E4E
Engineers for Europe
September 1, 2022 - August 31, 2025
Project Ref. Nr.: 101054872 — E4E — ERASMUS-EDU-2021-PI-ALL-INNO

Partner Snapshot [Ordem dos Engenheiros]

ORDEM
DOS
ENGENHEIROS

Developed by: [Ordem dos Engenheiros]
2024

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1. INTRODUCTION

The Ordem dos Engenheiros (OE) is a professional public association representing engineering graduates who practice the profession of engineer. Its main mission is to contribute to the progress of engineering, stimulating the efforts of its members in the scientific, professional and social fields, as well as compliance with the rules of professional ethics. It's divided into regions, namely the South, Center, North, Madeira and Azores. Each region has district delegations and respective secretariats, facilitating proximity to society and members.

Every year, OE develops a theme for public discussion, with 2024 being the year of Gender Equality in Engineering.

OE is organized into 17 specialties, namely: Aeronautical and Space Engineering, Agronomic, Environmental, Food, Biomedical and Bioengineering, Civil, Electrotechnical, Forestry, Geospacial, Geological and Mining, Computer, Materials, Mechanical, Naval and Oceanic, Chemical and Biological, Industrial Engineering and Management and Safety and Quality; and 23 Specializations, which confer the Professional Title of Specialist on their members.

Since 2002, a system of continuous training actions has been set up, in which each region promotes training actions in the various engineering disciplines, with the aim of updating the knowledge of its members. This training is extended to members of the Professional Associations of the PALOP (Portuguese-speaking African countries).

In 2014, the OE also created the Training Action Accreditation System, the OE+AcCEdE® System, with the aim of guaranteeing the quality of the training offered to engineers by accrediting continuous training actions, promoting the periodic updating of engineer's knowledge and skills for the proper exercise of their profession. Any training action from HEI's and Continuous Education Enterprises that have a duration between 8 hours and 1 year are eligible for receiving the OE+AcCEdE® System Accreditation.

The OE is implementing VALOR^{E}, a system for the professional development of engineers, based on:

- Verification of competencies;
- Experience and specific practices in Engineering Acts;
- Lifelong learning;
- Appropriate ethical and deontological behavior;
- Practices, attitudes, resources and others that enhance the Engineer.

Its objectives are: to create a certified Curriculum Vitae (CV), by verifying the practice of engineering acts; to position the Engineer as a professional of superior recognition, by adopting innovative criteria in addition to those currently used by the reference institutions; to reinforce public confidence in Engineers, ensuring that they have the competences that the OE recognizes; to reinforce the importance of the OE as a professional association and its image in society, based on the competence, quality and public and social notoriety of its members.

2. QUANTITATIVE INDICATORS ON THE EVOLVING NATURE OF THE ENGINEERING PROFESSION

According to the OE's data, it can be seen in Table 1 that in the years 2022 and 2023, OE issued a total of 2060 and 1851 Training Certificates for training actions distributed between the various regions and the Accreditation System OE+AcCEdE®.

Table 1: Total number of certificates issued in training actions promoted by the OE and through the Accreditation System OE AcCEdE®.

	South	Center	North	Azores	Madeira	OE+AcCEdE®	Total
Total number of trainees (2022)	718	484	53	500	92	213	2060
Total number of trainees (2023)	696	736	72	115	8	224	1851

Tables 2 and 3 show the areas of engineering in which the aforementioned certificates were issued.

Table 2: Training carried out in the Specialties in 2022.

	South	Center	North	Azores	Madeira	OE+AcCEdE®	Total
Agronomy	---	---	1	---	---	1	2
Environment	---	---	---	2	---	---	2
Civil	2	7	9	14	---	5	37
Electrotechnics	---	2	---	---	---	4	6
Floresty	---	---	---	---	---	---	0
Geospacial	1	---	---	---	---	---	1
Geology and Mining	---	---	---	---	---	---	0

Informatics	4	2	---	---	---	---	6
Materials	1	---	---	3	---	---	4
Mechanics	---	---	---	---	---	4	4
Naval	---	---	---	---	---	---	0
Chemistry and Biology	---	---	---	---	---	1	1
Transversal	12	---	12	---	---	1	25
Total	20	11	22	19	0	16	----

Table 3: Training carried out in the Specialties in 2023.

	South	Center	North	Azores	Madeira	OE+AcCEdE®	Total
Agronomy	---	---	1	---	---	1	2
Environment	---	2	1	---	---	2	5
Civil	1	10	9	2	1	7	30
Electrotechnics	---	2	4	---	---	2	8
Floresty	---	---	---	---	---	---	0
Geospacial	---	1	---	1	---	---	2
Geology and Mining	---	---	---	---	---	---	0
Informatics	3	---	---	---	---	---	3
Materials	---	---	---	---	---	---	0
Mechanics	---	---	---	---	---	4	4
Naval	---	---	---	---	---	---	0
Chemistry and Biology	---	1	---	---	---	3	4
Transversal	17	2	12	---	---	1	32
Total	21	18	27	3	1	20	----

As can be seen, transversal skills are those in which there are more training actions, followed by continuous training actions in the area of Civil Engineering.

3. QUALITATIVE DESCRIPTORS OF THE EVOLVING NATURE OF THE ENGINEERING PROFESSION

OE organized a series of Conferences entitled “Captação e Vinculação de Talento na Engenharia” (Attracting and Connecting Talent in Engineering) throughout 2024, with the presence of leaders from some of the country's largest public and private engineering companies, Higher Education Institutions (HEI’s), science, technology and innovation centers, business associations and student associations, a public discussion that revealed the lack of qualified human resources in the areas of Engineering in Portugal, coupled with the current and future lack of interest among young people in higher education in this technical-scientific area in the very near future, which weakens the national production system and the economy and will jeopardize the country's development in the very short term. To this end, some companies are already developing measures to retain young talent.

The main conclusions of the conferences, divided by general conclusions, opportunities, needs and challenges and supported by the secondary research carried out, were:

General conclusions:

- Engineers have a high capacity for adaptation (added value); A good engineer very easily becomes a good manager (for example);
- Innovation centers don't feel a drop in the "quality" of engineers coming into the market, but they do feel a cultural difference, boosted by the pandemic; Some engineers tend to have difficulty adapting to change or leaving their comfort zone;
- There is room in the job market for both 3-year and 5-year graduates, each with their own skills: for field work it's great to have a 3-year graduate, but for conceptual work a 5-year graduate is preferable. If companies start hiring only 3-year engineers (“half engineers”) because there is a shortage of talent, there will later be a problem because there will no longer be any Portuguese development/design engineers ("full engineers");

Opportunities:

Since the pandemic, people have started to value their personal lives more with flexible working hours or flexibility for remote working, where possible, motivation, interaction between people, appreciation in the workplace, etc.

- Attracting/retaining talent requires:
    - Schools have do be a part of the talent attraction (engineering colleges and secondary schools, at least);
    - Companies need to change their mentality and culture, which needs to be more flexible and informal, with less bureaucracy and hierarchisation (One company mentioned that it has 60% Millenials and 15% Generation Z; the company's mentality needs to be adapted to the younger employees wants and needs);
    - If possible, companies should promote internal rotation/mobility to other countries;

    - Companies must make employees feel valued;
    - Companies should promote better work-life balance;
    - Companies should offer their workers other benefits, such as daycare;
    - Valorisation of the engineer's career - Adequate salary;
    - Companies need to invest in training and updating their employees;
    - Close relationship between schools and companies;
    - Partnership working models;
    - Give preference to internal recruitment before external recruitment, promoting career progression for those who are interested.
- On a political level, to motivate young people to return/stay in the country, it was suggested:
    - Investing in medium/long-term strategic planning instead of the current short term, setting priorities;
    - Making it easier for young people to obtain housing;
    - More and better tax measures for young people (e.g. youth tax);
    - Strengthening Portugal's economic and business fabric, in order to boost companies' competitiveness;
    - Valuing young people;
    - Rethink the concept of progress (progress is often thought of as linear);
    - Redefining the concept of a successful company;
    - Showing that engineering is the basis of society, and that it can help assert certain positions in the country;
    - Eliminating the feeling of "precariousness";
    - Qualification policies and support for young people starting their careers are essential.
- When young people look for work, they try to identify with the company's values and place a lot of value on the atmosphere in the workplace and empathy with coworkers;
- Large companies are more comfortable these days, as they are more attractive because they are large, geographically dispersed, can do various types of activities to motivate their workers, and promote a better work-life balance (young engineers these days want/prefer to have different experiences and relevant projects);
- More initiatives should be promoted, such as the presence of secondary schools that go to universities for laboratory classes, so that students can interact with the reality of an engineering course; some HEI’s already have "open days", where they welcome parents and potential future students;
- Companies are increasingly looking for professionals with a balance between ethics, emotional intelligence and holistic knowledge, who value sustainability and social responsibility. More often, what gives advantage to a future employee is their individual and personal journey throughout their studies, as well as the school where they were trained;
- Young people should be shown what an engineer does, because many don’t know, possibly before they reach secondary school (social media can help shape the opinions of future students);
- Perhaps teachers' careers could be more flexible, with older teachers moving closer to management, to facilitate the rejuvenation of the teaching staff, which in turn would make it easier for students to get closer to the teachers;

Needs:

- HEI's are an open system, with losses from admission to the final diploma. As such, we need to work on the efficiency of this open system in order to reduce the losses in the training process;
- There is still a big gap in attracting women to engineering that needs to be adressed (perhaps this is a cultural problem);
- We need to create more scholarships, support students and develop the process of lifelong learning through collaboration between companies and HEI's;
- There should be an integrated approach to attracting talent, even at a territorial level (including the whole country, rather than just the big centres);
- There needs to be more integration of higher education into previous education (secondary and basic education, perhaps from 9th grade onwards, showing the role of engineering), so that students make a more informed choice about what they want to do in the future; It also needs to be shown in secondary education, for example, that everyone has an active role in society, everyone is a citizen of the world and of their own country;
- There needs to be mixed career guidance teams in schools (in terms of representation of professional areas);
- Teaching must adapt to today's reality; it can no longer be 19th century teaching, 20th century teaching staff for 21st century students;
- Higher education teaching staff needs pedagogical training adapted to the interests of today's students;
- Soft skills are increasingly necessary/critical, and are what differentiate people from machines (empathy, resilience, communication, leadership, teamwork, problem-solving, sustainability, critical thinking, flexibility, adaptation, problem-solving skills, etc); Engineering degrees should also include learning new programmes;

Challenges:

- The problem of retaining and attracting talent cuts across several professional areas, although it is most noticeable in the field of engineering, since engineering is the basis of countries' development;
- Depending on the area of engineering, there can be different problems: for some areas the problem is attraction, for others it's retention;
- There are two sides in the problem of attraction and retention: in the short term, the problem is retaining talent; in the long term, it's regenerating qualified company staff;
- Engineers can easily change employers;
- Investments are not constant, which leads to fluctuations in the needs of the various companies;
- Enterprises in Portugal, for the most part, can't compete with companies from abroad in terms of the conditions offered to their workers, except for a few larger companies;
- Approximately 44 % of Portuguese entrepreneurs have a 9th grade education, which means they take fewer risks and hire fewer engineers (for a small or medium-sized company, an

attempt at innovation that could go wrong is a big risk; also, an engineer also requires a higher salary);

- There is a misplaced belief that older people (over 50) have been trained a long time ago, their skills are outdated and they no longer have the same abilities as a young graduate;
- It's easier for young people to emancipate themselves abroad, since Portugal is the country with the 4th highest tax burden (low wages Vs current cost of living Vs minimum wage Vs taxes);
- HEI's are having trouble attracting students for master's degrees. Nowadays, graduates prefer to enter the job market straight away and then complement their training with a postgraduate course, rather than doing a master's degree;
- The teaching staff must promote changes in teaching methods;
- Some of the teaching staff in higher education, aged around 40/50, don't have yet a secure position, meaning that it is difficult to promote the rejuvenation of the teaching staff.

4. CONCLUSIONS AND RECOMMENDATIONS

Retaining and attracting talent is a cross-cutting problem in various professional areas, most perceivable in engineering, which is the basis for the functioning and development of society. This problem has two dimensions: short and long term.

Nowadays, there is an increasing need for an integrated approach between the various stages of education and the job market, in order to attract more students to the field of engineering, through initiatives that show the role of an engineer to young people and to society.

There is also a need to encourage upskilling, reskilling and the updating of engineers' knowledge, in a joint effort between companies, continuing education bodies and HEI's. Companies themselves should also encourage, incentivize and promote their employees to enter into upskilling, reskilling and knowledge updating programs. Considering the current dynamism of the job market, there is a pool of talent being wasted because older people are considered to have outdated skills and no longer have the same capabilities as a young graduate.

Companies are increasingly valuing the HEI where each one obtains a diploma and the individual background of each person, appreciating skills/characteristics such as emotional intelligence, ethics, social responsibility, sustainability, critical thinking, etc.

It's important to note that the younger generations are placing increasing importance on the balance between their personal and professional lives, flexible working arrangements (including, where possible, working in a hybrid model), the possibility of career progression, valorization of their work, etc. Companies therefore need to adapt to the expectations and needs of their employees, promoting a more informal and flexible culture, with less bureaucracy and hierarchy.

On a political level, it is advisable to focus on setting priorities and defining medium and long-term strategic plans. It is also necessary to redefine the tax measures to strengthen the companies competitivity and attract more entrepreneurship in engineering areas.

Finally, HEI's are considered an open system, with losses from the moment of admission to the time of the final diploma, so it is essential that the teaching staff be rejuvenated, with pedagogical training adapted to the new reality of today's students.

5. REFERENCES

Abandono voltou a subir no ensino superior público e continua mais alto nos politécnicos. (2024, June 20). *Diário de Coimbra*. Retrieved July 2024, from https://clientes.presspower.pt/pt/noticia/?ne=gxg8w%2fW1w8KlcLC53Nx4bQ%3d%3d&tf=PT&tt=PT-PT&tm=DeepL

Andrade, F. (2023, October 11). *As raparigas têm lugar na engenharia e há uma nova edição do programa que lhes abre a porta ao futuro*. Retrieved June 2024, from https://tek.sapo.pt/expert/artigos/as-raparigas-tem-lugar-na-engenharia-e-ha-uma-nova-edicao-do-programa-que-lhes-abre-a-porta-ao-futuro

Barnes, C. (2023, September 2023). *Linkedin*. Retrieved June 2024, from Soft Skills for Engineers: The importance of communication, teamwork, and other non-technical skills in a highly technical field: https://www.linkedin.com/pulse/soft-skills-engineers-importance-communication-teamwork-cory-barnes/

Beatriz Martins, C. M. (2024, July). Se há poucas, vou ser uma delas. *Expresso*. Retrieved July 2024, from https://multimedia.expresso.pt/mulheresengenharia/?fbclid=IwZXh0bgNhZW0CMTAAAR3csiHK8TCdiTl6UxpHq7YtselvmprWtxVX64du-_6iwqjygppBAs9riL8_aem_r8cr5t51H3epmWXMhyA4tw#group-section-Creditos-OCrRbYnHox

Bosa, J. (2023, September 6). *Linkedin*. Retrieved June 2024, from Soft Skills in the Engineering Sector: https://www.linkedin.com/pulse/soft-skills-engineering-sector-jnb-career-services/

Buchholz, C. (2024, March 1). *Linkedin*. Retrieved June 2024, from Mind the Gap: Addressing the Skills Gap in the Engineering Industry: https://www.linkedin.com/pulse/mind-gap-addressing-skills-engineering-industry-buchholz-cert-cii-caije/

Business Europe. (2022, June 21). *Labour Force and Skills Shortages: how to tackle them?* Retrieved from https://www.businesseurope.eu/

Conselho Nacional de Educação. (2023). *Estado da Educação 2022.* Lisboa. Retrieved June 2024

Débora Barni de Campos, L. M. (2020, August 28). The Importance of Soft Skills for the. *Creative Education, 11*, 1504-1520. Retrieved June 2024, from https://doi.org/10.4236/ce.2020.118109

ICE. (2023, October 11). *Girlguiding joins forces with the ICE to empower future engineers*. Retrieved June 2024, from https://www.ice.org.uk/news-insight/news-and-blogs/latest-news/news/girlguiding-and-ice-to-empower-future-engineers

Indeed. (2024, February 13). *Career Development*. Retrieved June 2024, from 12 Engineering Skills That Companies Look For: https://www.indeed.com/career-advice/career-development/engineering-skills-companies-look-for

Lopes, M. (2023, December 5). *Futuro do trabalho: Nove tendências que as empresas vão ter (mesmo) de ter em conta em 2024*. Retrieved June 2024, from https://hrportugal.sapo.pt/futuro-do-trabalho-nove-tendencias-que-as-empresas-vao-ter-mesmo-de-ter-em-conta-em-2024/

Manpower Group. (2024). *Global Talent Shortage - 2024*. Retrieved June 2024, from https://go.manpowergroup.com/talent-shortage

Margarida Rodrigues, F. S. (2022). *Mais e Melhores Empregos para osJovens - Livro Branco.* Retrieved June 2024, from https://obsempregojovem.com/p/65796ec408db1d41cec700f2

Martins, P. (2024, April 30). *Um mercado de trabalho envelhecido, segmentado e com salários na cauda da Europa*. Retrieved July 2024, from https://ffms.pt/pt-pt/atualmentes/um-mercado-de-trabalho-envelhecido-segmentado-e-com-salarios-na-cauda-da-europa?_gl=1*1t4qz4s*_up*MQ..*_ga*MTIxOTQ1MDA5MS4xNzE4NzA1MjIx*_ga_N9RLJ8M581*MTcxODcwNTIyMC4xLjEuMTcxODcwNTM1NC4wLjAuMA

Mateus-Coelho, N. (2024, January 19). *O êxodo dos engenheiros*. Retrieved June 2024, from CNN: https://cnnportugal.iol.pt/engenheiros/nuno-mateus-coelho/nuno-mateus-coelho-o-exodo-dos-engenheiros/20240119/65aa9b7fd34e371fc0bc260a

Nunes, R. R. (2024, June 26). Os alunos que as empresas precisam. *Sábado*. Retrieved july 2024, from https://www.sabado.pt/portugal/detalhe/como-se-garante-o-futuro-no-mundo-do-trabalho

OECD. (2023). *Education at a Glance 2023: OECD Indicators.* Paris: OECD Publishing. Retrieved June 2024, from https://doi.org/10.1787/e13bef63-en

Oliveira, R. (2024, February 5). É obrigatório o aumento do salário médio. *Expresso*. Retrieved June 2024, from https://expresso.pt/opiniao/2024-02-05-E-obrigatorio-o-aumento-do-salario-medio-ed29f426

Pinheiro, P. (2024, June 29). As mulheres na engenharia. *Público*. Retrieved July 2024, from https://www.publico.pt/2024/06/29/p3/cronica/mulheres-engenharia-2095555

Portocarrero, M. (2024, January 29). *Quais são os empregos do futuro?* Retrieved July 2024, from https://ffms.pt/pt-pt/atualmentes/quais-sao-os-empregos-do-futuro?_gl=1*cup097*_up*MQ..*_ga*MTMzODQ2NjA4NS4xNzE4NzkwODQ5*_ga_N9RLJ8M581*MTcxODc5MDg0OS4xLjAuMTcxODc5MDg0OS4wLjAuMA