EXPLORING THE IMPACT OF BREXIT ON UK'S ENGINEERING EDUCATION SECTOR FROM THE PERSPECTIVE OF EUROPEAN STUDENTS AND STAFF

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ABSTRACT

The United Kingdom has a tradition of excellence in higher education and is recognised as an important player in engineering education and research globally. With 20% of the engineering academic staff and 12% of the student body being European (based on official data related to 2017/2018), much has been anticipated about the likely consequences of Brexit, including the disruption of research collaborations and mobility of staff and students.
Understanding the post-Brexit context is important for British higher education institutions, but Brexit also has implications for individuals' home countries, like Portugal, that have a history of sending graduates to the UK. The study reported here is part of a larger project funded by the Royal Academy of Engineering to explore, from the perspective of European students and academic staff, the impact of Brexit on the UK's engineering education sector. In this paper, we interrogate the perspectives of three Portuguese citizens engaged in engineering education in the UK – two women including one undergraduate student and one postgraduate student, and one man who serves as a lecturer. 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.The outcomes of the project will be relevant to predicting the future of engineering education, and estimating the impact Brexit wil have on mobility and research collaborations between the UK and European higher education institutions.

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1   INTRODUCTION

The UK higher education attracts a far higher number of international academics from all over the world, who teach and do research, than any other country in Europe, being only surpassed by Switzerland [1]. Moreover, because engineering itself is considered a global field, this sub-field of higher education also relies on international mobility more than most academic disciplines in the UK

The impact of the *United Kingdom European Union membership referendum of June 2016*, commonly referenced as the *Brexit referendum*, is still unfolding and under continuing analysis. However, it is widely anticipated that it will disrupt European student and staff mobility and may have negative repercussions for education, research and innovation [2]

Data analysis conducted by the UK's Higher Education Statistics Agency (HESA) regarding European students and staff revealed an increase of 6.5% in the number of undergraduate engineering students from EU countries in the academic year immediately following the referendum (2016/17) [3]. By this time, across engineering faculties in UK, European academic staff (teaching, research) comprised 17.4%. Comparing this 2016/17 figure with 2015/16 reveals a 6.5% increase of European academic staff overall. Looking only at research staff in 2016/17, one in four academic researchers (26.4%) was European; this reflects a 3.1% increase from the previous year. These numbers suggest that although UK universities are still attractive destinations for European academics, staff on 'research-only' contracts may not be as readily enticed to move to the UK after the Brexit as other types of academics. This could be due to instability of funding available from Europe as well as UK sources to support work of foreign researchers workgin in the country. As for students, speculative interpretation of the above data suggests that EU students may have been taking the opportunity to study engineering in the UK as a 'last chance' before fees, funding and visa requirements change. However, more detailed data are needed to assess if these speculative hypotheses are accurate and also to understand the impact of the Brexit decision on European students and staff members who are currently studying or working in the UK's engineering higher education institutions.

Prior to this study, no data on experiences and perceptions had been collected from European engineering students and academic staff regarding Brexit, making it difficult to anticipate the impact the UK's departure from the European Union might have on the engineering education sector. Understanding concerns and expectations held by European students and academic staff is essential to achieving evidence-based decisions to effectively support the recruitment and retention of European talent into UK engineering education. The research project reported here has collected and analysed data regarding the impact leaving the European Unions may have on mobility, funding, skills development, future study and career prospects of Europeans involved in engineering education in the UK.

1.1 Project "Brexit impact on UK's engineering education sector"

In April 2019, the Royal Academy of Engineering funded the project "Brexit impact on UK's engineering education sector: Exploring EU students and staff experiences", a joint collaboration between the UCL Centre for Engineering Education (CEE) and the Engineering Professors' Council (EPC) in the UK. This project aimed to contribute with new and critical understanding of motivations and limitations related to studying and working in the UK. Issues such as mobility, funding, skills development, future study and career prospects have been included. The research team is collecting data from students at undergraduate and postgraduate levels of study, and from academic staff on both research-only, teaching-only, and research-and-teaching contracts. The outcomes of this project will be useful for the engineering education sector in the UK by providing insights for those involved with recruitment and retention of students and academic staff. Ultimately, the project will also provide greater understanding of the landscape of international and pan-European collaboration across Engineering Education.

Although data on the post-Brexit context are important from the point of view of actors and stakeholders in British universities, the Brexit phenomenon also has implications for countries that have a history of sending graduates to the UK. In recent years Portugal has been one of these countries. In the wake of the economic crisis in 2008, there was a widely reported 'brain drain' wherein graduates left Portugal *en route* to the UK or other Northern European countries [4,5]. This has been a source of concern across Portugal. An additional factor at play in the Portuguese context is that while there has been an enormous expansion of access to higher education since the country's political revolution (establishing, in the 1970s, democratic independence from the former dictatorship) and there have been more women than men entering its higher education institutions for the last 30 years, the number of young women enrolling on engineering programs has been relatively low at around 26% [6,7].

Keeping these factors in mind, this paper focuses on Brexit-related perspectives contributed by three Portuguese citizens currently engaged in the UK Engineering Higher Education sector. These Portuguese participants in the larger research study provide valuable insight that warrant their own dedicated reporting. SEFI is an ideal venue to share such findings as understanding Portuguese involvement in and contributions to different education systems outside can benefit the European engineering education community.

This small qualitative study aims to address the research question: what factors do Portuguese citizens engaged in the UK Engineering Higher Education sector perceive as important in planning their future?

2 METHODOLOGY

2.1 Research Design

The overall project has adopted an exploratory mixed methods design involving a qualitative phase (interview, reported in this paper) followed by a quantitative phase

(online survey, currently ongoing). In the qualitative phase, a diverse sample of European students and academic staff members currently studying or working in UK Engineering higher education institutions were interviewed to explore their experiences, concerns and future expectations following the Brexit referendum. Key issues identified in this phase are now being explored via a quantitative phase, wherein a larger sample of European students and academic staff across the UK is being engaged in an online survey.

In the interviews, students and staff were asked about: 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; their experience in the UK overall, and what impacts they had felt as a result of Brexit; and what their career plans entail, and their prefrences regarding leaving or remaining the UK.

Answers provided by each interviewee were followed-up with probing questions to yield further insight. The interviewer (this paper's lead author) raised the topics of mobility, funding (e.g., tuition fees and research grants), international research collaborations, career development, institutional support and legal advice.

At the time of writing this conference paper, the qualitative phase of the larger study had been completed, and the quantitative phase was under development.

2.2 Procedure

After approval was granted from the UCL Ethics Committee, participation calls and participation information sheets were circulated via EPC newsletters and relevant social media (Twitter and LinkedIn). All interviews were conducted before the UK General Election occurred on the 12th of December 2019, and well before the COVID crisis, both of which would have influenced the narratives provided. Online interviews were conducted in English and recorded for professional transcription.

This paper presents thematic analyses of a subset of interviews with three Portuguese participants, since only Portuguese citizens were represented across three different groups of interviewees: undergraduate students, PhD students, and academics. Thematic analysis [8] of the data was chosen as a methodological approach as there was an interest in finding themes in order to answer the research questions. This type of analysis was also chosen by other researchers who conducted a small-scale qualitative study exploring the impact of Brexit on the career aspirations of final year British students [9].

The open-ended approach of the interviews was suitable for this methodology as thematic analysis "is not wedded to any pre-existing theoretical framework" [10, p. 81].

2.3 Participants

A total of 24 participants (15 academic staff and 9 students) were interviewed between October and early December. This paper focuses on interviews with three participants, chosen to provide an understanding of the Portuguese context. These participants are: Sofia, an undergraduate student; Paula, a recent PhD recipient, now working as a post-doc; and Luís, a lecturer who is currently doing a PhD. All

names are fictitious. Their academic profiles, engineering sub-fields, places of work/study and year of having moved to the UK are shown in Table 1.

Table 1. Subset of Portuguese participants

Participant	Academic Profile	Year moving to the UK
Sofia, Undergraduate (England)	3rd year undergraduate student in Biomedical Engineering	2017, after Brexit referendum
Paula, Postgraduate (Northern Ireland)	Postgraduate student In Environmental Engineering recently appointed as Post-Doc	2016, before Brexit referendum
Luís, Lecturer (England)	Lecturer in Mechanical Engineering currently doing a PhD	2014, before Brexit referendum

3   FINDINGS

3.1 Factors and expectations when coming to study or work in the UK

Sofia had never considered studying abroad until she heard, from a company visiting her secondary school, that the learning style in UK universities was more practical than in Portuguese universities.

> *I was told that in England it was more practical. It was not so theoretical as in Portugal. I wanted to take the risk and see how it was and actually, it has advantages for me to go out of the country*

She was interested in gaining work experience after graduation, and saw more opportunities to do that in the UK.

> *Also, the recognition after [graduation] (…) they have a lot of employability. I was planning on maybe staying here [in the UK] for one year or something, just to earn money because it's really good here, compared to Portugal, they earn more. Of course, it's a different lifestyle, but it's good for opening my career (…). And they have a lot of placements, that's really good and even in the master's, they have partnerships with another university, which is also really good.*

Sofia mentioned that having a degree from the UK on her CV was something that would have a higher value than a degree from Portugal.

> *For the CV it's really good (…) for them to see my CV, and that I was studying in England, that I had some internships (…). It's better compared to taking a graduation in Portugal.*

This perceived value of a UK degree was also mentioned by the postgraduate student. Paula, having studied in Portugal for both her bachelor's and master's degrees, envisioned herself pursuing a PhD abroad. She mentioned the value of a UK degree, and the opportunity be fully funded for study as the main drivers for choosing the UK.

> *Well, considering I did the bachelor's and the master's in Portugal, I wanted to have a PhD somewhere outside of Portugal. At the time I applied to a lot of universities, even Australia for example, and the US. But I always wanted, deep down, to come to the UK because (…) it looks well on the CV to do a PhD in the UK. (…) I don't really understand, but apparently doing a PhD in the UK was*

always very highly esteemed, so I wanted to come here. (…) I tried for a year and a half, almost two years before I successfully got this PhD because I wanted a fully funded PhD. There was no way I could live abroad just by myself, so I needed a fully funded. At least at the time, there were a lot more opportunities in the UK than in other countries (…).

Luís completed his bachelor's degree in Portugal and tried to become involved in projects in his area of interest. However, as none of these projects came to fruition, he decided to explore other opportunities and found the possibility to pursue a master's in the UK.

I've always had an interest, growing up, in this subject area. I felt like I needed more specialized knowledge on the field to have an easier access into the industry (…) [coming to the UK] was solely based on the availability of the subject area. I came to do Motorsport Engineering. It's a degree that not all countries have. Certainly, my home country doesn't have that degree, there's no market for it.

Following the completion of his postgraduate degree, he was offered a PhD scholarship, and also a teaching position at the same institution, and he decided to accept.

I was offered a scholarship to do the PhD. It was never the plan initially to stay for research or anything. Staying for work was being considered, but then, yes, the scholarship – I thought "this is the opportunity to attempt taking a PhD. It will be now. Later would be much harder". Teaching commitments started soon after as well. It was just having the opportunity for doing that, if that makes sense.

3.2 Experiences in the UK and impact of Brexit

The three interviewees shared positive experiences in the UK, at both professional and personal levels.

Sofia was enthusiastic about her learning experiences at the university, and stated that lecturers were supportive and approachable, and that being part of a small class was beneficial.

I realized it was even better than what I'd thought. It's very practical. Professors – I have a very good connection with them, and we are a small class. We are only 13, so it's really good. We are very close with the professors. It is amazing!

Sofia also mentioned that, compared to Portugal, the UK's culture was more accepting of people's individualities and that this was something that she cherished. She also valued the opportunity to connect with colleagues from different cultural backgrounds. Regarding Brexit, Sofia was initially worried. She was being informed by the Portuguese company and was going to apply for UK pre-settlement status.

Paula was also very enthusiastic about both her professional and personal experiences in the UK, specifically in Northern Ireland. She enjoyed her PhD journey, and valued the skills and knowledge she acquired as also being part of a welcoming and supportive research group.

I learned how to build actual reactors to make the experiment, which was super interesting because I had never built one from scratch. (…) I did learn a lot, especially in areas that I didn't have that much knowledge, so it was quite

interesting (…) I really enjoy, and I absolutely love, the group I work with. How approachable they are; and the exchange of knowledge is really nice as well. I absolutely love it, otherwise I wouldn't have stayed anyway [chuckles]. But I absolutely love it. I really like it here.

She was also very pleased with her lifestyle in Northern Ireland and said that the resemblances between Northern Irish and Portuguese cultures made her feel at home. At the time of the interview, Paula was still sceptical about outcomes of the referendum. She was hoping that the UK would not leave the European Union. She based this hope on the constant postponing of Brexit deadlines by the UK government. At a personal level, she hadn't noticed any differences since the referendum, but agreed that the there was tension every time a deadline approached. This tension was especially high prior to the initial leave date, scheduled for the 31st October 2019, when she decided to finally apply for pre-settlement status. In terms of the impact on universities, she was particularly worried about getting access to research funds in the future, because she could see herself pursuing an academic career in the UK.

They [university] were scared (…) because funds were going to be cut, because most of the things come from the European Union.

Luís was pleased with having access to opportunities that he hasn't even considered before coming to the UK.

I think it's been good. Certainly, I have access to a lot of opportunities which I'm sure wouldn't have happened. But at the same time, they weren't planned [chuckles]. It's been interesting because none of these… ending up teaching wasn't the plan coming here. It's been interesting and rewarding, for the most part.

He was worried about the negative impact of Brexit on feeling welcome, free movement and overall welfare. He also stated that Brexit would have a negative impact on various industry sectors at a national level, but wouldn't affect his collaborations with local industries.

The commercial vehicle, the automotive side, definitely, there's potential for disruption of the industry in the UK. The UK has, I think, engine manufacturers. I'm sure there will be disruptions to some extent, at least until they figure something out to get goods to the other side in a way that complies with legalities, administration issues. The other one would be [related to] the workforce itself. (…) A lot of our industry is close by. Even though a lot of the workforce for that industry is international, but they're pretty close by. The communication hasn't deteriorated in any way. The industry itself will have their own challenges. As far as our relationship, that I'm aware of, it hasn't changed.

3.3 Future plans, and intention to remain in the UK

Sofia was planning to apply for a master's and, possibly, a PhD position in a UK university. Long-term, work wise, she was considering moving to a different country.

I was not very mature in that time [chuckles] [when applying for an undergraduate degree]. Now I realized that for my master's I want a better thing (…) in that time, I was thinking on the recognition and rankings, and where the students go (…). I

didn't pay much attention because I was so excited to come to England. But now I'm applying for master's for next year. I'm starting now doing applications for [a university in England], and maybe [a university in Scotland] because it's for computer science, and they are both good. (…) if I get into the [university in England's] master's, maybe then I can go for a PhD (…). Then after the PhD, which is a long time from now, I'm thinking on maybe going for a year, or two maybe, working in England, or maybe another country

When asked about the hypothetical scenario of not being able to apply for a master's or PhD position in the UK, Sofia was not sure where to go. However, she was not considering going back to Portugal.

Following the completion of her PhD, Paula got a short-term contract in her university while she waited for her viva (thesis defence). She wanted to stay in Northern Ireland.

Like I said, I really like the group I'm in, and I really like Northern Ireland, so I didn't really want to leave. Then I got extensions and now I have an extension until [a specific date]. There was a time that I wasn't sure if I was going to get an extension or not, and so I was applying to other places.

She also considered enrolling in courses on teaching in higher education, so she could develop a new set of skills to work in academia in Northern Ireland.

I don't know what's going to happen in a year. Well, I think if I can, I'd rather stay but I might think about doing one of those courses, like the courses for teaching in higher education. Maybe start thinking about applying to grants, but then again it will depend if Brexit goes forward or not. Maybe go do some teaching as well. I would like to stay here.

Although she would prefer to stay, Paula was ready to explore other opportunities for postdoc positions outside the UK.

As a lecturer, Luís had already considered exploring job opportunities outside of the UK, particularly in industry.

Definitely sometimes, there are thoughts of exploring positions in other countries, more in the industry than academia (…). Yes, yes, I think [Brexit] definitely has an impact. The question between academia and industry was always there. But now, it's more academia here versus industry, which I could access at somewhere else. Because engineering skills are quite easily transported across borders. They don't depend so much on the local language to a certain extent. They are easily integrated.

His decision to remain in the UK, on the other hand, would be influenced by non-professional impacts of Brexit, such as freedom of movement and quality of life.

For me to continue to think of the UK as attractive as it was before, if we could keep people moving backwards and forwards without any more hassle than it already has, and if life as a whole doesn't deteriorate – ideally it would improve – but if it doesn't get worse than what it is, then yes, I'll be happy to continue here. Professionally, I'm in a good place. (…) So, professionally, I'm not too concerned. It's more to do with the quality of life and enjoying the place.

4   DISCUSSION

Based on having such a small sample size, little of what the participants said can be assumed true for a larger group, yet some of the patterns were very strong across these three Portuguese participants, and resonate with the larger sample of participants. For these three participants, the UK was perceived as offering top-notch education that would be well-received in Portugal and recognized worldwide. All participants described having good experiences in the UK, both personally and professionally. All described supportive learning environments and enjoyable teaching and working styles. They had all felt welcome and enjoyed interactions with peers and citizens but now fear things may change after Brexit. Nevertheless, all three of these participants would like to remain in the UK longer.

They all showed a high level of adaptability in dealing with the many unknowns and uncertainties created by Brexit. They all described upward career mobility following their initial studies in the UK and a desire to learn more and to develop themselves farther in the future. They would all be happy to continue to live and work in the UK, as long as further education and job opportunities remain available, as long as quality of life persists, and as long as they feel welcome.

At the point of the interviews, all conducted before the UK general election (12 December 2019), and the official withdrawal of the UK from the European Union (31 January 2020), these three participants were positive about their experiences in the UK, and the engineering higher education system they found in the country. They remained happy with their choice to come to the UK. However, they realised there might be a need to leave, and they might have to take additional actions to be granted rights to stay and work in the UK.

This paper presents an overview of the initial findings of interviews conducted with European engineering students and staff studying and working in the UK, after the UK's decisions to leave the European Union. The interviews conducted with three Portuguese participants provide a snapshot of what was discussed with the larger, more diverse group of participants. As noted above, the results of these three specific interviews may not be immediately transferrable to a larger population; however, comparing these data with the other interviews and with the quantitative survey data that is soon to be collected, will support wider transferability of the findings.

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