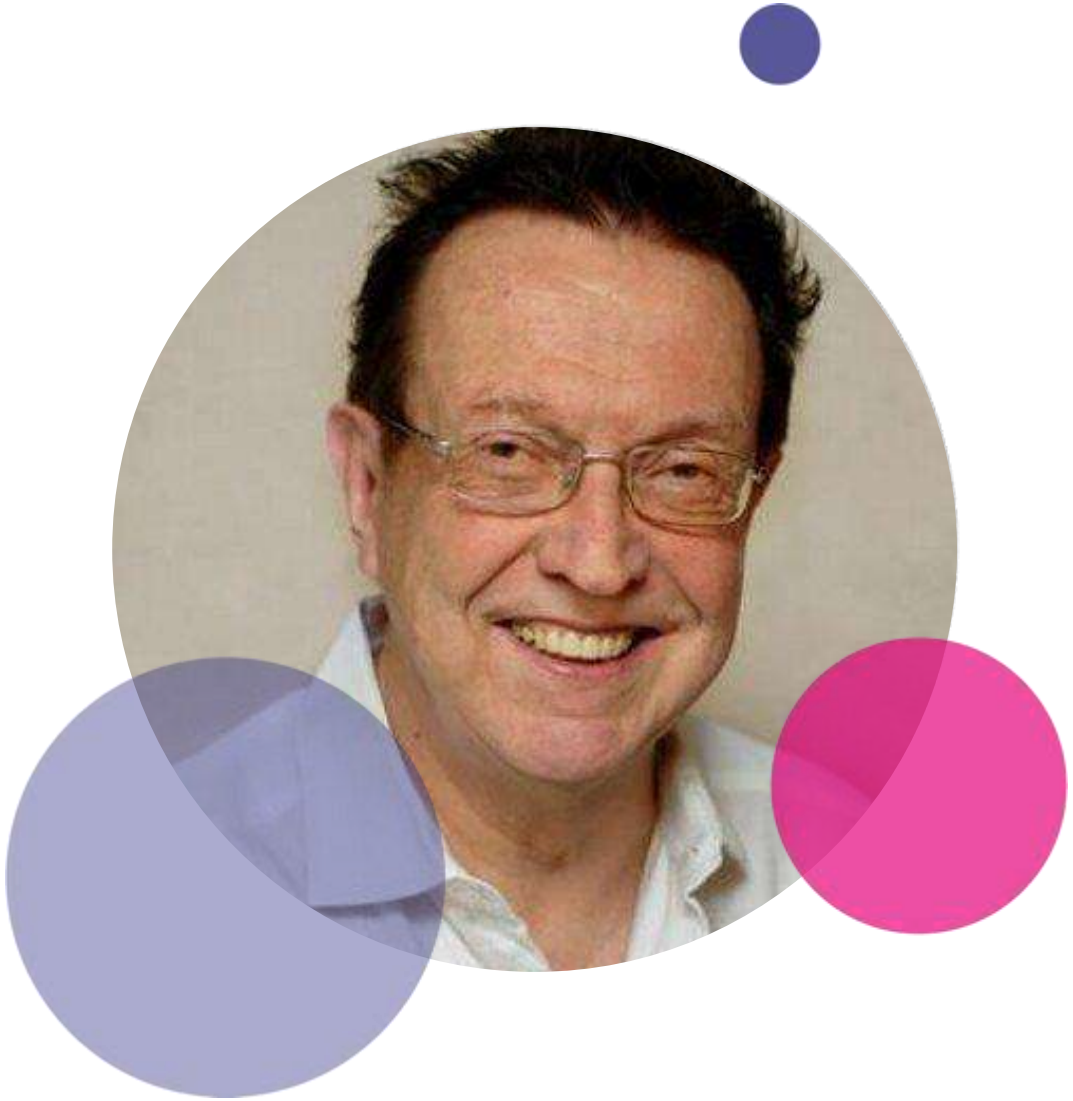
LESSONS ON THE INCREASING ROLE OF DIVERSITY IN TECH – The Story of Czechitas

Barbora Buhnova, Masaryk University & Czechitas

IE Gender Equality Webinar Series, June 7, 2022



"Why the wrong people choose software engineering and the right people do not?"

Ivar Jacobson

(Co-)Author of UML, Rational Unified Process (RUP), Essence

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“Bridging communities to foster innovation — on track towards democratization of innovation.”

Barbora Bühnová

Co-founding & Gov. Board, Czechitas
Vice-dean, Faculty of Informatics, Masaryk University

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TAKEAWAY

“The reason why women self-select away from tech (referring to their competencies) IS THE VERY REASON WHY WE NEED THEM IN.”

THE INCREASING ROLE OF DIVERSITY

in Software Engineering/Architecture

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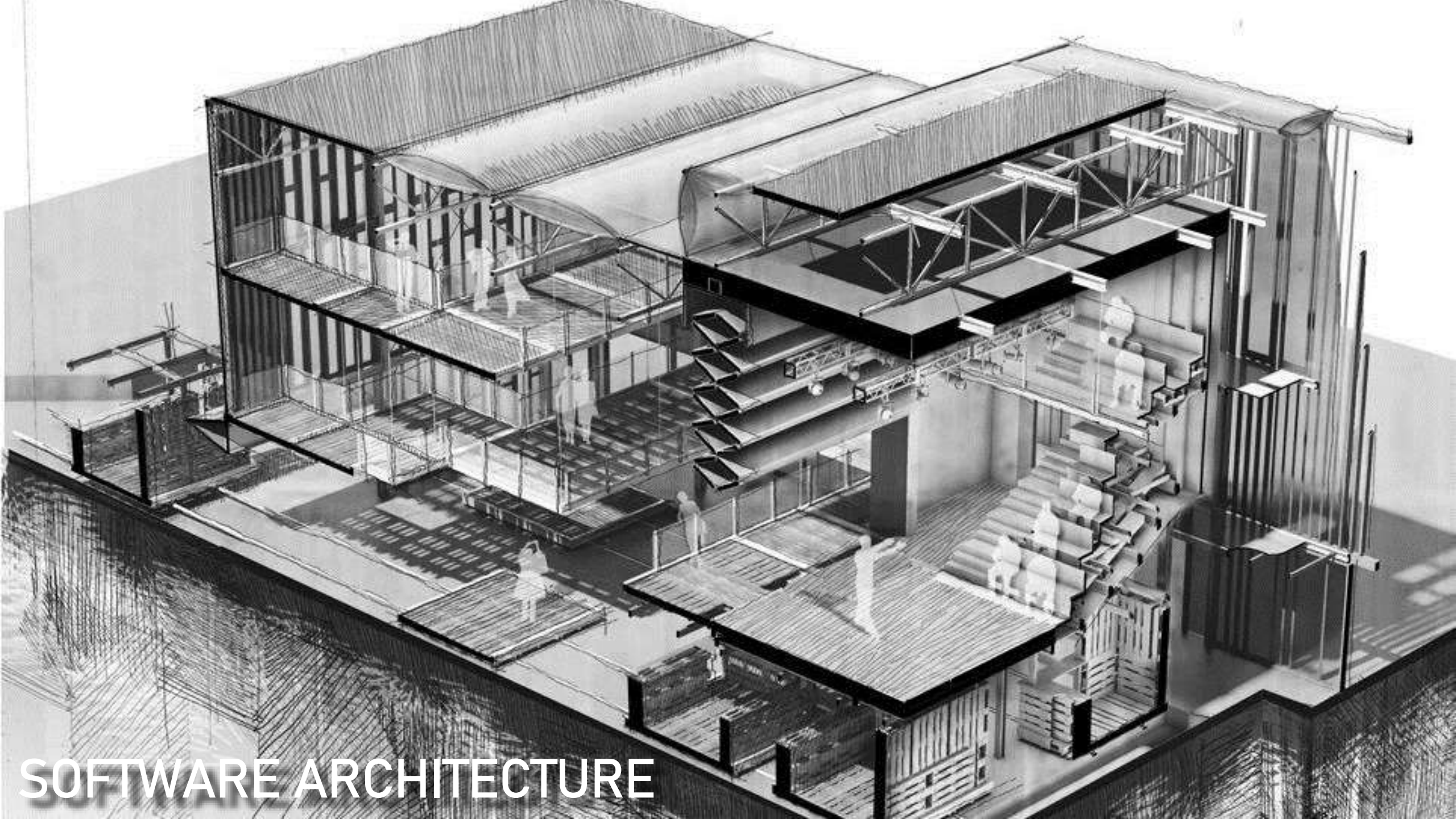

SOFTWARE ARCHITECTURE

SOFTWARE ARCHITECTURE

SW ARCHITECTURE IS NOT ITS BLUEPRINT

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What is then a SW Architecture?

Till 2000

– Software architecture refers to **the fundamental structures** of a software system… [IEEE 1471:2000]

Since 2000

– Software architecture encompasses **the set of significant design decisions** that shapes a software system… [RUP, 1998]

Quality Criteria

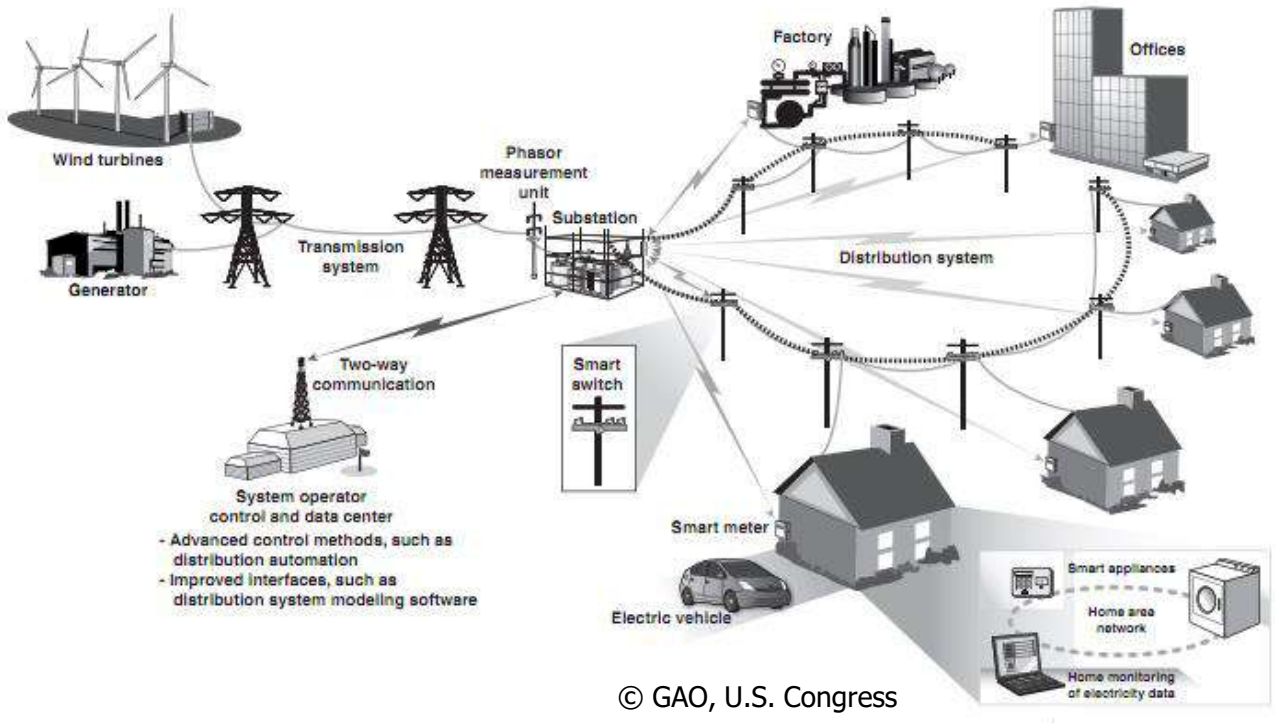
- **Reliability** – The probability of correct/failure-free system operation.
- **Performance** – The degree to which a system meets its requirements for timeliness, i.e. response time or throughput.
- **Security** – The ability of a system to prevent unauthorized access and protect the confidentiality, integrity and availability of data.
- **Safety** – The ability of a system to operate without the danger of causing serious harm (e.g. human injury).
- **Robustness** – Degree to which a system is able to withstand an unexpected event without quality degradation.
- **Resilience** – The ability of a system to recover quickly after a disaster.

WHAT MAKES ARCHITECTING DIFFICULT?

Digitalization meets Hyperconnected World

What makes architecting these systems difficult?

- Hyperconnected world, problem cascading, unpredictable impacts
- The cyber and physical space merged into one
- Uncertainty about the trustability of connected devices
- Securing against threats that are not existing yet



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Engineering for the Unknown

It is no longer enough to engineer systems for **problem avoidance**

- We need to anticipate **intentional & unintentional** problems on all levels

Prebuilt mechanisms for:

- recognizing an attack/fault,
- stopping it from propagating,
- ensuring safety under attack/fault,
- recovering from an attack/failure,
- forensics after the attack/failure

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Engineering for the Unknown

It is no longer enough to engineer systems for **problem avoidance**

- We need to anticipate **intentional & unintentional** problems on all levels

Prebuilt mechanisms for:

Detection of insider attacks in organizations

- recognizing an attack/fault,
- stopping it from propagating,
- ensuring safety under attack/fault,
- recovering from an attack/failure,
- forensics after the attack/failure

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Engineering for the Unknown

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Prebuilt mechanisms for:

- recognizing an attack/fault,
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Forensic-Ready software systems

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Engineering for the Unknown

It is no longer enough to engineer systems for **problem avoidance**

- We need to anticipate **intentional & unintentional** problems on all levels

Trust in Autonomous Ecosystems

Prebuilt mechanisms for:

- recognizing an attack/fault,
- stopping it from propagating,
- ensuring safety under attack/fault,
- recovering from an attack/failure,
- forensics after the attack/failure

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NEED FOR EXTENSIVE MINDSET STRETCH

Bridging Communities & Thinking out of the Box

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What shall be the competencies of a SW architect?

- Ability to understand, envision, trade-off, integrate, stragegize
- Breadth of knowledge, communication, leadership, decision making
- Awareness and prevention of cognitive biases

ULTIMATELY

- SW architecture is the **shared understanding of your experts**
- The more **diverse** they are, the **stronger** the architecture is going to be

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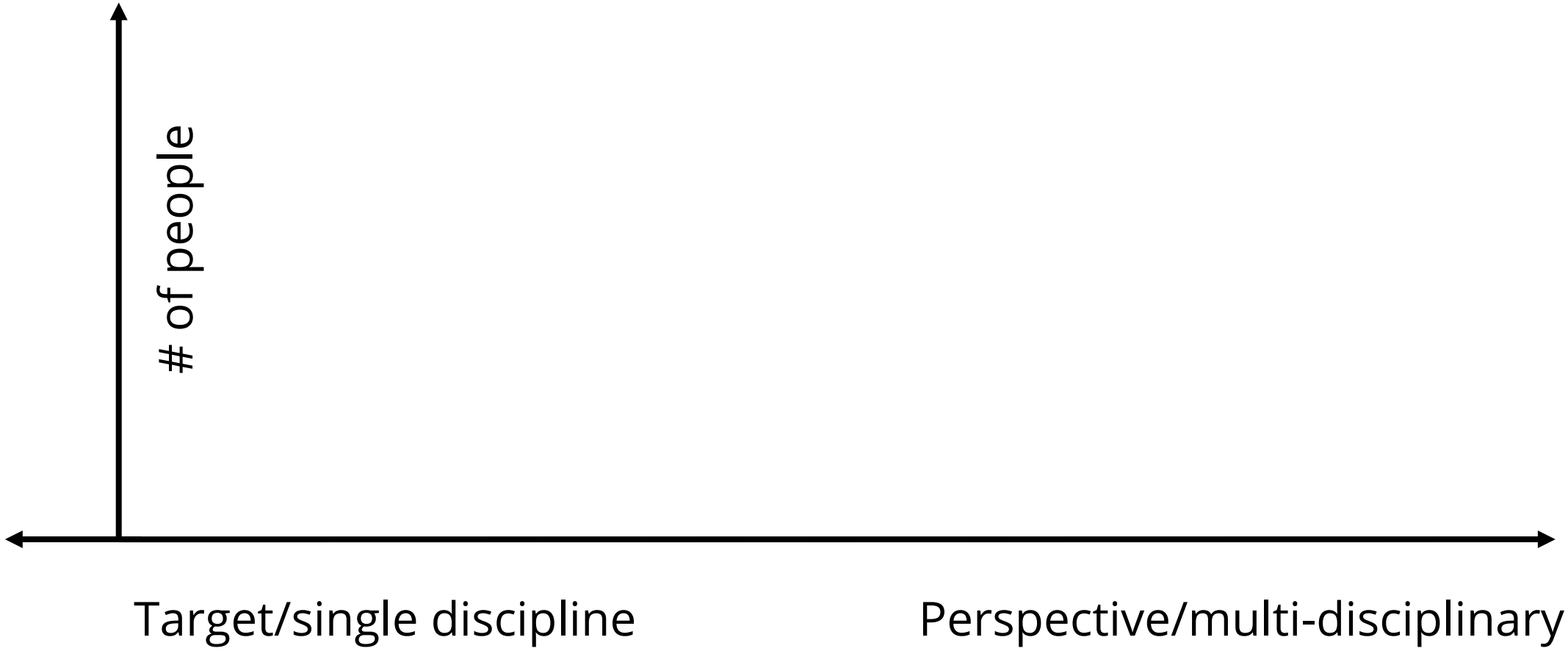
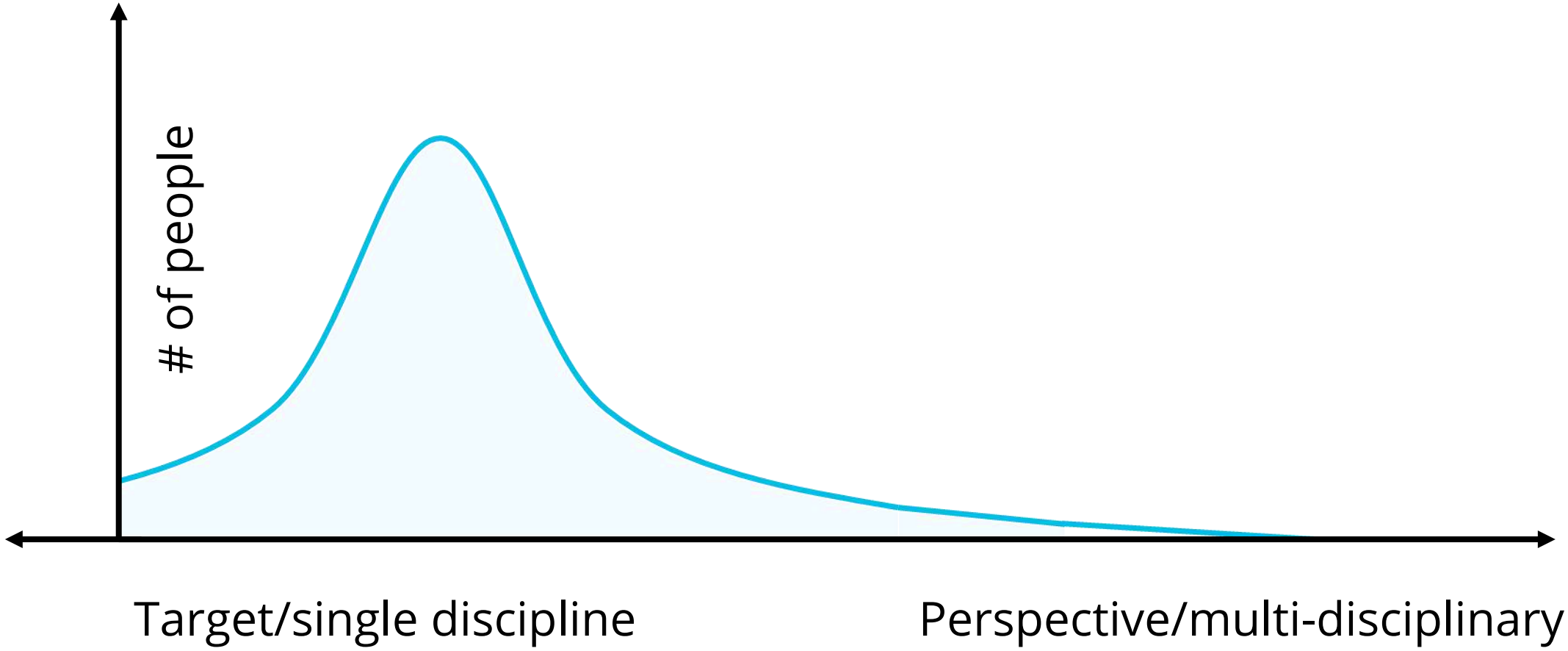
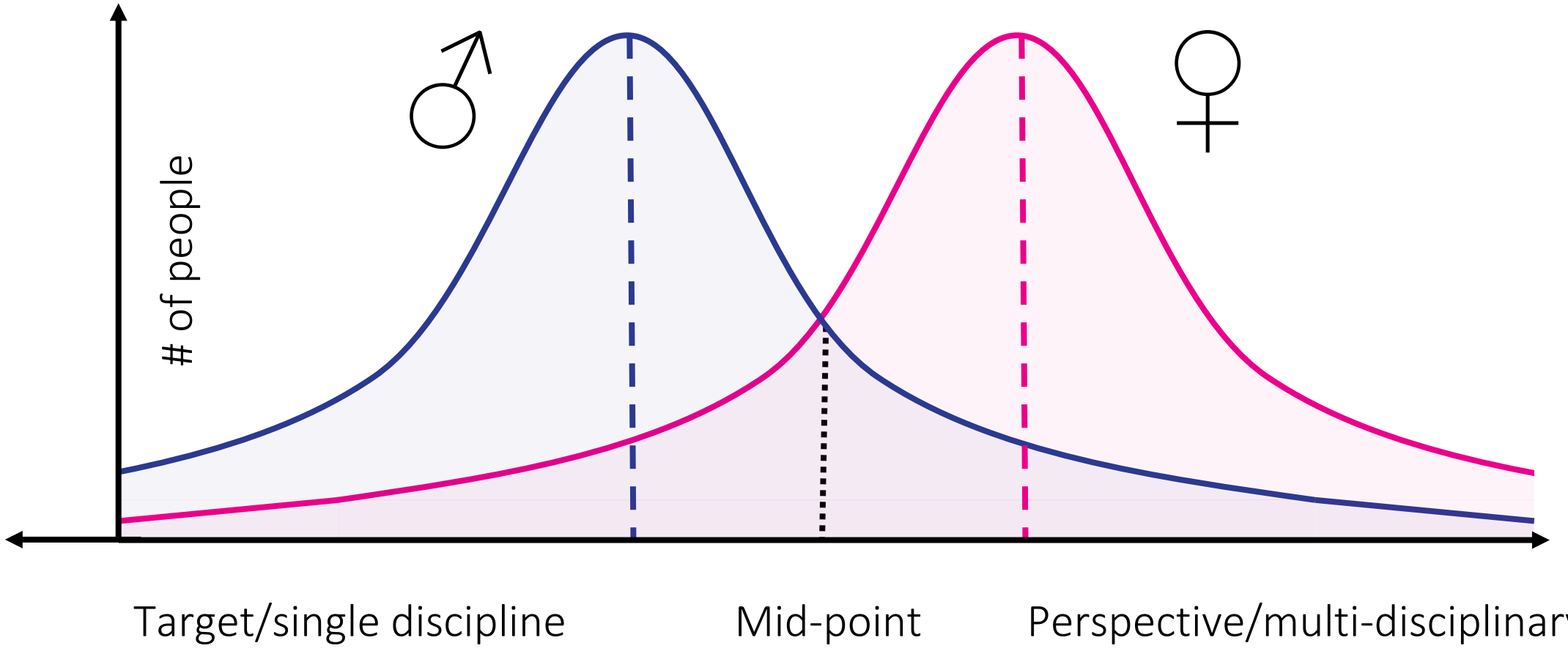
WHO WE ARE IN SOFTWARE ENGINEERING/ARCHITECTURE?



WHO WE ARE IN SOFTWARE ENGINEERING/ARCHITECTURE?



WHO WE WANT TO BE?



[1] B. Annis and R. Nesbitt, ”Results at the Top: Using Gender Intelligence to Create Breakthrough Growth”, Wiley, 2017.

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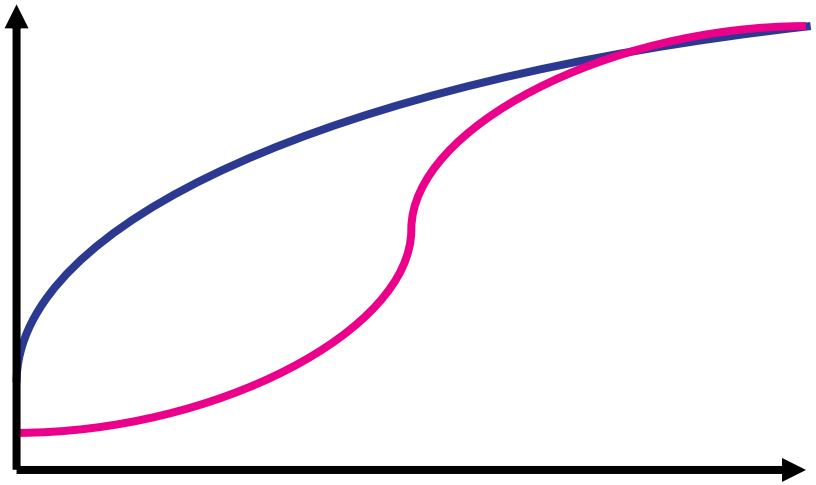
HOW WE ARE LEAVING THE PERSPECTIVE-ORIENTED INDIVIDUALS OUT

- Differences in approaching complex problems
  - Perspective-oriented individuals need to build their context map first
    → they are slower learners at the beginning
    → but great integrators and multitaskers later
    → they feel anxiety from their context map
    never being complete



- They have more interests as little kids
  - Using technology for a purpose, not to change it
    → often starting later with advanced tech tasks
- And there are some aspects related to girls specifically
  - Perfection vs. bravery

TAKEAWAY

“The dark side of biases is that we tend to judge people’s potential based on how their talent spectrum matches the talent spectrum of the already-successful ones.”

VICIOUS CYCLE AND BIAS REINFORCEMENT

- We've created a funnel through our education that filters certain individuals out, creates disproportionate representation that feeds stereotypes and makes things even harder to gravitate back to balance.
- Our assessment of CS competence fit at schools is frozen back in times of knowledge over skills, specialization over integration and cross-fertilization.
- Still visible in job interviews, promotion criteria (also in academia), e.g.
  - Prove you are a specialist first, then we can talk
  - Multidisciplinary and human-aspects given less credit
- Non-stereotypical talent individuals mimicking the stereotypical talent

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STUDY ON THE FRUSTRATIONS STEERING WOMEN AWAY FROM TECH

With insights from Czechitas

FRUSTRATIONS STEERING WOMEN AWAY FROM TECH

- Design of the study
  - Women who are in tech vs. those who would like to (re-)establish their connection to tech later
  - 139 participants from Czech Republic (1/3), Germany (1/3), rest of the world (1/3)
- Goal of the study
  - Why do women choose particular study programs and careers as alternative to tech?
  - What are the triggers and benefits of these alternatives that tech is lacking?
  - What are the obstacles steering them away from tech? And are they preventable?
- Published
  - Happe, Lucia, and Barbora Buhnova. "Frustrations Steering Women away from Software Engineering." IEEE Software (2021).

FRUSTRATIONS STEERING WOMEN AWAY FROM SE

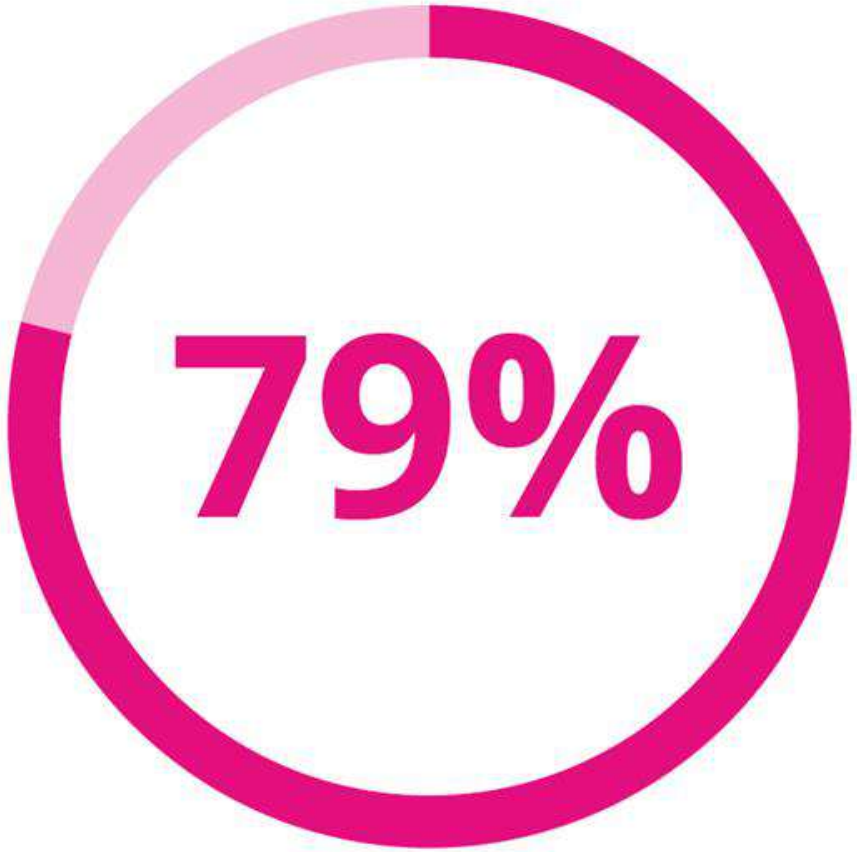
- Access (to engaging education, supportive teacher, supportive family environment, guidance)
- Stereotypes (by girls about CS engineer/field, by they close environment about CS engineer/field/girls in CS)
- Confidence (self-efficacy)
- Belonging (boys club, missing networking, mentors)
- Feeling valued (defensive culture, the fact that the women feel they need to keep proving their value, flawed meritocracy)

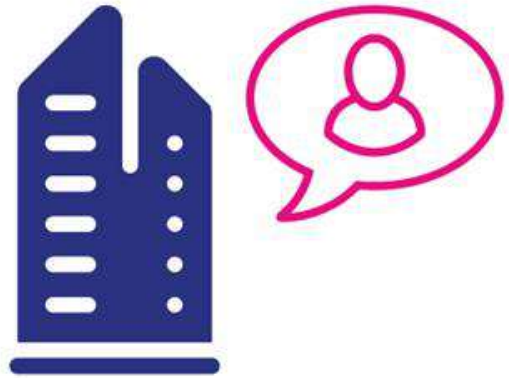
LESSONS LEARNED FROM THE STUDY

- Girls falsely believe
  - that they and their interests do not fit and are not connected to tech,
  - that because of having other interests and not investing all their time into computing they cannot be successful in tech,
  - that their non-stereotypical skills and interests will be considered as second-class, and will not be appreciated in tech.
- Multidisciplinary lens
  - The women in the study showed to have on average 5.5 other major interests.
  - There is thus a potential in creating alternative pathways into SE by building on individual interests, to create identities that do resonate.

CAN WE HELP THE SITUATION?

THE STORY OF CZECHITAS





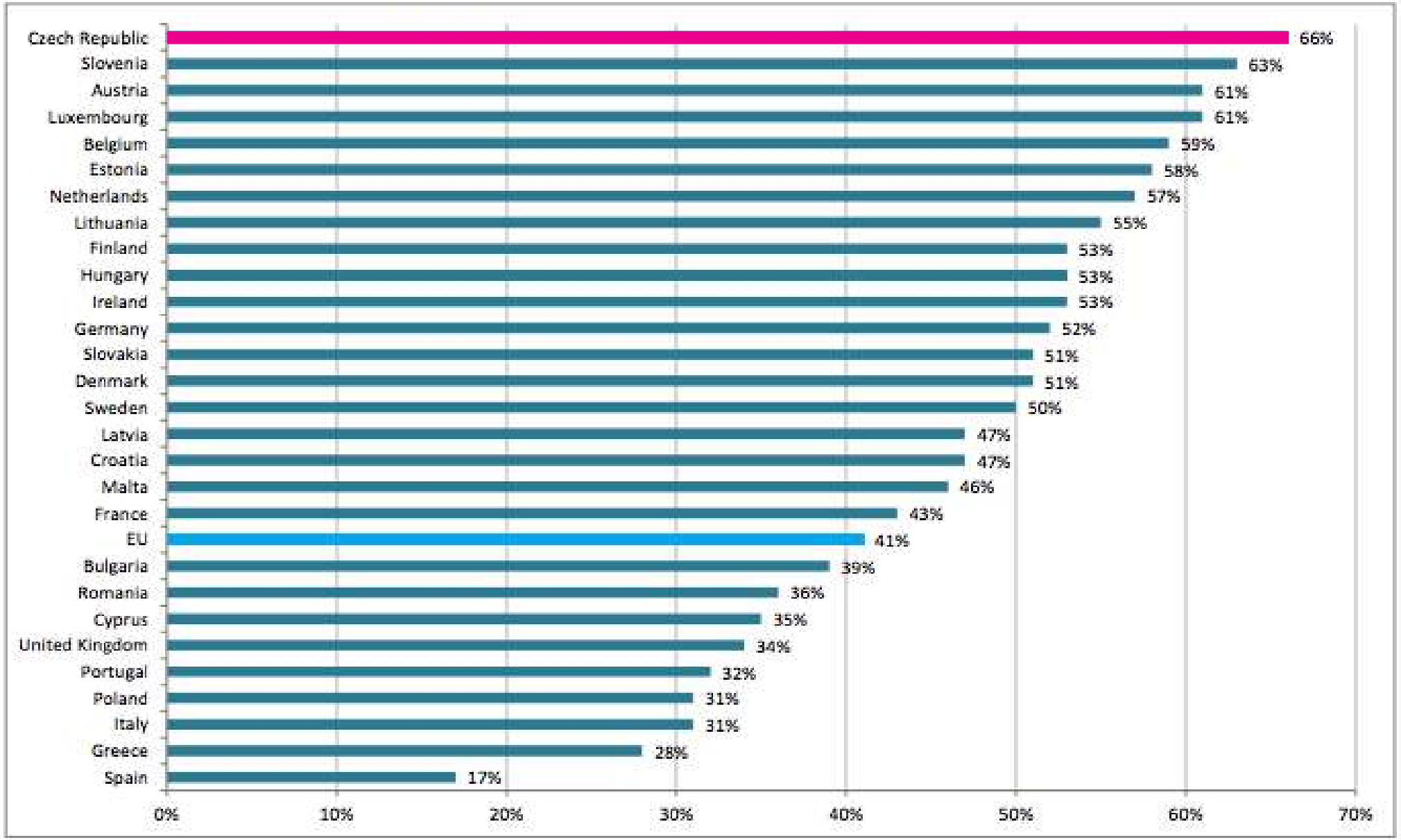
79% of Czech enterprises with **ICT vacancies** struggle with finding the right talent

(**53%** in Europe)

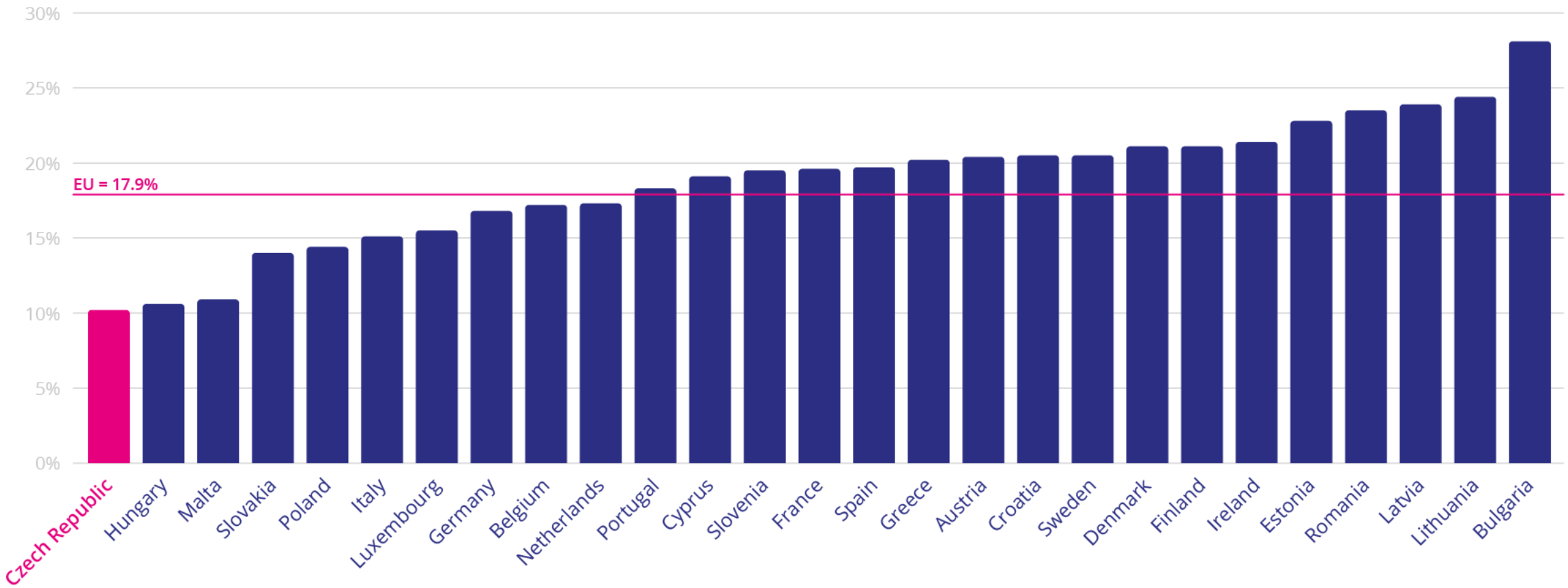
Source: Eurostat (online data code: isoc_ske_itrcrn2)

Share of enterprises which had hard-to-fill vacancies for ICT specialists, 2016

(as % of enterprises which recruited / tried to recruit ICT specialists)

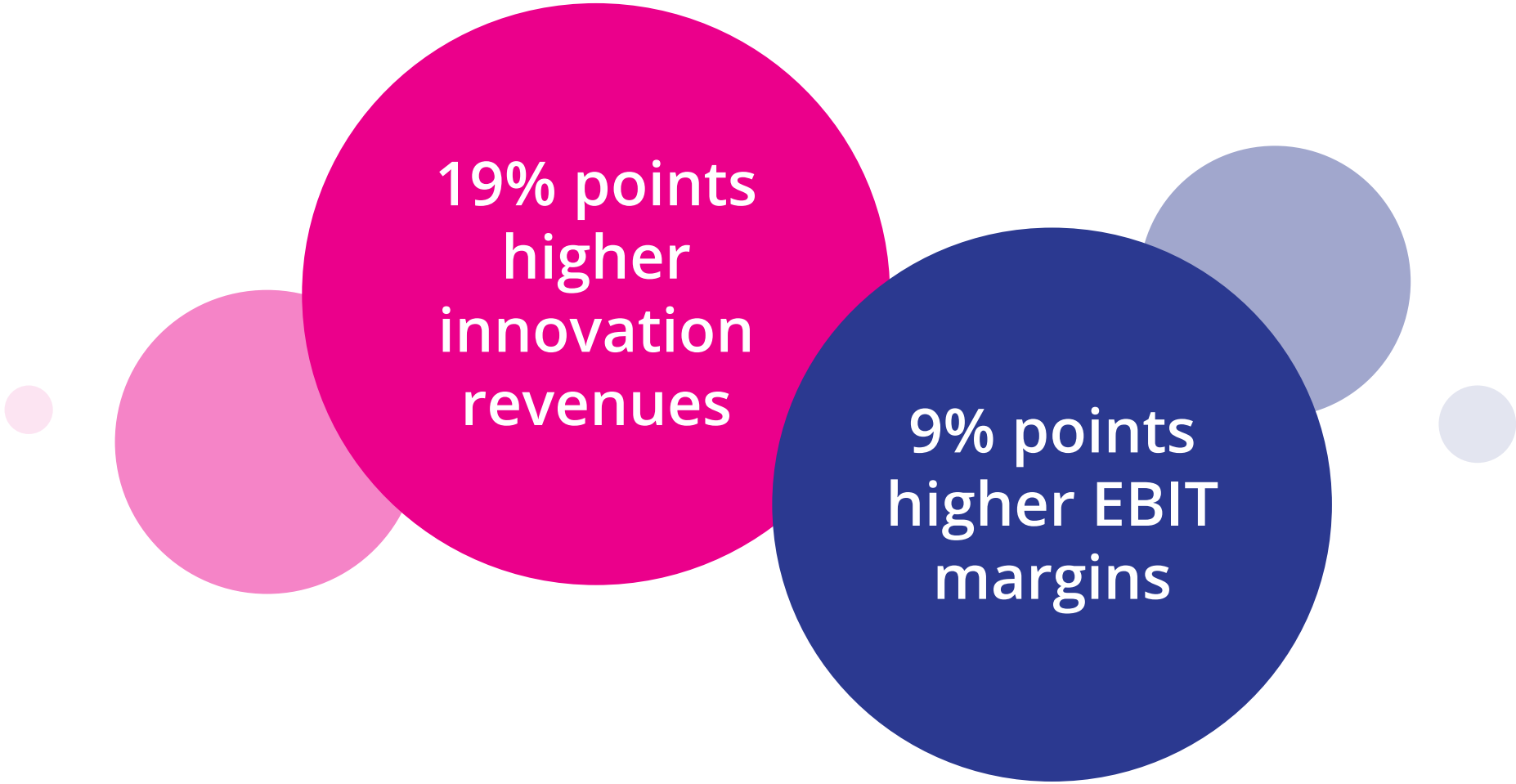


Proportion of women among ICT specialists, 2019



eurostat

DIVERSE TEAMS PERFORM BETTER



Source: Harvard Business Review, 2018

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WHY DIVERSE TEAMS PERFORM BETTER?

- They are more innovative and agile, but how specifically?
- They imagine smarter and multi-faceted solutions, spot biases
- They increase the possibility of new connections between experiences, perspectives, and insights
- They see more angles on potential problems
- They benefit from larger talent pool
- They lead people to being their authentic self, be happier in their job

We started with popularization of STEM among girls and women and their education towards ICT skills.

*__STEM__: __S__cience, __T__echnology, __E__ngineering and __M__athematics
*__ICT: I__nformation and __C__ommunication __T__echnologies

Continued with outreach towards children and their ICT/STEM teachers.

And ended up developing complex upskilling academies with technical mentoring and experience with real projects.

Not forgetting alumni programs, career development and consultancy for companies.

Community education

Safe environment and encouragement

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Practical and meaningful education

Role models
Career guidance
Companies engagement

MISSION

To inspire and empower new talents for stronger diversity and competitiveness in tech.

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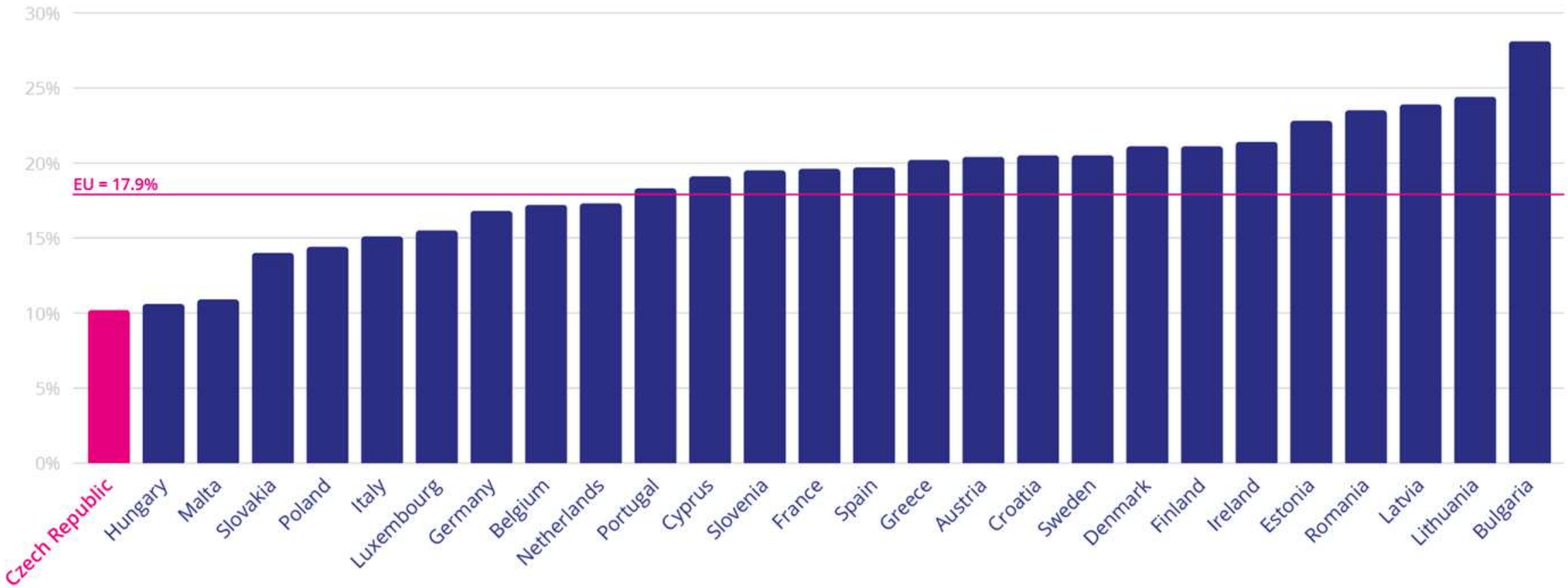
Proportion of women among ICT specialists, 2019



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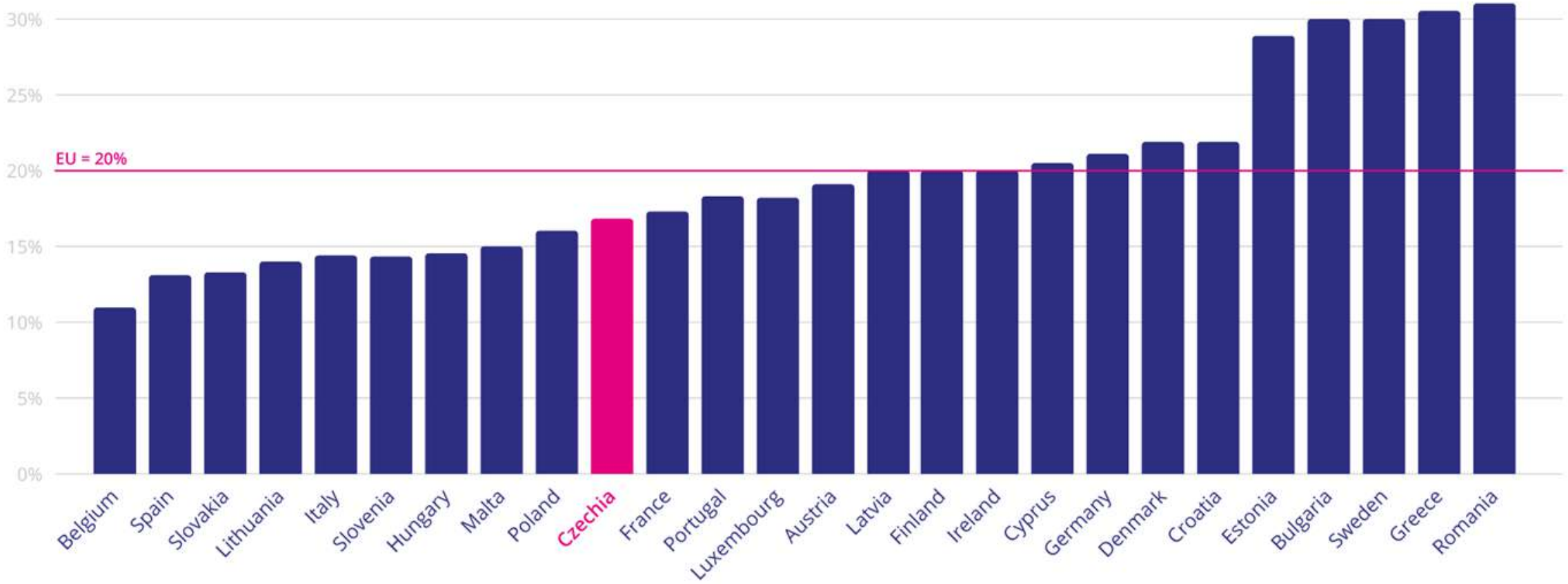
Proportion of Women among ICT Students



Source: Human resources in information technologies, 2021

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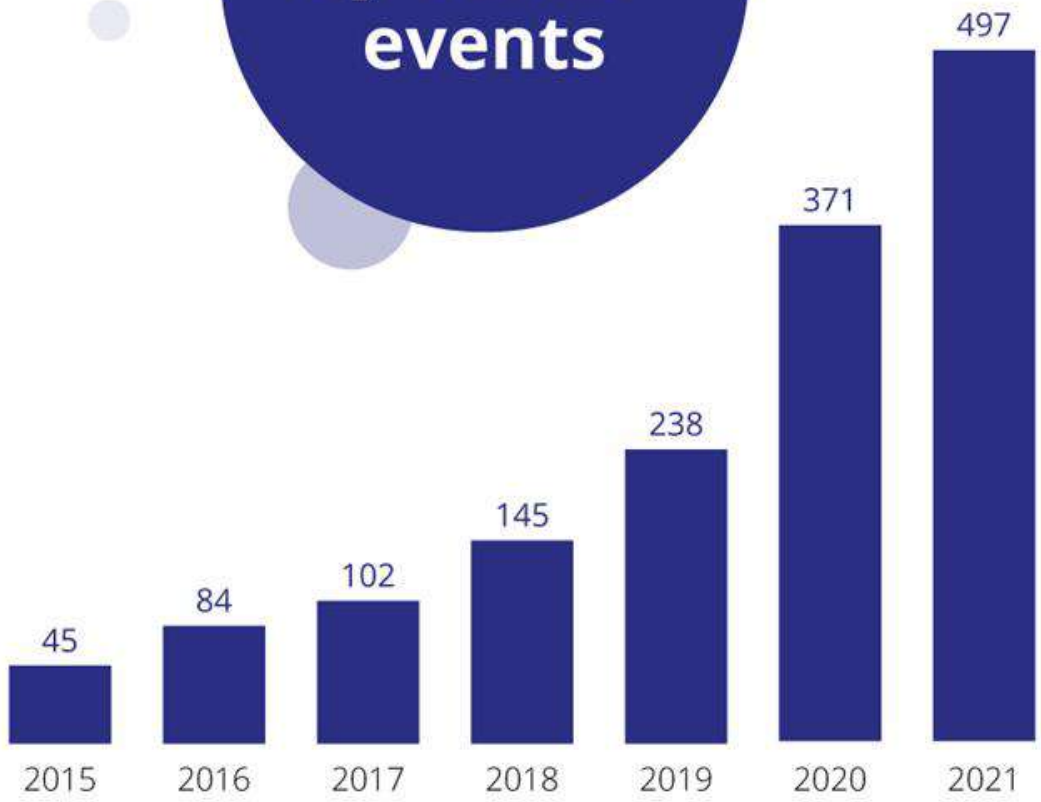
1,482+ events



41,018+ graduates

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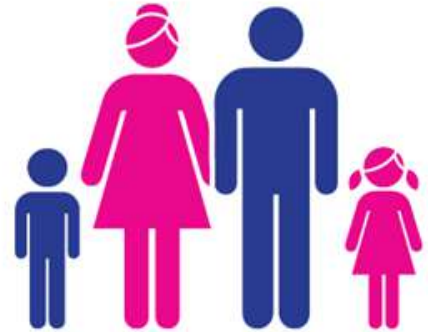
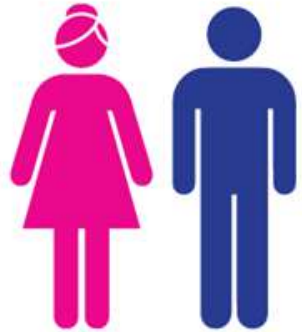
Liberec
Mladá Boleslav
Karlovy Vary
Praha
Hradec Králové
Plzeň
Olomouc
Ostrava
Brno
České Budějovice
Zlín

KIDS

HIGH SCHOOL STUDENTS

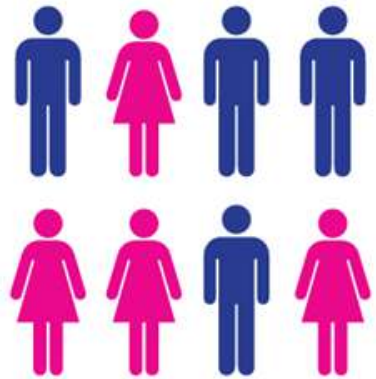


PARENTS

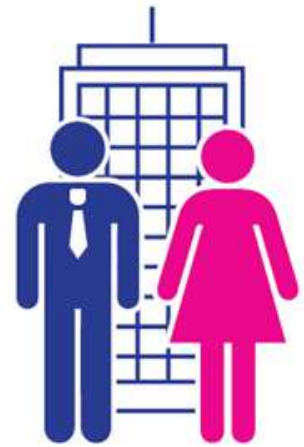


ADULTS

TEACHERS



PUBLIC



COMPANIES

IT Basics
Say hi to IT

Digital skills
Make your life easier with digital technologies

Coding
Get to know the world of code and learn how to code

Webdesign
Build your own website

Data Analysis
Find out what hides among the data

Testing
Test an application or a website

Career Design
Improve your career opportunities

IT in Practice
Become an IT expert

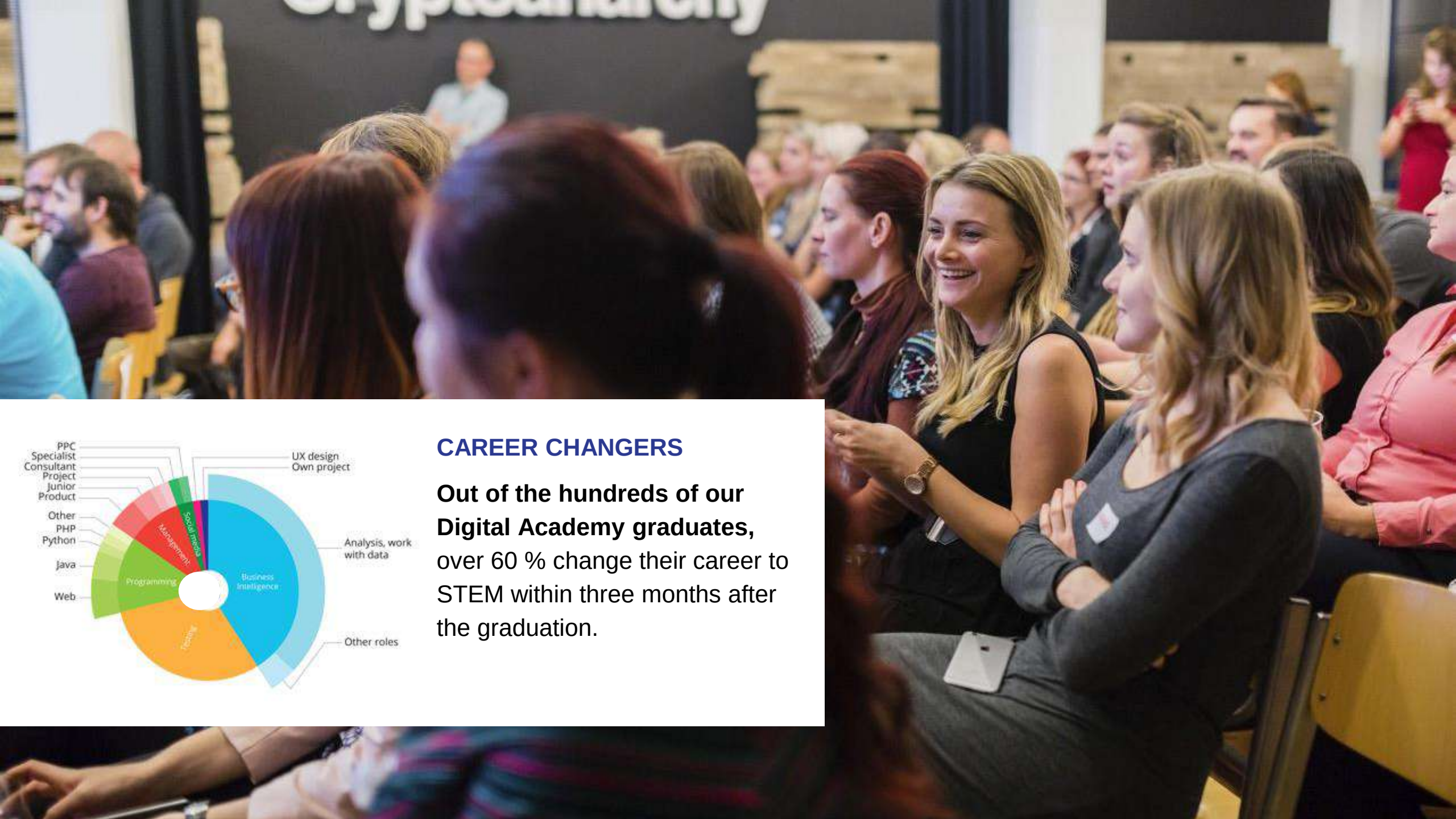
Community Events and Other Activities

FORMAT OF EVENTS

One-day workshops
Long-term courses
Upskilling academies
Hackathons
Coding clubs
Internships

… AND FOR CHILDREN

Summer schools for high-school girls
Summer camps for kids
Programs for schools
Programs for teachers and headmasters
EU Code Week, Hour of Code events
Family days



CAREER CHANGERS

Out of the hundreds of our Digital Academy graduates, over 60 % change their career to STEM within three months after the graduation.

CZECHITAS is a **community** connecting people who want to **learn IT** with those who want to **share** their IT knowledge. We connect *companies, municipalities, universities, IT experts* and *non-profit organizations* under a common goal of making IT skills more accessible to general public.

Nejúspěšnější obsahový počin 2017
2018

Ceny SDGs Finalista 2018
2018

SXSW Community Service Award
2017

Národní cena kariérového poradenství
2017

Digital Skills and Jobs Coalition

European Digital Skills Awards Finalist
2017

Aspen Young Leaders Programme
2016, 2017

Young Transatlantic Leaders Innovation Programme
2016

Forbes 30 pod 30
2016

Global Entrepreneurship Summit
2016

Top ženy Česka
2016

European Citizen Award
2016

Nominace na křišťálovou lupu
2015, 2016, 2017

Social Impact Award
2015

New Europe 100
2015

SOCIAL ECONOMY EUROPE
PRESENTS

THE EUROPEAN

SOCIAL ECONOMY AWARDS

2021

OCTOBER 12 - SLOVENIA

WHAT HELPED US TO BECOME SUCCESSFUL?

WHAT HELPED US TO BECOME SUCCESSFUL

- Love for what we do – giving us purpose, energy and direction, holding us together
- Visual and playful communication – informal and fun, visually attractive, love brand
- Community and sense of belonging – connecting those who strive to learn with those who strive to share and teach, and those who want to support the connection
- Safe environment and encouragement – safe to make mistakes, experience success, opportunity to exchange, collaboration, personalized feedback, guidance
- Creating stories – to inspire, to give hope and confidence, relatable role models
- Sustainable financial model – engagement of companies, universities, municipalities
- Knowledge and understanding – of the frustrations steering girls away from STEM

COST Action – CA19122

European Network For Gender Balance in Informatics

- **Duration**: 4 years, Oct 2020 – Oct 2024
- Initially **24 member countries** in the network of proposers
- Currently **38 members countries**
- Action Chair: Prof. Letizia Jaccheri, Norway
- Grant Holder Scientific representative: Informatics Europe, Switzerland
- **Website** http://eugain.eu/
- **Follow us on Facebook and Twitter** eugain19122

cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

EUGAIN Network for Gender Balance in Informatics

- EUGAIN supports the academic community, policymakers and industry in sharing **recommendations and guidelines** on:
  - **(i)** How to persuade **more girls to major in Informatics** in university;
  - **(ii)** How to **retain female students** and assure they finish their studies and start successful careers in the field;
  - **(iii)** How to **encourage more female Ph.D.'s** and postdoctoral researchers to remain in academia and apply for professorships in Informatics;
  - **(iv)** How to support and inspire young women in their **academic careers**.

[https://eugain.eu/]

cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

TAKEAWAY

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Thank you.