Faculty of Mechanical and Industrial Engineering

WARSAW UNIVERSITY OF TECHNOLOGY

Sustainable Printing 4.0 – Insights from the Survey in Poland

Authors:

Bartlomiej Gladysz, Krzysztof Krystosiak, Krzysztof Ejsmont, Aldona Kluczek and Aleksander Buczacki

Warsaw University of Technology

Agenda

- Introduction
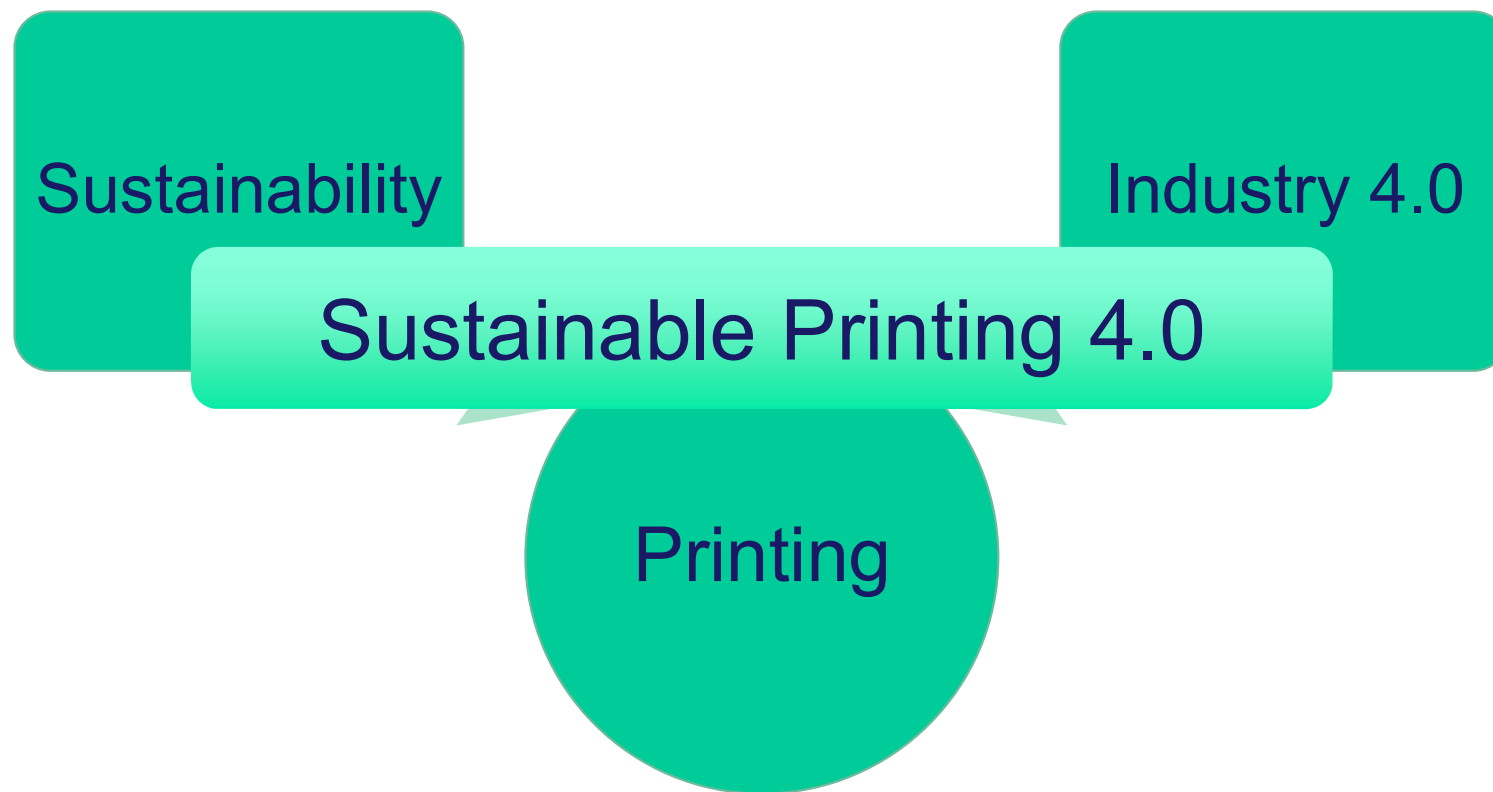- Methods
- Results
- Conclusion
- Further research

Warsaw University
of Technology

Introduction

- Customers expectations
- Industry 4.0 in printing industry
- Sustainability in the printing industry
- Environmental considerations

Warsaw University
of Technology

TBL perspective	Expected benefits	Concerns
Economic	Increased revenues and profitability More accurate planning Shortened lead times Increased reliability of machines	Cost-intensive Possibility of offering new products and services Difficulties with determining full financial benefits and economic efficiency (this can be achieved by using one of I4.0 technologies: computer simulation modelling)
Environmental	Increased energy efficiency Decreased manufacturing scrap waste Decreased materials usage Decreased emissions	Increased industrial and post-industrial waste Increased energy consumption Decreased availability of raw materials
Social	Increased of safety More ergonomic environment (tasks fitted to persons)	Human-robot interaction (HRI) issues Threat of unemployment Privacy issues

Warsaw University
of Technology

Sustainable Printing 4.0

Sustainability

Industry 4.0

Sustainable Printing 4.0

Printing

Warsaw University of Technology

Research questions

- What is the awareness level concerning the Industry 4.0 technologies and sustainability practices in your company?

- Which Industry 4.0 technologies are currently used in your company or which you plan to implement in the future?

- Which sustainability practices are currently used in your company or do you plan to implement in the future?

- Which obstacles did you encounter when implementing/using Industry 4.0 technologies and sustainability practices in your company?

- Do Industry 4.0 technologies and sustainability practices currently contribute to your company or will they in the future?
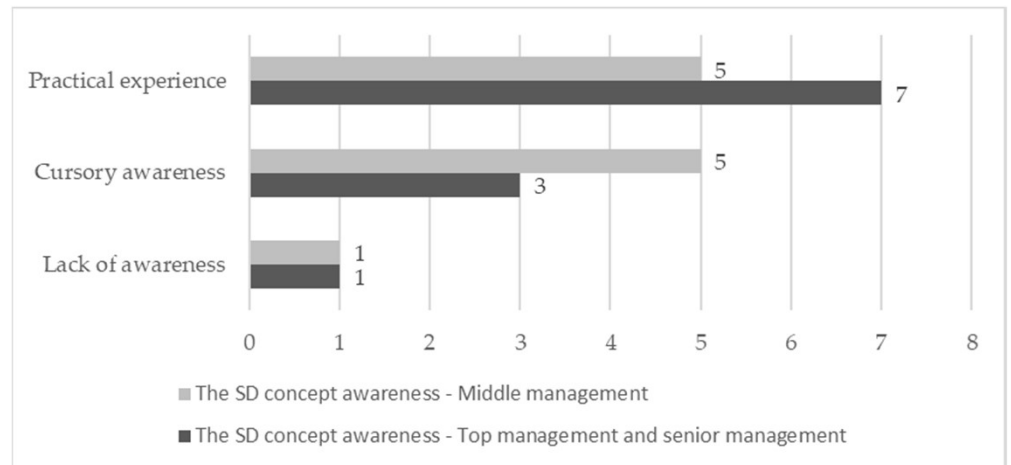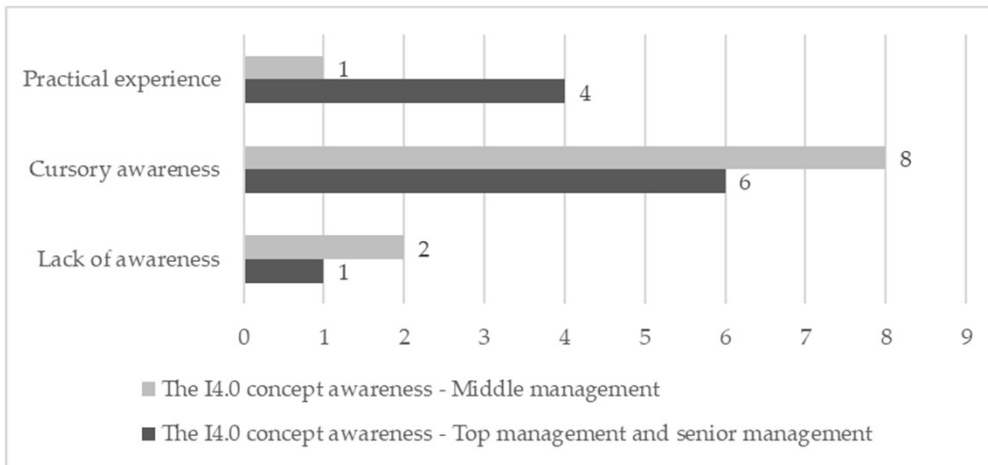
Warsaw University
of Technology

Research sample

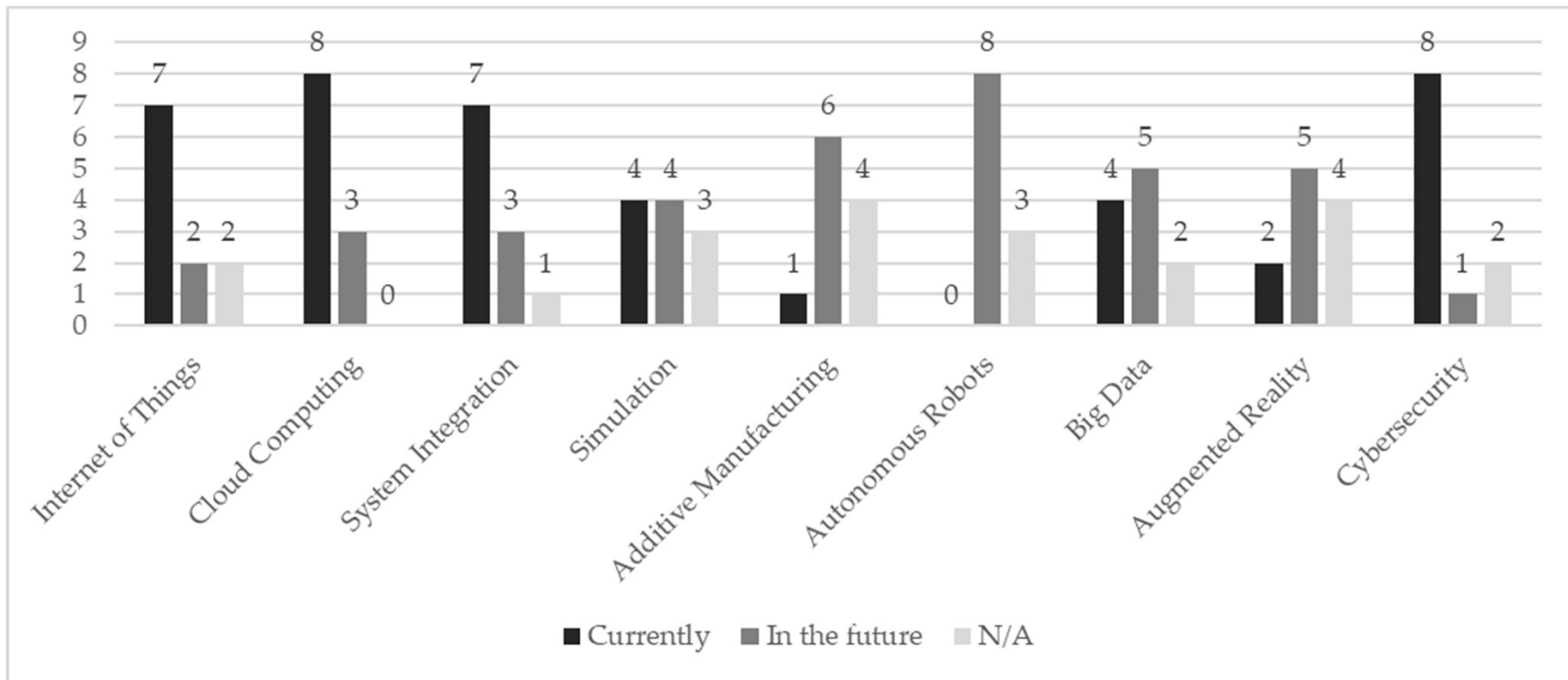| Company	Size	Range of operations	Interviewee's position
A	Medium	European	R&D Manager
B	Large	Global	Chief Executive Officer
C	Medium	European	Chief Technology Officer
D	Large	European	R&D Engineer
E	Medium	European	Technology Manager
F	Medium	International	Lean Manager
G	Large	International	Chief Operation Officer
H	Medium	European	Chief Executive Officer
I	Small	European	Vice Chief Executive Officer
J	Small	National	Deputy Production Manager
K	Large	European	Prepress Manager

Warsaw University
of Technology

What is the awareness level concerning the Industry 4.0 technologies and sustainability practices in your company?
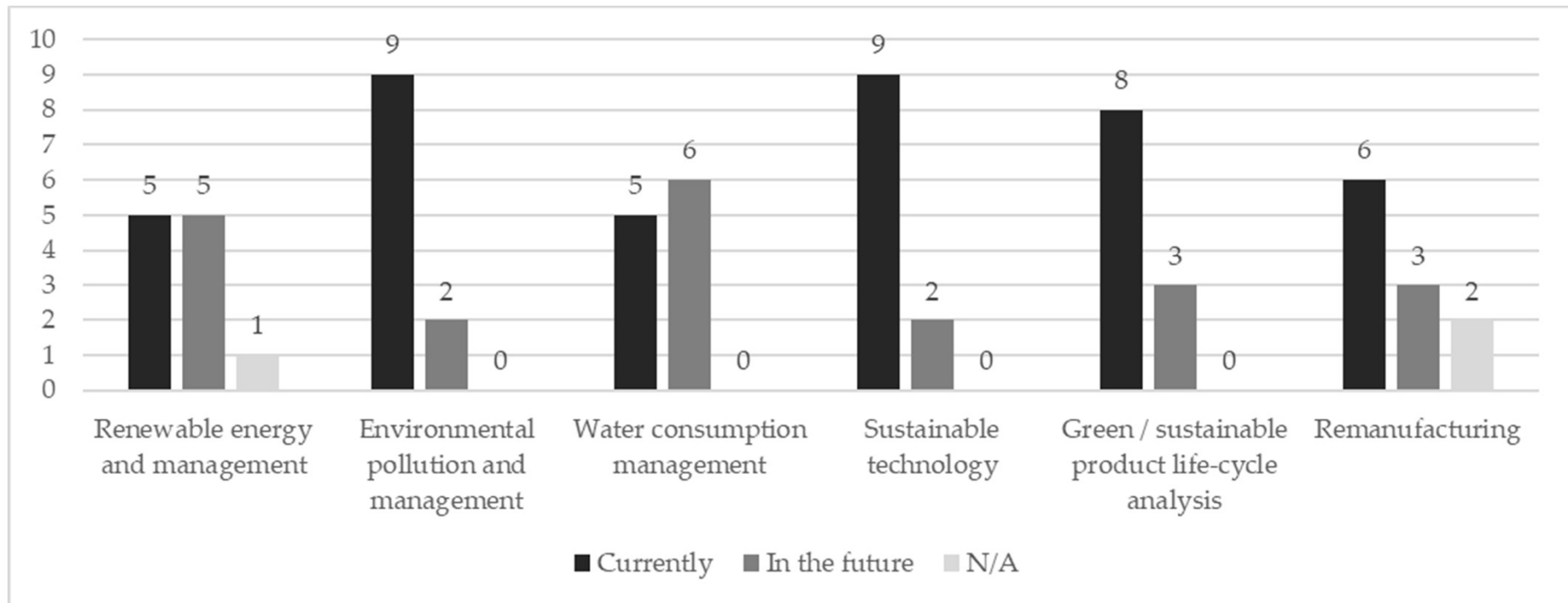
Which Industry 4.0 technologies are currently used in your company or which you plan to implement in the future?
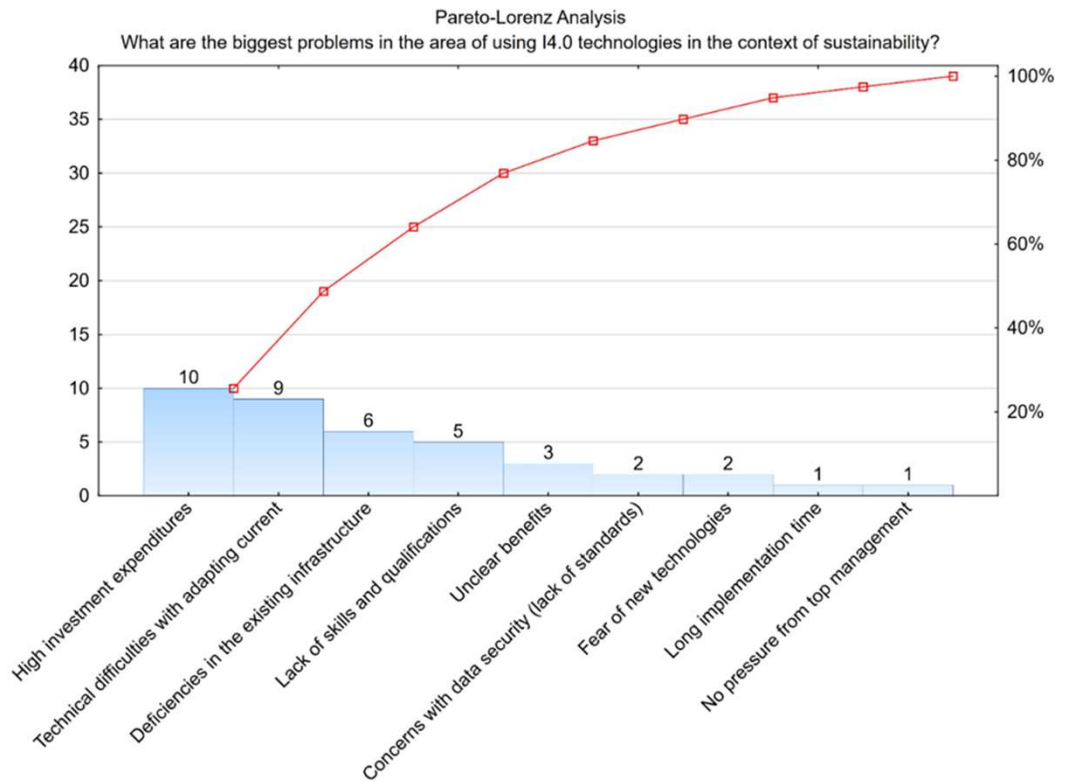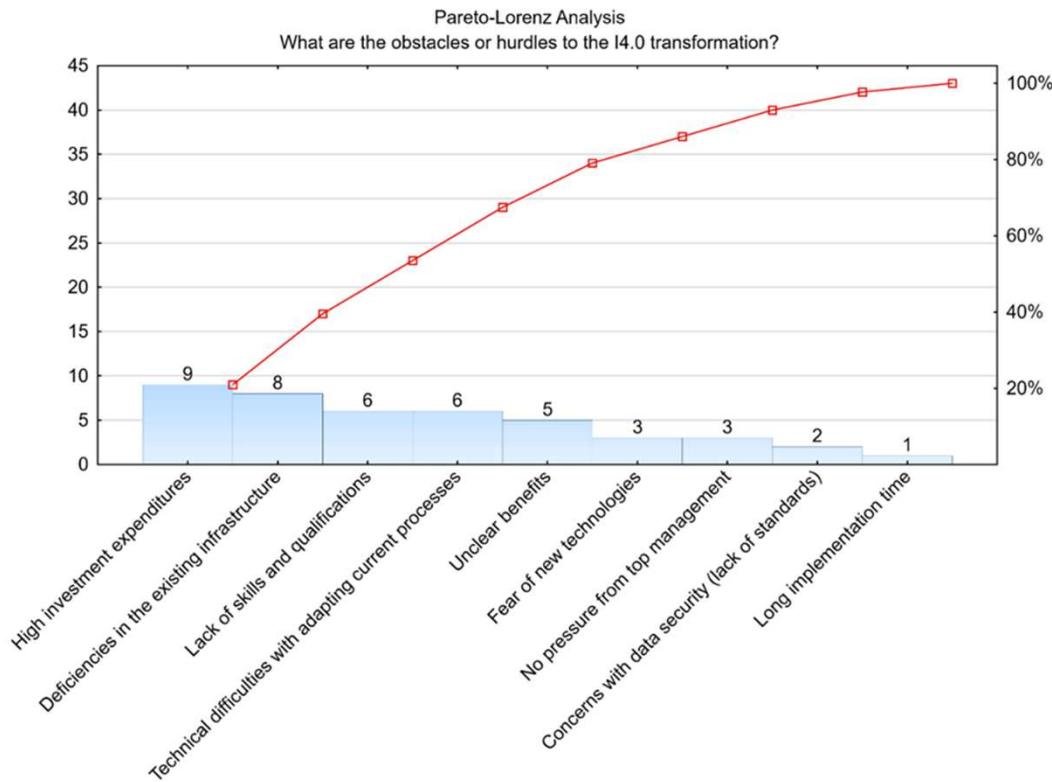
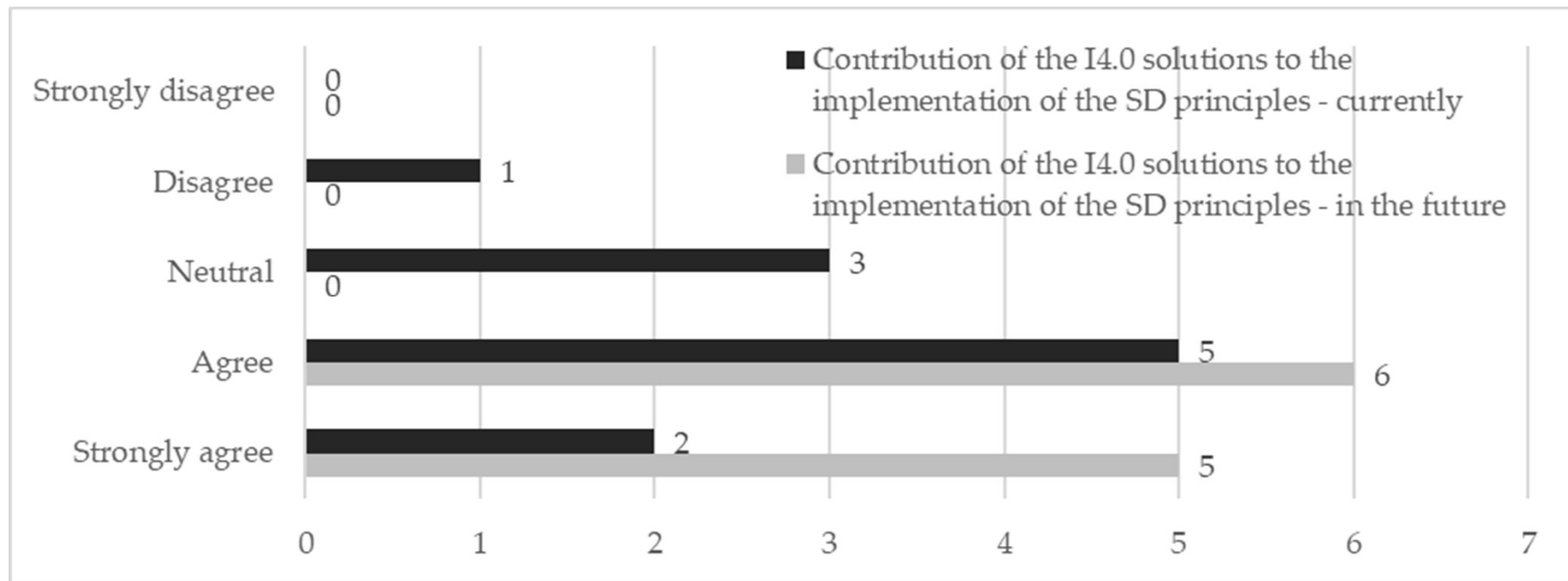# Which sustainability practices are currently used in your company or do you plan to implement in the future?

Warsaw University
of Technology

Which obstacles did you encounter when implementing/using Industry 4.0 technologies and sustainability practices in your company?

Pareto-Lorenz Analysis
What are the obstacles or hurdles to the I4.0 transformation?

Pareto-Lorenz Analysis
What are the biggest problems in the area of using I4.0 technologies in the context of sustainability?

Warsaw University of Technology

Do Industry 4.0 technologies and sustainability practices currently contribute to your company or will they in the future?

Conclusions

- Industry 4.0 and sustainability relationship

- Holistic Industry 4.0 – sustainability relationship

- Model of sustainable Industry 4.0

- The credibility or 'trustworthiness' of the results

- Reliability

Warsaw University
of Technology

Further research

- The impact of I4.0 on sustainability in the context of printing companies
- Obtained results may encourage scientists and practitioners
- Digitalization for sustainability in the printing

Warsaw University of Technology

Faculty of Mechanical and Industrial Engineering

WARSAW UNIVERSITY OF TECHNOLOGY

Thank you for your attention

Speaker:

Krzysztof Krystosiak

   mail: krzysztof.krystosiak@pw.edu.pl

   tel: +48 660 198 165

Warsaw University of Technology

WUT