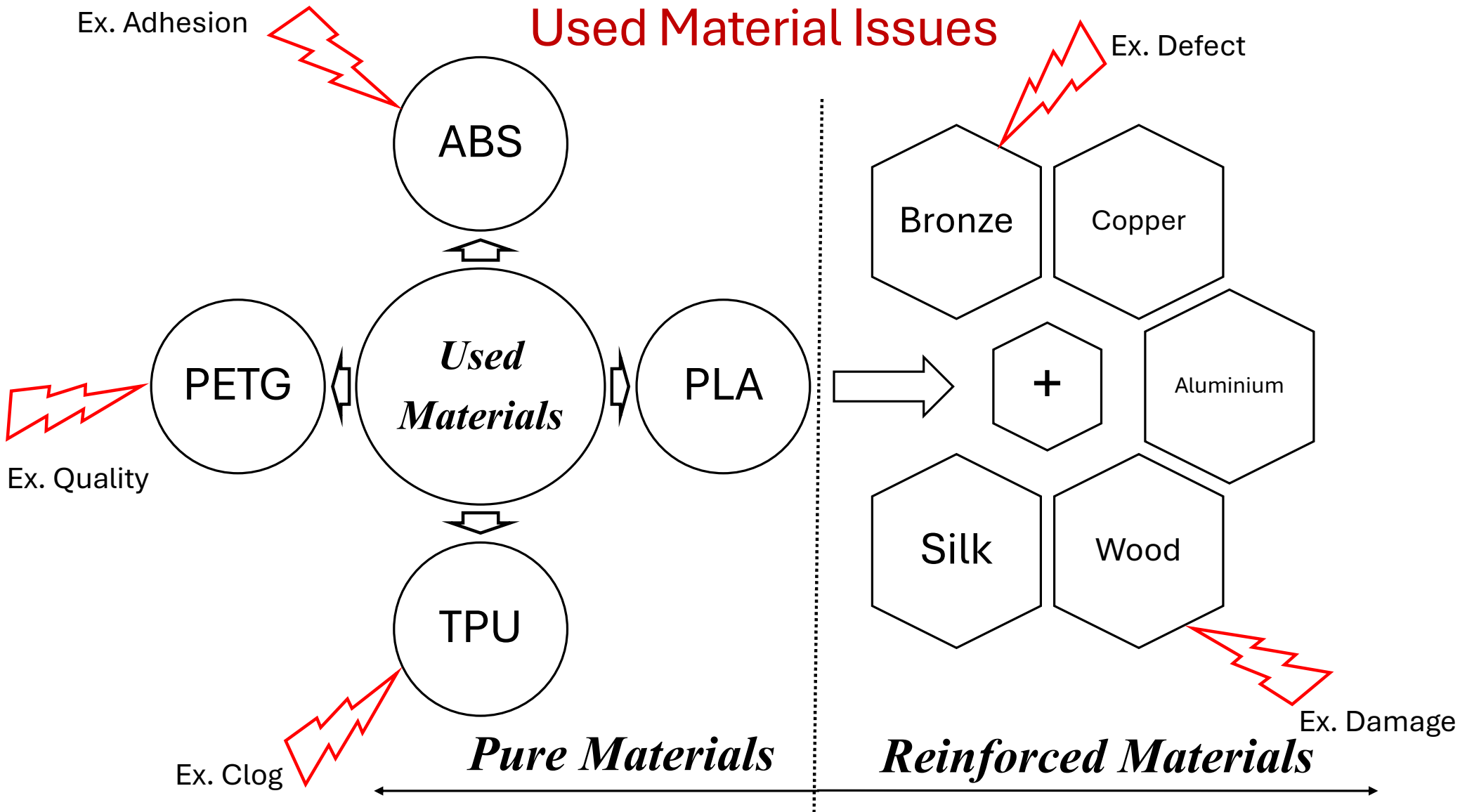# Contributions to Software Developments at BigRep GmbH
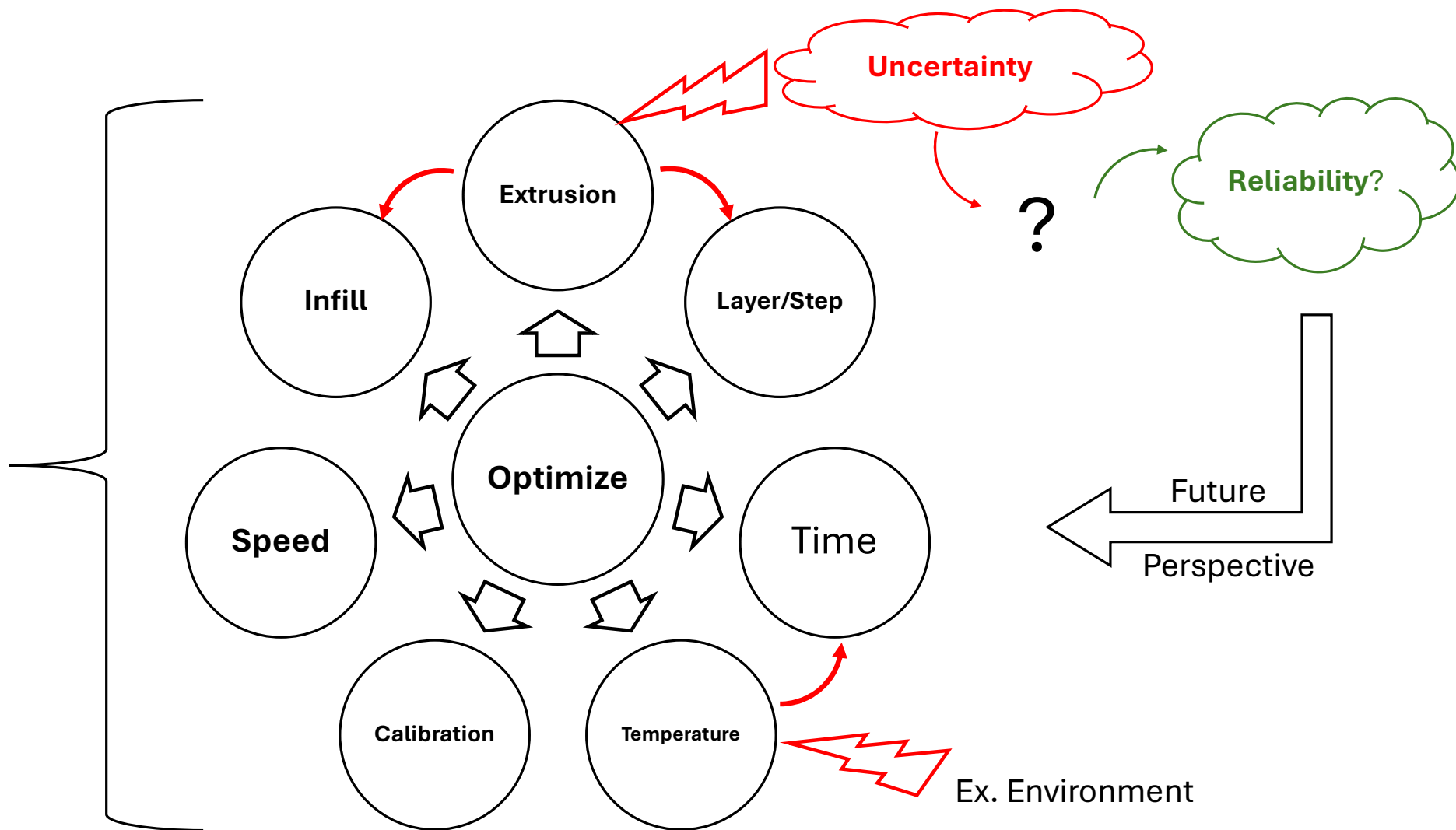
19-02-2025   10:00 -12:30

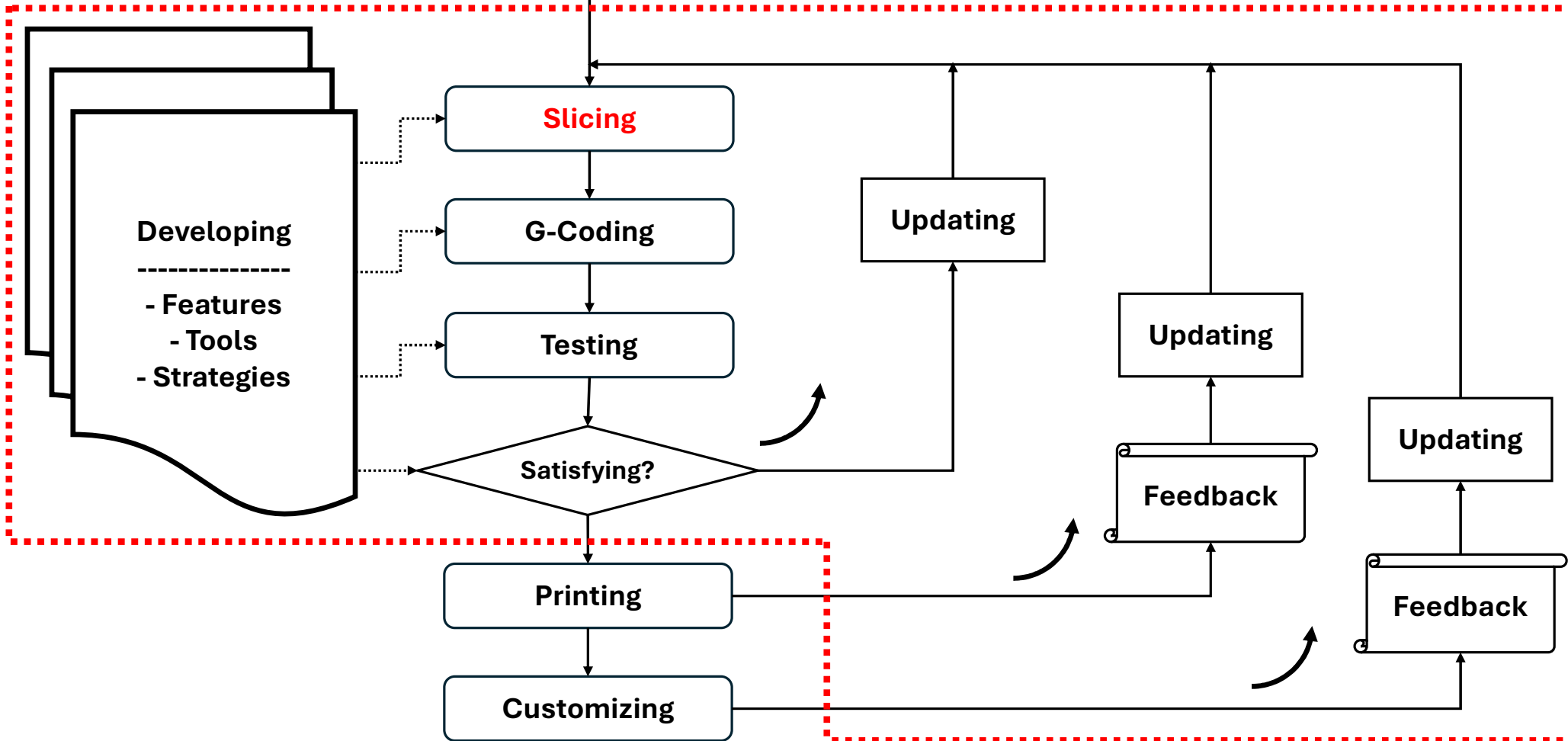**Ghais Kharmanda**

3D printing 4u

Cologne - Germany

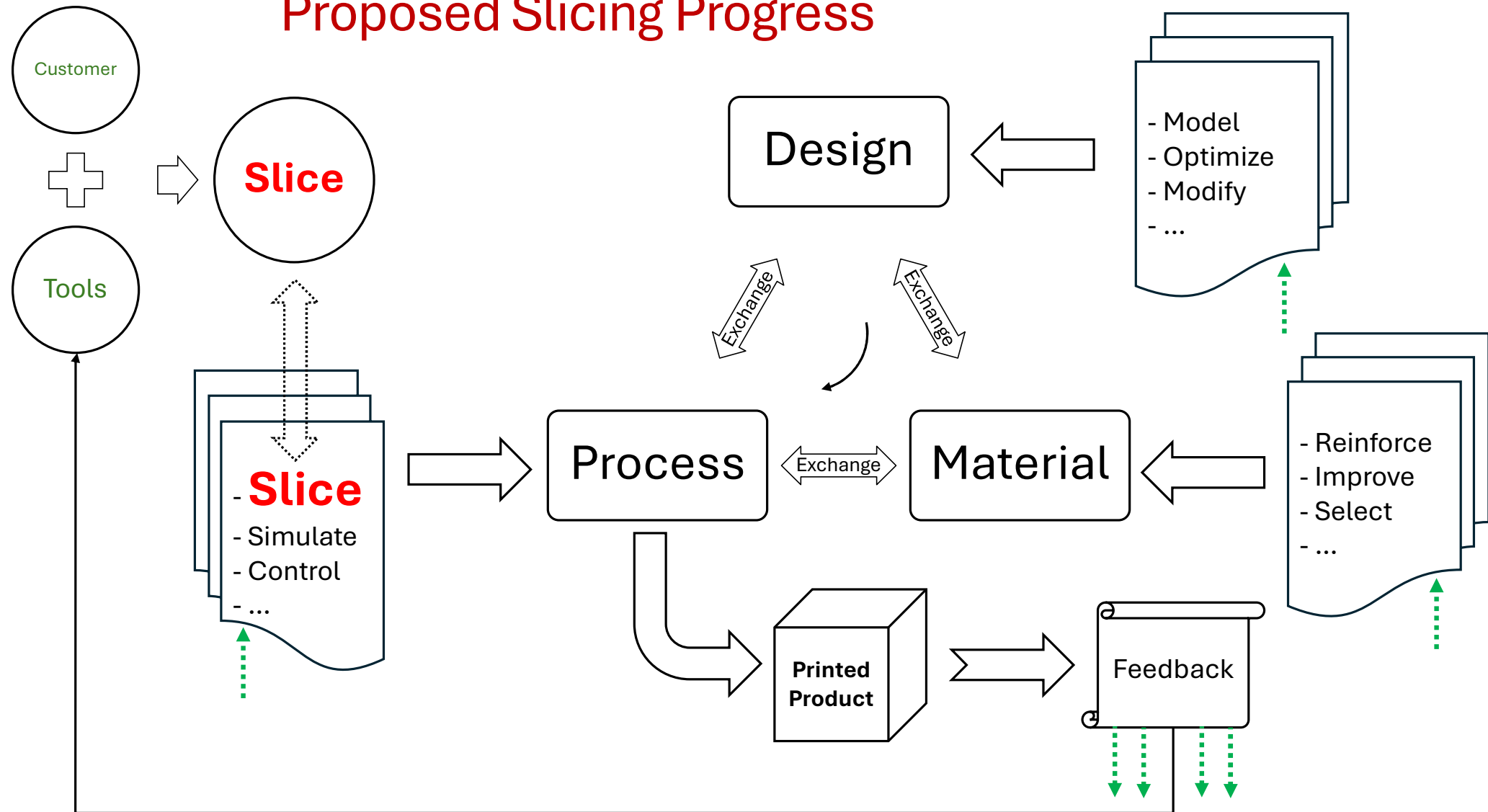# Used Material Issues

Ex. Adhesion

ABS

Ex. Quality

PETG

Used Materials

PLA

Ex. Clog

TPU

Pure Materials

Ex. Defect

Bronze

Copper

+

Aluminium

Silk

Wood

Ex. Damage

Reinforced Materials

Multi-Level Optimization
(Software Development)

Modelling

Slicing

G-Coding

Testing

Satisfying?

Printing

Customizing

Developing

- Features
- Tools
- Strategies

Updating

Updating

Updating

Feedback

Feedback

Proposed Slicing Progress

Customer

\+

Tools

Slice

- **Slice**
- Simulate
- Control
- ...

Design

- Model
- Optimize
- Modify
- ...

Exchange

Exchange

Process

Exchange

Material

- Reinforce
- Improve
- Select
- ...

Printed Product

Feedback

Original Model → Slicing → **Printed Model**

Effective Slicing Needs
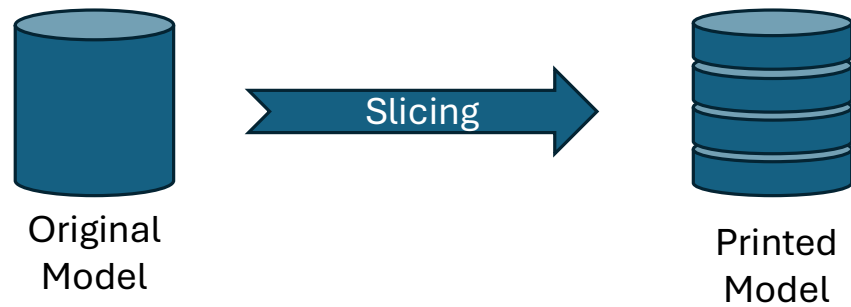
- Effective algorithms in literature
- Cost/quality,
- Connection between layers,
- Number of layers (resolution),
- Thickness of each layer (resolution),
- Slicing time (balance, several criteria),
- Mechanical properties (tensile),
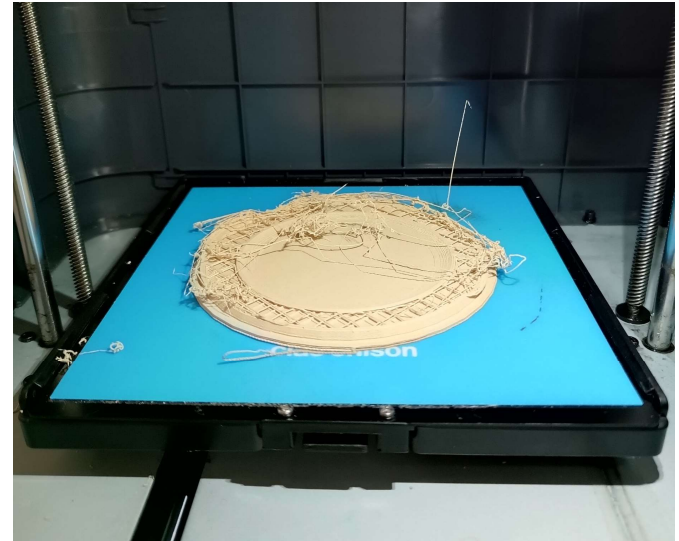- Likelihood of failure.

Multi-directional slicing strategies

- To improve surface quality
- To avoid/reduce support structures

Defect Case

Failure Case

Future Perspectives (1)

- Can we provide the users with an open-resource software where they can tweak or even re-write the codes according their needs?

- Can we integrate certain previously developed algorithms existing in literature?

- Do we need topology optimization to find the best distribution of support structures?

- Can we develop AI-driven monitoring system to reduce the likelihood of failure?

- What about automatic calibration and its corresponding needed sensor?

- What about execution inaccuracies?

- What about 4D printing?

Future Perspectives (2)

- How can we optimize slicing process to improve mechanical properties of the final products?

- What about mechanical anisotropy induced by FFF?

- How can we avoid unsuitable solidification problems?

- Can we develop a reliability algorithm to overcome uncertainty cases? BUT, how to integrate reliability concept into FFF process?

- How can we develop optimization tools to reduce slicing time?

- For which developments can we use Python? Easy BUT certain platforms.

- For which developments can we use C++? Many platforms BUT difficult.

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