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
“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
“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
SW ARCHITECTURE IS NOT ITS BLUEPRINT
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**
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
Engineering for the Unknown

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Forensic-Ready software systems
Engineering for the Unknown

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NEED FOR EXTENSIVE MINDSET STRETCH
Bridging Communities & Thinking out of the Box
What shall be the competencies of a SW architect?

— Ability to understand, envision, trade-off, integrate, strategize
— 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
WHO WE ARE IN SOFTWARE ENGINEERING/ARCHITECTURE?

# of people

Target/single discipline  Perspective/multi-disciplinary
WHO WE ARE IN SOFTWARE ENGINEERING/ARCHITECTURE?

Target/single discipline vs Perspective/multi-disciplinary

# of people
WHO WE WANT TO BE?

Target/single discipline  Mid-point  Perspective/multi-disciplinary

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
“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
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**
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?
79% of Czech enterprises with ICT vacancies struggle with finding the right talent (53% in Europe)

Source: Eurostat (online data code: isoc_ske_ltrcn2)
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

EU = 17.9%
DIVERSE TEAMS PERFORM BETTER

- 19% points higher innovation revenues
- 9% points higher EBIT margins

Source: Harvard Business Review, 2018
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: Science, Technology, Engineering and Mathematics
* ICT: Information and Communication Technologies
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

Practical and meaningful education

Role models career guidance companies engagement
MISSION

To inspire and empower new talents for stronger diversity and competitiveness in tech.
Proportion of women among ICT specialists, 2019

EU = 17.9%
Proportion of Women among ICT Students

Source: Human resources in information technologies, 2021
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.
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/](http://eugain.eu/)
- Follow us on Facebook and Twitter eugain19122
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/]
“The reason why women self-select away from tech (referring to their competencies) IS THE VERY REASON WHY WE NEED THEM IN.”
Thank you.