



EXPERIENCES OF EUROPEAN ENGINEERING STUDENTS AND ACADEMICS IN THE UK: FINDINGS OF AN EXPLORATORY MIXED-METHODS STUDY

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ABSTRACT

In the UK Higher Education, 20% of all academic engineering staff and 12% of engineering students are European nationals. There has been much discussion about the impact of the UK's departure from the European Union in current and future relationships. However, prior to this study, no data on the impact of Brexit on engineering education and research, from the perspective of European students and academics, had been collected.

This study explores the impact of Brexit on European engineering students and academics experiences in UK Higher Education Institutions – their motivations to study and work in the UK, mobility, funding, and career prospects. The study adopted an exploratory mixed methods design. It began with a primary qualitative phase, where a diverse sample of 9 European engineering students and 15 academics were interviewed to explore their experiences following the Brexit decision. The key issues identified in this phase, via inductive and thematic analysis,

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were then explored in the following quantitative phase of the study, with a larger sample of European nationals – 89 engineering students and 104 academics – in an online survey.

The UK's engineering education is still attractive to a majority of European students and academics. However, changes in financial support for students, restrictions on freedom of movement and access to research funding are key decision factors when considering staying or leaving the UK. The findings of the study are also relevant for understanding the impacts on engineering research collaborations between the UK and higher education institutions in Europe.

1 INTRODUCTION

The United Kingdom has a long tradition of excellence in higher education and is recognised as being an important player in global engineering education and research. Regarding higher education, the UK attracts a far higher number of international academics of all disciplines, from all over the world, who teach and do research, than almost any other country in continental Europe, being only surpassed by Switzerland [1]. The engineering education sector relies on international mobility more than most sectors of society in terms of attracting experts from all over the world to research and teach in the UK and attracting international students.

Following the referendum, Mayhew [2] reflected on the implications of Brexit for the HE sector and identified three major areas – the impact on students, the impact on staff, and the impact on research funding. Mayhew also highlighted the freedom of movement for the sector as being critical in future EU-UK negotiations. The role of student and staff mobility, as a means to support UK universities research connections and competitiveness is also mentioned by Highman, "(...) future EU-UK relationships in research and science can only be properly implemented with the support and input of both academic and professional staff, while also including the student voice." [3, p.51].

To date, few studies have explored students' voices and, in particular, their career aspirations following Brexit: a study by McCroy and Thomson [4] focussed on UK undergraduates [4], and the study of Dodourova, Clarkin, and Lenkei [5] which included both British and non-British students.

Prior to this study, no data on experiences and perceptions about Brexit had been collected from European (EU) engineering students and academic staff, to understand better the impact of the UK's departure from the European Union on engineering education. The study reported here has collected and analysed data regarding the impact of leaving the European Union on mobility, funding, skills development, future study and career prospects of European nationals involved in engineering education in the UK.

2 METHODOLOGY

The study adopted an exploratory mixed methods design [6], collected and combined data from interviews (phase 1, qualitative) with and a survey (phase 2, quantitative) of EU engineering students and academics.

2.1 Interviews

A sample of 9 EU engineering students and 15 EU engineering academics were interviewed between October and November 2019, prior to the UK General Election, which occurred on the 12th December. A brief description of this sample is presented in Table 1.

In the interviews, students and staff were asked about: 1) factors they considered when choosing to study/work in the UK, career prospects they expected to have, and experiences and skills they were expecting to achieve; 2) their experience in the UK overall, and what impacts they had felt as a result of Brexit; 3) and what their career plans entail, and their preferences regarding leaving or remaining the UK.

Table 1. EU engineering students and academics (interviews)

Sample	Students	Academics
Sex	6 female, 3 male	3 female, 12 male
Degree/Position	5 undergraduates, 4 PhD students	4 researchers, 11 lecturers (teaching and research)
EU Nationalities	Danish, Dutch, Italian, Portuguese, and Romanian	Belgian, Bulgarian, Dutch, French, German, Italian, Portuguese, Romanian, Spanish
Universities location	5 universities: 3 England, 1 Northern Ireland, 1 Scotland	8 universities: 4 England, 2 Scotland, 1 Northern Ireland, 1 Wales

The transcripts of semi-structured Interviews were coded thematically to identify: (1) participants' motivations to come to study or work in engineering in the UK, (2) their experiences and future career plans, and (3) whether all of these were impacted by Brexit. Thematic analysis [7] of the interview was chosen as a methodological approach as there was an interest in finding themes in order to answer the research questions. The open-ended approach of the interviews was suitable for this methodology as thematic analysis "is not wedded to any pre-existing theoretical framework" [8, p. 81].

The key issues identified in this phase were used to inform the design of online surveys for students and staff

2.2 Survey

Due to the outbreak of COVID-19 pandemic, the launch of the online surveys were delayed to June 2020, after a pilot test with a convenience sample of 3 students and

3 academics. Due to a low response rate during summer term, the survey was kept open until September 2020. A total of 89 EU students and 104 EU academics completed the survey. An overview of this sample is presented in Table 2.

Table 2. EU engineering students and academics (survey)

Sample	Students	Academics
Sex	31.5% female	26% female, 62.5% male, 11.5% no answer
Degree/Position	37% PhD, 29.2% undergraduates, 25.8% Integrated Master's, 8% Master's (1-2 years degree)	31.8% reported 'Professor', 'Assistant Professor' or 'Associate Professor' as their job title; 21.2% 'Lecturer'; 13.5% 'Senior Lecturer' or 'Principal Lecturer' (13.5%); 10.6% 'Research Fellow', 'Research Assistant', 'Research Associate' or 'Postdoc fellow'.
EU Nationalities	22 nationalities. Most frequent: 14.6% Italian, 10.1% French, 9% German, 9% Romanian.	18 nationalities. Most frequent: 18.8% German, 17.9% Italian, 13.4% and French.
Universities location	13 universities: 94.4% England, 5.6% Scotland and Northern Ireland	37 universities: 71.2% England

3 RESULTS

The findings of the study are presented in the following three sub-sections: 1) EU engineering students and academics motivations to come to study/work in the UK, career prospects they expected to have, and experiences and skills they were expecting to achieve; 2) their experience in the UK overall, and what impacts they had felt as a result of Brexit; 3) what their career plans entail, and their preferences regarding leaving or remaining the UK.

3.1 Motivations

3.1.1 Students

Education. The interviews revealed that the international reputation of UK's universities and the desire to live abroad and have a different learning experience were common motivations to choose studying in the UK. Undergraduate students had the expectation to be taught in a more practical/hands-on approach and develop their technical English. Data collected in the surveys confirmed the importance of these same factors and motivations.

[Italian undergraduate student] (...) *comparing to my home country (...) I would have learnt more about the theory and the background. I would have only used Italian. While in England, I would have learnt better English, more technical English, I would have more practical skills, more transferable skills (...) the English system is that they want you to get out there and work as soon as possible. While if I stayed in Italy, I would probably have become more of a researcher or an expert or something.*

Career prospects. Interviewed undergraduate students mentioned that the UK offers better job opportunities after graduation, especially at entry-level, in comparison to their home countries. For PhD students, UK universities offered more funded positions in their fields of interest and research opportunities than other European countries. These factors played an important role in their decision.

Funding. The vast majority of undergraduate and Integrated Masters students surveyed had a student loan, and all but two PhD students were fully funded. The interviews also highlighted that being eligible for Home/EU tuition fees for the whole duration of their degrees, as well as being able to access student finance, were key factors for undergraduate students. The follow-up survey confirmed that eligibility for a student loan, in the case of undergraduate students, and full scholarship, in the case of PhD students, was one of the most important factors when deciding to come and study in the UK, for more than 50% of the respondents.

3.1.2 Academics

Professional development. The UK engineering higher education sector was described as the “perfect environment” to develop both research and academic careers, offering good job opportunities, career progression and leadership positions in comparison to other European and non-European countries.

Distance to home country. On a more personal level, staying in Europe, or coming back to Europe after an experience abroad, was important to academics interviewed. This would mean they were able to stay at a short distance to their home countries and families. The English language was a key factor to choose the UK to pursue their academic careers. For these academics, speaking the language was essential to be able to fit into the UK’s society.

[Spanish academic] *In the UK you have the perfect environment to develop a normal engineering professional career or academic career (...) Apart from that, I speak some English, so maybe it was a work opportunity. It's not easy to move to a country. I do know the language; I know the culture. When I worked in [non-EU country], I had a good job, good salary but my [foreign language] was very limited. Plus, the idea that we can go to a place that is not your home country and start to live like a local, it is something that was important.*

The survey confirmed that easy travel between the UK and home country, more research and job opportunities in the UK than in other countries and being able to work and live in an English-speaking environment were the most important factors motivating their decision to come to work in the UK engineering education sector, regardless of whether academics had come to the UK prior or after the Brexit referendum.

3.2 Experiences

3.2.1 Students

Learning environment. Overall, students who were interviewed were satisfied with their decision to come and study in the UK and reported a wide range of positive experiences. Undergraduate students were particularly pleased with opportunities to engage in teamwork and problem solving. Being able to learn with international staff and students was a very positive aspect of their education and personal experiences in the UK.

The surveys confirmed that EU students' most valuable experiences of their time studying engineering in the UK were being part of a diverse and international university environment, quality of teaching and access to resources, as well as good links to industry.

[German Integrated Masters student] *[I benefit from] meeting international and open-minded people from around the world, as well as learning in an industry-focused environment.*

[Italian PhD student] *The chance of meeting people from all over Europe and the world, getting to know a variety of cultures and ways of thinking [was beneficial].*

The impact of Brexit. Most of those students interviewed who came to the UK after June 2016 said that Brexit had no substantial impact on their decision to study engineering in the UK. They mentioned being well informed about their ability to study in the UK. Two thirds of undergraduates, half of PhD students and one third of those on Integrated Masters courses surveyed maintained they would have come to study engineering in a UK university if they were making that decision today. For these students, quality of teaching and future prospects were the main reasons why. But for those who would not come to study if making that decision today, increasing costs incurred by EU students after Brexit (international fees), a potential reduction in jobs and research opportunities in the UK, and a general feeling of not being welcome, were their main concerns.

This was confirmed by the larger survey sample, with many students reporting that having to pay international fees, and not being eligible for a student loan/scholarship, would have been a major deterrent if they were making the decision to study engineering in a UK university today. In fact, only 8% of the surveyed undergraduate students would have come to study in the UK if not eligible for a student loan. The figures were 23.8% for Integrated Masters and 28.6% for PhD students.

[Polish undergraduate student] *Without the student loan, I would not be able to study in the UK, thus I would not even think about paying International/Non-European tuition fees.*

[Slovenian-Croatian PhD student] *As of last week, when it was announced EU students will be charged international tuition fees, my answer is no. Before I would still encourage others to apply to the UK.*

3.2.2 Academics

Working environment. The interviews revealed that, overall, academics were pleased with their experiences in the UK, citing good work conditions and being part of an international and collaborative environment as two of the most positive

aspects. Universities were described as safe, supportive, and welcoming to EU and international staff.

[Belgian academic] *I really, really enjoy the UK, working over here. In an academic setting, the institutions I worked so far, both of them and then contacts with other academic institutions – I always had the feeling that the general approach to research is a collaborative approach, where within the same institutes you're considered to be colleagues, working towards a bigger goal of striving and pushing the boundaries of what we know, and advance with research. Whereas in Canada and the States it was much more of a competitive environment amongst colleagues within the same department, which was something that I didn't really feel comfortable with.*

Career progression. In the survey, academics were positive about their career progression and access to resources, and less positive about their ability to secure EU research funding after the Brexit referendum.

[French academic] *(...) I'm still very happy in the UK, I have to say. I'm very sheltered and protected. (...) It hasn't changed anything in my professional life. Three years ago, I got promoted as well. It hasn't affected my career pathway. I still feel supported by the university to the same level as any of my UK peers.*

The most valuable experiences of their time working as an engineering academic in the UK, among those surveyed, were the opportunity to work in an international, multicultural and multidisciplinary environment. Collaboration with national and international partners and access to research funding, as well as opportunities for career progression and good links to industry were also seen as very valuable.

The impact of Brexit. Many academics perceived these experiences as beginning to change negatively due to Brexit.

Less positive aspects among those interviewed were associated with an increased burden in academic administration, as well as unexpected teaching commitments by research staff, but this was not associated with Brexit or the UK.

When asked at interview about what changed in the last three years, many references were made about the negative impact of Brexit, immediate and future, on research capacity, collaborations, and access to funding and equipment. A few EU engineering academics reported being excluded from research proposals with European institutions

There were also mentions to the potential impact of Brexit on teaching and recruitment of EU students and staff. Some participants noticed a decrease in the number of EU applicants, particularly at postgraduate level.

One senior academic was particularly worried about the lack of information regarding potential changes in EU regulations in his engineering discipline/industry, and the future recognition of UK qualifications.

[Italian academic] *The day UK leaves [the EU], will the PhD title be recognised in another EU country? Probably yes but we don't know. Will the UK be part of Horizon or the next main research programme from the EU? They say yes but we don't know. It's a mixed sort of thing. (...) we have a lot of regulations that come from the EU but do they want to diverge?*

Interviewed academics with links to the industrial sector acknowledged that some industries were already struggling to recruit highly skilled workers from EU countries

but were optimistic about being able to secure future deals with the sector. To them, Brexit could be seen as an opportunity to establish new partnerships between UK's academia and industry, and open new research funding avenues.

[German academic] *The good thing is that we're getting a lot of industry interest and these industry projects are easier to navigate (...) so we're generating income from that side.*

On a more personal level, academics were concerned about the state of the economy, restrictions to freedom of movement, and a general feeling of not being welcome. In general, academics in Scottish universities felt more welcomed than academics based in other regions. Two academics were very concerned about the impact of Brexit, and the lack of certainty, on their mental health and general well-being.

Most of those surveyed felt welcome in their own institution and in the broader engineering higher education community, but not particularly welcome in the UK.

To guarantee his rights and access to opportunities, one interviewed EU academic applied for British Citizenship to put his "mind at peace". Other two academics were considering applying in the future, since their plans were to remain in the UK indefinitely. However, personal factors would play an important role in their final decision.

All those surveyed who had British citizenship, a total of 9 academics, said that Brexit was the "major driver" to apply for it. These were mostly senior academics who were not considering moving out of the UK before retirement. Senior and highly experienced members of the academic staff, with permanent positions, expressed more concerns about the idea of having to relocate somewhere else. They feel they are in a stage of their careers where they need more stability and certainty about the future.

The academics who did not intend to apply for British citizenship described themselves as having a strong European identity and did not see value on being a citizen of a non-EU nation. In fact, for this group of academics, Brexit was the main reason not to apply for a British citizenship.

3.3 Plans

3.3.1 Students

Job opportunities. The interviews and surveys revealed that undergraduate and PhD students alike were concerned about the potential negative impacts of Brexit on the state of the economy, on their rights as EU citizens, and on their future plans in the UK. Despite this, more than half of those surveyed planned to stay in the UK after graduation, while some of those interviewed were particularly keen to stay in the UK for further studies, with undergraduate students particularly wanting to stay and develop their engineering careers in the UK.

Career progression and family plans. For the PhD students we spoke to, the willingness to stay in the UK was dependent on having access to job opportunities and research funds, as the UK was seen as an attractive place to pursue their future

career plans as engineering academics. They made more references to the importance of feeling welcome and having family plans as important factors to consider in their decision to stay or leave the UK after Brexit.

3.3.2 Academics

Career progression. Most of the interviewees would like to remain in the UK, although many have already considered moving out – nine out of ten EU academics surveyed have considered moving out of the UK. If deciding to leave the UK, most were planning to do it in 2 to 5 years-time, and get back to their home countries, other European country (Switzerland, Germany, Netherlands and France were mentioned more frequently) or Canada.

The interviewees proposed that their ability and willingness to stay in the UK will be determined by opportunities for career progression and being guaranteed the same rights that EU nationals had before Brexit regarding: freedom of movement, access to EU research funding, and being treated as UK citizens. This was confirmed in the survey.

Many academics, in both interviews and survey, expressed concerns about the validity of the EU Settlement Scheme, the impact of a no-deal on UK's economy, and not feeling welcome as before. Reflecting these worries, only one third of the surveyed EU engineering academics would have come to the UK if they had to make that decision today.

4 DISCUSSION

The UK's engineering education is still attractive to a majority of EU students, at different levels of study. However, interview and survey data support the idea that EU undergraduate students who started their degrees after June 2016 were taking the opportunity to study engineering in the UK as a 'last chance' before changes to fees, funding, and visa requirements. Being eligible for home fee status and financial support were among the most important factors when making the decision to study engineering in the UK.

Whereas EU engineering academics agree that the UK's universities provide the resources and opportunities for career progression and research leadership, only one third of survey respondents would have come to the UK if they had had to make that decision today (at the time of the survey, June-September 2020).

One third of EU academics surveyed came to the UK as undergraduate and/or postgraduate engineering students. Many EU students plan to stay in the UK after graduation to work as engineers. However, changes to study conditions and the UK's points-based immigration system are seen as heavy barriers to EU nationals and are likely to have a negative impact not only on student and academic staff recruitment, but also on the UK's engineering research and innovation base, and on its much-needed, diverse and talented workforce.

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A summary report can be found on EPC website: <http://epc.ac.uk/brexit-impact-on-uks-engineering-education-sector/>

REFERENCES

- [1] ETER (2019). *Internationalisation of Academic Staff in European Higher Education*, European Tertiary Education Register. Retrieved from: https://www.eter-project.com/uploads/analytical-reports/ETER_AnalyticalReport_01_final.pdf
- [2] Mayhew, K. (2017). UK higher education and Brexit, *Oxford Review of Economic Policy*, Vol. 33, No. S1, pp S155-S161.
- [3] Highman, L. (2019). Future EU-UK research and higher education cooperation at risk: what is at stake? *Tertiary Education and Management*, Vol. 25, No. 1, pp. 45-52.
- [4] McCrory, M., & Thomson, T. (2019). The political is personal: Brexit and the career aspirations of UK undergraduates, *Journal of the National Institute for Career Education and Counselling*, Vol. 42, No. 1, pp. 3-8.
- [5] Dodourova, M., Clarkin, J. E., & Lenkei, B. (2020). The die is cast: Brexit's influence on student career intentions, *Studies in Higher Education*, Vol. 45, No. 3, pp. 648-664.
- [6] Borrego, M., Douglas, E., & Amelink, C. (2009). Quantitative, qualitative, and mixed research methods in engineering education, *Journal of Engineering Education*, Vol. 98, No. 1, pp. 55-66.
- [7] Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage Publications.
- [8] Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology, *Qualitative Research in Psychology*, Vol. 3, pp. 77-101.