant to this research? (3 responses)

“Courses are too broad and don't actually teach the student skills they need when they qualify. Graduates are useless on site for the 1-2 years”

“Better lecturers”

“The course needs to change in order for graduates to leave feeling confident in their engineering abilities”

Appendix B – Survey Results (Graduates)

SURVEY RESULTS – GRADUATES

Which university did you attend? (16 responses)

University	Number
Abertay University	1
Dundee University	3
Glasgow University	0
Glasgow Caledonian University	3
Edinburgh Napier University	1
Edinburgh University	0
Herriot Watt University	0
Robert Gordon University	1
University of Aberdeen	0
University of Strathclyde	2
University of the Highlands and Islands	1
University of the West of Scotland	3
None	1

What course did you attend? (16 responses)

Course title	Number
Civil Engineering	10
Civil and Environmental Engineering	2
Environmental Civil Engineering	2
Construction Management	1
Civil Engineering and Leadership	1

At what level did you complete your studies? (16 responses)

Level of completion	Number
Bachelors	13
Masters	1
HND	1
Not complete	1

How long is it since you completed your studies? (16 responses)

How long?	Number
Less than 6 months	2
7 – 12 months	1
1 year	3
2 years	2
3 years	1
4 years	3

5 years	2
More than 5 years	2

How long did it take you to secure your first graduate position after leaving university? (16 responses)

How long?	Number
Less than 6 months	12
7 – 12 months	3
1 year	0
2 years	0
More than 2 years	0
I have not yet secured my first graduate position	1

What was the nature of your first graduate position after completing your studies? (16 responses)

Nature	Number
A mixture of site based and office based for a Contractor	9
Site based for a Contractor	6
Not complete	1

Which of these do you feel your course prepared you well for? (16 responses)

Career direction	Number of responses (16)
A construction site based role working for a contractor	7
An office based role working for a Contractor	6
A role on the Client side (e.g. Local authority, housing association or utility provider)	2
An office based consultancy role	6
None of the above	1

What was your mode of study? (16 responses)

Mode of study	Number
Full-time	14
Part-time	2

Did you complete an industrial work placement during your studies? (14 responses)

Answer	Number
Yes	9
No	5

What was the nature of your work placement? (5 responses)

Nature	Number
Site based for a Contractor	4
On the Client side	1

How long did you spend on work placement in total over the course of your studies? (5 responses)

Length of time	Number
1-3 months	1
4-6 months	3
7-12 months	1

Did you feel this was: (5 responses)

Statement	Number
About right	4
Not long enough	1

How do you think it affected your job prospects on graduation? (5 responses)

Statement	Number
I was offered a graduate position with my work placement employer before the end of my studies	3
It had a significant influence on me securing my first graduate position	2
It had some influence on me securing my first graduate position	0
It didn't have influence on me securing my first graduate position, I would have got the job regardless	0
I am still not in employment related to my course	0

Did your part-time employment lead directly to your current employment? (2 responses)

Answer	Number
Yes, my part-time employment led directly to a graduate position	1
No, I now work for a different employer in a graduate position related to my studies	1

Who funded your university tuition fees? (2 responses)

Who funded	Number
I funded them myself	0
My employer funded them	2
They were funded by a mixture of myself and my employer	0

Are you currently in employment relevant to your studies (16 responses)

Answer	Number
--------	--------

Yes	16
No	0

During your time at university, how much hands-on experience do you feel you had on the following: (16 responses)

Topic	Enough Experience	Not enough experience
CAD for creating 3d drawings	5	11
CAD for creating 2d drawings	1	15
Spreadsheet for cost projections	1	15
Spreadsheets for design calculations	5	11
Programming software	2	14
Survey software for extracting co-ordinate information	1	15
Building Information Modelling	1	15

Do you feel you had adequate access to: (16 responses)

	Yes	No
Software licenses to install on your own computer	11	5
University computers with the software you need	12	4

Which of the following were included in your course? (16 responses)

Software	Number of students who have had access
Microsoft project	9
AutoCAD	13
Survey software such as LSS, n4CE, TBC, Magnet, Starnet or LISCAD	1
Structural design software	3
Hydraulic design software	10
Geotechnical design software	3
BIM software (BIM)	5

Do you feel your course adequately covered the full range of software packages necessary for graduates working for a Contractor? (16 responses)

Answer	Number
Yes	11
No	5

What additional software packages do you think should have been included in your course? (Open question) (11 responses)

Software	Number
"LSS"	2

"N4ce"	2
"3D Modelling software"	1
"Other AutoCAD programmes"	1
"Civil 3d"	2
"Excel"	3
"BIM software (BIM)"	1
"Revit"	2
"None, just more on times on the ones already included"	1
"More AutoCAD and Programmes"	1
"MX"	1
"None"	1

What software was included in your course but not in sufficient depth (open question)? (11 responses)

Software	Number
"Civil 3d"	2
"Surveying Software"	1
"AutoCAD"	6
"MathCAD"	1
"N4ce"	1
"Microsoft Project"	2
"There was a structural one but I can't remember the name of it"	1
"None"	1

How much experience of reading construction drawings did your course give you? (16 responses)

Drawing type	Enough experience	Not enough experience
Drawings in general	8	8
A1 or A0 paper drawings	5	11
Full sets of drawings for a project	1	15
Steel reinforcement drawings	6	10
Road construction drawings	2	14
Steel framed buildings	7	9
Structures e.g. bridges	4	12
Manholes and drainage	4	12
Retaining walls	8	8
Reinforced concrete	9	7

How much experience do you feel your course gave you in site surveying and setting out? (16 responses)

Topic	Enough experience	Not enough experience
Taking basic level surveys using a level	11	5
Setting up benchmarks on a brand new site	3	13
Checking that equipment is working correctly	8	8
Setting construction elements to a fixed level	5	11
Setting out positions using a total station	4	12
Using a tape measure to measure existing features	8	8
Using a tape measure to set out positions	6	10
Extracting setting out information from real life construction drawings	2	14
Using the different functions in the total station	1	15
Use of GNSS equipment	0	16
Understanding the full range of equipment available	1	15

How do you feel about the quality of teaching at your university? (16 responses)

Statement	Number
All my lecturers had excellent teaching skills and kept me involved with the learning	2
Most of my lecturers had excellent teaching skills and kept me involved with the learning	8
Few of my lecturers had excellent teaching skills and kept me involved with the learning	6

What was the predominant teaching style you experienced? (16 responses)

Style	Number
Traditional lecture style i.e. the Lecturer presenting to a group of students with little or no two-way engagement	11
Lecture with class engagement i.e. the Lecturer presents for a short while and then splits the class into smaller groups to do exercises	5
Tutorial i.e. the Lecturer sets individual or group exercises and then the students work through them with the Lecturer present to assist when needed	0
Students carry out personal reading and then classroom time is used for exploring the subject in more depth via class discussions/ group work based on the learning	0
Students watch videos provided by the Lecturer and then classroom time is used for exploring the subject in more depth via class discussions/ group activities/	0
Self-guided study and coursework submission with very little contact time with the lecturer	0

Which of the following teaching styles do personally find most effective? (16 responses)

Style	Number
-------	--------

Traditional lecture style i.e. the Lecturer presenting to a group of students with little or no two-way engagement	1
Lecture with class engagement i.e. the Lecturer presents for a short while and then splits the class into smaller groups to do exercises	8
Tutorial i.e. the Lecturer sets individual or group exercises and then the students work through them with the Lecturer present to assist when needed	7
Students carry out personal reading and then classroom time is used for exploring the subject in more depth via class discussions/ group work based on the learning	0
Students watch videos provided by the Lecturer and then classroom time is used for exploring the subject in more depth via class discussions/ group activities/	0
Self-guided study and coursework submission with very little contact time with the lecturer	0

Which teaching delivery style would you like to have seen more of? (16 responses)

Style	Number
Traditional lecture style i.e. the Lecturer presenting to a group of students with little or no two-way engagement	1
Lecture with class engagement i.e. the Lecturer presents for a short while and then splits the class into smaller groups to do exercises	5
Tutorial i.e. the Lecturer sets individual or group exercises and then the students work through them with the Lecturer present to assist when needed	9
Students carry out personal reading and then classroom time is used for exploring the subject in more depth via class discussions/ group work based on the learning	2
Students watch videos provided by the Lecturer and then classroom time is used for exploring the subject in more depth via class discussions/ group activities/	2
Self-guided study and coursework submission with very little contact time with the lecturer	1
None of the above. The balance was about right	1

In a typical week, how many hours did you spend in a traditional format lecture (i.e. with the lecturer presenting information verbally or with visual aids such as PowerPoint, a whiteboard or a flip chart)? (open question) (16 responses)

Answers ranged from 0 to 30 hours with an average of 15.4 hours

In a typical week, how many hours did you spend in a traditional format tutorial lessons(i.e. working through solutions to problems with a lecturer there to help you)? (open question) (16 responses)

Answers ranged from 0 to 16 hours with an average of 5.8 hours

In a typical week, how many hours did you spend working together with other students on a group project? (open question) (16 responses)

Answers ranged from 0 to 10 hours with an average of 3.1 hours

In a typical week, how many hours did you spend working independently on your personal contribution to a group project? *(open question) (16 responses)*

Answers ranged from 0 to 15 hours with an average of 4.9 hours

In a typical week, how many 'focused' hours did you spend on course work? *(open question) (16 responses)*

Answers ranged from 1 to 20 hours with an average of 7.8 hours

In a typical week, how many hours did you spend on voluntary study such as personal reading or watching relevant documentaries? *(open question) (16 responses)*

Answers ranged from 0 to 5 hours with an average of 1.8 hours

On average, how many hours did you spend per YEAR, in practical lessons (e.g. preparing concrete mixes, strength testing materials or using survey equipment)? *(open question) (16 responses)*

Answers ranged from 0 to 200 hours with an average of 32.4 hours

On average, how many live construction site visits did you attend per YEAR, organised by your university? *(open question) (16 responses)*

Answers ranged from 0 to 2 visits per year with an average of 0.6.

8 people attended zero construction site visits per year.

How did you feel about your course? *(16 responses)*

Statement	Number
I enjoyed it and it helped me to look forward to my chosen career	3
Some bits were interesting, some bits were boring	8
I didn't enjoy my course but I am enjoying my career	5
I didn't enjoy my course and I'm planning to leave the construction industry	0

Which of the following do you feel were NOT adequately covered in your course? *(16 responses)*

Topic	Number
Health and Safety	9
ICT/ Relevant software packages	11
Relevant maths (e.g. design calculations, cost estimating)	3
How construction businesses make money	7
New and innovative construction technologies	3
Surveying and setting out	13
Geotechnical design	0
Hydraulic design	2
Highway design	4
Construction contracts	7
Construction processes (the details of how things physically get built)	8
Use of design codes	2

Structural steel design	0
Reinforced concrete design	0
Management of construction projects	9
Management of the design phase of construction processes	4
Environmental impact of the construction process	4
Environmental impact of the finished d	4
Building Information Modelling (BIM)	10

Which of the following did your course NOT prepare you well for? (16 responses)

Topic	Number
Verbal communication skills	3
Report writing	2
Written communication such as emails	2
Listening skills	0
Leading a team	6
Working as a team	0
CV writing	4
Interview skills	8
Dealing with difficult people	9
Presentation skills	0
Public speaking skills	3
Handling large amounts of complex information	3
Working with minimum supervision	2
Interpreting and working with hard copy drawings	9
Interpreting and working with electronic drawings	9
Surveying	1
'None of the above so not sure what to answer'	1

Did your course fall short of your expectations in any way? (16 responses)

Answer	Number
Yes	9
No	7

How did your course fall short of your expectations?

"In terms of software related to construction work."

"in terms of software related to construction work."

"I expected the course to prepare us more for working within the industry, though we did not learn enough about what the job actually consists of. I believe if we were shown more of the software packages and using the equipment needed it would have made a better impact of our learning. I have not used any information taken from university in my current job, though i do have a better understanding of the engineering environment, i took this from my previous place of work."

“Should of been more time spent on problems with a site engineer faces i.e setting out.”

“Lack of course material aimed at Civil Contracting.”

“No site experience whatsoever. Very little practical work undertaken”

“It was sold as a “sandwich” degree course with emphasis on the course providing opportunity to work within the industry while you studied. I didn’t feel the course lecturers provided any direction on where to look for jobs or what part of the industry people with certain standards of qualification would look for. I got my first job after I graduated by chance, looking at a friends facebook page where he advertised a trainee role and I took off from there and I am now an engineer with 6 years experience. Had that not happened I’m unsure if I’d be in construction right now because I had never even heard of the company he worked for nor had I really had any exposure to the possibility of working for a contractor (my only job searches at that time were for graduate schemes etc as it as all I was aware of). During the course I feel more should be done to tally up graduate results (1st class / lower second class etc) with realistic applications for work, so that when you do graduate and know your standard of qualification you have an idea where to look because that is the aim at the end of it all. That is not to say those with a lower class qualification would be a poorer employee than a graduate with 1st class honours, rather that they would perhaps be suited more to working up the ladder for a contractor and honing practical skills before moving into management positions at a later stage when they have attained more site experience. This has proved to be my experience.”

“I felt that there was not enough time spent on the site based elements such as familiarisation with Autocad, setting out and use of different instruments. For example, I never used a GPS instrument at all during my course. I have more or less taught myself how to use a GPS instrument and I have learned most of my Autocad skills by using the Autocad bible I bought from Amazon. I’m still not efficient in establishing site control and post processing effectively. This is a crucial element to a site based engineers abilities and it is largely overlooked by colleges/universities.”

“Poor lecturers, course lacks in relevance to ‘real life’ situations.”

“It was mainly based around design, with little to no teaching of site based construction work. Some (not all) lecturers were disengaged from students and it was clear they were more interested in their research than teaching.”

Upon completion of your course, did you feel well prepared for employment in the construction industry? (16 responses)

Answer	Number
Yes	9
No	7

Can you give any details about why you did not feel well prepared for employment in the construction industry? (10 responses)

“The course covers more of the design and calculation side of engineering rather than the software and equipment side which is most commonly used.”

“Only basic surveying undertaken, no support for site engineering and no site visits”

“see previous answer”

“The course was good as a civil engineering course in theory, however in practice most engineers end up in contractors rather than designers (this was even stated in first year to us roughly 70 / 30 % split at best contractors / designers)”

“The course could have taught and covered setting out in far greater detail showing its importance more as a skill along with the various new technologies for this rather than focus mainly on the idea of teaching engineering principals such as bending moments etc. where relatively few people leave uni to become designers and more are either site based engineers or project managers.”

“Overall this isnt the courses fault but the industries, there is a demand for graduates to be taught engineering principles to demonstrate there ability to learn and understand theory but the job rolls available for recent graduates or early entry into the industry tend to be in setting out site based engineering which isnt taught well at uni, or to be junior level project managers where skills in management and contracts are required. Neither of these relates to Civil engineering courses at uni designed to teach principles of engineering rather than practicals of engineering or how to actually start and manage a project on site. I for instance had barely any experience of NEC3 leaving uni and this is the predominant contract type i work with and many others must as well currently.”

“Some of these failing might be covered in graduate schemes however few people ever get into these out of the thousands who must graduate every year, and having not experienced one myself i cannot comment on how good or bad these are.”

“Mainly because I was entering the industry as a site based engineer, focused on setting out using total stations and gps instruments, interpreting technical drawings and extracting setting out info from them and I felt like it was not covered in great detail throughout.”

“Did not feel I had enough practical knowledge to go out and work on site. Quickly picked up after working on site, not prior.”

“I had never used a total station. Very little experience with an automatic level & theodolite so I did not full understand how to use them. I was unprepared as to what to expect from working on site. During my 3/4 years working in the construction industry I have used very little from what I was taught at university”

What did you particularly value about your course? (16 responses)

“One lecturer in particular and his use of excel as a design tool. A one week course on surveying. The balance of theory and practical skills.”

“Hands on lab experience”

“team building”

“the opportunity to acquire placements”

“none”

“Ample report writing and group coursework which assisted with communication skills. Provided basic knowledge on Civil Engineering although many skills are gained from hands on experience rather than theoretical knowledge - especially in contracting.”

“The bit of paper at the end. Joking aside, if not into design engineering and learning about the science of everything, then XXXXX university isn't for you. Why would you ever want to waste your time learning the full science behind engineering, yet not spend time using widely used software packages and working through everyday problems presented in the real world.”

“Industrial Placement”

“The accreditation to work as a professional”

“I valued the information provided about materials, the structural theory taught is important as even as a contractor its good to understand at least the fundamentals of designs for projects you might be involved in. I also enjoyed the subjects though limited on project management and the setting out course as part of 3rd year though i feel there should be more of this in the overall course.”

“Learning new material/information”

“Interacting”

“At the time I thought I was well prepared but more suited to a consultancy. Working for a contractor highlighted my lack of setting out skills. We learned about outdated setting out instruments. The structural design elements of the course were the best”

“As I was completing the course through my work, I met loads of different people who work for loads of different companies and we all keep each other informed about who is hiring, rates of pay etc and I find that interesting to keep up with.”

“Valued the good lecturers, the only ones that we learnt from. Also valued final year support.”

“Giving me the opportunity to get a career in construction and possible other industries.”

What changes would you make to your course? (16 responses)

“Longer days and less assignments”

“More emphasis on contractor side of construction”

“ More software available and more contact with it.”

“Shape the course around what jobs are available to students after university”

“More teaching of the elements for a site engineer”

“Provide surveying module for every year. Understand how to read construction drawings thoroughly. “Focus on Health and Safety and possibly.”

“Make practical exercises a large part of the course and tailor them to real life, up to date scenarios”.

“Explaining what jobs people do and then tailored learning to suit these jobs”

“see previous answer”

“More practical setting out, with newer more up to date equipment and more focused on drawings and real life scenarios. An increase in real project management with proper startup, h&s information, and contract information. More site exposure (though my course did encourage sandwich placements, however had limited help in getting such things) More outreach to previous graduates in there experiences and knowledge / advice.”

“More construction involvement”

“None”

“Teach about robotic total stations and GPS and how to read drawings”

“More time spent on practical elements.”

“Take student feedback on board about poor lecturers”

“Half of the course should be more practical. Setting out, reading drawings, understanding how things would actually be built.”

Do you have any general thoughts, comments or observations about your course, which may be relevant to this research? (8 responses)

“Most lecturers were fantastic but the department was clearly understaffed.”

“more setting out required. Too office based in terms of regulations, H&S and not enough practical.”

“Good lecturers. Modules taught could be more focused towards contracting.”

“Civil engineering at Dundee university is all theory, no practical work whatsoever. Avoid if looking to learn about site engineering, such as setting out, reading and understanding drawings, bending schedules, drainage, foundations etc.”

“see previous answer”

“As above”

“Courses need a more even mix of learning for contractor and consultancy based work it’s very one sided towards consultancy just now”

“Most of knowledge that is required on site is learnt within first few weeks on the job. Uni does not prepare you enough for the reality of a workplace”

Does your university have strong relationships with industry employers? (16 responses)

Answer	Number
Yes	6
No	2
Don't know	8

Was your university instrumental in helping you secure your first graduate position? (16 responses)

Answer	Number
Yes	3
No	12
Don't know	1

First graduate position - How many people does the company employ? (16 responses)

Employees	
0-50	1
51-250	11
251-500	1
501-1000	2
More than 1000	1

What kind of induction were you given when you started your first graduate position? (16 responses)

Type	Number
A formal induction as part of the company's induction process	10
An informal induction from my line manager	4
I wasn't given an induction, I was provided with the relevant information piecemeal over the first few weeks	2
I wasn't given an induction and I still don't feel I have all the information I need	0

How long was your company induction? (14 responses)

Length	Number
Less than 30 minutes	3
Half an hour to an hour	3
2 hours to half a day	1
A full day	4
Between one day and one week	3
Longer than a week	0

What was communicated to you verbally in your company induction? (14 responses)

Information	Number
The company's aims/ purposes	13
The type of work that the company undertakes	11
How to apply for annual leave	7
Who to contact if you are off sick	8
Information about the leader of the company	9
Information about the directors of the company	10

Information about the training courses you will attend	7
How specifically the company will support you in your personal and professional development	6
Who you can speak to if you have a personal problem which may impact on your work	6
An opportunity to meet other graduates who have started around the same time as you	3
An opportunity to meet other graduates how have started in the last few years	2
Your duties and responsibilities relating to health and safety	11
Specific challenges that the company faces relating to health and safety	8
Accredited graduate training scheme which the company supports (e.g. ICE or RICS)	4
Who your line manager is	12
Your duties and responsibilities	11
Duties and responsibilities which are outwith the scope of your job role	7
Information about the duties and responsibilities of others you will work with e.g. Section Engineer, Sub-Agent, Site Agent, Project Manager, Quantity Surveyor, Contracts Manager, Delivery Manager, Operations Director etc	9
Career progression routes within the company	8
Information about how mentoring works	5
The name of your mentor	5
Guidance on how to complete site paperwork such as Technical Queries, Confirmation of Verbal Instructions, Inspection Test Plans, Requests for Information or Non-Conformance Reports.	5
Information about care of equipment e.g. surveying equipment, testing equipment	6
Information about equipment checking regimes for surveying equipment including procedures, relevant forms, frequency acceptance criteria etc	5
None of the above	0

What WRITTEN INFORMATION were you given in your company induction? (14 responses)

Information	Number
The company's aims/ purposes	11
The type of work that the company undertakes	10
How to apply for annual leave	7
Who to contact if you are off sick	6
Information about the leader of the company	6
Information about the Directors of the company	6
Information about the training courses you will attend	3
How specifically the company will support you in your personal and professional development	4
Who you can speak to if you have a personal problem which may impact on your work	3

Your duties and responsibilities relating to health and safety	6
Specific challenges that the company faces relating to health and safety	6
Information about accredited graduate training schemes which the company supports (e.g. ICE or RICS)	2
Who your line manager is	5
Your duties and responsibilities	7
Duties and responsibilities which are outwith the scope of your job role	5
Information about the duties and responsibilities of others you will work with e.g. Section Engineer, Sub-Agent, Site Agent, Project Manager, Quantity Surveyor, Contracts Manager, Delivery Manager, Operations Director etc	7
Career progression routes within the company	6
Information about how mentoring works within the company	2
The name of your mentor	2
Guidance on how to complete site paperwork such as Technical Queries, Confirmation of Verbal Instructions, Inspection Test Plans, Requests for Information or Non-Conformance Reports.	3
Information about care of equipment e.g. surveying equipment, testing equipment	4
Information about equipment checking regimes for surveying equipment including procedures, relevant forms, frequency acceptance criteria etc	3
None of the above	3

Who led the induction? (14 responses)

Position	Number
Your line manager	9
A member of the HR team	2
A Director	1
"H&S Adviser"	1
"Employer"	1

How well supported did you feel in the first year of your first graduate position? (16 responses)

Response	Number
Well supported. There was at least one person (senior to me) who ensured that I had all the information and support I needed.	8
Not very well supported. I don't feel that someone (senior to me) took personal responsibility for ensuring I had all the information and support I needed	8

How many memberships of professional bodies will your company pay for you to join? (16 responses)

Number of bodies	Number
0	7

1	2
2	0
3	0
As many as I want	1
Don't know	6

Which of the following recognised graduate training schemes does your company offer? (16 responses)

Training scheme	Number
The ICE graduate training scheme	5
The CIOB Professional Development Programme	1
The company's own bespoke graduate training programme	3
None of the above	8

Are you registered for a training scheme? (16 responses)

Training scheme	Number
The ICE graduate training scheme	5
The CIOB Professional Development Programme	0
The company's own bespoke graduate training programme	1
None of the above	10

Do you feel your company do all they can to ensure you are given the necessary range of work experience so that you can achieve the objectives? (6 responses)

Answer	Number
Yes	6
No	0

Does your delegated engineer (or CIOB equivalent) provide you with the support you need? (6 responses)

Answer	Number
Yes	5
No	1

Does your company provide you with all the training courses you need to help you complete your training programme? (6 responses)

Answer	Number
Yes, at the earliest opportunity	3
Yes, but the timescales prevent me progressing as quickly as I would like to	3
No	0

Do you feel your training scheme is relevant to graduates working for a Contractor? (6 responses)

Answer	Number
Yes	5
No, it is more relevant to consultancy based graduates	1

How do you feel that being registered on a graduate training scheme affects your career progression? (6 responses)

Response	Number
It is helping me progress more quickly in the short term (the initial 1-3 years of my career)	4
It will only affect my career progression after 3 years	1
It will only affect my career progression after 5 years	0
It will only affect my career progression after 10 years	0
It doesn't make any difference to career progression	1

When you started in your first graduate position, were you given clear information about the training courses you would attend and likely timescales? (16 responses)

Answer	Number
Yes	8
No	8

Which of the following applies to your first graduate position? (16 responses)

Answer	Number
I was/ will be given all the training I need, relevant to my job role.	9
I was not/ don't feel I will be given all the training I need, relevant to my job role	7

How easy is/ was it for you to access the following types of training in your first graduate position? (16 responses)

	Easy	Difficult	Impossible	Don't know
Health and safety training directly relevant to your job role	13	1	0	2
Health and safety training which would allow you to progress to the next level	12	2	0	2
Technical training directly relevant to your job role	9	6	0	1
Technical training which would allow you to progress to the next level	8	7	0	1
Personal development training directly relevant to your job role	10	4	0	2

Personal development training which would allow you to progress to the next level	8	6	0	2
---	---	---	---	---

If the perfect handbook for site engineers existed (electronic or hard copy), what would it contain? (16 responses)

Subject	Number
Common drawing symbols	13
Common abbreviations	15
Glossary of construction site terminology	13
Guidance on how to complete TQs, RFIs, NCRs, CVIs, IPTs and other forms	13
Guidelines on how to complete permits	13
Guidelines on completing site diaries	13
Guidelines on how to record levelling activities	13
Guidelines on where to find relevant health and safety information	14
Advice on dealing with difficult people	8
Advice on dealing with stress or anxiety	5
Guidelines on the potential pitfalls and contractual issues in using electronic information provided by the Designer	12
Information about the role of the site engineer	10
Information about other job roles on site	10
Approx costs of various construction materials	9
Approx costs of various items of plant	9
Approx costs of human resources	7

Which of the following videos, which would be smart phone friendly, do you think students and graduates should have access to? (16 responses)

Video	Number
Showing and explaining various construction activities on site e.g. pouring concrete, steel fixing, structural steel, manhole construction etc	13
Step-by-step video tutorials for using surveying equipment correctly	15
Step-by-step video tutorials for software such as CAD, Microsoft Project, Microsoft Excel	12
Step-by-step video tutorials for all the basic maths needed (including what you covered in higher maths and at HNC/HND)	8
Step-by-step video tutorials for worked examples e.g. mechanics, geotechnology hydraulics	12
Interviews with people in industry explaining their job roles and challenges they face	5
Strategies for solving technical problems	7
Video tutorials on how to interpret different types of construction drawings including common symbols and abbreviations	6
Case studies about contractual disputes	7
Video about Building Information Modelling	8

None of the above	0
-------------------	---

Would you like to have access to an online community, where construction graduates can access useful resources, post interesting photos and videos and ask questions to each other and to more experienced professionals/ mentor? (16 responses)

Answer	Number
Yes	13
No	3

What do you feel about your employer's expectations of you? (16 responses)

Answer	Number
Too low. My employer underestimates my capabilities	3
About right	11
Too high. My employer has unrealistic expectations of me	2

Do you have any general thoughts or comments that may help us with our research?

“Contact different companies in different areas of the country.”

Appendix C – Survey Results (Employers)

SURVEY RESULTS – EMPLOYERS

What is your job title? (51 responses)

Job title	Number	
Contracts Manager	5	10
Delivery Manager	0	0
Director	2	4
Foreman	3	6
Graduate Training Manager	0	0
Managing Director or CEO	0	0
Operations Manager	2	4
Project Manager	10	20
Quantity Surveyor	0	0
Section Engineer	5	10
Senior Forman	0	0
Site Agent	4	8
Site Manager	1	2
Sub Agent	4	8
Training Manager	4	8
Works Manager	1	2
Early Careers Advisor	1	2
Support & Development Engineer	1	2
Survey Manager	1	2
Construction manager	1	2
Site Engineer	1	2
Senior Engineer	1	2
Health and safety manager	2	4
General Manager	1	2
Commercial manager	2	4

Where are you currently based for work? (51 responses)

Location	Number	%
North of Scotland	5	9
Central belt	40	80
Southern Scotland	6	11

How many people does your company employ in the UK? (51 responses)

Employees	Number	%
0-50	3	6
51-250	21	42
251-500	6	12

501-1000	5	10
More than 1000	16	32

How many people does your company employ in the Scotland? (51 responses)

Employees	Number	%
0-50	7	13
51-250	25	50
251-500	11	22
501-1000	5	10
More than 1000	3	5

Do you think that in general, graduates are sufficiently prepared for working for a Contractor when they leave university? (51 responses)

Answer	Number	%
Yes	41	80
No	10	20

Which of the following statements do you feel best describes graduate Civil Engineers and Construction Managers? (51 responses)

Answer	Number	%
All of them have all the skills I would expect them to have	0	0
Most of them have the skills I would expect them to have	16	31
Some of them have the skills I would expect them to have	25	50
Few of them have the skills I would expect them to have	10	19

What is your assessment of the skill levels of Civil Engineering and Construction Management graduates in the following areas? (51 responses)

	Frequently lacking		As expected		Generally strong		No opinion	
	No.	%	No.	%	No.	%	No.	%
Interpreting construction drawings	12	24	29	60	7	14	3	6
Taking off quantities	15	30	30	60	1	2	5	10
Practical setting out skills such as using a tape measure, level and total station	29	60	14	28	6	12	2	4
CAD skills for creating drawings	9	18	23	46	15	20	4	8
Use of survey software for extracting data for setting out	20	40	20	40	8	16	3	6
Preparing engineering sketches and diagrams	13	26	27	52	6	16	5	10
Analytical skills	9	18	26	52	12	24	4	8
Problem solving skills	15	30	22	44	12	24	2	4

Project management software	11	22	25	50	6	12	9	18
Relevant maths skills	1	2	28	56	16	32	6	12
Verbal communication skills	11	22	27	54	10	20	3	6
Written communication skills	13	26	25	50	10	20	3	6
Health and safety awareness	20	40	20	40	10	20	1	2
Presentation skills	13	26	21	42	14	28	3	6
Knowledge of the construction process	24	48	17	34	8	16	2	4
Environmental awareness	15	30	22	44	13	26	1	2
Use of surveying software for calculating volumes	15	30	23	46	9	18	4	8
Spatial awareness	8	16	30	60	3	4	10	20
Working under pressure	24	48	20	40	3	4	4	8
Dealing with difficult people	30	60	13	26	4	8	4	8
Working long hours	18	36	24	48	7	14	2	4
Commercial awareness	24	48	20	40	3	6	4	8
Contractual awareness	26	52	17	34	3	6	5	10
Working in inclement conditions	14	28	28	56	7	14	2	4
GNSS equipment	14	28	15	30	5	10	17	34
Confidence in general	10	20	27	54	13	26	1	2

Are you involved in the recruitment of Civil Engineering or Construction Management graduates? (51 responses)

Answer	Number	%
Yes	37	73
No	14	27

How easy is it to recruit Civil Engineers or Construction Management graduates? (14 responses)

Answer	Number
There are plenty candidates, but most of them are not up to the required standard	4
There are plenty of good quality candidates	0
There is a shortage of candidates but generally they are up to the required standard	6
There is a shortage of candidates and they don't tend to be up to the required standard	4

How does a work placement affect the quality of candidates? (14 responses)

Answer	Number
Candidates who have completed a work placement are significantly better quality than those who have not	13
There is no difference between the candidates who have completed a work placement and those who have not	1

Do universities engage sufficiently with employers? (51 responses)

Answer	Number	%
Yes	4	7
No	19	38
Don't know	28	55

Do you feel that universities invite the opinions of employers regarding the employability of graduates? (51 responses)

	Answer	%
Yes, and they act on them	1	2
Yes, but they don't act on them	5	10
No	10	20
Some do, some don't	11	21
Don't know	24	47

Does your company proactively engage with universities? (51 responses)

Answer	Number	%
Yes	34	66
No	17	34

How does your company engage with universities? (34 responses)

Answer	Number
We have a representative on the industry liaison group of at least one university	4
We recruit directly from certain universities through careers departments and careers events	15
Our employees engage informally with universities through meetings and networking events	13
We engage with universities via third parties such as CECA and CITB funded training groups	14
We don't have any mechanisms for engaging with universities	1
We would like to engage with universities but we are not clear how to	2
We have given up trying to engage with universities	0
Don't know	5

Which of the following recognised graduate training schemes does your company offer? (51 responses)

Training scheme	Number	%
The ICE graduate training scheme	24	48
The CIOB Professional Development Programme	13	26
The company's own bespoke graduate training programme	18	36
None of the above	5	10

Don't know	9	19
We encourage our employees to tailor...	1	2

Is the ICE graduate training scheme sufficiently relevant to graduates working for Contractors? (51 responses)

	Number	%
Yes	15	29
No, it is more relevant to consultancy based graduates	14	28
No	22	43

Is the CIOB professional development programme sufficiently relevant to graduates working for Contractor? (51 responses)

Answer	Number	%
Yes	13	26
No, it is more relevant to consultancy based graduates	6	12
No	32	64

Do you think there is scope for a graduate training scheme which is specifically designed for those pursuing a career with a Contractor? (51 responses)

Answer	Number	%
Yes	31	62
No, the needs are met by existing schemes	8	16
No	12	24

Do you think there is scope for a competency scheme to supplement existing training schemes, which could cover practical skills like site surveying and setting out? (51 responses)

Answer	Number	%
Yes	37	73
No, the ICE scheme is perfectly adequate	5	10
No	9	17

If a suite of short courses was available, designed to provide graduates with practical experience, what do you think it should include? (51 responses)

	Number	%
Concrete appreciation – 1 day	36	72
Steel fixing – 1 day	31	61
Site surveying and setting out – 5 days	45	90
GNSS – 1 day	26	52
CAD Skills – 1 day	31	62
Plant appreciation – 1 day	34	68

Interpreting construction drawings – 1 day	36	72
Bricklaying – 1 day	16	32
Welding –1 day	11	22
Drainage – 1 day	35	70
Formwork – 1 day	32	64
Introduction to BIM – 1 day	24	48
None, this type of training is not necessary	1	2
<i>“Curtain walling/ cladding/ lifting operations access equipment (towers, MEWPS etc)”</i>	1	2
<i>“Site safety culture”</i>	1	2
<i>“Programme appreciation regarding the logic in a construction programme”</i>	1	2
<i>“Behavioural safety”</i>	1	2
<i>“Quality management”</i>	1	2
<i>“Graduates should have minimum site experience during attending university. Graduates need to have exposure to contracting and site works to understand all the construction activities, practical knowledge and experience is more useful than theoretical.”</i>	1	2
<i>“Any of the above would be useful depending on the specific role a graduate engineer is being asked to perform”</i>	1	2

How do you think this type of course should be funded? (51 responses)

Answer	Number	%
Fully funded (free to the Contractor)	15	30
Subsidised	27	54
The Contractor should pay	3	6
<i>“Funded from the money the apprentice levy employers now have to pay”</i>	1	2
<i>“Contractor to fund Industrial Training Periods (Wages)”</i>	1	2
<i>“If the contractor has sponsored them with agreement for them to work for them then the contractor could provide cost toward the course”</i>	1	2
<i>“Willing to contribute”</i>	1	2
<i>“Should be covered within the University curriculum, with assistance from businesses, i.e. real people that are actually working in industry.”</i>	1	2
<i>“At the contractor’s discretion to chose between fully funded, subsidised or paid for by contractor.”</i>	1	2

If a suite of short courses was available, designed to help construction graduates with non-practical skills, what do you think it should include? (51 responses)

Answer	Number	%
Written communications	28	56
Delivering toolbox talks	21	42
Stress and anxiety awareness	24	48
Contractual awareness	33	66
Commercial awareness	32	64

Time management	30	60
Setting and achieving career goals	16	32
Assertiveness/ Dealing with difficult people	29	58
Site paperwork (Site diaries, TQ, RFI, NCR, ITP permits etc)	32	64
Using sketches and diagrams to solve problems	33	66
None, this type of training is not necessary	5	10
Telecommunications	1	2
Willing to contribute	1	2
Any of the above depending on ...	1	2

How do you think this type of course should be funded? (51 responses)

Answer	Number	%
Fully funded (free to the Contractor)	16	32
Subsidised	28	56
The Contractor should pay	4	8
<i>"Funded from the money the apprentice levy employers now have to pay"</i>	1	2
<i>"Willing to contribute"</i>	1	2
<i>"At the contractor's discretion to chose between fully funded, subsidised or paid for by contractor."</i>	1	2

Do you know what the Constructionarium is? (51 responses)

Answer	Number	%
Yes	14	27
No	37	73

If the perfect handbook for site engineers existed (electronic or hard copy), what would it contain? (51 responses)

Subject	Number	%
Common drawing symbols	37	74
Common abbreviations	36	72
Glossary of construction site terminology	40	80
Guidance on how to complete TQs, RFIs, NCRs, CVIs, ITPs and other forms	39	78
Guidelines on how to complete permits	30	60
Guidelines on completing site diaries	33	66
Guidelines on how to record levelling activities	37	74
Guidelines on where to find relevant health and safety information	38	76
Advice on dealing with difficult people	25	50
Advice on dealing with stress or anxiety	23	54
Guidelines on the potential pitfalls and contractual issues in using electronic information provided by the Designer	32	64
Information about the role of the site engineer	40	80
Information about other job roles on site	29	58

Approx costs of various construction materials	27	54
Approx costs of various items of plant	27	54
Approx costs of human resources	26	52
“Guidelines on commercial terminology and contractual obligations	1	2
“Basic safety rules ie blind spots on plant, fall from heigh, excavations.	1	2
“Telecommunications”	1	2
“All of the above are useful depending on the requirements of the graduate	1	2

Which of the following videos, which would be smart phone friendly, would you like your graduates to have access to? (51 responses)

Video	Number	%
Showing and explaining various construction activities on site e.g. pouring concrete, steel fixing, structural steel, manhole construction etc	39	78
Step-by-step video tutorials for using surveying equipment correctly	34	68
Step-by-step video tutorials for software such as CAD, Microsoft Project, Microsoft Excel	31	62
Step-by-step video tutorials for all the basic maths needed (including what you covered in higher maths and at HNC/HND)	20	40
Step-by-step video tutorials for worked examples e.g. mechanics, geotechnology hydraulics	28	56
Interviews with people in industry explaining their job roles and challenges they face	22	44
Strategies for solving technical problems	26	52
Video tutorials on how to interpret different types of construction drawings including common symbols and abbreviations	30	60
Case studies about contractual disputes	23	46
None of the above	3	6
<i>“The expectations of companies in terms of work output and professionalism</i>	1	2
<i>“Some basic dos and don’ts on site safety”</i>	1	2
<i>“Telecommunications”</i>	1	2
<i>“All of the above would be useful but there are probably videos already available online, however, there is scope for a tailored suite of videos, but these would have to be regularly updated to keep abreast of the changing construction environment.”</i>	1	2

Do you think there is scope for an online community, where graduates can access useful resources, post interesting photos and videos and ask questions to each other and to more experienced professionals/ mentors? (51 responses)

Answer	Number	%
Yes	47	92
No	4	8

If there were no barriers, what changes do you think should be made in order to improve the employability of Civil Engineering and Construction Management graduates?

"More practical built into the theory"

"More relevant site experience spread out throughout the course duration, not just at the year in industry stage"

"Too much focus on the design element of construction. More opportunity to specialise in construction management and the associated relevant courses (structural and concrete design, h&S etc)"

"More experience on site during their degree course."

"On site experience. Setting out. Surveying and volumes."

"More awareness of surveying equipment, software and practical experience of setting out & surveying"

"A full section of course work covering commercial, contractual, HSW, Environmental, Quality control, programming, interpersonal skills"

"More site based training"

"Industrial Training as part of degree coupled with mentoring when on site"

"On site experience being a requirement to attain your degree"

"Work experience on site and a design office, during their course. Management skills training for junior management level roles dealing with personnel on site. Practical hands on experience of the main roles on a project carried out by operatives, ie concrete pouring, shuttering, steelfixing, pipe laying - above and below ground, road works and the safety requirements, plant awareness by operating plant in a safe environment to be aware of blind spots. Assessments of general site / design knowledge at the end of each year at University"

"Mandatory work experience / careers experience"

"Have the course more relevant to industry"

"More placement time for university attendees to gain practical site knowledge"

"More construction knowledge in an engineering degree"

"in an ideal world under graduates would secure placements with a contractor to split university and onsite time equally during there education"

"Universities could better split courses so graduates are better prepared to join a contractor, so they have more of an understanding of H, S & E issues, setting out, record keeping etc. My impression is that a lot of time is spent on design, which although is useful background knowledge, it is not the skills that they need straight away."

"Have universities focus more on the contractual side of things. A lot of university courses seem to hold a heavy bias to consultancy work in particular as structures and buildings. However, a lot of the civil engineering at the moment is found in the water, renewable energy and highways areas. I believe encouraging students to gain placements over the first two years of university, one in a consultancy and one in the contracting field would provide them with enough information to see what career path they would like to go down. I then believe that the students should be able to pick certain subjects based on their interest i.e. if a student prefers contracting work maybe they should take a construction management module and not be forced to take a structural analysis module because it's mandatory. This often discourages a lot of students."

"Practical experience and strong work ethic is required".

"subsidy from the state"

"More in the real world training"

"More free courses"

"Funding"

"They should work full time in industry early into their studies."

"Improve setting out skills, use of up to date survey equipment i.e Trimble s7 or Leica S15 etc, use of survey books for levelling."

"More setting out based course as that's where most graduates start off"

"More realistic site training bringing in common duties and problems on sites."

"A full supported and structured programme with timescales covering the items mentioned above"

"More practical experience"

"More hands on experience with technical areas such as concrete, brickwork, curtain walling etc"

"Increased opportunity for work place learning during the course. Recent experience with Graduate Apprentices shows a much more advanced employee at the time of graduation."

"Need to veer away from focusing on what qualifications graduates have and focus on the experience and practical knowledge. Just because a graduate comes out of university with a 1st Class Undergraduate or Post Graduate Degree does not mean he/she has the practical knowledge to work in industry."

"Longer placement periods even if it means a longer overall course duration"

"More liaison between University/Further Education establishments and local employers"

"More practical knowledge, sandwich courses, where a element is spent working in the industry. This is a great opportunity for the student to build up their CV and network so that they have a good footing to find a job and start their career. This could be run in conjunction with employers who could "sponsor" the students".

"More on the job experience during the duration of the course"

“There should be proper professional equivalents of the CSCS card scheme as many engineers are running about with Labourers Cards just to get on to site and they regularly fall foul of their cards expiring as they jump between employers in the current peripatetic environment of employment for engineers.”

“There should be a full section dedicated to SMSTS”

Do you have any general thoughts or comments that might help us with our research?

“I am currently doing a part time MSc in Civil Engineering with Construction Management. Despite the university presumably offering the course as part time to allow students to study alongside employment within the industry, their course was not accommodating. Modules are over separate days meaning more time away from work (surely it should be day release, not 3no. 2 hour sessions a week). This could help with further learning.”

“Contact employers of new graduates and their training departments / mentors”

“University courses are from my experience naturally academic and of little use in the real world”

“What industry are the people who complete the survey currently or have worked in, ie house building, heavy civils -bridges etc, water/wastewater infrastructure, power production/supply. In the view of the person completing the survey have skills improved in some areas and reduced in others. Does previous practical experience gained prior to University improve a graduates understanding, knowledge and problem solving skills?”

“Our answers are based on your questions, which you have formulated based on your view of graduates. Suggest holding informal conversations with graduates before and after joining the workforce and management like myself who actually work with graduates, rather than senior managers and personnel managers.”

“the course just now needs changed”

“Possibility of a feedback on the scoring that the individuals who carry out the research could then agree /disagree with to gain further levelling of the research”

“ICE should tailor a contractor chartership programme for graduate contractor employees. Currently it’s set up to allow consultancy graduates gain chartership at a very young and often inexperience age”

“I believe university has to embrace more construction modules rather than more design. When I was at university it seemed to be almost 3:1 design to construction modules and I had to take them due to them being mandatory. Universities should also look for guest lecturers to come in and reinforce the lessons with what the main lecturer or professor is teaching. Often a lot of lectures are withdrawn from the cold face of the industry and having someone there who is exposed to it day in day out would be a great way to show students what an actual day is like for contractors and/or consultants.”

“I think you have acknowledged that there is an experience problem given the nature of the questions. Work experience on site is a key aspect and should be considered as mandatory during the summer holidays with intermittent specialist role weeks during college term - BIM, etc”

“paid internships - 2-4 weeks for each semester of education”

“More communication with civil contractors possibly joint ventures”

“This might help long term.”

“This would also be helpful for personal who require refreshing their knowledge if they have been doing other roles and need/wish to go back to this type of role”

“I would like to see these funded through the CITB levy”

“More “user friendly” forums of information exchange for practising engineers rather than just the formal associations and institutions of the professions”

End of Report