STATE OF THE PRACTICE SURVEY: PREDICTING THE INFLUENCE OF AI ADOPTION ON SYSTEM SOFTWARE ARCHITECTURE IN TRADITIONAL EMBEDDED SYSTEMS

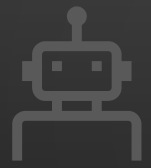
JASMIN JAHIĆ, ROBIN ROITSCH

JJ542@CAM.AC.UK

15.09.2020, ECSA 2020

IS ADOPTING AI AN ADEQUATE ARCHITECTURAL DECISION?

AI has many benefits.



AI is a complex technology.

Is adopting AI adequate according to architectural drivers (business and functional)?

Is AI compatible with the existing software architectural solutions?

SOLUTION ADEQUACY CHECK

Strength, Weakness, Opportunities, and Threats (SWOT) analysis.

Architecture Trade-off Analysis Method (ATAM).

Rapid Architecture Evaluation (RATE) method.

RESEARCH QUESTIONS

EXISTING SOFTWARE ARCHITECTURE AND ENGINEERING PRACTICES TO SUPPORT DECISION-MAKING.

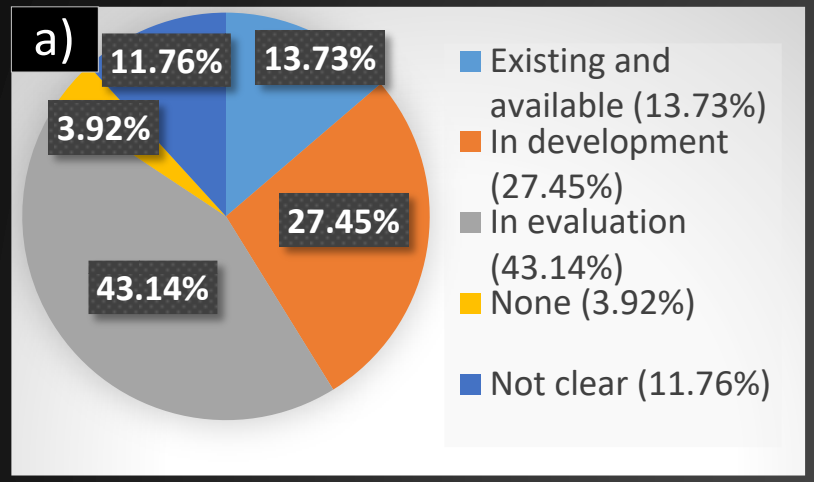
REQUIREMENTS AND LIMITATIONS STOPPING THE AI ADOPTION.

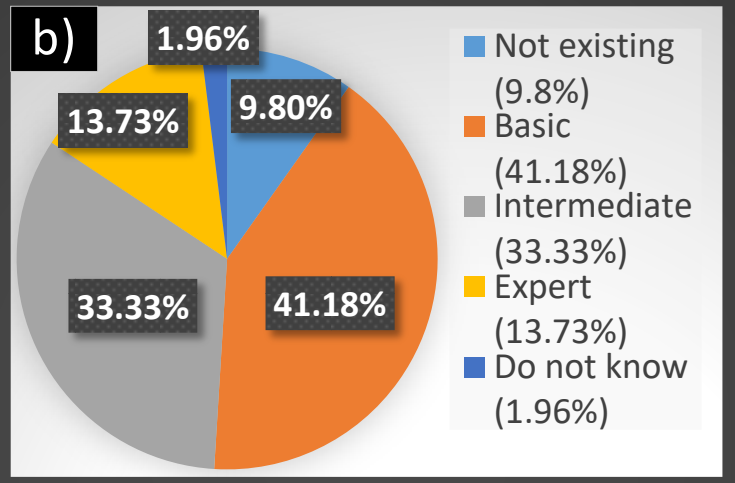
GAPS - WHAT COULD ENHANCE EXISTING DECISION-MAKING TECHNIQUES IN CONTEXT OF AI ADOPTION?

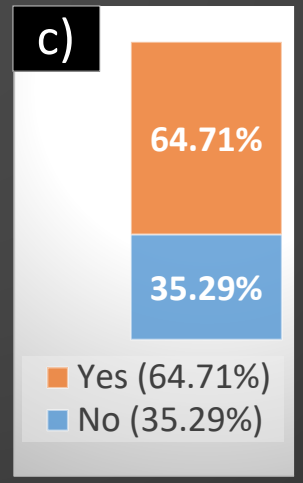
SURVEY SETUP

- 51 embedded software system companies from Austria, Germany, and Switzerland.
- Company size: 1 to 49; 50 - 999; 1000-4999; over 5000 employees
- 12 industrial domains (agriculture, automotive, avionics, autonomous machines, computer vision, defence, industrial applications, medical, smart home/city, public sector, energy, IT and Internet of Things (IoT)).
- 14 application fields (research and development, autonomous flying, automotive applications (driving, management), biometric application, image processing and vision, IoT platforms and connectivity, audio equipment, journalism, predictive maintenance, drilling services, energy management systems, lightning systems, industry 4.0 and robotics, medical devices).

INTERNAL KNOWLEDGE AND EXPERIENCE WITH AI





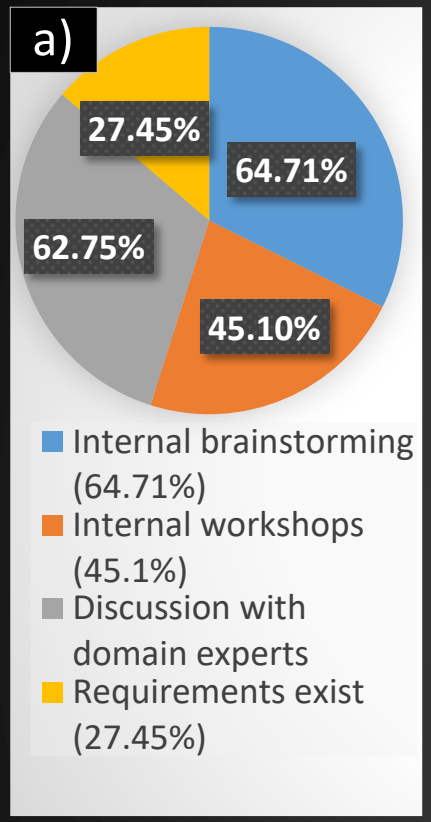


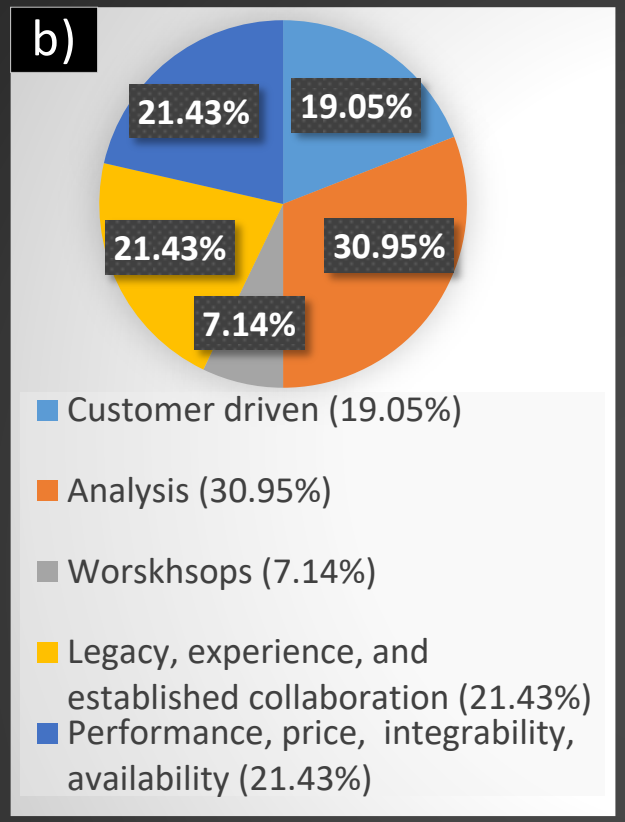
a) Stage of AI adoption.

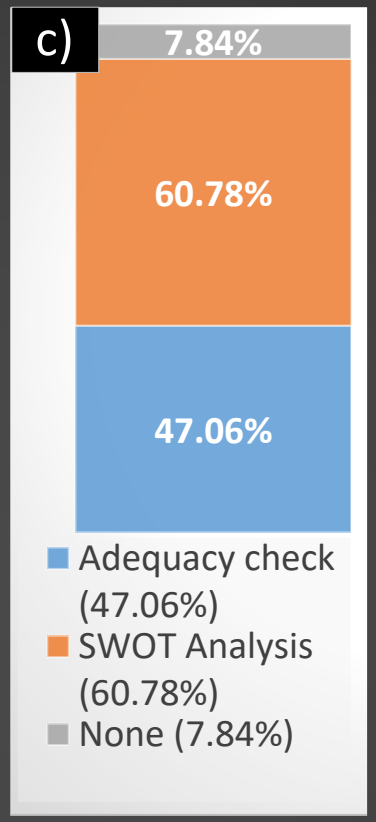
b) Internal competences and knowledge about AI.

c) Presence of dedicated AI experts.

EXISTING SOFTWARE ENGINEERING AND ARCHITECTURE PRACTICES



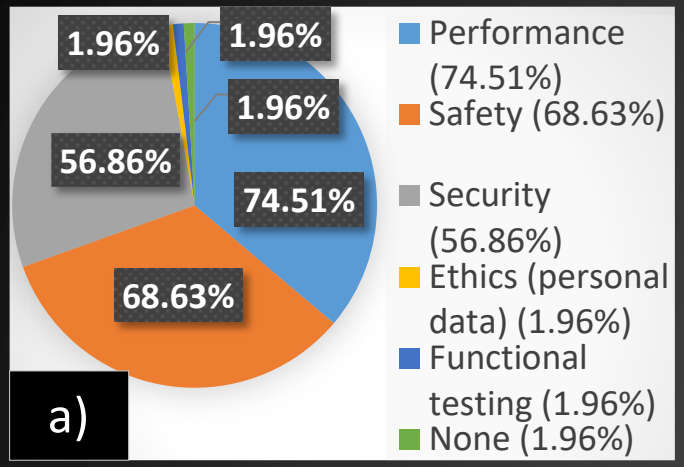


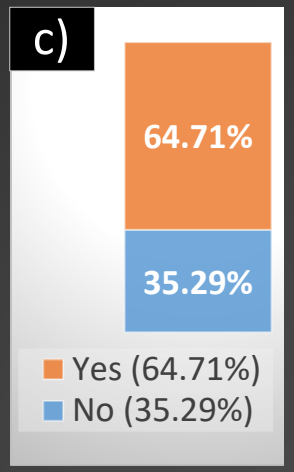


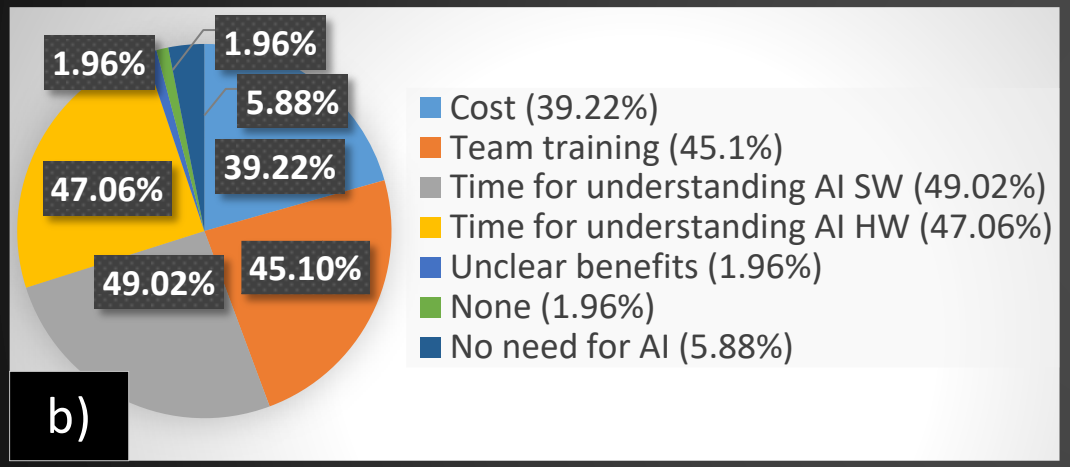
a) Requirements engineering approach.

b) Decisions-making drivers regarding suitable technologies.

c) Techniques for evaluating the influence of adopting new technologies on software system architecture.







a) Non-functional quality requirements.

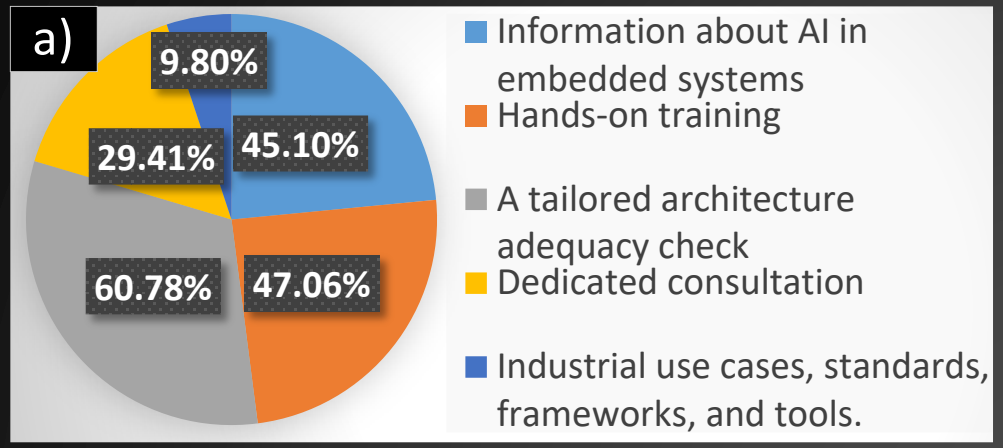
b) Technical, commercial, and organisational constraints.

c) Presence of dedicated AI experts.

REQUIREMENTS AND LIMITATIONS HINDERING AI ADOPTION

ENHANCING DECISION-MAKING PROCESS FOR AI ADOPTION

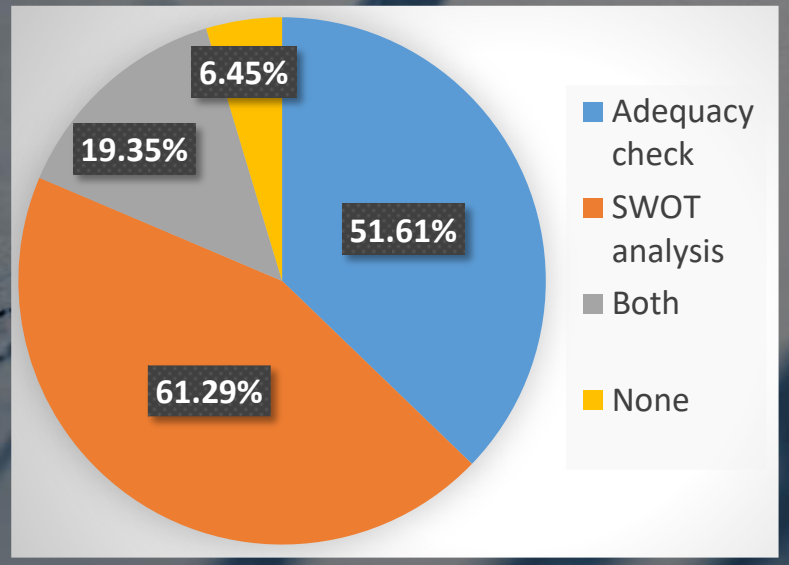
a)



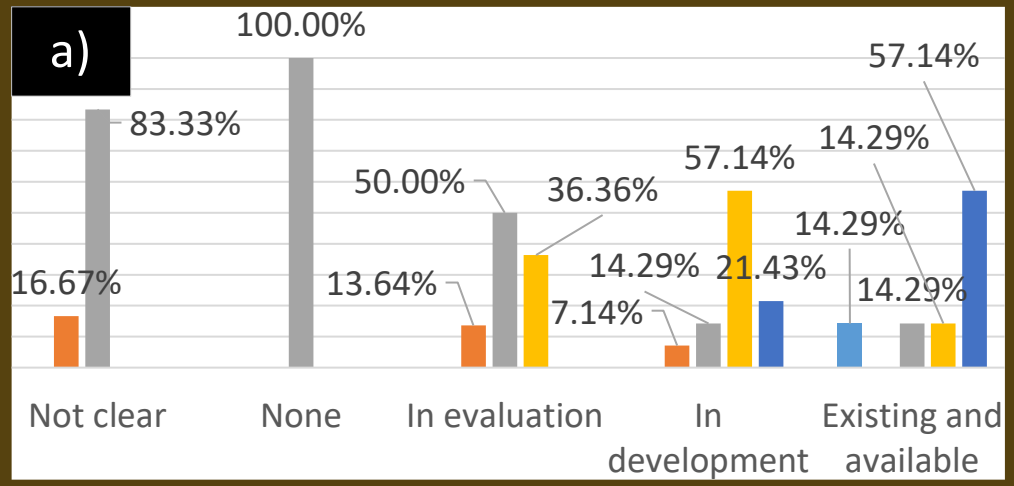
b)

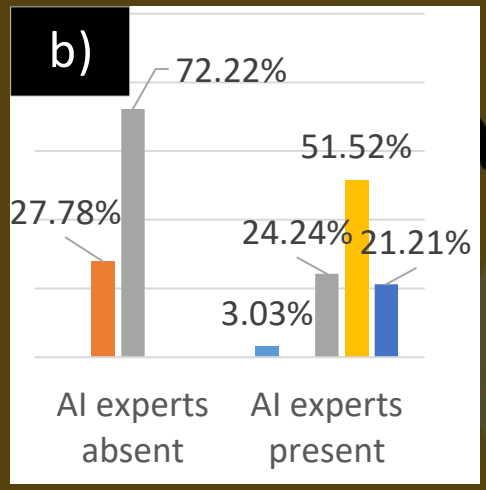
a) Knowledge and techniques that could (further) facilitate adoption of AI.

b) Concrete points that companies need to understand about AI to (further) adopt it.



USE OF THE EXISTING ANALYSIS APPROACHES AMONG PARTICIPANTS THAT CONSIDER THAT THEY ALSO NEED A TAILORED ADEQUACY CHECK FOR TO FACILITATE ADOPTION OF AI.





a) STAGE OF AI ADOPTION.
b) PRESENCE OF AI EXPERTS.

SURVEY RESULTS ACCORDING TO INTERNAL KNOWLEDGE THAT COMPANIES HAVE REGARDING AI

CONCLUSIONS

- There is a gap between the knowledge that AI experts have about AI and the knowledge about using AI in software engineering.
- There is a need for a tailored adequacy check.
- There is a need to decompose the problem.
- There is a need to explicitly expose the lack of knowledge about concrete AI related properties, components, and processes before making a decision about adopting AI.