

# Title: Quantifying the flexibility level of architectures by their space reservations and envelopes

## Background

Product platforms have a longer lifecycle than the lifecycles of the product variants generated from the platform, so product planners need to consider the possibility of future changes when designing platforms that flexible enough to accommodate them. The increasing rate of change both in market expectations and technology in the automotive sector means that platforms need to embed a higher level of flexibility than before to avoid having to continuously redevelop new platforms, losing efficiency in production and development. The main challenge to increase the level of flexibility product platforms is that flexibility has to be traded against other dimensions, and the impact of a highly flexible product platform on the production system has to be considered.

This master thesis will be connected to the project “VISP - Value and flexibility Impact analysis for Sustainable Production” funded by VINNOVA. The project has the objective to develop a model-based decision support that allow manufacturers to offer a greater flexibility without comprising production efficiency. At present, no modeling and simulation support exist to support system architects and platform development teams in these trade-offs. Too many resources are consumed to manage increasing diversification that follow from the introduction of radically new technologies resulting in unwanted adjustments and changes in production. The student/s will work on Work Package 2 lead by researchers at the Systems Engineering Design group at Chalmers and will work closely with Volvo Cars Group (VCG). WP2 will focus on the development of a methodology to model new flexible platform architectures and assess them in relation to the value model developed in WP1. The initial phase of the project would include a literature review on production and platform flexibility in general, and more specifically on the role of geometry, framing of research questions, and a selection of components to study. The project would then proceed as a series of in-depth interviews and study of internal documentation aimed at finding the answers to the research aims.

## Thesis aims

1. to study through in-depth interviews and internal documentation how the company makes decisions about the space allocation for different components, and how the process takes into account flexibility, and
2. how can the information collected by expressed as a metric that can be used to compare alternative scenarios on the basis of the flexibility they provide for the future development of the platform.

## Additional potential areas of interest:

1. Identify best practices on the definition of geometrical envelopes, space claims, and interfaces.
2. Produce a model and solution methodology to estimate efficient packing of components for various scenarios.

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