Europe's Most Needed Software Roles and Skills.

NEEDS ANALYSIS REPORT 2021 I KEY FINDINGS

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This report sheds light on the **current and future needs** for **software skills and professionals** in Europe.

The conclusions are drawn based on the **study of job vacancies**, available **research on software skills, education and training programmes, labour market reports, and databases**.

We also collected experts' input about their expectations for the future of software roles, skills, and their provision.

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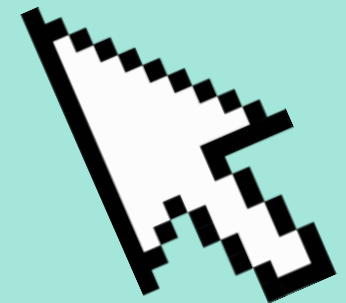
Data collection in numbers

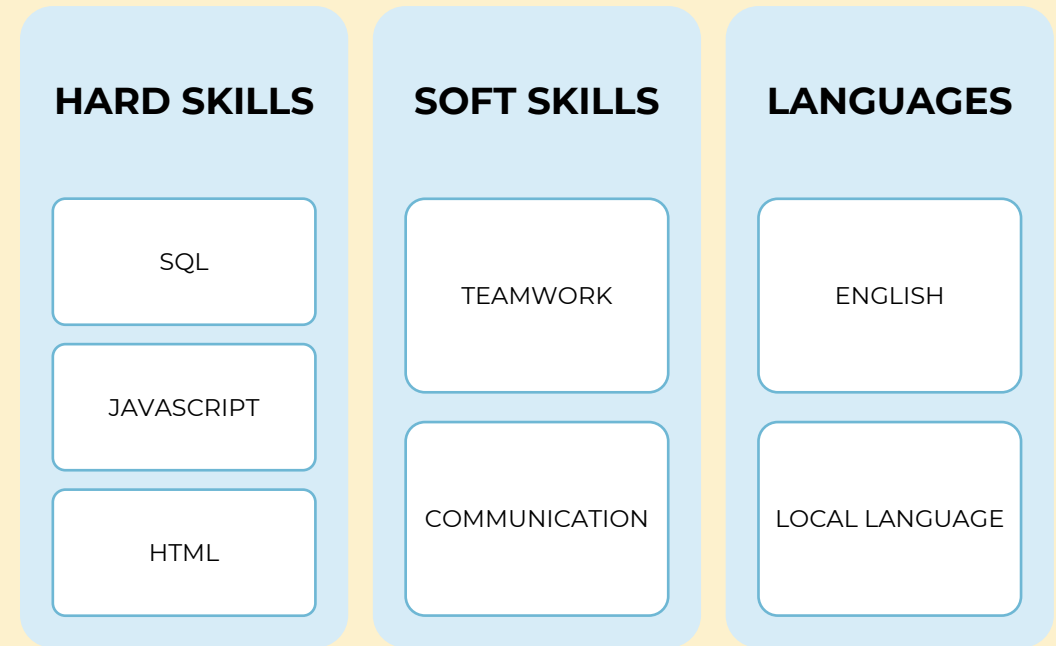|	
Academic literature study	20 selected top papers
Labour market desk research	• 63 national labour market reports • 14 national labour market databases • 905 job vacancies from 20 countries
Demand questionnaire	301 respondents from 21 countries
Expert focus groups	• 12 national groups, 118 experts from 11 countries • 1 European group, 14 experts
Supply desk research	• >1000 VET and higher VET providers from 14 countries • 69 programmes

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Key findings

Findings literature review

- Most new skills require a foundation in core 'traditional' software skills
- Soft skills: ability to work in (diverse) team (i.e., agile), customer focus, innovation
- Profession-related skills: this is a weakness, **little on ethics**, some on business skills

- Influence of the changing work context, e.g., safety of critical large embedded systems
- Software developers have a **responsibility towards society** (conflicting obligations)

- New skills and work contexts should mean **new approaches to teaching**
- Subjects (e.g., agile) are often taught but not well: "appearances can be deceiving"
- Importance of skill or competence frameworks to **guide curricula development**

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Findings job vacancies

MOST WANTED

- Within the selected profiles, the most looked for one is Developer (31 %)

- For most profiles, the required years of experience is not specified (43 %)

- Job level: mostly on intermediate level (33 %)

- Most job vacancies are from large companies (40 %)

HARD SKILLS	SOFT SKILLS	LANGUAGES
SQL	TEAMWORK	ENGLISH
JAVASCRIPT	COMMUNICATION	LOCAL LANGUAGE
HTML		

Findings labour market reports

- Importance of soft skills is increasing
- Number of difficulties faced recruiting ICT professionals is increasing
- Number of "must-have" requirements is increasing (5,5 in 2019 VS. 6,2 in 2020)
- IT industry is in some countries one of top 3 most attractive industries (salary levels, stability, security), e.g., Romania
- Some countries are strategically investing in methods to attract ICT professionals from abroad (e.g., Ireland, Estonia)
- A lot of data about importance of cybersecurity

Countries are actively looking for solutions to fill the skills gap

different training programs

different funds

employer branding campaigns

partnerships with universities

internal company academies

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Findings expert groups (roles)

- Important to move from "I"-shaped specialists to **"T"-shaped and "Pi"-shaped professionals**
- Life expectancy of roles is questionable, hence the importance of <mark>lifelong learning</mark>, developing new competencies
- **Interdisciplinary** and **multidisciplinary** teams are crucial
- The **fusion of capabilities** is becoming increasingly relevant
- Demand for combination of <mark>technical and non-technical roles</mark>

Findings expert groups (skills)

Hard skills

- Focus on increasing complexity on safety and security, ethics in the software field, connection to industry
- Focus on users and customers, and technology

Soft skills

- Cognitive skills, creative and analytical thinking, self-directing, motivation
- Cooperation, utilising empathy, storytelling
- Ability to "sell" the solution concept internally (communication, presentation and negotiation)

→ Understanding the business (needs) and context (interdisciplinary skills)

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Findings expert groups (learning)

- Lifelong learning (at own pace: micro credentials, nanodegrees)
- More emphasis on upskilling and reskilling (short programmes, short intensive training)
- Modular programmes (flexibility, custom pathways)

- **Collaboration** between universities and organisations (apprenticeships, corporate academies)
- Providing students with **real-life experiences**, authentic tasks (developing soft skills, work-based learning)

- **Delivering strategies**: experimental learning, gamification, peer-to-peer learning, storytelling
- Knowledge of other domains, e.g., through elective courses, additional training

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Findings questionnaire

- There is and will be a lot of demand for developers
- There is and will be little demand for digital media specialists

- Profession-related skills like security management, project management are important but not as important as soft skills
- Important are: Problem solving, critical thinking and self-management
- And interpersonal skills: Teamwork, communication

- The most important driver for training is **new technical developments**
- Backlog in training primarily arises due to a lack of time (personnel and organisation)

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Findings supply desk research

- **Programming and working with data structures**/algorithms are common in learning programmes
- Mostly "standard" languages (C, C++, C#, HTML, SQL); and in some cases Python, Ruby, etc.
- Supply for DevOps skills is very limited at **VET level**
- AI/machine learning skills are mostly found at **master level**

- Almost **no specific courses** on documentation, project management and sustainability
- Information on **security management** is included in specific courses
- There is little attention paid to soft skills. They are not in learning programmes or only part of courses

- At **VET level**, most of the transversal skills taught are **communication and teamwork.**
- At **bachelor or master level**, an emphasis is put on **critical thinking, problem-solving, and creativity**

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Conclusions

Conclusions on roles

Developers are needed the most
- "developers are becoming more and more part of the regular organisation instead of a separate entity"
- "shift to new kinds of developers, like full stack developers and low code developers"

People in software roles need to have the right skills from the start
- "The challenge for the educational field is therefore to educate and train people in such a way that they possess as much as possible the right skills to enter jobs in organisations"

Strengthen the relation between organisations and educational institutions
- "Partnerships between education and training providers and organisations with a need for software professionals […] can be of great help to close the gap between supply and demand."

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Conclusions on skills

Programming Principles
- Now: Java, Javascript, SQL, HTML, PHP, C++, C# and Python
- Future: general programming principles to adapt quicker

Important profession-related skills
- Now: agile project skills, security (management) skills
- Future: sustainability management (sustainable software development), understanding the business

Interpersonal soft skills are foundational
- Teamwork, general communication skills
- Language skills: English and local language (mobility issue)

Personal soft skills are key
- Critical thinking & analysis, problem solving and self-management

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Conclusions on learning

Time for training in organisations is limited

- …but upskilling remains needed
- Right skills at entry in organisation is important

Short, modular programmes and micro-credentials

- More flexible recognition of "small" learning outcomes

Broader education/ training

- T-shaped and Pi-shaped professionals

Learning providers and organisations working together

- Organisations provide real life examples/environments to practice
- Learning providers participate in organisation's academies

Educate flexible lifelong learning software professionals

- Ideally starts already in primary school (programming logic)
- Lifelong learning attitude to stay up-to-date and adapt (learning skills)

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Read the
[full report]()

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