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## Diversity, equity, and inclusion in engineering education: an exploration of European higher education institutions' strategic frameworks, resources, and initiatives

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## DIVERSITY, EQUITY, AND INCLUSION IN ENGINEERING EDUCATION: AN EXPLORATION OF EUROPEAN HIGHER EDUCATION INSTITUTIONS' STRATEGIC FRAMEWORKS, RESOURCES, AND INITIATIVES.

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**ABSTRACT**

Significant efforts have been made to promote gender equality in higher education (HE) in Europe. Examples include the establishment of the Athena Swan Charter in the UK in 2005 and the 2019 launch of the Irène Curie Fellowship scheme by Eindhoven University of Technology. But which initiatives address broader diversity, equity, and inclusion (DEI) challenges in HE? And which are specifically focused on engineering education?

This exploratory study aims to improve our understanding of the ways in which a set of European HE Institutions engaged in engineering education address DEI at an organisation level, and how this is communicated within the public domain. The analysis of online data provided by a purposive sample of institutions is guided by the following research questions (RQ):

1. How is DEI addressed and defined in institution-wide strategic frameworks?
2. How many institutions describe having an institution-wide DEI organization?
3. What specific policies around DEI are being developed, and what areas are mentioned, defined, and prioritized?
4. What structures and resources noted as part of their DEI activities are specific to engineering faculties and departments?
5. What engineering-specific DEI initiatives exist that are not available in the public domain or are not written in English?

Our sample is composed of the host institutions of the authors of the paper, and represent different European countries: Belgium, Denmark, France, Ireland, Portugal, Switzerland, and the UK. The findings of this exploratory study will be used to inform the design of a large-scale survey to identify DEI practices across the SEFI community.

**1. INTRODUCTION****1.1 Motivation**

A recent New York Times article [1] posed the question “What does it mean to say ‘I’m in favor of diversity’ when you haven’t even reckoned with what the state of diversity is in your own institution?”. Whilst the article focused on academic publishing, the same could be asked of engineering education in Europe. The current paper represents the beginning of our attempts to map how diversity, equity, and inclusion (DEI) are defined by our institutions.

SEFI has been engaged in diversity, equity, and inclusion. In its Diversity Statement, SEFI affirmed to “continually review its policies and practices to fulfil this commitment and to ensure that it influences SEFI’s activities and liaisons” (2018). Respect for diversity and different cultures, as well as institutional inclusiveness, are core values adopted by SEFI’s Board of Directors. More recently, and following SEFI’s Position Paper on Diversity, Equality and Inclusiveness in Engineering Education [2], SEFI and ASEE produced a joint statement [3] calling for examination, reflection, and active promotion of diversity, equity, and inclusion in engineering.

However, it is our experience that definitions of diversity and inclusion vary considerably between institutions, and that many initiatives are concerned only with widening the participation of women in engineering. Although gender imbalance remains a critical issue in the European engineering context, this narrow definition of diversity is inadequate to represent the different aspects that simultaneously form essential aspects of people’s identities and can lead them to experience exclusion, stereotyping, and microaggressions [4]. We argue for the importance of clear, comprehensive definitions of DEI and why data on the current way these terms are used by European engineering institutions can help us increase awareness of diversity, equity, and inclusion issues, but also identify, share, and celebrate good practices and initiatives across the SEFI community.

## 1.2 Literature review

A number of recent studies, such as the 2018 McKinsey Report [5], assert that diverse and inclusive teams are more creative, providing their companies with a competitive advantage. Many companies have established policies to both promote diversity in their hiring practices and encourage more inclusivity in the workplace. However, more effort is needed in this regard. Hilary Leever, Engineering UK chief executive, writes [6]: “While engineers have responded fast, flexibly and with huge personal commitment at this time of corona-crisis – we know that it could have been better. We know this because workforce diversity improves innovation, creativity, productivity, resilience and market insight and the engineering workforce could and should be much more diverse.” Also, to fill in the continued shortage of engineers, Neelie Kroes [7] states that education and industry should focus on underrepresented groups and make Europe stronger. The latter is also highlighted by IEEE Innovation [8]: “Although 80% of future professions will require STEM expertise by 2020, millions of students in under-resourced communities lack the opportunities necessary to prepare for careers in these fields.” Engineering stereotypes can also play into the difficulties experienced. Pawley [9] observed that engineering schools often characterise “the ideal student” as a young, single White male. Assumptions about who engineering students are can negatively impact students from underrepresented groups. While this research was US focused, many in Europe will agree that this is also germane to European engineering schools - engineering education, research and practice lacks diversity of people and cultures, which ultimately affect the diversity of approaches to teaching, learning and research, and diversity of knowledge and skills.

But what does ‘diversity’ mean? “Equality, equity, diversity and inclusion are terms that are often used interchangeably, despite the fact that they may mean different things.” [10, p.23].

Diversity is the presence of differences within a given setting. In the educational sphere and in the workplace, that can mean differences in race, ethnicity, gender, gender identity, sexual orientation, age and socioeconomic class. According to the INVITED Report [10, p.23], diversity is “a multi-dimensional concept, dependent on the cultural context and level of awareness of difference. Certain dimensions of diversity have received particular attention because the groups identified as either under-represented, disadvantaged or vulnerable (or any combination of these three). In terms of gender, there is a clear under-representation of women in academic and leadership positions”.

Equity is the process of ensuring that processes and programs are impartial, fair and provide equal possible outcomes for every individual. ‘Equity’ goes beyond ‘equality’, as it “includes needs-based support to level out relative disadvantage. It thus often comes along with measures such as positive action or positive discrimination. Equity also takes into account that there are often structural barriers towards participation which, if they cannot be removed, make such needs-based individual support necessary.” [10, p.44].

Inclusion is the practice of ensuring that people feel a sense of belonging in a given community. This means that every person within the community making up an HEI feels comfortable and supported by the organization. Inclusion requires “awareness about different aspects of diversity” [10, p.44].

## 2. METHODOLOGY

This study adopts a critical discourse theoretical framework for analysing and assessing how diversity, equity and inclusion are communicated via university websites, and defined in strategic documents, such as mission or diversity statements. The approach works well because “website content is a form of institutional discourse” [11, p.67] and the internet provides “a rich cultural data source” [12, p.247] particularly about the higher education institutions (HEIs) in Europe that provide engineering education and participate in SEFI. Merkl [13] looked at the diversity statements of 11 universities in the United States, identifying themes to assess what they addressed equality and to “identify whether university Diversity Statements aid in maintaining or disrupting inequality in the university” (p.ii). Merkl proceeded to focus on 4 universities that were selected for maximum variation. She “compared the Mission Statement to the Diversity Statement, analyzed common university statistics, and evaluated website pictures” and then “conducted a cross-case analysis to identify patterns and considered the implications of those patterns” (p.ii).

At this initial pilot phase of our study, we have focused on the eight host institutions of the authors of this paper. Lažetić [14] studied HEI websites of a similar European sample; his study used content analysis alongside MANOVA to assess messages of

corporate branding versus public-service orientations of the sampled HEIs. Similarly, Creamer and Ghoston [15] conducted a content analysis of the mission statements from 48 random colleges/schools in the United States, followed by a quantitative phase to explore the correlation between the inductive codes and three measures of the representation of women among those same colleges of engineering. To date, our research team has harvested publicly available data, organized it in tabular format, and conducted initial analysis. As we progress from this pilot to full study, we will adopt either Pauwels' [12] six-step process for assessing websites from perspectives that are both medium-specific and socio-cultural, or Merkl's [13] approach, to explore RQ1: How is DEI addressed and defined in institution-wide strategic frameworks? This paper focuses on the description of the institution as a DEI organisation, its policies and priorities (RQ2, RQ3) and engineering-specific structures, resources and activities (RQ4, RQ5).

## 2.1 Institutions

The eight institutions included in this exploratory study are: 1) Technical University of Denmark (DTU), Denmark; 2) École polytechnique fédérale de Lausanne (EPFL), Switzerland; 3) Instituto Superior Técnico (IST), Portugal, 4) University of Leuven (KU Leuven), Belgium; 5) École Polytechnique de l'Université d'Orléans (Polytech Orléans), France; 6) Swansea University, United Kingdom/Wales; 7) Technological University Dublin (TU Dublin), Ireland; 8) University College London (UCL), United Kingdom/England.

## 3. RESULTS

This section summarizes the main findings of the following research questions:

- RQ2. How many institutions describe having an institution-wide DEI organization?
- RQ3. What specific policies around DEI are being developed, and what areas are mentioned, defined, and prioritized?
- RQ4. What structures and resources noted as part of their DEI activities are specific to engineering faculties and departments?
- RQ5. What engineering-specific DEI initiatives exist that are not available in the public domain or are not written in English?

An overview of these findings, as well as a brief description of each university (type of institution, population, and female ratio) is provided in Table 1.

## 4. DISCUSSION AND CONCLUSION

Of the institutions examined, almost all have an institution-wide DEI organisation while departmental or faculty-wide policies in engineering are prevalent in most cases. The area that is prioritised in most institutions is gender balance, followed by disability, while socioeconomic background and other areas are also mentioned. Engineering faculties appear to focus on gender balance. This is in line with existing research on diversity in engineering, which indicates that gender tends to monopolise the discourse on DEI.