



ROYAL  
ACADEMY OF  
**ENGINEERING**  
*Ingenious*

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**Public Engagement Grants**

**Final Report Form**

**[Revised format 21 January 2016]**

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## 1. Project details

### a) Project:

Title:	I'm an Engineer, Get me out of here
Start date:	2 <sup>nd</sup> May 2016
End date:	30 <sup>th</sup> July 2017

**b)** Please provide a **summary of your project** that can be shared with the wider engineering and public engagement practitioner communities and be published on the Royal Academy of Engineering website. Please include: the project aims, what you did, how you worked with engineers and the main impacts on engineers, the public and your organisation (up to 450 words)<sup>1</sup>. Please also send us any high resolution images of the activities you ran.

*I'm an Engineer* is a STEM engagement activity where school students and engineers meet and interact online.

Students challenge the engineers over fast-paced, text-based, live online CHATs. They ASK them anything they want, and VOTE for their favourite to win £500 to be spent on further public engagement.

The project develops young people's awareness of STEM careers and helps to break down stereotypes around engineers and engineering.

It gives engineers an opportunity to improve their skills and confidence in communicating about their work and often gives them a renewed sense of enthusiasm and a fresh perspective towards their own work.

*"It was very open and candid, the students weren't shy at all like they typically might be in a classroom with an engineer standing in front of them personally."* – Engineer, November 2016

*"It was fun and easy to do. I thought it would take a bit of energy to get ready for the chats, but they were easy to do and didn't take much out of the day at all. It was great to hear all sorts of different questions, and be real with the students. In some ways being online allows you to do that in ways that you can't face to face."* – Engineer, June 2016

*"[I have learnt] That even girls can be engineers if they want to and you can do anything that you want in engineering as there is so many possibilities."* – Student, November 2016

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<sup>1</sup> You may need to repeat some of this information elsewhere in this final project report.

*"I have learnt more about what it is like to be an engineer and what engineers are like. It also makes me want to look into engineering a bit more."* – Student, November 2016

*"The students found talking to real people very engaging. They weren't shy and surprised me with the depth of questioning they went into. It was very exciting for them and they learnt a lot. (So did I!)"* – Teacher, I'm an Engineer 2016

This Ingenious Grant enabled us to connect 2,810 students from 78 schools with 33 engineers. Of students who logged in, 87% actively engaged with the event through CHAT, VOTE and ASK where they posted more than 2,600 questions. Schools identified as likely to be underserved by engineering outreach (widening participation schools) made up 34% of those involved, exceeding our objectives for this group.

Feedback from students shows that they learnt more about the types of tasks that engineers do, the type of skills required to be an engineer, the type of people who work as engineers, the type of projects that engineers work on and the role of engineers in society.

c) One of the key aims of the Ingenious Grant Scheme is to support **creative engineering-themed public engagement**. Please provide a commentary here on the ways in which your project delivered this aim e.g. what did you do that was novel for your organisation / the wider STEM engagement community? What new approaches did you use to recruit and train engineers, to facilitate interactions between engineers and the public, to engage the public with engineering, to reach new audiences?

We delivered on this aim by increasing the involvement of schools currently underserved by STEM outreach activities and by prioritising recruitment of engineers from SMEs.

### **Widening Participation**

The event is completely online which gets around barriers to engaging such as travel distance and materials; this is a novel approach as most STEM engagement involves someone visiting a school or the school making a trip to a local organisation.

We targeted schools less likely to receive in-person visits by engineers because of these barriers.

We targeted English schools who meet at least one of criteria:

- The % of students achieving 5 grades A\*–C at GCSE is below 45%

- The % of students achieving level 4 in reading, writing, and maths at KS2 is below 45%
- The % of students eligible for free school meals is higher than 41%
- POLAR3 is in the first quintile
- A SEN School
- A school that is more than 25 miles away from a major research University

We also provided additional support to these schools in the form of phone calls to teachers, taking them through using the site and helping them book live chats.

We developed criteria for Scottish and Northern Irish schools. Read more about our progress in Widening Participation (WP) at <https://about.imanengineer.org.uk/widening-participation/>

We were successful in involving WP schools and in total 34% of all schools fulfilled our WP criteria, exceeding our objective of 30%.

### **Working with SMEs**

The vast majority of engineers are employed by SMEs, but small companies often do not have the resources to support and develop outreach. This means schools' engagement is predominantly undertaken by large companies, limiting personal development opportunities for engineers, as well as the types of engineers that students get to meet.

We believe *I'm an Engineer* is an opportunity to address this. We wrote by letter and email to SMEs that we thought would be have a specific interest in each of the themed zones and invited their engineers to participate.

In total, 10 engineers based in SMEs took part in this round of *I'm an Engineer*. Half of these were recruited after we made direct contact with their employers.

## Key outcomes - metrics<sup>2</sup>

- a) What was the original target number of activities, events and/ or resources you aimed to deliver

Deliver six *I'm an Engineer* zones across three events (June 2016, November 2016, March 2017), involving 30 engineers and 2,000 students.

- b) How many activities, events and/ or resources were actually delivered? If target was exceeded or not reached please provide a brief explanation.

All six zones were delivered. Three additional engineers (33 total) were involved after a decision to increase the number of engineers in each zone from five to six. More than 2,800 students from 78 schools took part.

- c) How many engineers did you originally plan to involve in your project and from what fields of engineering? How many female engineers did you plan to recruit?

We planned to involve 30 engineers representing a diverse range of engineering fields.

We planned to recruit approximately 50% female engineers and at least 10% engineers from a BAME background.

- d) How many engineers were you able to recruit for your project and from which fields of engineering? How many of them were women? If your targets were exceeded/not reached please provide a brief explanation.

We increased the number of engineers in each zone to give greater flexibility for live chats and to try to increase the number of engineers participating in each one. Typically three engineers apply for every place each event, so we had a good range of engineers to select from when seeking additional participants.

Of the 33 engineers who took part, 17 were male and 16 were female. This is in line with our intention to recruit approximately half female participants. Eight engineers were from a BAME background (24%), exceeding our target.

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<sup>2</sup> The following sections (3, 4 and 5) ask you to report against the *Ingenious* **key outcomes** defined at the start of your project.

We had three themed zones and three general zones. All five of the candidates in the general Apprentice zone had entered engineering via an apprenticeship. The themed zones were Motor Zone, Environment Zone and Robotics Zone.

Engineers in the general zones included a logistics specialist, materials scientists, roboticists and a civil engineer.

e) What were your original target outcomes for public audiences including the target audience type and number?

To get 2,000 students to engage with the engineers in the events

- At least 30% of the students taking part are from Widening Participation schools
- 60 teachers taking students online
- At least 75% of students actively engage with the event
- The % of students who think engineers have an interesting job increases
- The % of students who would like to work as engineers in the future increases
- At least 75% of the students say they know more about the role of engineers in society after taking part
- 40,000 views of the zones by members of the public in the year after.

f) What audience type and numbers did you actually reach? If target was exceeded/not reached please provide a brief explanation

Overall 2,810 students logged into the Ingenious funded zones, and 87% actively engaged with the event (measured as participation in one or more of ASK, CHAT or VOTE).

37% of active students in the six zones were from WP schools. This exceeds our target of 30%.

In total 74 teachers from 67 different schools took part, exceeding our target of 60 teachers.

The percentage of students who thought engineers have an interesting job increased from 74% to 80% over the event.

The percentage of students who would like to work as an engineer in future increased from 32% to 34%.

73% of students said they knew more about the role of engineers in society after the event.

Pages in the zones have been viewed more than 37,000 times since June 2016. We expect this number to grow as two zones have only been online for 3 months.

## **2. Key outcomes – experiences**

### **a) Engineers' experiences**

From the results of the evaluation you conducted with the engineers describe how they rated their experience of the project including:

- How useful they found the training you provided
- How well organised they thought the project was
- How much they enjoyed the experience of taking part

Please give figures wherever available (e.g. 7 out of 9 engineers found the activity enjoyable) (up to 400 words):

All 33 engineers were actively engaged in the events by attending live chats and answering ASK questions from students.

All engineers who gave feedback said they enjoyed the experience and they would recommend it to a colleague. All said they were satisfied with their experience.

Engineers had a positive experience regarding the organization of the event. All engineers who read the briefing notes said they were "quite useful" (54%) or "very useful" (46%); 83% responded that the amount of emails they received from us was "just right".

### **b) Public audiences' experiences**

From the results of the evaluation you conducted with the public audiences at your events describe how they rated their experience, in particular the extent to which they found them

- Enjoyable
- Informative
- Thought-provoking
- Relevant to them / their companions

And how much the experience:

- Increased their understanding of engineering
- Changed their opinion of engineering

Please give figures or percentages wherever available (eg 82% found the activity enjoyable) (up to 400 words):



From student post-event surveys, 72% of students enjoyed the event (35% - "I really enjoyed doing it", 37% "It was pretty good").

Of the remainder, 15% responded "I'm not sure what I think about it".

Teachers reported high levels of engagement and enthusiasm from their students:

*"The students were thrilled they were talking to real life engineers and they were responding to them individually. The excitement when their question was answered was fantastic! This sort of opportunity doesn't arrive easily."* – Teacher, I'm an Engineer, 2017

*"Great for pupils to interact with real people in real time. Great for pupils of both genders to see positive examples of people doing real jobs - world of work. Great enthusiasm from pupils who engaged really positively with the engineers."* - Teacher, I'm an Engineer, 2016

*"I really like the live web chat. The children get so excited and are totally engaged in the event. I like the fact that it is interdisciplinary learning also. I think STEM subjects are very important."* - Teacher, I'm an Engineer, 2017

In survey feedback, students were most likely to agree that they knew more about the types of tasks engineers do (89%), and the projects that engineers work on (81%).

A large proportion also felt they knew more about the type of people who work as engineers (78%) and the role of engineers in society (73%).

In their free text responses, students often mention learning about the variety of types of engineers, training and qualifications, salaries, and job satisfaction (e.g. fun).

*"about the type of people do engineering and what they do. also about them travelling around the world enjoying themselves whilst doing their job."* – Student feedback, I'm an Engineer, 2016

*"I have learned what kind of jobs engineers do and what kind of skills it takes to have a career in engineering."* – Student feedback, I'm an Engineer, 2016

*"I have learnt that there are a lot of different types of engineers not just mechanical engineers."* – Student feedback, I'm an Engineer, 2016

*"I have learnt that engineers have to work very hard and be in education for a long time but, at the end they earn high amounts of money and it's fun!"* – Student feedback, I'm an Engineer, 2016

## Key outcomes – impacts

### a) Impacts on engineers

From the results of your evaluation describe below the evidence for your project's impact on the engineers:

**Knowledge and understanding** (e.g. of public attitudes towards engineers; of the challenges of engaging the public; of working with different types of audience; of the societal impact of their work) (up to 100 words):

After taking part, 80% of engineers see their work from a different perspective; 100% have a better understanding of how students view engineering.

*"I really loved the mix of questions that I got. They really made me think about what I do which is something that you can forget to do when it becomes the norm!"* – Engineer, 2016

Engineers also learnt from each other:

*"It was really interesting to see the other engineers' approaches."* – Engineer interview, 2016

**Attitudes** (e.g. level of confidence in their presentation skills, enthusiasm for public engagement, appreciation of the value of public engagement, interest in taking part in further public engagement) (up to 100 words):

After taking part, 85% feel re-energised about their work:

*"I walked away from it energized. That made me go back to my work and put into practice the things I'd been saying - that there are lots questions to answer, that it's okay to make mistakes."* – Engineer interview, 2016

Engineers also find taking part personally rewarding:

*"I felt a really special bond with a couple of students in some live chats, and you walk away with the feeling that I've empowered some people"* – Engineer 2016

**Skills** (e.g. use of different communication media, translating technical content into accessible information, project planning, presentation skills, team-working) (up to 100 words):

88% of engineers who took part agreed that they had improved their communication skills.

*"It makes you think. If you can't break down what you're doing so that ten year olds can understand it, you probably don't understand it yourself."* – Engineer interview, 2016

**Confidence** when talking to the general public & school groups about their work (up to 100 words):

After taking part, 93% said they felt more confident about communicating their work.

68% said they were more confident about using online tools.

**Interest** in taking part in further public engagement activities (up to 100 words):

After taking part, 98% said they would like to do more public engagement.

*"This has been the first time I have been involved with any STEM outreach work, but the friendly and encouraging staff that run the event helped me through giving me advice along the way. I look forward to more engagement with schools and students local to me."* – Engineer blog post, 2017

Describe how the data was collected (e.g. observation, questionnaire, interviews and so on) including comments on how reliable you feel this data is (up to 100 words):

Data from engineers was collected via a post-event online survey and a small number of interviews with engineers.

## **b) Impacts on audiences**

From the results of your evaluation describe below the evidence for your project's impact on the public audiences';

Knowledge and understanding (e.g. of engineering and its impact on their lives; of the societal issues arising from engineering projects; of the breadth and variety of engineering) (up to 100 words):

Teachers highlighted learning for their students around careers in engineering and breaking down stereotypes about engineers and the type of work they do.

97% of teachers felt their students were more aware of STEM careers after taking part.

*"The chance for students to actually interact with real-life engineers was fantastic, in them realising the range of STEM careers available to them. it also allowed them an insight into the day to day life of an engineer and that's it's not just nuts, bolts, spanners and hammers."* – Teacher feedback, I'm an Engineer, 2016

Attitudes to engineering (e.g. positive perception of engineering and the contribution it makes to their lives; greater consideration of engineering as a career option or likelihood to recommend engineering as a career option) (up to 100 words):

92% of teachers said their students had a more positive view of STEM subjects. After the event, 80% of students said they thought engineers have an interesting job.

*"I have learnt that as an engineer you get to express yourself doing things from environmental to space it's very imaginative."* - Student feedback, 2016

Some teachers also mentioned a specific impact on girls:

*"Children's views about what engineering entails are challenged. Girls are more interested in STEM as a result - realise it's something they can do too and something they might enjoy."* – Teacher feedback, I'm an Engineer, 2016

Skills (if relevant) (up to 100 words)

76% of students reported an increase in awareness of the skills needed to be an engineer.

In addition, teachers frequently give spontaneous reports about how the event develops other skills.

*"Using the available technology to teach the students about relevant careers but also developing relevant and direct questioning skills. Links to online behaviour!" - Teacher, I'm an Engineer, 2016*

75% of teachers also agreed that they were more confident using online tools.

Describe how the data was collected (eg observation, questionnaire, interview) including comments on how reliable you feel this data is (up to 100 words):

Data was collected through a post-event survey sent to teachers and pre and post event questionnaires to students which were delivered within the *I'm an Engineer* website.

### **3. Project objectives**

- a) Please restate your *Ingenious* project objectives, as set out in your project planning template.
1. To get 30 engineers engaging with school students
    - At least 80% engage with the students
    - At least 80% enjoyed the experience and would recommend to colleagues
    - At least 75% want to do more public engagement than before
    - At least 75% acknowledge an improvement in communication skills
    - Include 5 engineers who started as apprentices in Apprentice Zone
    - 6 engineers from targeted SMEs take part
  2. To get 1,980 students to engage with the engineers
    - At least 30% of the schools are Widening Participation schools
    - 60 teachers taking students online
    - At least 75% of the students actively engage with the event
    - The % of students who think engineers have an interesting job increases

- The % of students who would like to work as engineers in the future increases
  - At least 75% of the students say they know more about the role of engineers in society after taking part
3. Distribute £3000 in prize money for further public engagement
  4. Seek new funders in the form of 2 other companies or organisations who agree to sponsor future zones.
  5. To continue to make the event easier and more efficient to run
    - Optimise work streams and share website improvements across other *I'm a....* , *Get me out of here* projects
  6. To evaluate the project to see if our aims and objectives are being met.
    - Produce individual zone reports for engineers and teachers, and an evaluation report at the end of the funding period.
- b) Addressing each objective in turn describe what you have learnt through your evaluation (up to 500 words)

Objectives 1) and 3) for engineers have been met very successfully. There was a high level of engagement from engineers during the event and we met all our targets.

Overall, participating engineers are very happy with their involvement in the project and their interactions with students. However, some would like to have more opportunities to interact with and learn from each other.

Objective set 2) for students were broadly met. In all cases where we were able to manage the process (e.g. recruitment of schools and meeting our WP targets) we were successful, and in a number of cases were able to exceed our target.

We were also successful in meeting high levels of student engagement. The proportion of students who said they were interested in working as an engineer in future increased from 32% pre-event to 34% post event. Although this difference is modest, it reflects an upward trend in interest in engineering careers after taking part. Those who were fairly sure they did **not** want an engineering career decreased from 42% to 35% after the event.

The proportion of students who said they knew more about the role of engineers in society fell slightly short of our target (73% rather than 75%).

Regarding evaluation (objective 6) In March 2017 we started asking students for additional personal data. This seems to have had an impact on the amount of other data students give us - return rates for post-event questionnaires, in particular, seems to have reduced.

We are in the process of rolling out an updated chat interface which will improve the user experience. After this, we will be able to focus on a refresh of the student evaluation to make it more robust and more enjoyable for students to complete.

Objective 4: We held discussions with a variety of companies about potential support for *I'm an Engineer*. SMEs that were particularly keen on the project tend to be in a loss-making start-up phase with no money to provide financial support. Other companies were approached and one, in particular, despite strong internal support for *I'm an Engineer* chose to develop their own project to do something similar. A year later it has yet to be launched.

Objective 5: We have streamlined a number of processes over the course of 2016 including teacher recruitment and selection processes, and updates to our website deployment and the underlying design framework were planned and then implemented in 2017. Our chat engine was totally overhauled. Together, these changes allow us to improve our projects faster in response to feedback and make it easier and more cost effective to roll out new features.

## 4. Media coverage

a) Please describe below the media coverage your project generated including where, how much and of what it consisted. Please include links to any online coverage where available:

National press	
Regional press	
Local press	
Online	18 entries about <i>I'm an Engineer</i> in University



	Department sites, Education sites, personal blogs, school blogs...
Radio	
TV	
Specialist media (e.g. <i>Times Educational Supplement, Ingenia</i> )	
Other (please state )	

b) Any other comments on the media coverage you achieved (up to 200 words):

c) Describe how you raised awareness of the project among your peers, your organisation and the wider public engagement communities (e.g. newsletters, conference presentations, blogs, training courses, publications, social media) and how many people were reached (up to 200 words):

We regularly tweet about the events from the @iaegmooh account including the hashtag #IAEUK, typically seen by 8,000 users a week. We regularly contact the people on our mailing lists to tell them about event news and chances to take part. This includes the 859 teachers with an interest in *I'm an Engineer*, 651 engineers who've signed up to take part, and 920 people on our general newsletter list. We publicised applications for the events in other organisations' newsletters aimed at teachers and engineers, such as Sparxx and WISE newsletters. We also contact professional engineering organisations to make their members aware of the opportunity to take part, for example, the IET and IOM3. We shared zone reports with outreach staff at universities after each event so they are aware of the engagement of their academics. We repost content from our blog posts on LinkedIn, including in our event alumni group (440 members). Each post is typically seen 100 times. This year we have talked about *I'm an Engineer* at conferences including Brilliant conference, Engage conference, and the British Science Association education conference. We have held meetings with companies and universities to share best practice in student and engineer engagement.

## Shared learning

- a) What were the most successful elements of the project? For what reasons do you feel these were successful (up to 100 words):

*I'm an Engineer* gives thousands of young people the chance to ask their own questions to adults outside their school and family circles.

Many students won't have any personal connections with people like the engineers in the event and all the types of experience and expertise they offer. Taking part contributes to students' personal development and awareness of careers and future opportunities. It gives young people access to knowledge and ideas they would not otherwise encounter.

In addition, getting to ask whatever they want is empowering. For most school students, these kinds of interactions with adults remain rare, despite their clear positive impacts.

- b) What problems did you encounter? What strategies did you try to tackle those problems & how successful were they? (up to 100 words):

Finding corporate funding remains difficult. This year we developed materials to act as a conversation starter and successfully had engineers who have taken part to use them as introductions to decision makers at their companies. Despite this approach, the conversations that followed have not led on to results.

We are now developing a new international corporate fundraising programme, 'Meet a Million', launching in Autumn 2017, with the aim of connecting a million school students with engineers and scientists around the world. We have been advised to seek wealthy individuals who are keen to make a difference and offer them the chance to be part of the programme.

- c) What advice would you pass on to future *Ingenious* grant holders about how to deliver impactful public engagement with engineering?'

1. Listen to the group you're engaging with during the development, and running, of your activity. Our experience, and research (e.g. <http://onlinelibrary.wiley.com/doi/10.1002/sce.21288/full>) shows that trusting public audiences to be the starting point leads to impactful engagement with engineering.

2. Empower the people you're engaging. Giving them things to do and allowing them to be decision makers means people feel they 'own' the activity, rather than being passive spectators.
3. Make efforts to reach beyond the already engaged and identify the right audiences- a mixed comprehensive in a former seaside town will get more from your time than an independent girls' school in London.
4. Make efforts to reach beyond the stereotypes of engineering. We've had a great response to people working in biomedicine and software, for example.
5. Think carefully about the message your engagement is really sending- campaigns pointing out to girls that only 8% of engineers are female will reinforce the impression that engineering isn't for women. Focus instead on equal representation and equal success. Be aware that the language you use and the images you present are key to the perceptions people form of the activity before they even start engaging.

d) Please describe any collaborations or partnerships – who they were with, how well they worked, challenges you encountered and lessons learned (up to 200 words):

In addition to RAEng, we had funding from the UK Space Agency to run a space-themed zone in November 2016 (<https://spacen16.imanengineer.org.uk/>). This was successful, and saw the highest number of students logging in to one zone up to that point. We have applied for funding to run another Space Zone this year.

We also currently receive funding from the Wellcome Trust for zones focused on biomedical engineers until 2021. The zones over this past academic year (<https://diagnosis16.imanengineer.org.uk/> and <https://artificialbody17.imanengineer.org.uk/>) were as successful as the Ingenious zones.

As discussed above, the main challenge is partnering with engineering companies. We have learnt that strong support from individuals or groups concerned with public engagement within a company is difficult to translate into commitment from a wider organisation which may not share their passion. This lesson has helped shape our developing 'Meet a Million' strategy where we will offer people who have the resources to fund the project personally the chance to partner with us.

## **5. Sustained benefits and on-going work**

### **a) Additional evaluations**

If you have conducted an additional evaluation of your project please make a note of it here and send a copy of the report to the Academy:

Reports for each zone are available here:  
<http://about.imanengineer.org.uk/category/zone-reports/>

### **c) Further work**

Please describe whether any part of this *Ingenious* project will continue after the funding period and whether any aspects of the project are likely to become embedded in your work or the work of your partners/ collaborators (up to 200 words):

We plan to keep running *I'm an Engineer* and the demand from teachers for places has increased to similar levels as the longer running *I'm a Scientist* event. We have funding from Wellcome to support one biomedical zone per year until 2021.

We want to build on our success identifying and involving schools less likely to get in person contact with STEM professionals. We will further refine our criteria to identify these schools to ensure we're reaching those who benefit most. We'll then prioritise their recruitment and talk to those who've taken part to improve the extra support we give them during the event.

We have recruited an evaluation manager who is applying a science capital framing to evaluate the events. We want to establish how and where events contribute to the development of young people's science capital. We are specifically interested in the role of our events in challenging preconceptions and stereotypes about who engineers are; developing scientific literacy, in terms of topic specific knowledge and the process and context of science and engineering, and also with respect to young people's feelings of confidence about science; and developing young people's awareness of careers both within and beyond STEM.

### **d) Collaborations and partnerships**

Are the contacts with the engineers, collaborations or partnerships developed during the project likely to continue? If so, in what way? (up to 200 words):

**Engineers:**

We maintain relationships with our past participants through bi-monthly email updates, Twitter and a LinkedIn group for alumni across all the *I'm a...* events (currently 440 members). We will continue to contact the engineers for valuable feedback and reach out with potential new opportunities to work together.

We are currently piloting expanding the Careers Zone ([careers.imascientist.org.uk](http://careers.imascientist.org.uk)) to run year-round. This zone will enable alumni engineers to continue their online STEM engagement by answering students' careers questions and doing more live chats.

We will continue to work with STEM Ambassador Hubs and professional engineering organisations to strengthen our links with the engineering community.

**Teachers and schools:**

We are developing an improved teacher database so that we can better track how teachers participate in the event, and which schools are getting involved. This data will be enable us to reestablish relationships with schools that may have stopped taking part as teachers move jobs.

**Many thanks for completing your Final Project Report.**