



Design and Consulting Industry Skills Study

Executive summary 19.4.2024



Basis of the study

The design and consulting industry employs a significant number of highly educated workers from technical education fields. The industry is based on strong expertise in traditional engineering disciplines, but the changing operational environment requires increasingly broad and interdisciplinary knowledge to meet customer needs.

In this study, the skill needs of the design and consulting industry have been examined from quantitative and qualitative perspectives. Recommendations for promoting the development of the industry's expertise are presented at the end of the study.

The assessment of quantitative skill needs and workforce in the industry has utilized the statistical services and studies of the Finnish National Agency for Education, and information from Statistics Finland.

Qualitative skills needs of the industry were mapped based on interviews conducted with representatives of industry associations and companies in the industry at the beginning of 2024. Identifying future skill needs also took advantage of studies prepared by other industry representatives in recent years.

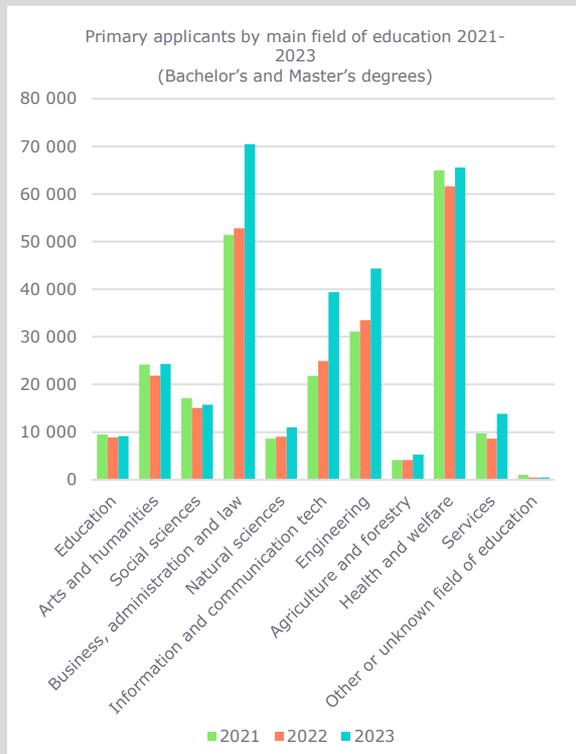
The fields of higher education in engineering examined in the study:

- Vehicle and Transportation Engineering
- Architecture
- Mechanical Engineering
- Process, Chemical, and Materials Engineering
- Civil and Urban Engineering
- Electrical and Automation Engineering
- Industrial Management and Leadership
- Environmental and Energy Engineering

The study was conducted from January to April 2024. The study was guided by Matti Kiiskinen and Otto Jalas from SKOL ry and Katriina Emaus from the Technology Industries of Finland. The work was carried out by Sami Ruotsalainen, Samuel Rintamäki, and Heikki Rannikko from Ramboll Finland Oy.

Number of applicants and places of study at the higher education level by main field of education

- The number of primary applicants for different fields of education in higher education have been on the rise in recent years. The most popular fields of education in 2023 were business, administration and law (70,400 applicants), health and welfare (65,500 applicants), and engineering (44,300 applicants).
- The number of applicants between 2021 and 2023 has increased the most in business, administration and law (+19,000), information and communication technologies (+17,600), and engineering (+13,200). The relative growth during this period has been greatest in information and communication technologies (+80%), engineering (+42%), and services (+42%).
- The number of places of study between 2021 and 2023 has increased the most in engineering (+3,683), health and welfare (+3,683), and business, administration and law (+2,804).
- The table shows the ratio of primary applicants to the number of places of study.



Field of education	2021		2022		2023	
	Places of study	Ratio of primary applicants to places of study	Places of study	Ratio of primary applicants to places of study	Places of study	Ratio of primary applicants to places of study
Education	4 361	2,2	4 477	2,0	4 259	2,2
Arts and humanities	7 282	3,3	7 536	2,9	7 838	3,1
Social sciences	3 714	4,6	4 018	3,8	3 896	4,1
Business, administration and law	14 700	3,5	16 332	3,2	17 504	4,0
Natural sciences	4 374	2,0	4 317	2,1	4 037	2,7
Information and communication technologies (ICT)	8 812	2,5	10 016	2,5	10 740	3,7
Engineering	16 296	1,9	18 217	1,8	20 147	2,2
Agriculture and forestry	1 483	2,8	1 703	2,4	1 726	3,1
Health and welfare	18 260	3,6	20 982	2,9	21 943	3,0
Services	3 759	2,6	4 034	2,1	4 276	3,2
Other or unknown field of education	471	2,1	215	2,1	186	2,6



Higher education places of study in the field of engineering

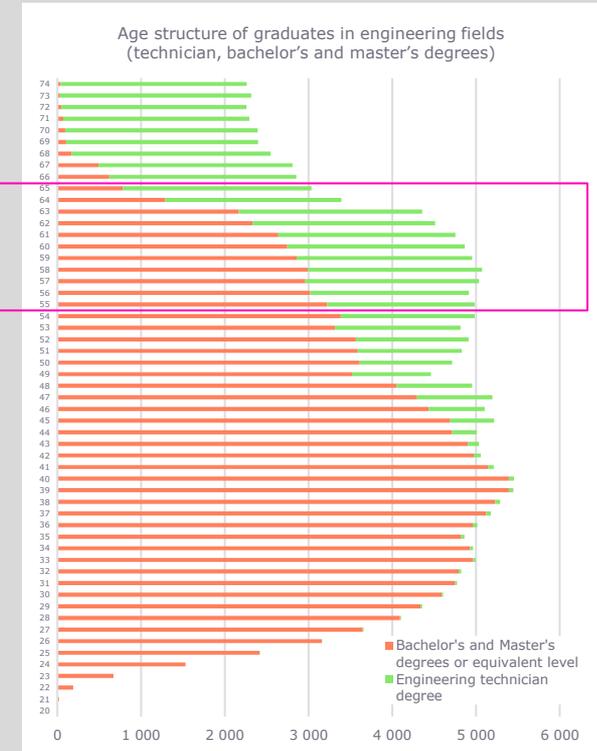
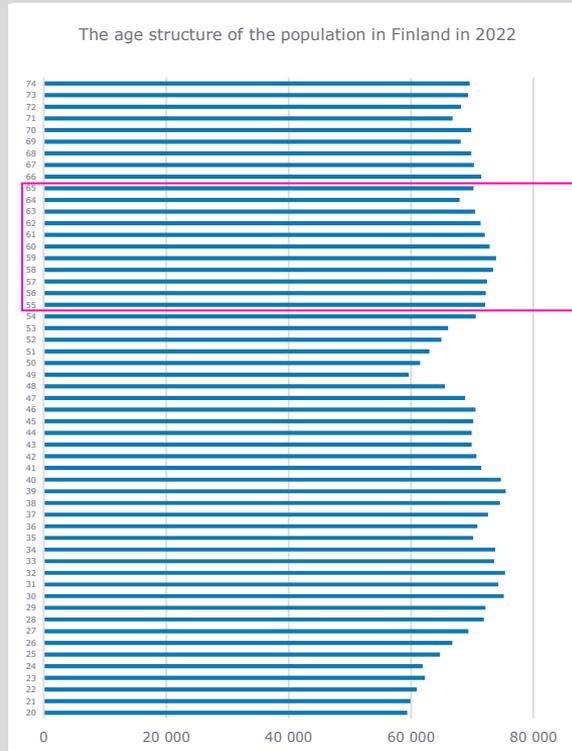
- In 2023, the most places of study in higher education in engineering were available in civil and urban engineering (3,900 places), electrical and automation engineering (3,600 places), and mechanical engineering (3,100 places).
- Between 2021 and 2023, the number of places of study increased the most in electrical and automation engineering (+856), environmental and energy engineering (+769), and industrial management and leadership (+645). The number of places of study decreased in the field of architecture (-3) and in other or unknown fields of engineering (-32).
- The highest relative increase in the number of places of study in the field of engineering was seen in vehicle and transportation engineering (+49%), industrial management and leadership (+46%), as well as environmental and energy engineering (+43%).

Places of study and primary applicants	2021		2022		2023		Change in number of places of study 2021-2023	Growth %
	Places of study	Primary applicants	Places of study	Primary applicants	Places of study	Primary applicants		
Vehicle and transportation engineering	731	1 518	1 001	1 746	1 091	2 367	360	49 %
Architecture	430	1 944	424	1 869	427	2 025	-3	-1 %
Mechanical engineering	2 615	4 839	2 749	5 121	3 108	7 110	493	19 %
Process, chemical and materials engineering	1 675	2 598	1 938	3 537	2 020	4 854	345	21 %
Civil and urban engineering	3 480	7 023	3 889	6 903	3 898	8 082	418	12 %
Electrical and automation engineering	2 760	5 814	3 259	7 008	3 616	9 681	856	31 %
Industrial management and leadership	1 396	3 555	1 705	4 125	2 041	5 607	645	46 %
Environmental and energy engineering	1 784	3 363	2 115	3 969	2 553	7 011	769	43 %
Other or unknown field of engineering	1 425	2 307	1 137	1 404	1 393	2 652	-32	-2 %



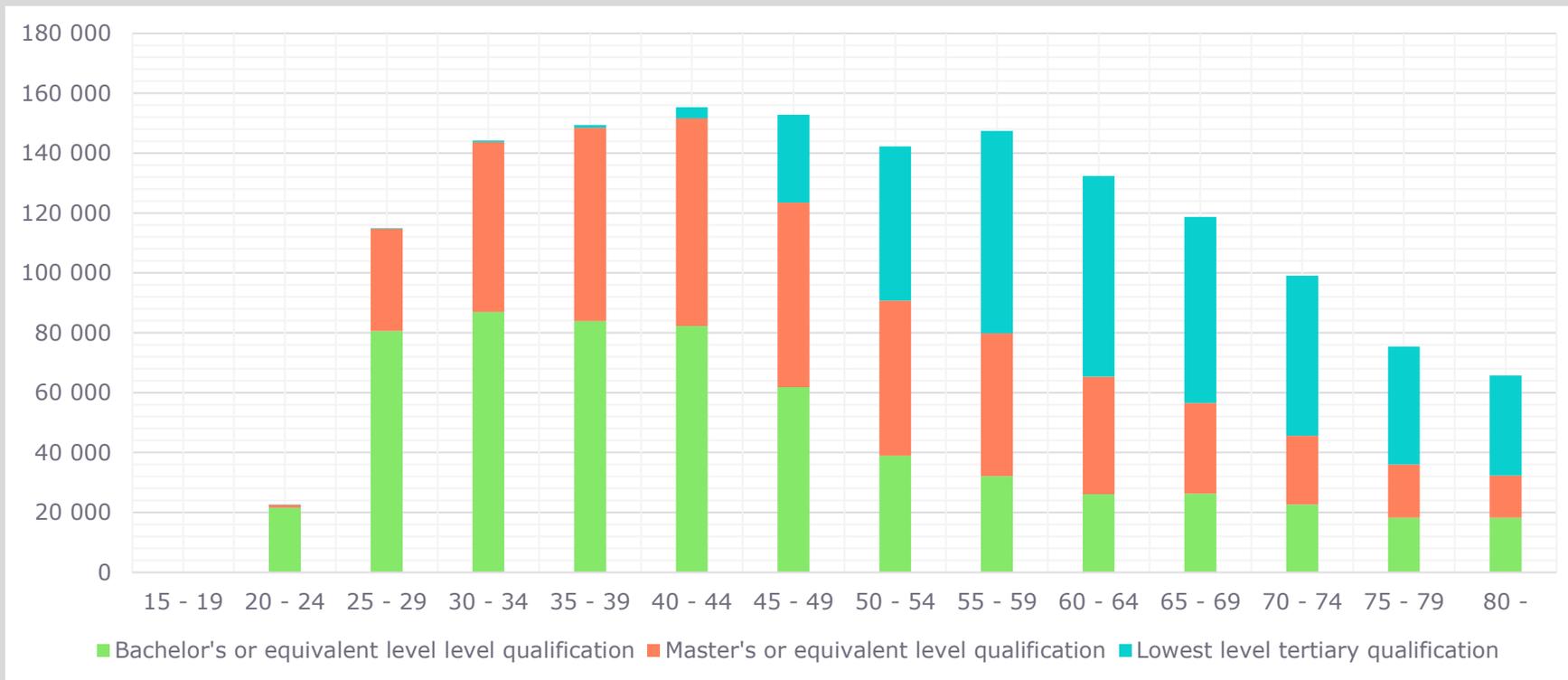
The age structure of the population and graduates in the field of engineering

- The age distribution of people with lower and higher university degrees in engineering fields is concentrated among those aged 30-45. This can be explained by the previously offered, especially technician training programs, which were phased out during the reform of the universities of applied sciences.
- The structure of education largely reflects the demographic structure of Finland, although the number of university-level places of study in engineering fields has been significantly increased in recent years. For example, the number of places of study in university education has grown by over 100% in the last 10 years, so in the future there will likely be a considerable number of university-educated individuals in the engineering field, reflecting the population structure.
- This leads to a future where retirement outflows will be smaller than the increase caused by the completion of degrees.
- The demand for workforce by the 2030s will strongly rely on industry growth and increasing skill requirements. High-level experts are also needed to replace long-term employees who have gained experience in the workforce without a university degree and who will retire in the coming years.





Population with higher education degrees in Finland by age groups



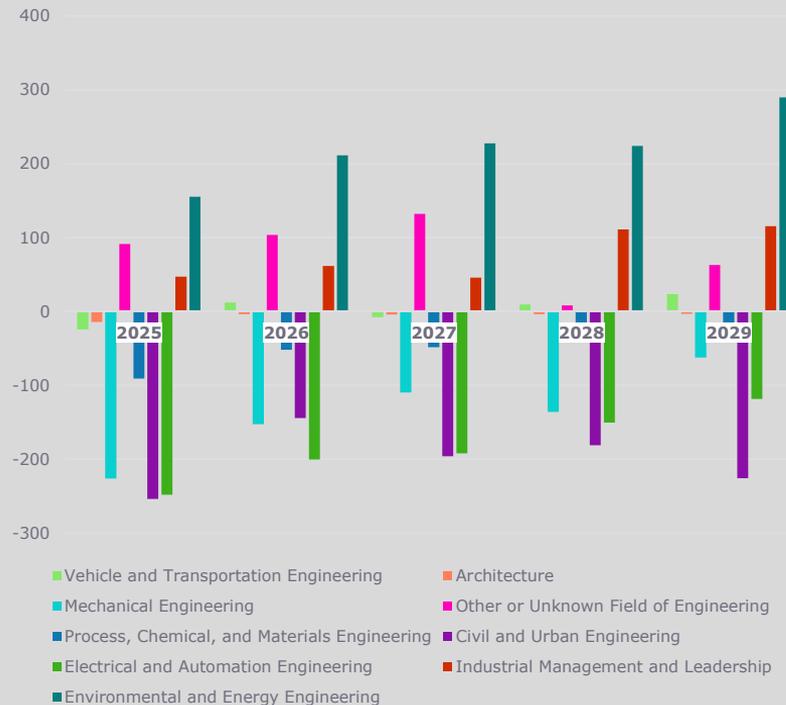
Design and consulting companies' surplus and deficit of workers in engineering fields

From the perspective of design and consulting companies the overall deficit of professionals in the field of engineering indicates a shortage of nearly **1,000*** specialists for the years 2025-2029.

- Vehicle and transportation engineering: **surplus of 13 specialists**
- Architecture: **deficit of 29 specialists**
- Mechanical engineering: **deficit of 687 specialists**
- Other or unknown field of engineering: **surplus of 398 specialists**
- Process, chemical and materials engineering: **deficit of 240 specialists**
- Civil and urban engineering: **deficit of 1,001 specialists**
- Electrical and automation engineering: **deficit of 909 specialists**
- Industrial management and leadership: **surplus of 380 specialists**
- Environmental and energy engineering: **surplus of 1,107 specialists**

The forecast suggests that the average deficit of employees in the design and consulting industry will increase by nearly **200** specialists annually over the next five years, with emphasis on the coming years.

- In reality, many tasks can be carried out by individuals with different educational backgrounds, and the employment needs specific to each field of engineering tend to balance out.
- The potential surplus in certain fields of engineering, especially for higher levels of education in a growing market, is largely explained by the significant increase in student admissions to higher level education institutes in recent years and the historically small number of graduates in certain degrees.
- For instance, now there are significantly more education in environmental and energy engineering than in past decades. Consequently, the retirement outflow (number of retirees) is notably smaller than specialist inflow due to the number of new graduates.
- Moreover, the quantitative growth in the need for specialists appears lower in smaller engineering fields, as the impact of growth is tied to the current number of professionals in specific field. In the logic of calculation, an appx. 2% growth on larger engineering fields such as civil and urban engineering translates into a high demand, e.g., in a demand for over 800 specialists in civil and urban engineering, while it results only in a demand for just under 200 specialists in environmental and energy engineering field.



Summary and reflection

Summary

- The most popular fields of higher education in 2023 were business, administration and law, health and welfare, and engineering.
- In 2023, the most places of study in higher education in engineering were available in civil and urban engineering (3,900 places), electrical and automation engineering (3,600 places), and mechanical engineering (3,100 places).
- The number of applicants to engineering fields in higher education has been mostly increasing in recent years. The most popular engineering fields in 2023 were electrical and automation engineering (9,700 applicants), civil and urban engineering (8,100 applicants), mechanical engineering (7,100 applicants), and environmental and energy engineering (7,000 applicants).
- From the perspective of design and consulting companies the overall deficit of professionals in the field of engineering indicates a shortage of nearly **1,000** specialists for the years 2025-2029.
- The forecast suggests that the average deficit of employees in the design and consulting industry will increase by nearly **200** specialists annually over the next five years, with emphasis on the coming years.

Reflection

- The number of applicants to higher education overall is on an upward trend, and especially in the engineering fields there is strong growth. Does this also indicate a positive perception of job prospects in the engineering fields?
- The number of places of study and applicants has increased strongly for engineering fields related to the green transition (especially electrical and automation engineering, environmental and energy engineering).
- Engineering education is available throughout Finland, but the main markets are concentrated in large urban areas, which may create challenges in finding experts in certain specialized fields (such as zoning, traffic planning, geotechnical engineering, infrastructure construction)





Industry associations' summary

General

- The fundamental trend indicates that finding skilled workforce is challenging. Economic fluctuations complicate the quantitative and qualitative management of skilled workforce.
- Geographically, there are differences between industries, for example, in the forest industry, workforce demand is consistent across regions throughout Finland. In the construction industry, workforce demand is concentrated in the Helsinki-Tampere-Turku growth triangle.
- Optimism for various industries is fuelled by potential green transition investments. These are expected to increase demand for workforce beyond the areas within the Helsinki-Tampere-Turku growth triangle, throughout the planning, construction, and production phases.
- Thesis projects and internships/summer job positions are important springboards into the work-life. Collaboration between educational institutions and businesses is seen as essential for the development and securing the skills needs.
- The demand for highly educated professionals is expected to rise across different industries.

Skills needs

- The basic competencies on STEM subjects in the engineering fields among graduates raises concerns in the views of different industries.
- Individuals entering the workforce are particularly expected to have the ability to learn new things and apply their knowledge in new contexts.
- Common skills needs across different industries relate to, for example, project management skills and information technology.
- In updating skills in hands-on jobs, apprenticeship training is seen as a good model. On the administrative and planning side, initiative in updating one's own skills is emphasized.
- Skill development increasingly requires tailored, relatively short-term trainings. This challenges the current business models of education providers, which are built on long-term duration of education.
- The lifelong learning system should emphasize the needs of businesses, especially when public funds are used for skill development.

Challenges and opportunities

- + The circular economy and investments in the green transition create a demand for skilled workers across various sectors and throughout Finland.
- + In terms of developing the competencies needed for the green transition, an opportunity lies in close networks between local educational institutions and local businesses. For example, there are good experiences from Kokkola in fostering collaboration between businesses and schools.
- + Vocational institutions can retrain workers for hands-on jobs with relative agility. Higher education curricula are more rigidly adaptable; however, the skills currently being produced are more readily applicable to the needs of the green transition.
- International talent recruitment is seen as an opportunity. However, recruitment is hindered by barriers such as language proficiency requirements (for example in matters of work safety), challenges in finding jobs for spouses, and wage competition compared to Central Europe.



Design and consulting companies

General

- The demand for workforce in the design and consulting industry will continue to grow in the future. The industry offers flexibility to other industries in terms of workforce needs and expertise in different economic climates.
- At present, the construction industry (building and real estate) has an oversupply of experts, but the situation is expected to improve.
- Energy boom, green transition, battery projects, responsibility, and sustainable development are widely discussed.
- If most of the green transition investments in Finland and Northern Sweden are realized, the current capacity of the industry to carry out these will be tied up in projects completely for a couple of years.

- Large design and consulting firms are often sought after for international work, meaningful employment, and large international projects. Graduates clearly have higher expectations towards working life than previous generations, which needs to be met.
- In design sector, there is still a clear distinction between two types of contributors: those who want to stay in the background, develop and design, and those who want to work with customers and sales.
- Young workers emphasize flexibility of work, meaningfulness, and work-life balance.

- The design and consulting industry underperforms significantly in terms of exports in Finland. Its share of turnover has decreased significantly, and Finnish expertise is no longer as visible and strong globally. However, large companies do carry out project work internally from one country to another.
- Company leadership achieves profit targets by riding the wave of the Finnish market growth, which results in a lack of ambition in their actions. Large design and consulting firms mainly carry out projects in regions where they have their own operations. The scarcity of large international projects is concerning. On the other hand, the Finnish market is small and there is not a strong influx from international markets.
- Artificial intelligence will significantly affect productivity expectations in the industry in the future. Companies will disappear from the industry if they cannot adapt to using artificial intelligence. Developing the associated expertise is critical for survival.



Design and consulting companies

Skills needs

- At the moment, there is a high demand for experts in EIA (Environmental Impact Assessment) and permitting, as several projects are in the preparation phase in Finland. With growing regulation, there is also a need for highly specific specialists (e.g., knowledge in nature and species). Experts are also needed in areas where these investments are being prepared/implemented.
- Demand exists for expertise in electric transportation, sustainable development, and the energy sector.
- New graduates are desired to have more project management skills and holistic perspective, as well as knowledge of current themes in the field, such as sustainable design.
- In the workplaces, there is a lot of training required for workers. The project management and customer service skills are better in newer generations of workers, but fundamental technical knowledge is weaker.
- Knowledge in data and information management, and artificial intelligence is and will continue to be an integral part of the design work. Automation and data modelling allow for the completion of basic tasks faster, after which more time can be used in refining the plans.
- There is a lot of room for improvement in the technical expertise and competencies of recent graduates. There should be a significant investment in fundamental technical knowledge, as it falls significantly behind on a global level in both the design and technology industries.
- The level of expertise should be raised significantly in order to compete internationally from Finland. It would be beneficial for the education to also largely be in English and partially even in other languages. In education, the standards of other markets should also be taken into account while still at school, at least at the European market level.
- Resilience, readiness for change, and changes in operational methods are required more and more quickly from both new and experienced workers in the future. Otherwise, Finland will fall behind in competition with other countries.
- Diverse educational backgrounds continue to be seen as an advantage in the future, and the frequency of retraining and specialization in new areas will increase.
- In the future, there will be a need for experts in increasingly specialized fields. The need to specialize and stand out from other consultants is becoming ever more crucial. There must be a very specific understanding of certain technologies, industries, and special needs.
- The ability to interpret international technology and aspects is growing. A holistic and comprehensive understanding of projects is necessary.

Design and consulting companies

Challenges and opportunities

- + Opportunities to recruit top talent in the industry during weak economic conditions (who are usually highly sought after).
- + International business allows domestic professionals to work even in weaker local economic conditions.
- Some construction industry professionals move to other industries during a downturn, leading to a shortage in workforce and challenges when the economy improves.
- Weak economic conditions affect the number of summer recruitments, impacting the development of practical skills in young people.
- There's a shortage of graduates in certain specialized fields (e.g. bridge and geotechnical design).

- + Interesting work tasks and diverse projects keep workers in the design and consulting industry.
- + Long-term projects, such as railway projects, create stability for the industry.
- + Cooperation with educational institutions and student organizations helps to convey the industry's message and attract future experts to the design and consulting industry.
- Language barriers in public projects prevent the use of foreign expertise.
- There is still a noticeable gender disparity in the technical field, with fewer women than men. Efforts and marketing must continue to reduce the disparity.

- + Downshiffters/freelancers could reduce the company dependence of specialized expertise in the future. On the other hand, do network-like "subcontracting work relationships" weaken the attractiveness of the industry?
- + Supporting the relocation of top international talents to Finland is important. It enables the implementation of projects internationally from Finland in the short term, and the expansion of business internationally in the long run.
- Government immigration policy has caused fear among current top professionals in the industry, who are looking at job opportunities elsewhere. New top talents also partly avoid Finland as a result.
- Validation of the qualifications and skills of international workers is an issue. Workers' expertise may not correspond to what is presented or the qualifications differ completely from Finnish degrees.

- + Opportunities in the United States market; a massive investment boom, repatriation actions, and a significant shortage of engineers. However, United States market requires good relationship building and adoption of local standards.
- + These contribute to the cumulative growth of specialized knowledge and skills.
- + Growth of Finnish expertise and increased visibility.
- +/- Widespread adoption of artificial intelligence.
- + Closer cooperation between educational institutions and businesses in communicating skill needs and adapting training programs. Certain focus areas for development can already be identified from various industries and what expertise should be increased over the next 5-10 years if certain technology investments are to be brought to Finland.
- + Proactively grasping onto megatrends and increasing related specialized expertise in education.

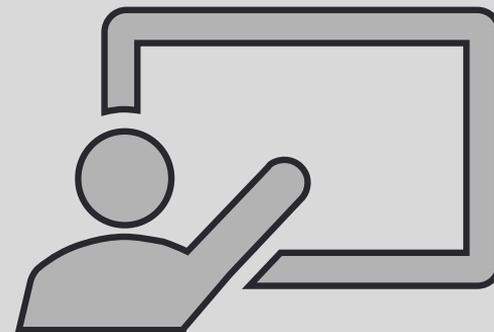
Summary and reflection

Summary

- The employment demand in the design and consulting industry is growing, and competition for experts with other industries is increasing. At the same time, new graduates have increasingly higher expectations of employers, including the meaningfulness of work, community, and development opportunities.
- There is a need to enhance basic engineering skills. Workers are required to have a more holistic perspective and specialization as artificial intelligence and digitalization transform the industry. Employers' expectations for future professionals are high.
- Cooperation and communication between companies and educational institutions must be increased to solve mismatches in skills supply and demand. Decisions made now will allow for preparation for the planned green transition investments in Finland and for capturing production repatriation projects from Europe to Finland.

Reflection

- Engineering education is moving towards more applied direction. Themes such as climate responsibility, digitalization, and technological disruptions, as well as acting as an expert and working in an international environment, are prominent in the near future.
- The construction industry requires diverse experts – the significance of the green transition, low carbon solutions, and circular economy is emphasized. The design and consulting industry is required to look ahead and have even more comprehensive view in projects. Can the companies develop a cluster of expertise around themselves?
- The design and consulting industry prioritizes billable work and operational tasks, and development often occurs if projects and work allow (except for student theses). Ideas and development are sought after, but not mandatory. Time and freedom must be allocated for development and innovation.
- Continuous learning, retraining, and adaptability are becoming an increasingly essential part of everyday work life and maintaining competitiveness. Learning must become a clear part of the job description and be allocated time, as the demands, expectations, and stress on professionals grow.
- Language issues must be resolved if the industry wants to achieve greater and export-driven growth. Currently, design and consulting companies underperform in taking Finnish engineering expertise to the world. How can exports be increased?
- Finland does not currently appear as an attractive option compared to Central Europe or other Nordic countries. Finland must become a tempting destination for international top talent, which requires the development of work communities and advocacy.
- The dialogue with students must not be overlooked when increasing discussions with educational institutions. We should create an understanding of what motivates new workers, how they meet companies' needs, and how job descriptions can be adapted.
- "Lighter recruitments" might become an advantage for the design and consulting industry. The ever-lengthening recruitment processes are burdensome and filter out applicants and those orienting towards the industry.





Key findings and recommendations

Raising the level of basic education



- Investment in STEM subjects is needed to boost engineering skills
- Finland's level must be developed to be internationally competitive



Developing internationalization

- Seeking new growth and economic stabilization from international markets
- Partial solutions to workforce shortages from international experts



Regional matching needs

- Experts have concentrated in growth centers, but investments have not
- Competitive advantages are found in local knowledge and presence

Investing in educational collaboration



- The number and content of educational places must be influenced now and the sufficient places of study for cyclical sectors must be secured
- Thesis and internship opportunities in the industry to be offered actively



Marketing the design and consulting industry

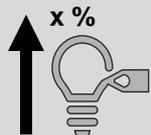
- The industry must be marketed more actively, especially in educational institutions
- Early influence reaches the employees of the future



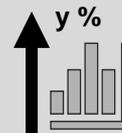
Tackling the skills revolution

- The industry's skills and practices are once again facing a transformation
- Responses to new expectations must be provided, and adaptability must be developed

“ By influencing the amount and quality of expertise now, we ensure sufficient expertise for the future
...and create conditions for increasing Finland's competitiveness – for both businesses and society ”



Growth in the quality of expertise



Value addition in design and consulting industry



Key expertise needs of companies in design and consulting industry



Digitalization, artificial intelligence

- The digitalization of work, such as the use of data modeling and artificial intelligence, will increase the productivity of the industry.



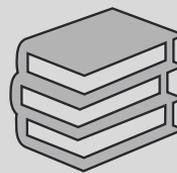
Environmental impact assessment and permitting processes

- Legislation requires increasingly multifaceted impact assessments and permitting processes. The slow pace of processes can act as a bottleneck for investments at worst, although the public sector and decision-making also play a significant role.



Green transition, sustainable development, circular economy, low carbon solutions, responsibility

- Mitigating climate change and various sustainability and responsibility goals will increasingly guide customer requirements and business. There are also opportunities through the development of refurbishment and wooden construction skills.



Fundamental and specialized technical knowledge

- Stronger fundamental technical expertise is needed, as well as deep expertise in certain topics. There must be investments in both student education and the deepening of employees' expertise.



Holistic approach

- Experts need to understand increasingly complex projects and be able to operate with different engineering fields and with internal and external stakeholders.



Energy

- A significant portion of potential future green investments is related in one way or another to energy production, refining or use. Energy expertise also plays a key role in updating current buildings, facilities, and systems towards more sustainable solutions.



Media highlights

In engineering fields, there is a clear deficit of skilled professionals predicted for the coming years, and especially in the design and consulting industry, there is a need for talent regardless of the current weak economic conditions in construction industry. The availability of skilled professionals and the growth in demand beyond current economic conditions must be ensured by providing a sufficient number of higher education places.

In design and consulting firms, the level of fundamental engineering knowledge in Finnish engineering fields is currently seen as weak. There needs to be an investment in and improvement of this basic knowledge to ensure the global competitiveness of Finnish companies.

The number and need for international experts continues to grow in Finland. Efforts must be made to attract these experts and to broaden their employability by enabling them to work without Finnish language skills. This requires a change in attitude within companies and among clients.

Artificial intelligence is rapidly emerging, and it is expected to increase the productivity of the design and consulting industry. Companies, now is the time to delve into the opportunities it brings to your businesses, both individually and collectively. The Federation of Finnish Technology Industries is making significant investments in the development of AI skills and accelerating its adoption in Finland. Explore what collaboration opportunities are available for you to develop AI expertise.