Steps to introduce modular architecture in an existing product familiy

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Steps to introduce modular architecture in an exisiting product familiy

Identify product functions

Define functional architecture

Define modular architecture

Define interfaces

Define modules

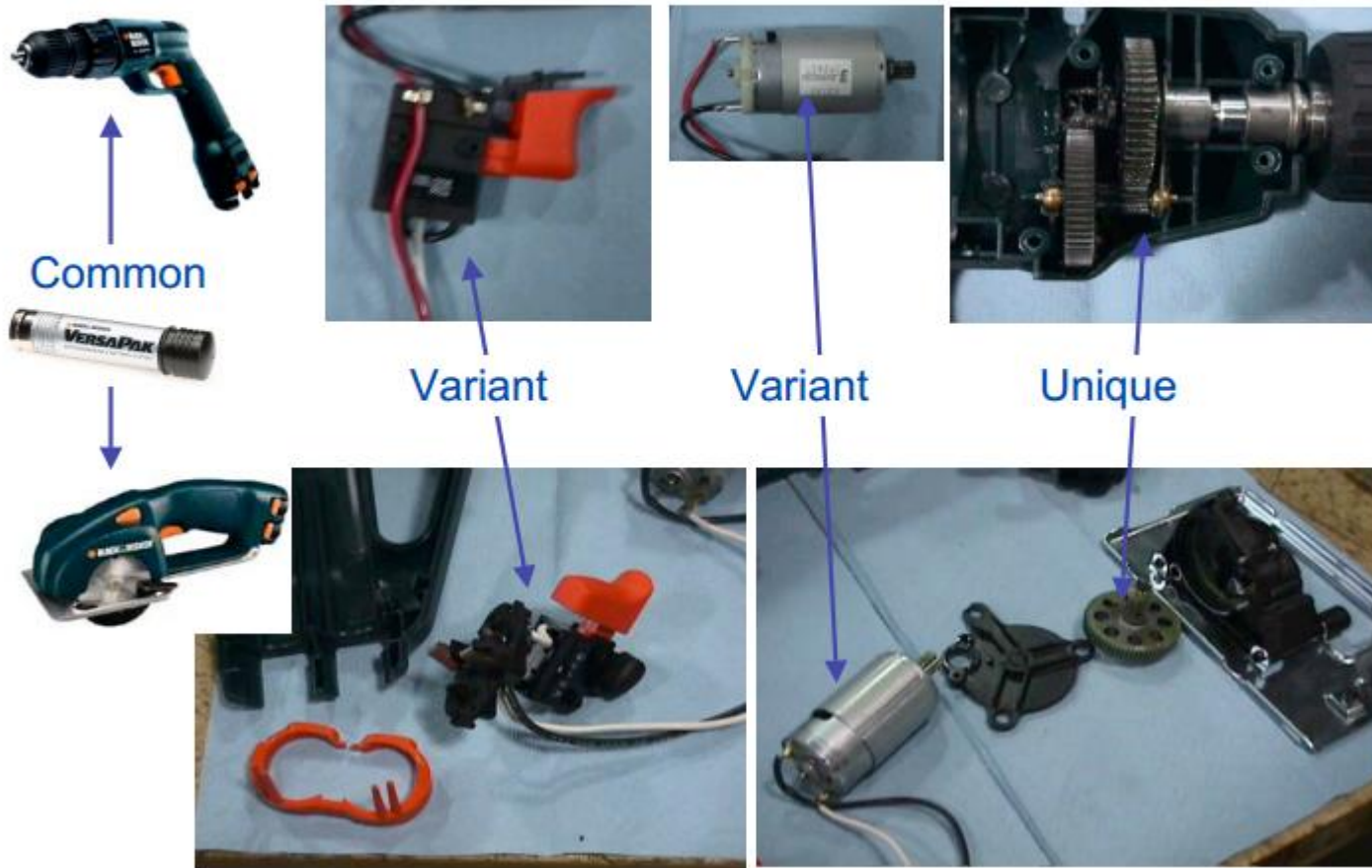**Define product configurations**
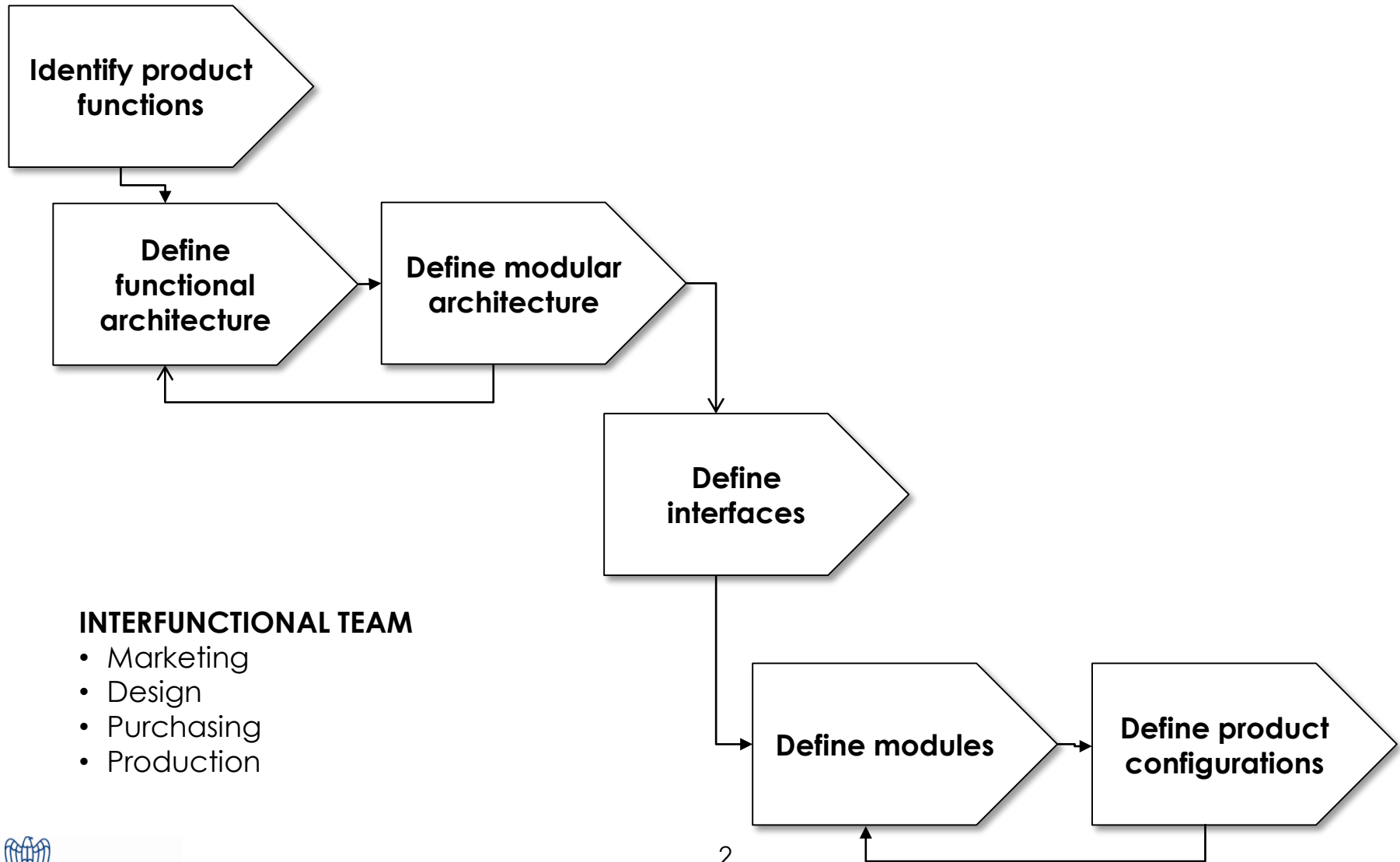
INTERFUNCTIONAL TEAM
- Marketing
- Design
- Purchasing
- Production

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Example: actual product family

Similar components on different products
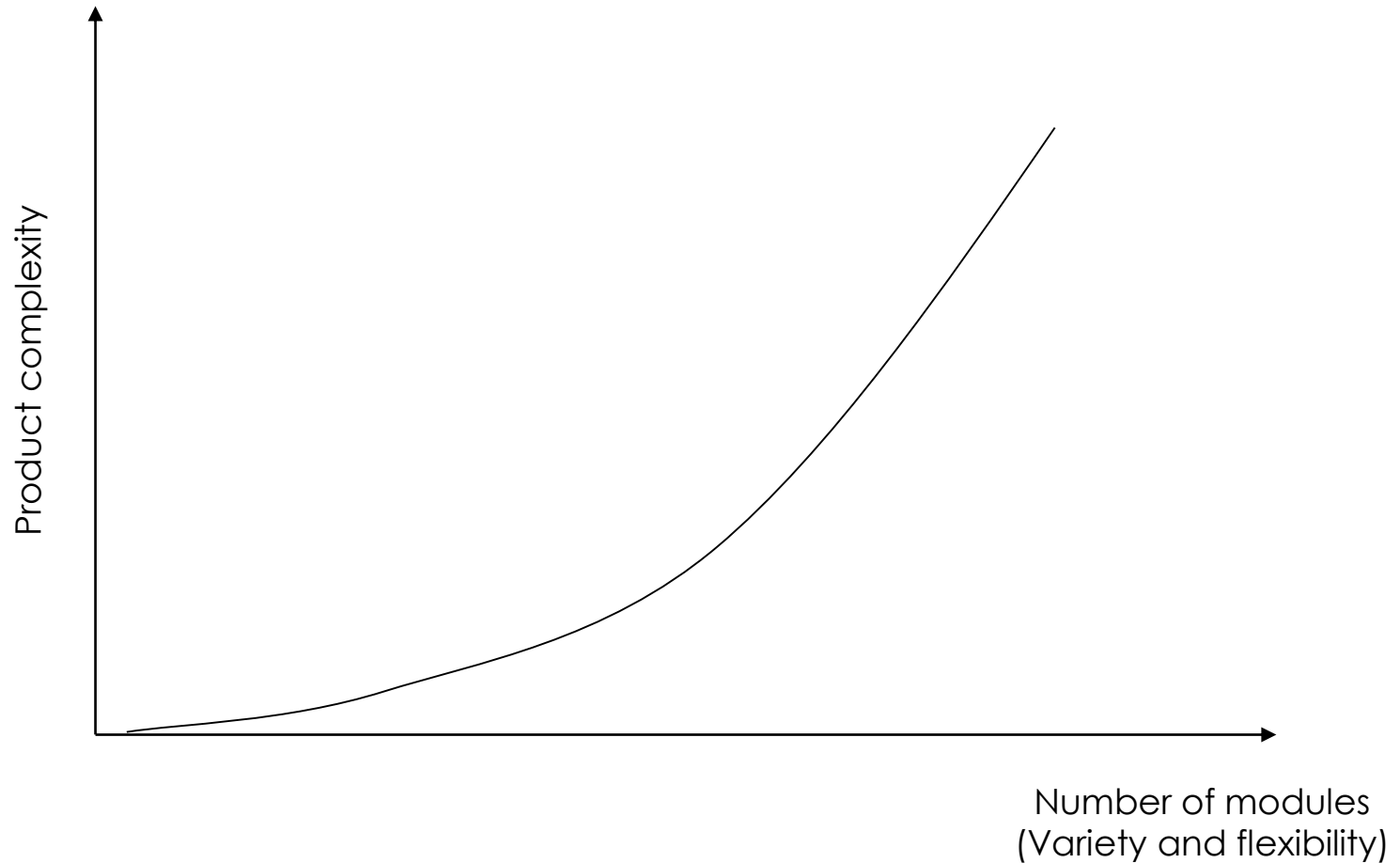

Example: B&D Versapack® Toolkit

Common

Variant   Variant   Unique

Source: Berkeley University

4

Product functional tree
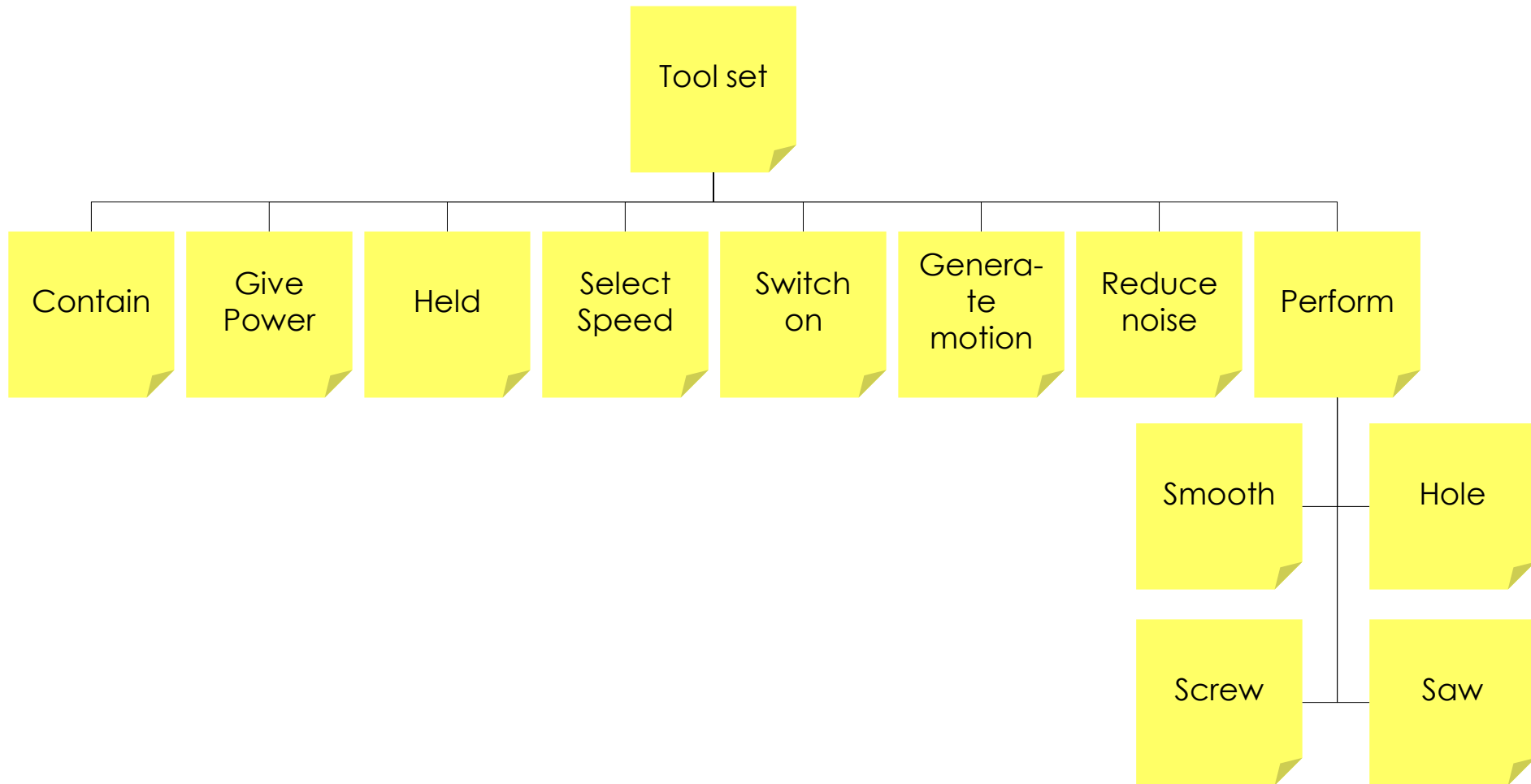
How many functions should be identified?

Functions / Modules matrix

	Contain	Give power	Held	Select speed	Switch on	Generate motion	Reduce noise	Hole	Screw	Saw	Smooth
Power Pack		X									
Handle			X								
Frame	X										
Speed selector				X							
Switch					X						
Engine						X	X				
Hole tool								X			
Screw tool									X		
Saw tool										X	
Smooth tool											X

Each function mapped into one single module

Each module may realize more than one function

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How to identify modules

- There are many possible solutions and only a heuristic process may be used
- Criteria to consider:
  - Carryover
  - Technologies
  - Production process
  - Suppliers
  - Testing
  - Service & Maintenance
  - Upgrading
  - Recycling

Modular product architecture
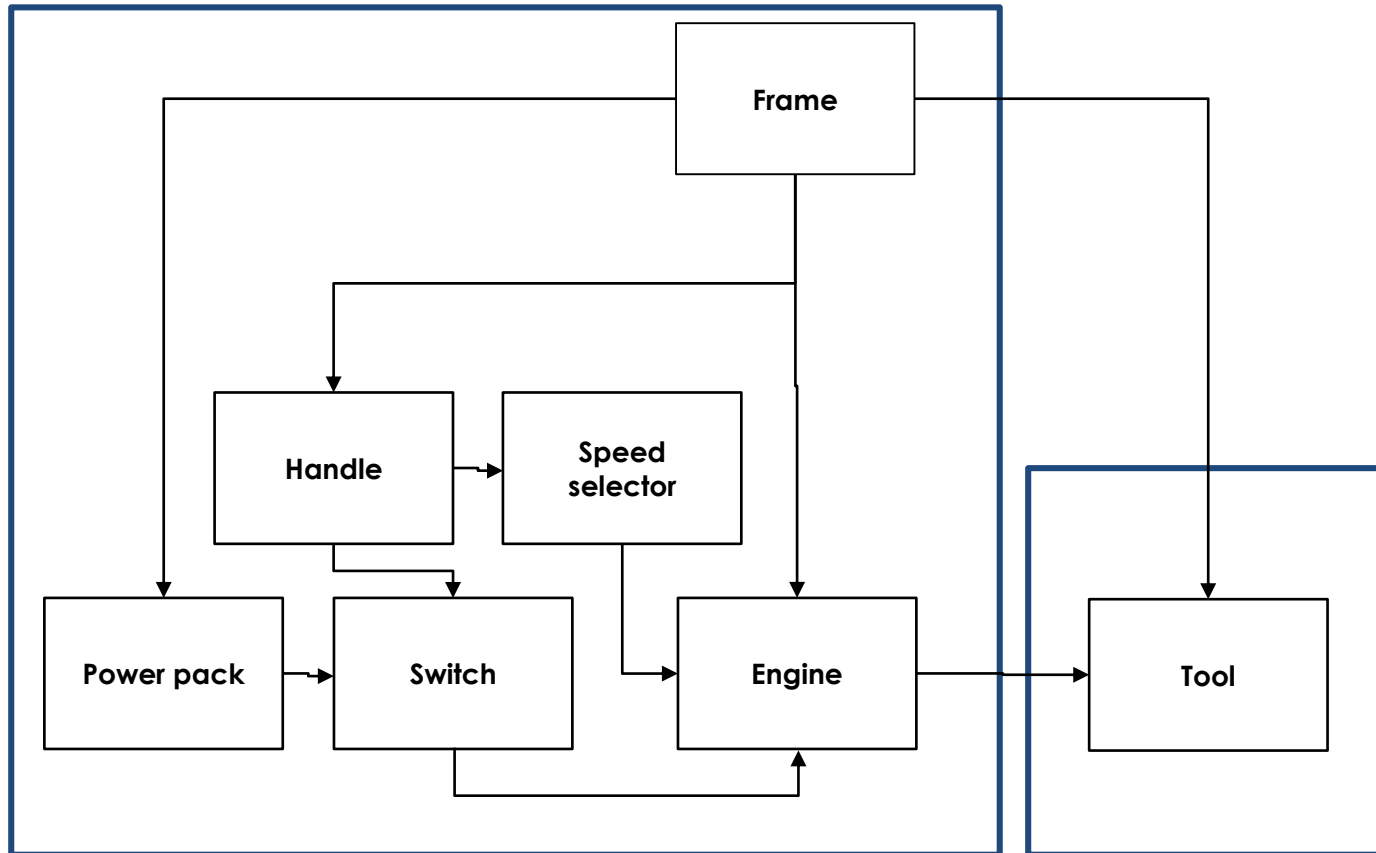
Interface matrix

	Power Pack	Handle	Frame	Speed Selector	Switch	Engine	Tool
Power Pack			Is contained / Contains		Is connected / Connects		
Handle			…	…	…		
Frame						…	…
Speed selector						…	
Switch						…	
Engine							…
Tool							

Design of the new family

	Drill Low end	Drill High end	Screwdriver Low end	Screwdriver High end	Jigsaw	Circular Saw	Sander	Number of modules
Power Pack	Low Energy	High Energy	Low Energy	High Energy	High Energy	High Energy	High Energy	**2**
Handle	Type 1	Type 1	Type 1	Type 1	Type 2	Type 2	Type 2	**2**
Frame	Type 1	Type 1	Type 1	Type 1	Type 2	Type 2	Type 2	**2**
Speed selector	No	Yes	No	Yes	No	Yes	No	**1**
Switch	Type 1	Type 1	Type 1	Type 1	Type 1	Type 1	Type 1	**1**
Engine	Low	High	Low	High	High	High	High	**2**
Hole tool	Type 1	Type 1						**1**
Screw tool			Type 1	Type 1				**1**
Saw tool					Type 1	Type 2		**2**
Smooth tool							Type 1	**1**

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Definition of each module
Engine

SPEED SELECTOR

Receives comand

Each imodule should be defined in terms of externally visible characteristics. Each variable should be defined in terms of admitted values

Engine

- **Power: 350W, 500W**
- **Power supply: 12v, 16 V**
- **Speed: 1, 2**
- **…**

FRAME

Is contained

Provides motion

TOOL

Receives comand

SWITCH

Each interface should be defined in terms of:
- Dimensions
- Physical coupling
- Input received (mechanical, electrical, hydraulic, …)
- Output provided mechanical, electrical, hydraulic, …)
- Info received
- Info provided

R = A RICHIESTA
R = ON DEMAND

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New product family

Selling a configurable product

- Requires a collaboration with the customer in order to configure the product
- The customer should be driven through a decision tree where he/she will never impact in wrong decisions
- This essentially means to design the «commercial dialogue» putting decisions on the right order considering:
  - The customer perspective (most important decisions in the beginning in order to allow more options)
  - The technical perspective (start with critical modules, in order to define the product)