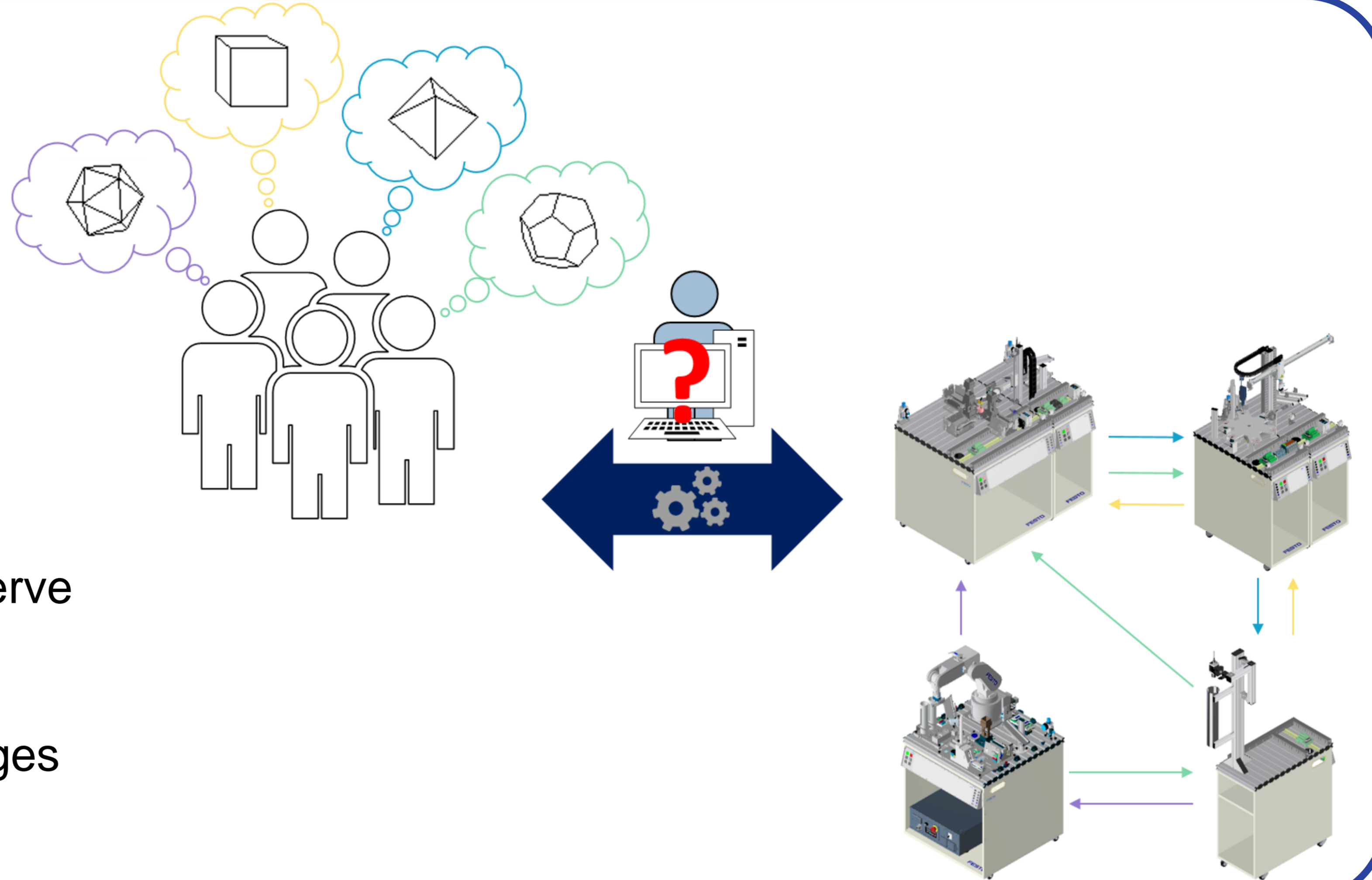


Context Sensitive Variability Modeling and Reconfiguration

Varying Production Requests for Manufacturing Systems

Lot Size = 1

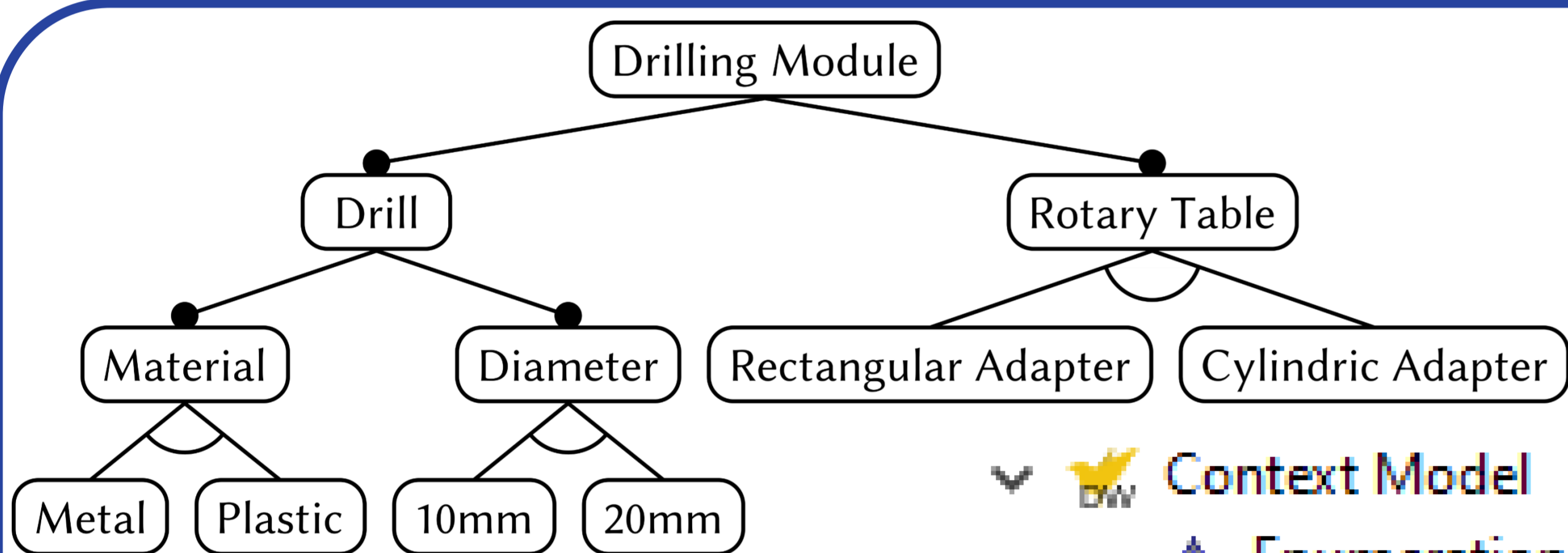
- Customization is a main selling point
- Customers want their very individual products
- Manufacturing systems need to be able to produce individual products based on customer requests
- Manufacturing systems are composed of multiple exchangeable modules



Challenges

- Evaluate whether manufacturing system is able to serve production request
- If necessary, compute how configuration options / modules of the manufacturing system must be changes

Context-Sensitive Variability Modeling



- Context Model
- ◆ Enumeration (Shapes): Shape
 - ◆ Integer: Hardness Degree (0 - 1000)
 - ◆ Integer: Hole Diameter (0 - 100)
 - ◆ Enum: Shapes
 - ◆ Literal: Cylindric (0)
 - ◆ Literal: Rectangular (1)
- ```

{context:"Hole Diameter" = 10} <-> "10mm"
{context:"Hole Diameter" = 20} <-> "20mm"
{context:"Hardness Degree" >= 300} -> "Metal"
{context:"Shape" = enum:"Shapes"."Rectangular"} -> "Gripper Jaws"
{context:"Shape" = enum:"Shapes"."Cylindric"} -> "Cylin. Gripper Jaws"

```

### Configuration Options

- Feature models with the root feature representing the manufacturing module
- Adaptable components are modelled below
- Resource parameters are subordinated

### Modeling Context & Relations

- Capture relevant product parameters that may trigger a reconfiguration
- Model dependencies between components, resource parameters, and product parameters

### Reconfiguration

- Translate production requests as context values & resolve relations to options using SMT

## Ontology Usage for Capability Description

### Why use Ontologies?

- High number of interacting systems
- Dealing with open context
- High complexity and dynamicity of exchanged data
- Planned long-term usage

### Modeling Context & Relations

- **Function (VDI/VDE 3682-2):** Transformation of input to output
- **Structure (IEC 62264-1):** Components as well as their relations to other components
- **Behavior (IEC 61131-3):** Procedures, states or variables for information processing
- **Characteristics (DIN/EN 61360-1):** Simple or complex data types

