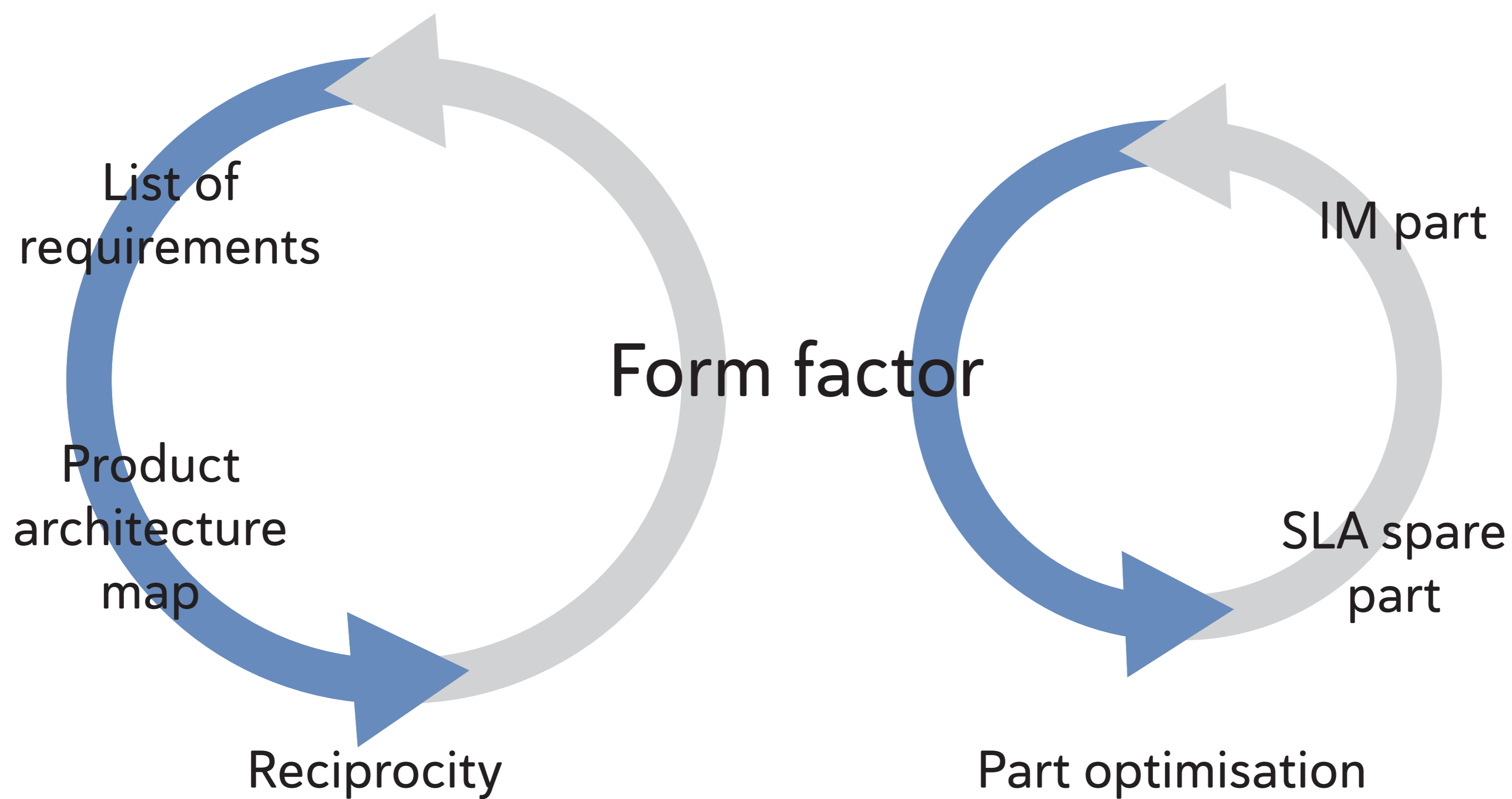
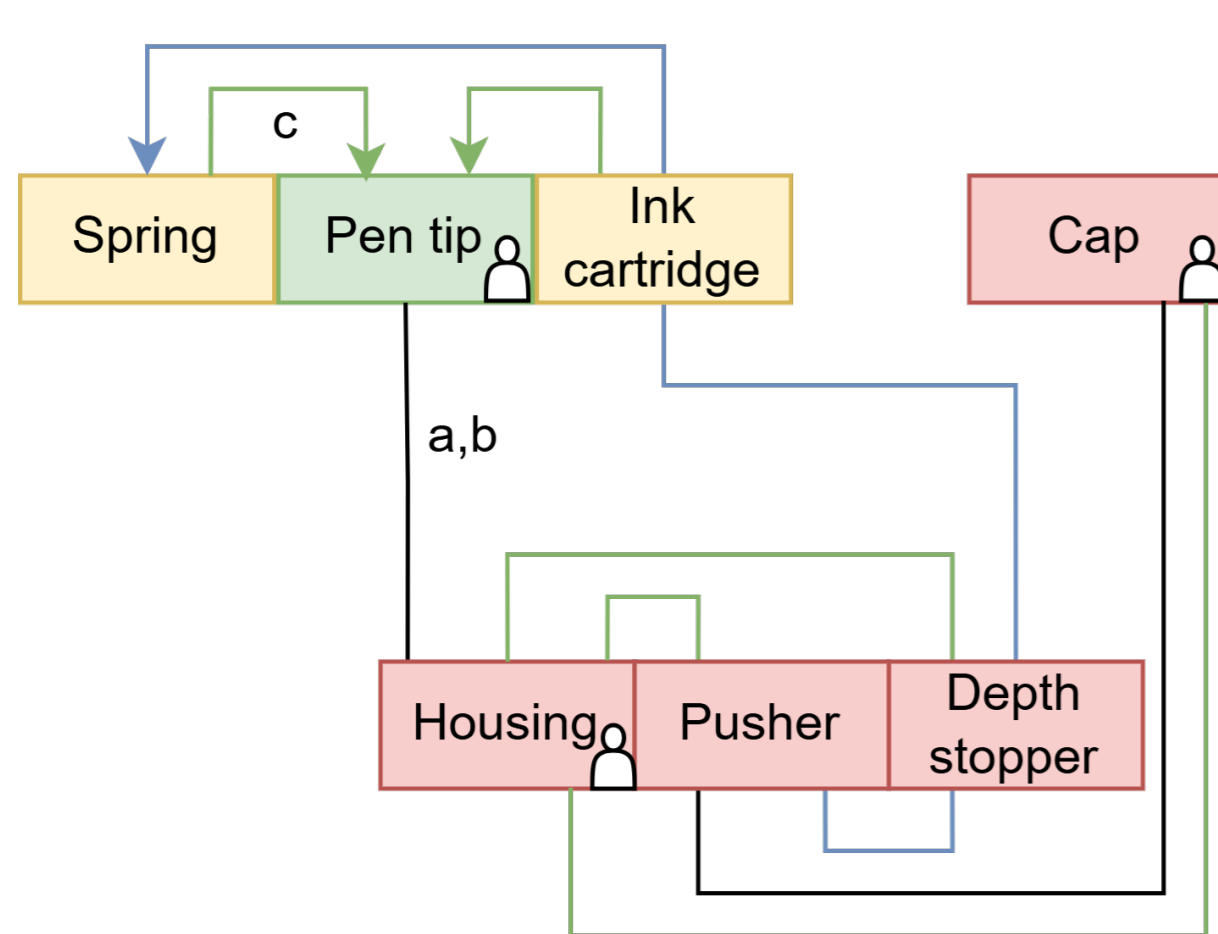


SLA SPARE PARTS

Development of a form factor optimisation guide to design interchangeable, functionally equivalent parts with injection moulding (IM) and stereolithography (SLA).

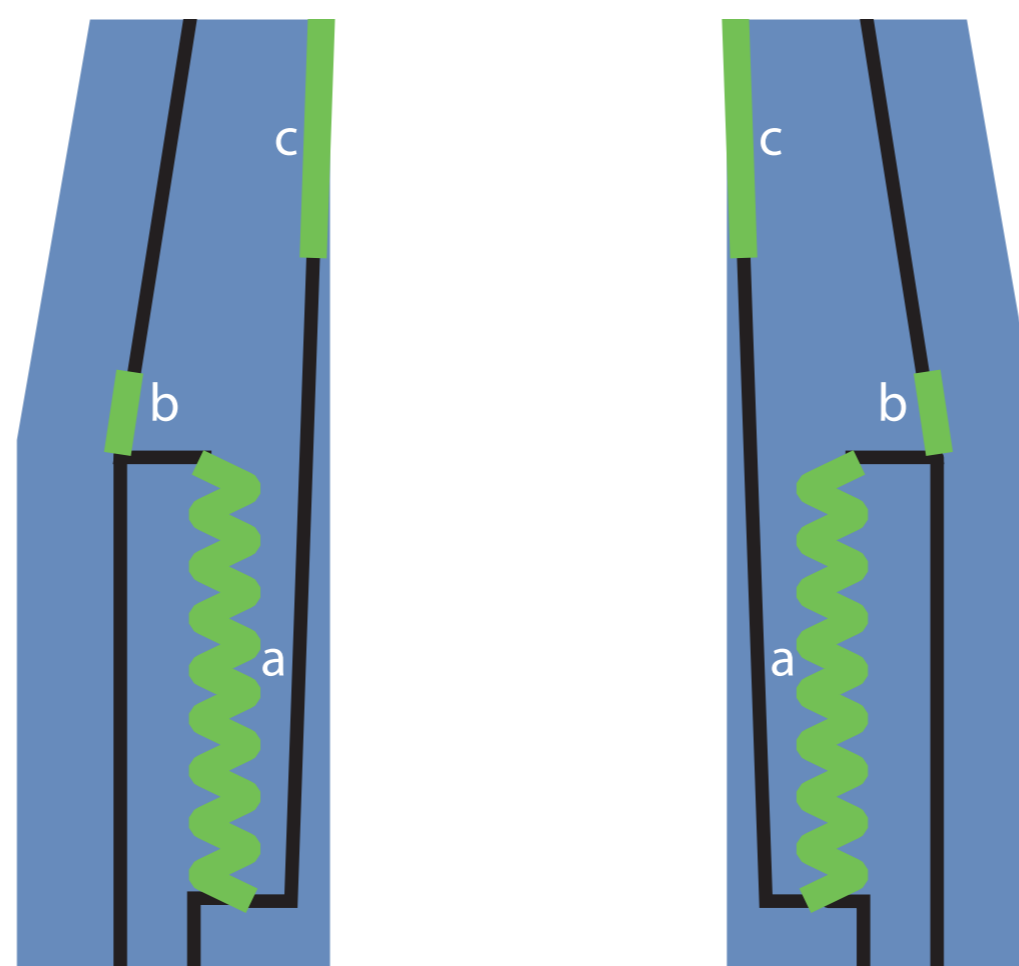


Product architecture map



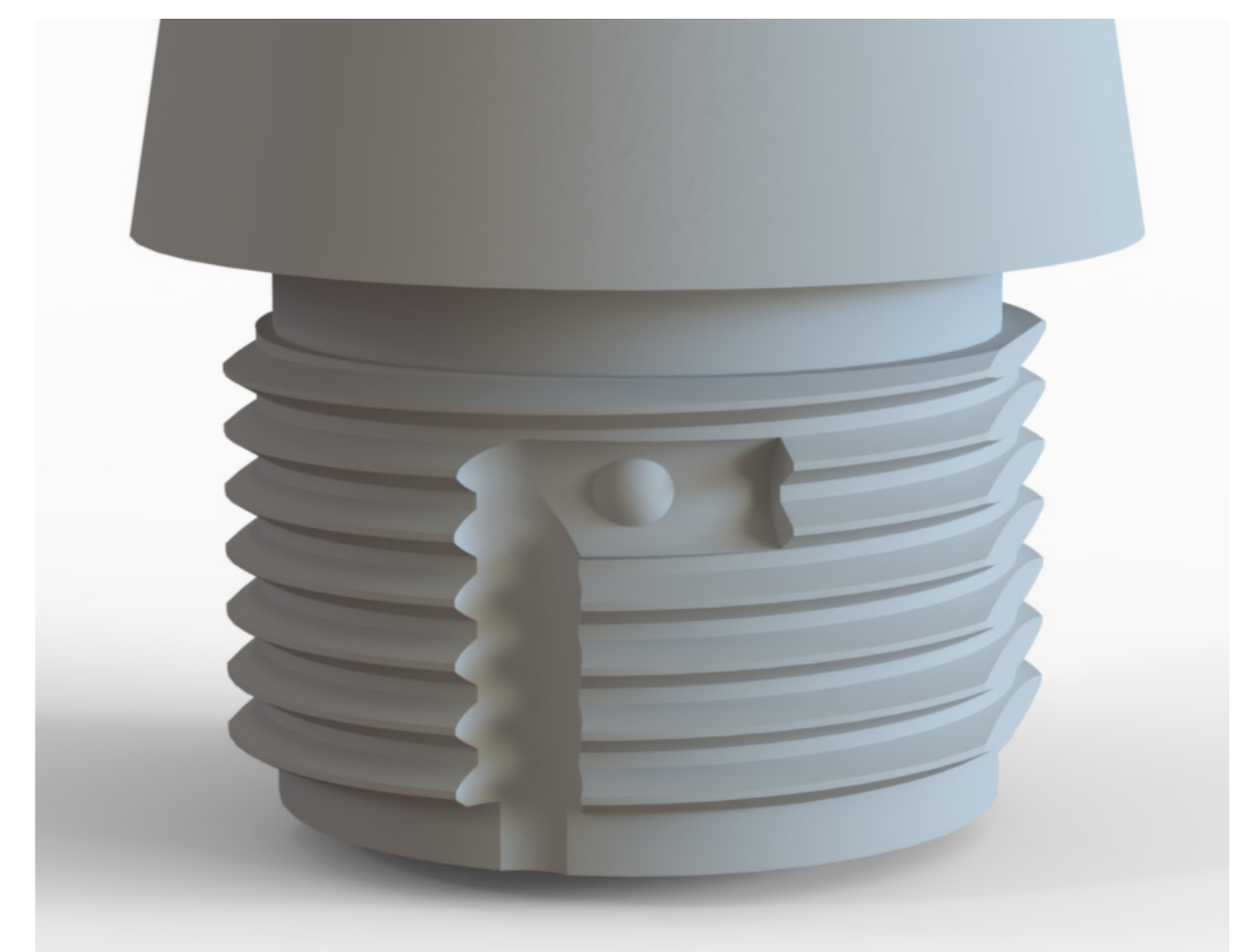
A geometry-based part coupling approach was developed to map parts that are coupled and to give information about their relationships. Graphic representations are used to display information regarding the part type, coupled interface type, part priority and other factors. In the figure above, functional surfaces a, b and c from the form factor are also indicated. For information on how to set up the product architecture map, please see the graduation report.

Form factor



The product architecture map and the list of requirements are used to define the design space (in blue) and non-design space (in green) of a part, referred to as the 'form factor'. The developed form factor definition approach uses functional surfaces and functional volumes to define the form factor. This is a manufacturing driven process: it must be possible to cope with all limitations of IM and SLA and end up with interchangeable, functionally equivalent parts. If this is not possible, reciprocity is applied. Reciprocity is the term that is used to describe the process of going back and forth between the designs of coupled parts and their requirements.

Part optimisation



With the form factor determined, it is time to optimise the part and its spare part for IM and SLA. This is a function driven process, making use of the full potential of the capabilities of both manufacturing technologies. The IM part and SLA part do not need to be identical. Several examples are shown in the graduation report. As long as both parts fit within the design space, they are interchangeable. The parts must contain all functional surfaces to be functionally equivalent. However, the functional equivalence is also dependent on the material properties of the part and if the part's geometry is capable of meeting its design requirements.

Author:

Wouter Hermen Bakkeren
How to design spare parts for stereolithography
to replace injection moulded parts
April 1st, 2025
MSc Integrated Product Design

Committee:

Chair: Prof. dr. A.R. (Ruud) Balkenende
Mentor: Dr. ir. E.L. (Zjenja) Doubrovski