Fraunhofer

IAPT

Fraunhofer Research Institution for
Additive Manufacturing Technologies
IAPT

Additive Design Automation

**Overall component optimization in terms of
quality, time and cost**

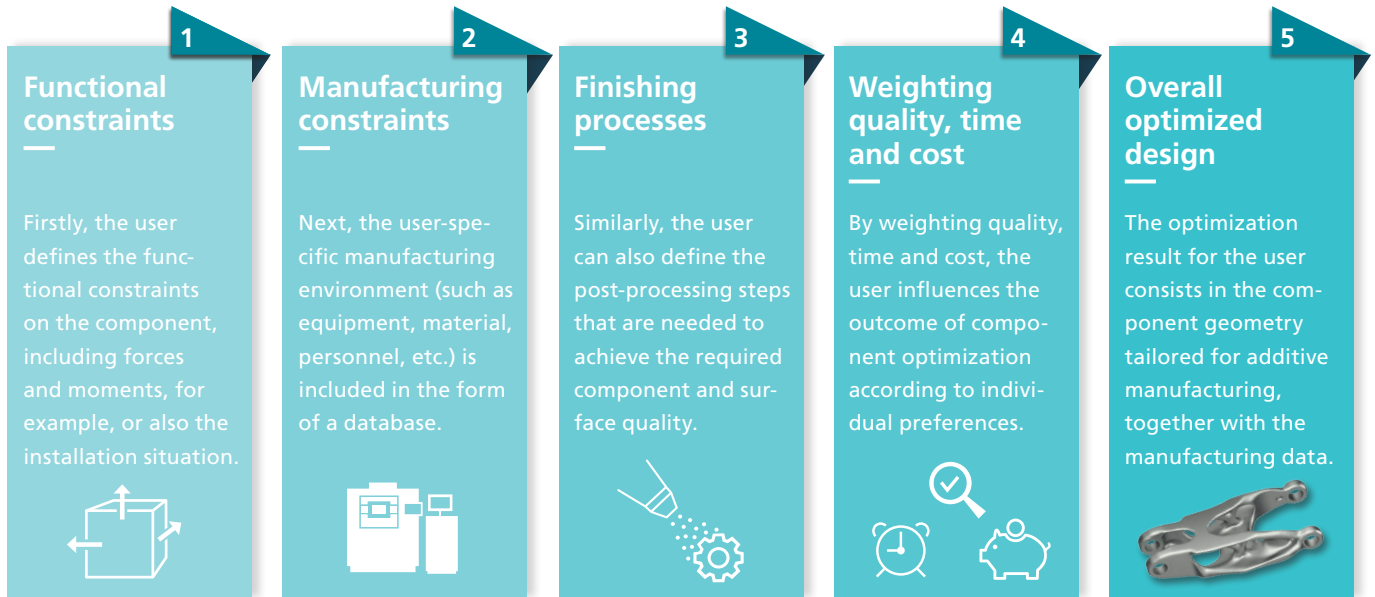## Problem statement

Current situation

- Product development currently optimizes components typically with regard to individual technical criteria, such as mass or stiffness, for example.

- However, such optimization does not necessarily guarantee the economic efficiency of the components involved, as this is essentially determined by the three influencing variables quality, time and cost.

- Furthermore, optimization is usually a manual process, making it very time-consuming and thus expensive.

Our solution

- Fraunhofer IAPT has developed and implemented a design workflow for overall optimization of components in terms of quality, time and cost.

- The workflow is fully automated and can be integrated into customer design process chains. The output consists in the optimized part design ready for additive manufacturing, together with the overall cost.

- Users can thus create the most economical component for their application in the shortest possible time.
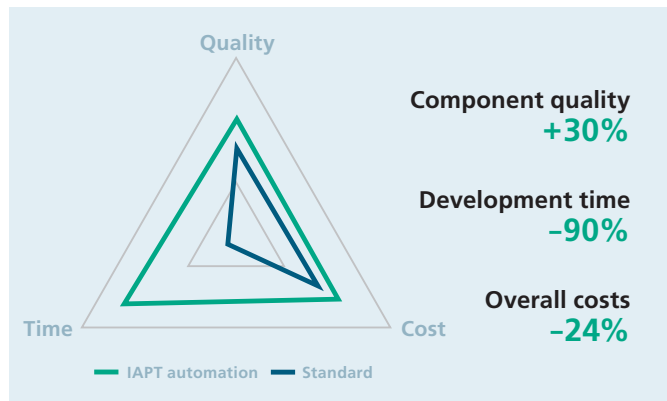
Design workflow

1

Functional constraints

Firstly, the user defines the functional constraints on the component, including forces and moments, for example, or also the installation situation.

2

Manufacturing constraints

Next, the user-specific manufacturing environment (such as equipment, material, personnel, etc.) is included in the form of a database.

3

Finishing processes

Similarly, the user can also define the post-processing steps that are needed to achieve the required component and surface quality.

4

Weighting quality, time and cost

By weighting quality, time and cost, the user influences the outcome of component optimization according to individual preferences.

5

Overall optimized design

The optimization result for the user consists in the component geometry tailored for additive manufacturing, together with the manufacturing data.

Application example

- Applying the design workflow to the example of an automotive bracket
- Individual consideration of existing resources (such as available machines or finishing methods)
- Integrated optimization of orientation, nesting and supports

Quality

Time — Cost

— IAPT automation — Standard

Component quality
+30%

Development time
−90%

Overall costs
−24%

Left: Optimization in terms of quality, time and cost
Right: Conventional part optimization

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