The E4E Common Methodology to Assess, Anticipate and Monitor the Evolution of the Engineering Profession with a Focus on Competences

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1. INTRODUCTON

The Engineers for Europe (E4E) project is not an academic endeavour but an operational answer to the many challenges of the engineering profession in Europe. An integral part of the project is the design of a mechanism to gauge the dynamics of the profession: such "monitoring tool" should be able to capture the dynamics and trends of the profession as a whole. As a European project concerning the engineering profession "at large", the methodology should not be too granular and specific, so as to be able to identify trends that affect the profession across industries, functions, and countries.

The aim of this methodology is to provide a set of common guidelines and references for E4E partners to carry out applied research, rather than fundamental research. Its objective is to create a unified framework that will allow E4E partners to gather data, information, statistics, and analysis to develop an operational document that facilitates dialogue between the worlds of education and work, across the engineering profession.

The goal of the E4E Project is to investigate the evolution of the engineering profession from an operational perspective. The E4E project includes a variety of partners, each representing a different facet of the engineering profession. Thus, the methodology aims to create a cohesive approach to investigate the engineering profession by combining various methods.

The methodology provides a common ground for E4E partners to gauge the dynamics, challenges and opportunities of the engineering profession, culminating in the yearly Engineering Skills Strategy.

1.1 The E4E project

The role of engineering in shaping our social and economic interactions has become increasingly important. Nowadays, engineering is crucial in designing and delivering products and services related to health, education, transportation, mobility, infrastructure, energy, climate action, water, sanitation and telecommunication. The profession's importance has been further amplified by the digital and green transformations, which have created new opportunities and challenges, such as Artificial Intelligence, the Internet of Things, the process of green growth, the circular economy and decarbonization.

Despite the growing importance of engineering, significant asymmetries, mismatches, and polarization have undermined the profession's potential impact. Official statistics, data, and empirical evidence illustrate how there is a shortage of engineers in Europe (McGrath, 2021[1]), which is chronically needed to meet the 2030 and 2050 targets. Additionally, reliable data and information about the profession's dynamics and trends are lacking.

The focus on technical skills for engineers has led to skill polarization dynamics, creating a considerable gap in transversal skills. Employers are increasingly seeking multidisciplinary skills in engineering. There is also a growing distance between the world of education and the world of work in engineering. Lack of integration among HE, VET, and Industry to upskill and reskill engineers has further exacerbated these issues.

The skills mismatch in the domain of professional skills (technical, interpersonal, and cognitive skills) and transversal competencies is widening and Europe is facing an "engineering innovation and competitiveness challenge" with competitive pressures from USA and Asia. These factors make it even more urgent to reinforce the profession and take steps to address these challenges.

E4E aims to establish a well-organized and long-lasting partnership between the education sector (including higher education + vocational training) and the engineering profession, represented by professional organizations and industry players. The primary objective is to enhance the innovation and resilience of European engineers by enabling them to acquire new competencies and skills such as digital, green, resilient, and entrepreneurial ones.

There are three primary objectives of E4E:

1. Contribute to strengthening the capacity of the engineering profession to address EU's societal challenges and priorities, such as digital and green transformations and decarbonization.
2. Bridge the gap between education, training, and industry in the engineering field.
3. Implement EU competence frameworks, including DigComp, LifeComp and EntreComp, in the context of the engineering profession.

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[1] McGrath, J., (2021), ELA (European Labour Authority): Report on Labour Shortages and Surpluses, November 2021

1.2 The Partnership

The project pools diverse expertise and experience from the various domains of engineering, pooling expertise from HE, VET, industry and professional bodies:

ENGINEERS EUROPE – ENGINEERS EUROPE is a federation of professional engineers that unites national engineering associations from 33 European Higher Education Area (EHEA) countries. ENGINEERS EUROPE is striving for a single voice for the engineering profession in Europe and wants to affirm and develop the professional identity of engineers.

FEUP – Faculdade de Engenharia da Universidade do Porto (FEUP) is the leading institution for higher education and scientific research in Portugal and one of the top 200 European universities, with +33.000 students (19% international), 2.000 academics & researchers and 1.600 administrative staff.

TU Dublin is Ireland's first Technological University by statute required to create programmes that involve business, enterprises and professions. The University also promotes diversity and equality access to underrepresented groups, including gender equality.

KU Leuven – represents excellence in international research and education. It is Belgium's largest university (+60.000 students) and one of the oldest in Europe (founded in 1425). KU Leuven ranks among the 50 best universities worldwide and is Europe's most innovative university.

AECEF – Association of European Civil Engineering Faculties, established in 1992, encourages cooperation among HEIs by organising 10 symposia dedicated to relevant topics such as university-industry interaction, use of ICT, the engineer of the future and sustainability.

Newport Group is one of Slovakia's largest private and independent business-oriented education providers. NG triggers higher education programmes, vocational training programmes, advanced professional training, and continuing education.

IVEPE – Institute of Industrial and Business Education & Training is a no-profit educational association, founded in 1980 by a group of Greek industries to establish a creditable VET body to provide quality training and supporting lifelong learning of employees, unemployed, self-employed and people of vulnerable social groups.

ANECA – National Agency for Quality Assurance and Accreditation of Spain is a public and independent body that strives to promote and improve the quality in higher education through the evaluation and accreditation of degree programmes, academic and staff institutions.
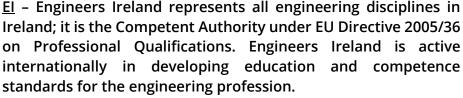
VDI - Verein Deutscher Ingenieur is the Association of German Engineers with a strong territorial presence at local level with state and district associations. VDI's mission is the same since 1856, to bundle "all the intellectual strengths of technology to work together".

EI – Engineers Ireland represents all engineering disciplines in Ireland; it is the Competent Authority under EU Directive 2005/36 on Professional Qualifications. Engineers Ireland is active internationally in developing education and competence standards for the engineering profession.

OE – Ordem dos Engenheiros is a public professional association representing engineering and established in 1936, with a legacy of 70 years. OE's mission is to control the access to the professional activity of engineers and its exercise, to contribute to the safeguard, promotion and progress of engineering and defend ethics, deontology, and professional qualifications of engineers.

REHVA – Federation of European Heating Ventilation and Air Conditioning associations, founded in 1963, is as an umbrella organisation connecting EU associations in building engineering services. REHVA represents +120.000 HVAC engineers and technicians from 26 European Countries.

ECEC – European Council of Engineers Chambers is the umbrella organisation of European Engineers Chambers, representing the professional interest of Chartered Engineers at EU level. ECEC currently represents 16 Chambers (and 4 associate partners) and over 300.000 highly qualified European chartered engineers.

2. E4E WORK PACKAGE 2

Work Package 2 (WP2)" deals with the European engineering profession and more in particular with the "Skills Council and the Skills Monitoring and Anticipation tools". It is the first technical work package of the E4E project. The goal of WP2 is to create a sustainable and effective framework for E4E that enhances the competitiveness of the engineering profession in Europe. This will be achieved through robust cooperation between HE-VET-industry and a systemic approach to identifying the skills and competences necessary to meet societal challenges.

WP2 consists of four main tasks:

1. Establishing the Skills Council's structure and governance mechanism.
2. Developing a common methodology to assess the evolution of the engineering profession's skills and competences.
3. Identifying trends and opportunities for skills development.
4. Anticipating the skill requirements of the profession through the E4E Skills Strategy.

The common methodology presented in this document represents the deliverable from task 2 in WP2 of the E4E project. This methodology serves as the foundation for task 3, which involves identifying trends, challenges, and opportunities for skills development within the engineering profession, and also for task 4, which entails anticipating the skill requirements of the profession through the E4E Skills Strategy.

The common methodology is structured on 3 pillars:

1. <u>Assess current situation</u>: the methodology defines the tools, data, research models and assumptions to assess the "state of play" concerning demand and supply of skills and competences for the profession, with a specific focus on the "non-technical" aspects such as:
   - Digital skills needed for a more integrated, dynamic and multidisciplinary profession.
   - Green skills: how the profession requires skills linked to a circular and greener economy.
   - Resilience skills: also referred to as "transversal", "soft" and "entrepreneurial" skills, i.e., adaptability, change management and care for each other as a community.
2. <u>Anticipate future needs</u>: based on realistic scenarios and the results of the analysis of the current situation, the methodology will allow to anticipate future needs for skills and competences of the profession.

3. <u>Monitor progress</u> on a yearly basis to gauge the evolutions of the demand and supply of skills for the engineering profession to adjust the Skills Strategy.

The multi-dimensional methodology of WP 2 establishes the framework for partners to identify challenges and opportunities for the EU engineering profession, its skills and competence dynamics considering the following trends:

1. Global dynamics & prospective to frame the E4E Skills Strategy in the international and global perspective, rather than remaining a self-serving "EU-centric" strategy.

2. Societal changes that can be positively tackled by the engineering profession and have an impact on consumers and citizens.

3. Economic and industry trends that will drive the profession at global and EU levels.

4. Labour market dynamics, including aspects such as entry in the profession, youth, ageing in the profession, gender inclusion in Science, Technology, Engineering, and Mathematics (STEM) in the profession, and sustainability.

5. Technology evolutions that may affect the set of skills and competences required by a qualified engineer.

3. AN OPERATIONAL APPROACH TO THE E4E RESEARCH METHODOLOGY

The E4E research methodology combines primary and secondary research methods to gather relevant data from various stakeholders in the profession.

Primary research involves the organization of focus groups, and/or interviews, and/or questionnaire-based surveys with representatives of the engineering profession along the whole cycle of education, training, the world of work, employers and industry. This approach enables the E4E project to involve at least 200 stakeholders relevant to the profession in each round of monitoring. This primary research method provides in-depth insights into the challenges, opportunities and skills required in the engineering profession.

Secondary research is based on desk research that captures specific trends for the engineering profession. This approach involves a review of relevant literature, reports, and statistics related to the profession, including the identification of trends and the development of at least 10 Fiches. Each Fiche depicts examples of concrete action, capturing not only good practices but also lessons learned about what works and what

does not work in the acquisition of digital, green, resilience and entrepreneurial skills among engineers.

The E4E Fiches identify examples and practices of concrete policies and initiatives at regional and national levels addressing digital, green, resilience and entrepreneurship skills shortages/mismatches and brokering multi-stakeholder partnership models. These Fiches provide actionable insights to policymakers, educators, and industry leaders about how to address the skills shortages and mismatches in the engineering profession and promote the acquisition of critical skills.

The material for preparing the fiches must be gathered through desk research (task 2.3). The fiches will be included in deliverable D2.4 (E4E Skills Strategy: Anticipating Skill Requirements for the Engineering Profession).

Overall, the E4E research methodology takes an operational approach to the analysis of the engineering profession, combining primary and secondary research methods to gather relevant data and identify opportunities and challenges for the profession. The methodology aims to provide actionable insights to stakeholders in the profession about how to address the skills shortages and mismatches and promote the acquisition of digital, green, resilience and entrepreneurial skills among engineers.

4. PRIMARY RESEARCH

The E4E project's primary research efforts in WP2 will involve a minimum of 200 stakeholders associated with the engineering profession throughout the entire cycle of education, training, industry, employers and the world of work. In this context, stakeholders refer to individuals who have a direct or indirect association with the profession and its related activities.

Each partner has the highest degree of flexibility to carry out the primary research, using any means available to reach and involve stakeholders. Possible means can be:

1. Direct interview (face-to-face)
2. Virtual interview (email-based or videoconferencing)
3. Focus groups
4. Roundtable discussion
5. Formal gatherings (i.e. seminar, conferences, workshops)
6. Informal gatherings (i.e. side events of conferences)

Partners will use the key research questions described in Box 1 to gather inputs from respondents. Inputs from respondents will be processed individually by each partner and used to develop the Country Snapshot.

Box 1. Key Research Questions

1) How will the engineering profession evolve over the next 5 and 10 years?
2) What are the emerging technical and transversal skills and competencies required in the engineering profession?
3) How do hard and soft skills differ in terms of their importance for success in the engineering profession?
4) What is the role of the engineering profession in the implementation of Sustainable Development Goals (SDGs)?
5) How can the engineering profession contribute to the achievement of SDGs through the development of new skills and competencies?
6) How can engineers be trained to become "conscious engineers" who prioritize ethical and sustainable practices in their work?
7) What are the challenges and opportunities for the engineering profession in adapting to the changing nature of skills and competencies required?
8) How can engineering education and training programs better prepare students for the evolving nature of the profession?
9) What are the key factors that contribute to successful multi-stakeholder partnerships in addressing skills shortages/mismatches in the engineering profession?
10) How can policies and initiatives at regional and national levels effectively address the digital, green, resilience and entrepreneurship skills shortages/mismatches in the engineering profession?

Please identify case studies (examples of what works) and lessons learned (examples of what did not work).

Each Organization participating in the E4E project should select a sample of stakeholders that reflects the specific sector representing their primary engagement. For example, universities should select stakeholders from the higher education sector, while VET providers should select stakeholders from the VET ecosystem. Similarly, professional bodies and industry partners should select stakeholders who are engineering professionals. This will ensure that the primary research is conducted with stakeholders who have relevant knowledge and experience in the specific sector and

can provide valuable insights into the skills and competencies required in their respective fields.

The target is to engage at least 200 stakeholders, requiring each consortium partner (there are 13 in the E4E-project) to involve at least 16 stakeholders in their primary research efforts. Larger partner Organisations are expected to involve a higher number than smaller partner organisations.

5. SECONDARY RESEARCH

The purpose of this section is to define literature and other sources for Secondary Research and any other resource that can provide comparable information and inputs into WP2.

E4E-Partners will carry out desk research to investigate existing literature, policy papers, analysis and diagnostics on the trends, dynamics, challenges, and opportunities of the engineering profession from the perspective of the specific sector to which each partner relates, as follows :

A) HEI - Higher Education Institutions : Universities will focus on the current state of engineering education, including curriculum, teaching methodologies, and pedagogical practices, as well as the challenges and opportunities associated with the evolution of the profession in the next 5 to 10 years.

B) VET : VET providers will dig into the current state of vocational education and training for engineering professions, including training programs, apprenticeships and other forms of work-integrated learning. They should also explore the role of VET providers in developing and delivering digital/green/resilience/entrepreneurship skills for engineers, as well as the challenges and opportunities associated with the evolving nature of the profession in the next 5 to 10 years.

C) Professional Bodies and Industry Associations : Associations and Professional bodies in the field of engineering will focus on the current state of the engineering profession in the workforce, including employment trends, job descriptions and required skills and competencies. They should also explore the role of professional bodies and industry in promoting the acquisition and development of digital/green/resilience/entrepreneurship skills for engineers, as well as

the challenges and opportunities associated with the evolving nature of the profession in the next 5 to 10 years.

Regarding the type of documents that partners will identify, those vary depending on many factors, i.e. publishing organisation, country, sector, etc. In general terms, partners will identify all those pieces of literature that can be researched irrespective of their name or definition. Examples of names of literature resources could be:

- Position Papers
- Policy briefs
- Documents issued by Professional Chambers
- Memoranda
- Analysis
- Research findings
- Surveys
- Etc.

The results of the literature research will then be consolidated in one document that will constitute the basis of the E4E project and will also be referenced to in the other Work Packages and their results.

A separate Excel file is the template for the collection of information on the literature research. The APA citation style will be adopted for the future research. (https://apastyle.apa.org/style-grammar-guidelines/references/examples).

A few guidelines on the type of documents partners should look for:

Policy documents and industry reports can go under various names (Policy document, memo, strategy, action plan, memorandum, programme document, etc). In addition to the policy papers produced by EU institutions, partners will identify specific market research/industry reports to gain a comprehensive understanding of the trends, dynamics, challenges, and opportunities of the engineering profession.

Another relevant resource is the research carried out at the academic level, as it can reveal valuable information of the dynamics of the engineering profession stemming from academic literature, PhD thesis and other research community stakeholders.

Irrespective of the name of the document, the key elements that guide E4E in the identification of the relevant documentation are:

- Source: any document emanated by :
  - A Public authority at any level of governance, i.e. from municipality to national/federal agency. Ministries and agencies may have published interesting reports about the quality of the engineering education, with

focus on necessary skills in the engineering profession. Please consider that the National Statistical Office is also part of this category, and usually a relevant source of data.

Pan European associations will investigate the "International public sector" represented by international organisations (UN System, OECD) as well as European institutions and agencies (Parliament, Commission, EASME, Cedefop, Eurostat, etc.).

- <u>Private sector</u>: many consulting firms can be a valuable source of information for the engineering profession, as consulting and advisory companies often conduct research on topics relevant to sustainable development and business trends. Apart from the large and famous companies (*McKinsey, KPMG, PwC, Deloitte, etc.)* there may be niche consulting firms that have published interesting reports. These reports can provide insights into emerging technical and transversal skills and competencies required in the engineering profession, as well as the challenges and opportunities for adapting to the changing nature of skills and competencies required.

- <u>Third sector and NGOs</u>: in this category, we include the business associations (Federation of Industrialists, Association of SME, sector-specific industry associations, etc.) that may have published interesting data and information on the evolving nature of the engineering profession. Under the Third Sector, we also include the "social actors" of the likes of Trade Unions, environmental groups, social inclusion associations, etc. each representing a specific interest (labour, environment, social, health, etc.).

- <u>Research community and academia</u>: universities and research centres typically publish very interesting – and at times thought-provoking – studies and analyses. While at times too theoretical by nature, those publications can provide a very interesting insight into the trends and dynamics of the engineering profession, as well as valuable data. In addition, referencing academic and scientific literature can typically strengthen the results of the research and analysis.

- <u>VET and educational ecosystem</u>: the VET system – and more generically the education system at large, if relevant and possible – should also be investigated as there may be interesting reports coming from VET providers and stakeholders that have worked on human capital aspects on the evolving nature of the engineering profession in general.

- Defining a hierarchy of sources: among the sources identified, partners should select those that are most reliable. Trustworthiness of the source is a function of the organisation/author publishing the report; for instance, the National Statistical Office of a country is the most reliable and credible source of data. When screening resources and references, please bear in mind that WP2 should hinge as much as possible on credible data and information. Just a few examples:

  - Among public authorities, reliability is often associated with the layer of governance, i.e., the National Bank or a Ministry is often regarded as more trustworthy than a local authority (due to capacity, ability to collect data, modelling techniques, etc.).
  - Among the private sector, business associations are usually very good sources as they represent a sectors interest rather than an individual enterprise's interest.
  - Among the research community, a scientific paper published in a "high impact" / Q1 / Tier 1 journal by outstanding academics is a more reliable source of information compared to other resources.
  - Among media, a well-established editorial resource (The Economist, Financial Times, Le Monde Diplomatique, etc.) is considered more reliable.
  - Among web resources, the blog of an organisation with a robust reputation (i.e. the blog of the OECD, IMF, WB, etc.) can be associated with higher reliability than Wikipedia or other open-source outlets.

  ! *Please note that the above are purely indicative comments and by* ! *no means are meant to undermine the credibility of sources and resources not directly mentioned as an example.*

- Date of publication: <u>no document dating earlier than 2019</u> should be taken into consideration. In the fast-evolving nature of the engineering profession, information, data, and statistics dating back three years before the research period may be no longer relevant and out of date. Exceptions are made for those documents that could still be relevant irrespective of the year of publication, for instance because of the prestige of the author/entity publishing the report or the validity of the information/data/qualifications.

In addition to policy and research documents, valuable sources are also web-based publications and resources. Great examples are the many resources (articles, videos, tools, etc.) available on LinkedIn and other networking platforms.

In consideration of the importance of web resources, partners are strongly encouraged to carry out research on their respective country's web resources (including national search engines in addition to international ones, i.e. in the case of

Germany, carry out the research using www.google.com, www.google.de but also www.web.de).

In searching the Internet, the following keywords could be of use:

1. "engineering profession" AND "evolution" AND "5 years" OR "10 years"
2. "emerging skills" AND "competencies" AND "engineering profession" OR "engineering industry"
3. "hard skills" AND "soft skills" AND "engineering profession"
4. "engineering profession" AND "sustainable development goals"
5. "engineering profession" AND "sustainable development goals" AND "skills development"
6. "engineering profession" AND "conscious engineering" AND "ethical practices"
7. "engineering profession" AND "skills and competencies" AND "changing nature" AND "challenges" OR "opportunities"
8. "engineering education" AND "training programs" AND "evolving nature" AND "engineering profession"
9. "engineering profession" AND "multi-stakeholder partnerships" AND "skills shortages" OR "mismatches"
10. "engineering profession" AND "skills shortages" OR "mismatches" AND "digital skills" OR "green skills" OR "resilience skills" OR "entrepreneurship skills" AND "policies" OR "initiatives"

The above search strings are merely examples that should be adapted by partners to their respective operational and national contexts.

As an example, the following sources and resources have been used at proposal stage to provide data, information, and statistics about the engineering profession in Europe:

- Bacigalupo, M., Kampylis, P., Punie, Y., & Van Den Brande, L. (2016). EntreComp: The Entrepreneurship Competence Framework. EUR 27939 EN, Publications Office of the European Union, Luxembourg. JRC101581.
- Cedefop. (2019). Science & engineering technicians: skills opportunities and challenges. Skills Panorama.
- Cedefop. (2019). Skills for green economy. Brussels, 11.12.2019 COM(2019) 640 final COMMUNICATION FROM THE COMMISSION The European Green Deal.
- Economist Intelligence Unit. (2020). Global Engineering Capability Review.
- EU Commission, DG Employment, Social Affairs and Inclusion. (2020). Analysis of Shortage and Surplus Occupations 2020.
- EU Commission. (2020). A European Approach to Micro-Credentials.

- Sala, A., Punie, Y., Garkov, V., & Cabrera Giraldez, M. (2020). LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence. EUR 30246 EN, Publications Office of the European Union, Luxembourg. doi:10.2760/922681.
- UNESCO. (2021). Engineering for Sustainable Development: Delivering on the Sustainable Development Goals. UNESCO Engineering Report 2021.
- Vuorikari, R., Punie, Y., Carretero Gomez, S., & Van Den Brande, G. (2016). DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: the Conceptual Reference Model. EUR 27948 EN, Publications Office of the European Union, Luxembourg. JRC101254.

6. RENDERING

The outcomes of the research will be condensed into a Partner Snapshot (Annex 3).

This report will provide valuable insights into the research methodology employed, the types of literature sources utilized and the major findings and takeaways obtained from the research on the evolving nature of the engineering profession.

The Partner Snapshot should have the following structure:

- Introduction: overview of the evolving nature of the engineering profession from the point of view of your organization across the HE, VET and business ecosystem. Also, describe the support system, institutional framework if any, etc.
- Quantitative indicators on the evolving nature of the engineering profession from the perspective of your sector: HE, VET, Professional Bodies and Industry in Engineering (adoption rates; challenges or drivers for their implementation; etc.)
- Qualitative descriptions of the evolving nature of the engineering profession from the perspective of your sector: HE, VET, Professional Bodies and Industry in Engineering (sector bias: for instance, one sector is more advanced than another, i.e. IT ?, Constructions ?, geographic distribution: some regions are better than others, etc.)
- Opportunities
- Needs
- Challenges
- Bibliography

Then, key findings from all the Partner's Snapshots will be consolidated into the E4E European Engineering Profession Skills Strategy of WP2

ANNEXES

ANNEX 1: GUIDELINES FOR PRIMARY RESEARCH

Annex 1.1. Survey guidelines

Conducting a survey involves a series of steps that should be followed to ensure the accuracy and validity of the results. Here's a general overview of the survey process:

- Define the objectives and target audience : start by defining the objectives of the survey and the target audience. This will help you determine the questions you need to ask and whom you need to survey.
- Choose a survey method : decide on the survey method that you will use. You can use online surveys, paper surveys, telephone surveys, or in-person surveys. Each method has its advantages and disadvantages, so choose the one that is most appropriate for your audience and objectives.
- Develop the survey questions : develop the survey questions based on your objectives and target audience. Keep the questions clear, concise, and relevant. Avoid leading questions, biased language, and jargon that the target audience may not understand.
- Test the survey : before launching the survey, test it with a small group of people to make sure that the questions are clear, the format is user-friendly and the response options cover all possible answers.
- Distribute the survey : once you have finalized the survey, distribute it to your target audience using the chosen survey method. Provide clear instructions on how to complete the survey and a deadline for responses.
- Make sure your survey is accessible and your participants understand how to complete it. Monitor your survey response rate and follow up with non-respondents to increase your response rate.
- Collect and analyse the data : collect the responses and analyse the data to draw conclusions and insights. Use statistical software to analyse the data and create reports that summarize the findings.
- Report the results: use graphs, charts and other visual aids to present the data in a clear and easy-to-understand way.

For the First Round of the Survey please use these links:

1. Survey Part 1: https://www.1ka.si/a/e4d66645
2. Survey Part 2: https://www.1ka.si/a/ed8243ab

Annex 1.2. Focus group guidelines

Focus groups are a qualitative research method that involves a group of individuals who are brought together to discuss a particular topic or issue under the guidance of a moderator.

A. <u>The bases for conducting focus groups can include</u> :

- Exploring attitudes and opinions. The focus group participants are encouraged to share their thoughts and feelings openly, which can provide valuable insights into their perceptions and preferences.
- Understanding behaviour. By asking participants about their experiences with a product or service, researchers can gain insights into how people use and interact with different products or services.
- Generating ideas. Focus groups can be used to generate new ideas or refine existing ones. By bringing together a diverse group of participants, researchers can get a range of perspectives and feedback, which can help generate new ideas or refine existing ones.
- Testing concepts. Focus groups can be used to test new concepts, products, or services before they are launched. By getting feedback from potential customers, researchers can identify potential problems or areas for improvement before the product or service is launched.

B. <u>To conduct a focus group, you can follow these general steps</u> :

- Determine the purpose and objectives : clarify what you want to learn from the focus group and why. Define the objectives and the key research questions you want to answer.
- Recruit participants : identify the target audience for the focus group and recruit participants that match the criteria. You can use a variety of recruitment methods, such as social media, online communities, email lists, and personal referrals.
- Choose a location : choose a location that is convenient for participants and provides a comfortable and safe environment for the focus group discussion. You can choose a physical location, such as a meeting room or a research facility, or conduct the focus group online.
- Develop a discussion guide : create a discussion guide that includes a set of open-ended questions or prompts that will guide the conversation. The questions should be designed to elicit detailed and informative responses from participants. Please consult the Key Research Questions, page 10 of this document.

- Conduct the focus group : on the day of the focus group, welcome participants and introduce the moderator. Explain the purpose of the focus group and review the ground rules. Start the discussion by asking the first question and encourage participants to share their thoughts and ideas.
- Record and transcribe the discussion : record the focus group discussion using a video or audio recorder. You can also take notes or have an assistant do it. Transcribe the discussion for analysis.
- Analyse the results : review the transcription of the discussion and analyse the results. Look for patterns, themes and insights that can answer the research questions and objectives.
- Report the findings : Write a report that summarizes the findings from the focus group. Use quotes, examples and data to illustrate the key insights and recommendations.

C. The profile of the focus group moderator :

A focus group moderator is responsible for facilitating the discussion and guiding the participants to provide valuable insights and information.

The moderator should have the following profile:

- Strong interpersonal skills : the moderator should have strong communication and interpersonal skills to build rapport with the participants and create a comfortable and safe environment for the discussion.
- Objectivity : the moderator should be objective and impartial to avoid influencing the participants' opinions or responses.
- Knowledge and expertise : the moderator should have knowledge and expertise in the topic or issue under discussion. This will help to ask informed and relevant questions and provide insights and interpretations of the results.
- Flexibility : the moderator should be flexible and adaptable to adjust the discussion guide or approach based on the participants' responses and reactions.
- Open-mindedness : the moderator should be open-minded and receptive to new ideas and perspectives, even if they challenge their preconceptions or assumptions.
- Neutral demeanour : the moderator should have a neutral demeanour to avoid any influence on the participant's responses or opinions.
- Listening skills : the moderator should have excellent listening skills to capture and interpret participants' responses accurately.
- Overall, the moderator should be a skilled facilitator who can keep the discussion focused and productive, while also ensuring that all participants feel heard and valued.

D. Suggested focus group report structure :

- Introduction : start the report by introducing the purpose and objectives of the focus group. Provide background information about the topic or issue under discussion and describe the target audience and recruitment process.
- Methodology : describe the methodology used to conduct the focus group. Include details about the location, date, time and duration of the focus group, as well as the number of participants and any relevant demographic information. Also, explain the discussion guide and how the moderator facilitated the discussion.
- Results : summarize the key findings from the focus group. Include quotes and examples to illustrate the key insights and recommendations. Group the results into themes or categories that answer the research questions and objectives.
- Discussion : discuss the implications of the findings for the topic or issue. Explain how the results align with the existing literature or research and identify any areas of agreement or disagreement with previous studies. Also, discuss any limitations or challenges encountered during the focus group.
- Recommendations : provide recommendations based on the findings of the focus group. Explain how the recommendations align with the objectives and research questions and identify any potential benefits or challenges associated with implementing the recommendations.
- Conclusion : summarize the main points of the report and reiterate the key findings and recommendations. Also, acknowledge any limitations or areas for future research.
- Appendices : Include any additional materials, such as the discussion guide, transcripts, or participant consent forms.

Make sure the report is well-structured, easy to read, and includes appropriate headings and subheadings. Use clear language and avoid jargon or technical terms that may be difficult for non-experts to understand. Finally, proofread the report for grammar and spelling errors before submitting it.

Annex 1.3. Semi-structured interview guidelines

Before conducting a semi-structured interview, you should have a clear understanding of your research questions.

- Select your participants : identify the participants who will provide the information you need. Consider factors such as age, gender, occupation, and expertise.
- Develop an interview guide : create a list of open-ended questions that you will ask your participants. You can also include follow-up questions that will help you get more information.
- Pilot test your interview guide : before conducting the interview, test your interview guide on a few participants to make sure the questions are clear and effective.
- Conduct the interview : schedule a time and place to conduct the interview. Make sure you have all the necessary equipment, such as a recorder, notebook, and pen. Start by introducing yourself and explaining the purpose of the interview. Encourage the participant to speak freely and ask follow-up questions as needed.
- Record the interview : it's important to record the interview so that you can accurately transcribe and analyse the data. Make sure you have the participant's consent to record the interview.
- Analyse the data : transcribe the interview and analyse the data. Look for patterns and themes in the responses that can help answer your research questions.
- Follow up : after the interview, follow up with the participants to thank them for their time and to clarify any responses that may need further explanation.

The profile of the interviewer:

- Good communication skills : the interviewer should be able to communicate effectively with the participants and establish a good rapport with them.
- Knowledge of the research topic : the interviewer should have a good understanding of the research topic and be able to ask relevant questions to gather useful data.
- Flexibility : the interviewer should be flexible in their approach and able to adapt to the participant's responses and follow-up questions.
- Objectivity : the interviewer should be able to maintain an objective stance throughout the interview and avoid biases that may influence the data collection process.

- Empathy : the interviewer should be able to empathize with the participants and create a safe and comfortable environment for them to share their experiences and opinions.
- Organizational skills : the interviewer should be organized and prepared for the interview, including having a clear set of questions to guide the conversation and a plan for recording and analysing the data collected.

Annex 1.4. Formal and informal gatherings guidelines.

A. <u>Collecting and analysing data after a formal/ informal gathering</u>

- Identify the purpose of the gathering : before collecting any data, you need to identify the purpose of the gathering. What questions do you want to answer? What information are you trying to gather? Understanding the purpose of the gathering will help you determine the data you need to collect.
- Choose your data collection method : there are several methods you can use to collect data after an informal gathering, such as surveys, interviews, focus groups, and observation. Choose a method that is appropriate for the purpose of your gathering and the type of information you want to gather.
- Create a data collection plan : once you have chosen your data collection method, create a plan for collecting the data. This plan should include details such as who will collect the data, how the data will be collected and when it will be collected.
- Collect the data : once you have a plan in place, it's time to collect the data. Make sure that you follow your plan and collect the data in a way that is consistent with your chosen method.
- Analyse the data : after collecting the data, it's time to analyse it. Look for patterns, trends and themes in the data. Identify any areas where there is agreement or disagreement among participants.
- Draw conclusions : based on your analysis, draw conclusions about the gathering. What did you learn? What were the key takeaways? Use your conclusions to inform any future gatherings you may plan.
- Communicate your findings : once you have drawn your conclusions, communicate your findings to the relevant stakeholders. This may include the participants of the gathering, organizational leaders, or others who may be interested in the results.
- Overall, collecting, and analysing data after an informal gathering can help you identify areas for improvement, and better understand the needs of your audience.

B. <u>The role of a researcher in a gathering and participatory observation</u>

- Setting goals and objectives : the researcher should work with the organizing team to establish clear goals and objectives for the gathering that align with the research project.
- The researcher should determine what data needs to be collected and how it will be collected. They should identify the best data collection methods and tools and ensure that they are appropriate for the gathering's informal nature.
- Recruiting participants : the researcher may help to identify and recruit participants who are relevant to the research question and ensure that there is diversity in the sample.
- Conducting data collection : the researcher should conduct data collection in a way that is ethical, respectful and aligned with the research goals. This might involve observing the gathering, conducting interviews or surveys with participants, or taking field notes.
- Analysing data : the researcher should analyse the data collected during the informal gathering using appropriate methods and techniques, such as thematic analysis or grounded theory.
- Drawing conclusions : based on the data analysis, the researcher should draw conclusions about the research question and the gathering's outcomes. They should also identify any implications for future research or practice.
- Communicating findings : the researcher should communicate the research findings to relevant stakeholders, such as the organizing team or participants of the gathering. This might involve preparing a report or presentation that highlights key findings and recommendations.
- Overall, the researcher in an informal gathering plays a critical role in ensuring that the gathering contributes meaningfully to the research project. They should work closely with the organizing team and be flexible and adaptable to the unique challenges and opportunities that arise in an informal setting.

C. <u>The Role of a Researcher in participatory observation</u>

- Observer: the researcher observes the activities and interactions of the group, taking detailed notes and recording key events and conversations.
- Participant : the researcher actively participates in the activities of the group, taking on a role within the group and participating in group activities, conversations, and interactions.
- Recorder : the researcher records data using a variety of methods, such as field notes, audio or video recordings and photographs.
- Ethnographer : the researcher seeks to understand the cultural context of the group and its practices and analyses the group's activities and interactions in relation to that cultural context.

- Interpreter : the researcher interprets the meaning of the group's activities and interactions and identifies patterns and themes in the data.
- Facilitator : the researcher may act as a facilitator, creating opportunities for group members to share their experiences and perspectives and encouraging dialogue and collaboration.
- Advocate : the researcher may advocate for the interests of the group being studied, and work to address any issues or challenges that arise during the research process.
- Overall, the role of the researcher in participatory observation is to engage with the group being studied in a way that allows for a deep understanding of their activities and interactions and to use that understanding to generate insights and knowledge that can contribute to the field of study.

ANNEX 2: GUIDELINES FOR SECONDARY RESEARCH

Annex 2.1. Suggested steps to follow for your Secondary Research

1. Identify the specific areas of the engineering profession that will be covered (Higher Education, VET, Professional Bodies, Industry).

2. Use relevant keywords and phrases and conduct a preliminary search on academic databases, research repositories and other relevant sources based on – as examples – the search descriptors as indicated on page 15 of this document.

3. Refine the search criteria by identifying additional keywords, concepts, and phrases that are relevant to the research questions.

4. Identify and select relevant sources: review the search results and identify the sources that are most relevant to the research questions. This may include academic articles, research reports, industry publications and other sources (Position Papers, Policy briefs, Documents issued by Professional Chambers, Memoranda, Analyses, Research findings, Surveys, etc.

5. Evaluate the quality and reliability of sources : assess the quality and reliability of the sources by reviewing the author's credentials, publication date and the credibility of the publisher or source. Ensure that the sources are peer-reviewed and use primary data sources.

6. Analyze and synthesize the information : read and analyze the selected sources, noting the key concepts, themes, and findings related to the research questions. Synthesize the information and develop a comprehensive understanding of the research topic.

7. Consolidate your findings using the Evidence Table (see Annex 2.2 below).

8. Identify any gaps in the literature and areas where further research is needed. This can help to refine the research questions and identify new areas for exploration.

9. Present the findings in a comprehensive report (see Annex 2.3 below). Present the findings in a clear and concise manner, using tables, graphs and other visual aids as necessary. Summarize the key concepts and themes and highlight any areas where there is consensus or disagreement among the sources.

10. Draw conclusions and make recommendations: based on the findings, draw conclusions, and make recommendations for future research, policy, and practice. Consider the implications of the findings for the engineering profession, education, and training.

11. Review and revise the research report, ensuring that it is well-structured, clearly written and based on sound evidence. Ensure that the report follows APA standards for citation and referencing.

Annex 2.2. Evidence Table Template

Suggested Table of Evidence content:

No	Author, study title, year	Problem statement	Methodology	Key Findings	Limitations

Advantages of using an Evidence Table in the literature review :

- Provides an overview of the research landscape : by organizing the key findings from multiple studies in a single table, researchers can quickly get an overview of the research landscape and identify areas of agreement or disagreement among the sources.

- Facilitates comparison and contrast : an evidence table makes it easy to compare different studies based on factors such as sample size, study design, intervention or exposure, and outcome measures.

- Aids in synthesis and interpretation : by summarizing the findings of multiple studies, an evidence table can help researchers synthesize and interpret the data more effectively, identifying patterns, trends and areas where further research is needed.

- Enhances transparency and rigour : by providing a clear and concise summary of the evidence, an evidence table enhances the transparency and rigour of the literature review, allowing others to follow the researcher's thought process and replicate the analysis if desired.

! Note that this document is aimed to help you elaborate the Partner Snapshot. They will not be required by the coordinator.

Annex 2.3. Secondary Research Report Template :

Suggested structure :

1. Background section (explain why the topic/problem is important; purpose statement / a clear sentence or paragraph that defines the purpose, objective, or intention of a document).

2. Methods (databases, search terms, inclusion/exclusion criteria, number of articles included in the review).

3. Findings or results (synthesis of the evidence/the main points that emerged from the review).

4. Discussion (possible directions: What will we do with this information ? What are the implications of these findings for practice ? What are the limitations of the evidence ?).

5. Conclusion (a concise recapping of the main points: quantitative and qualitative indicators on the evolving nature of the engineering profession, opportunities, needs, and challenges).

6. Bibliography

! Note that this document is aimed to help you elaborate on the Partner Snapshot. They will not be required by the coordinator!

ANNEX 3 : TEMPLATE OF THE PARTNER SNAPSHOT

E4E
Engineers for Europe
September 1, 2022 - August 31, 2025
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Partner Snapshot [Partner]

Developed by: [Partner]

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