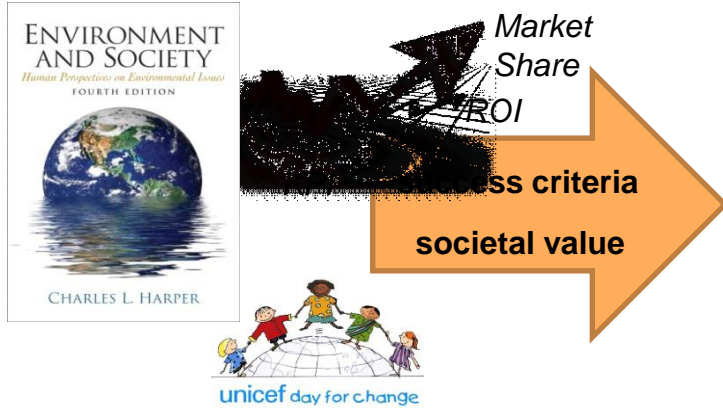
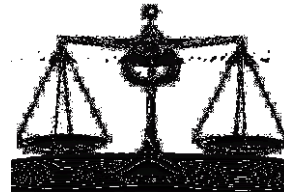


# Problem statement & solution approach

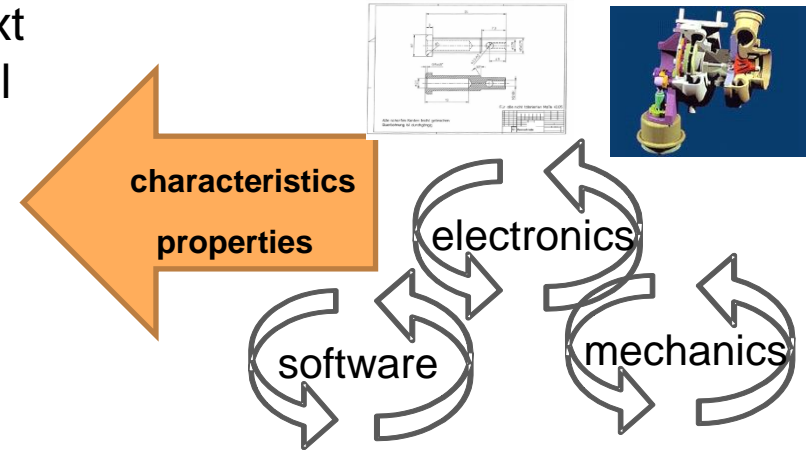
## Corporate and societal view



Trade-off between sustainability context areas and technical performance



## Traditional Engineering View



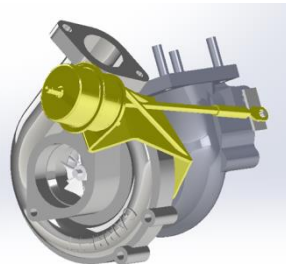
### Major Goal

Enable and qualify the engineer to develop products for sustainable value creation

### Approach

Development of a Design Decision Support Assistant (DDSA), embedded into the designer's IT environment

Turbomachine

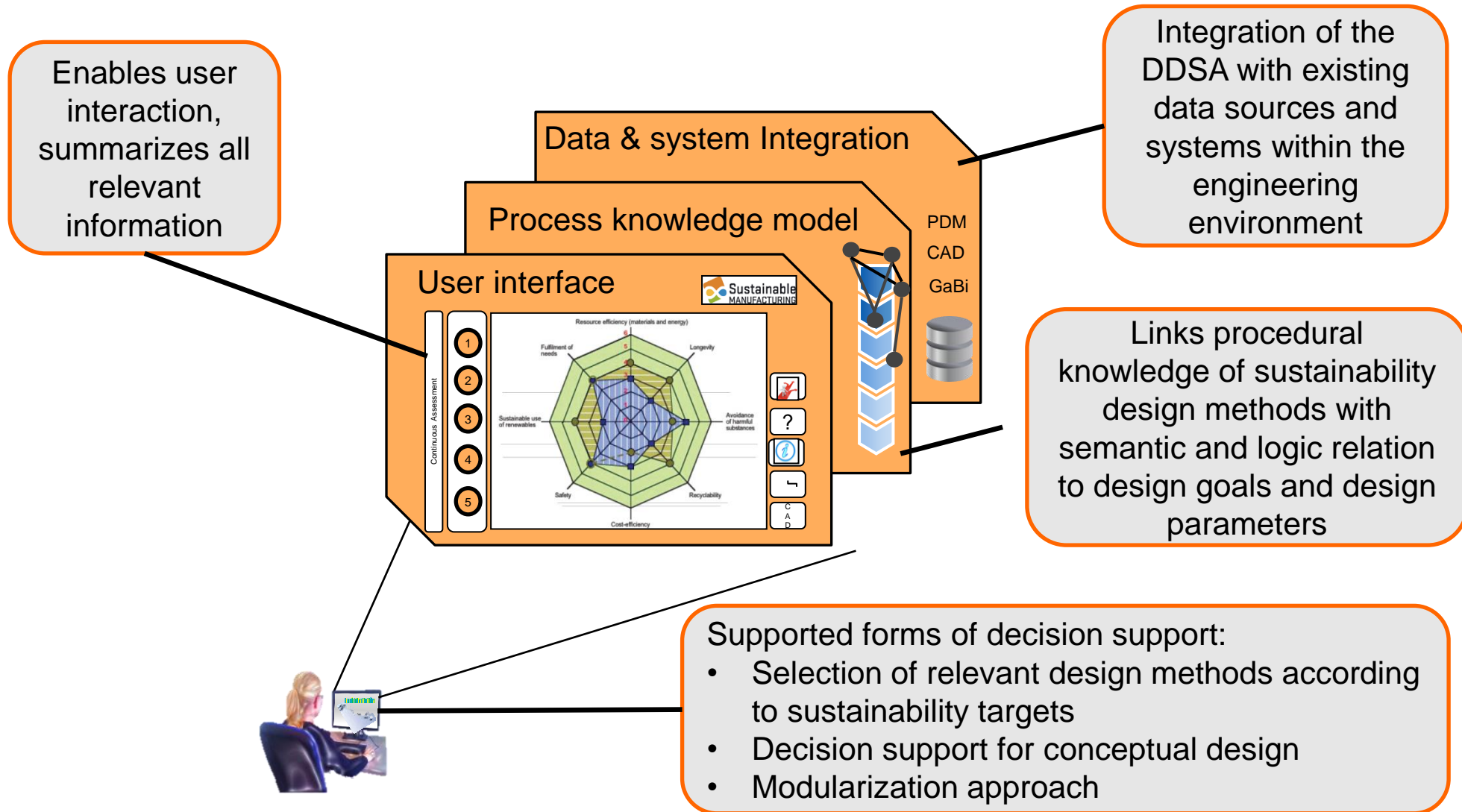


System design is based on the development of pedelecs and turbomachines in a bottom-up analysis

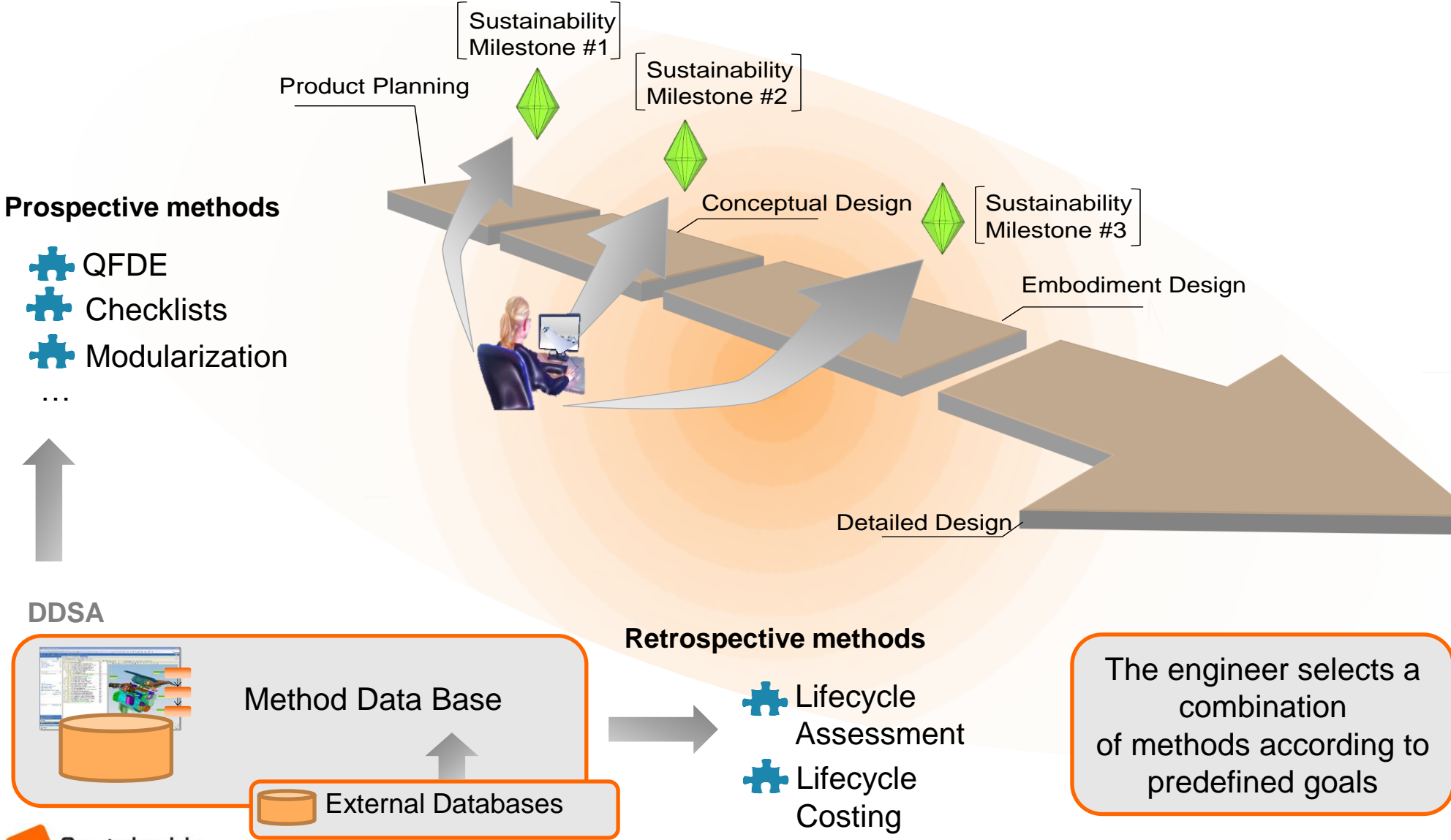


Pedelec

# Design Decision Support Assistant (DDSA) System Infrastructure

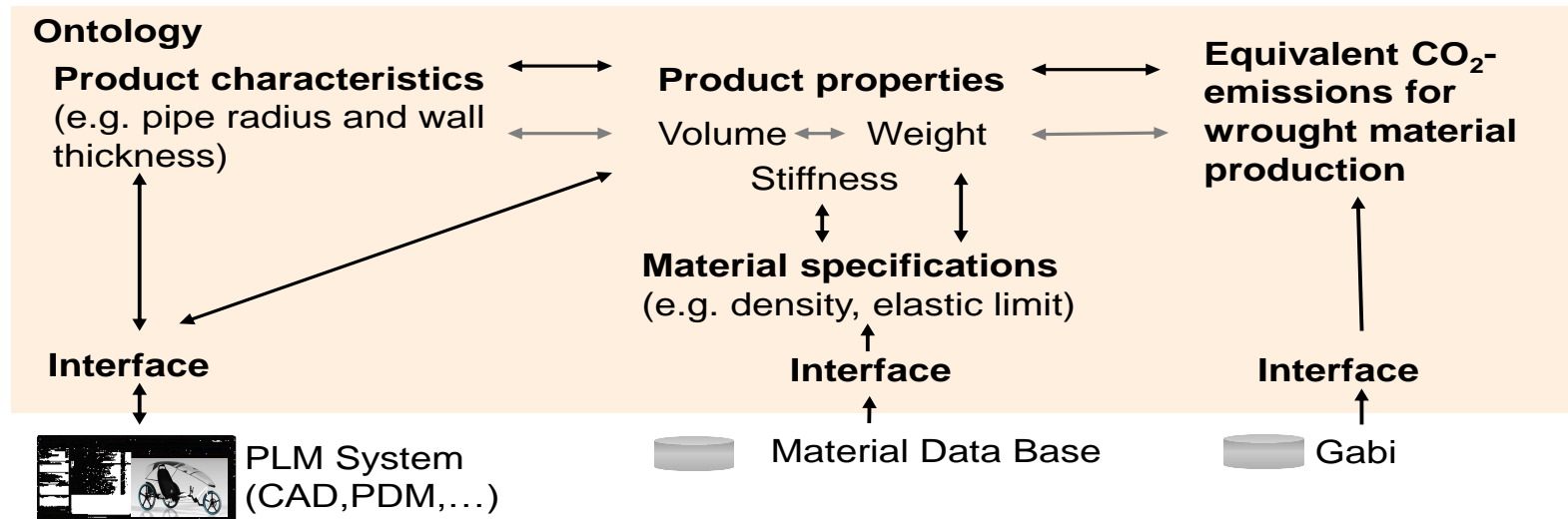


# Selection of relevant design methods



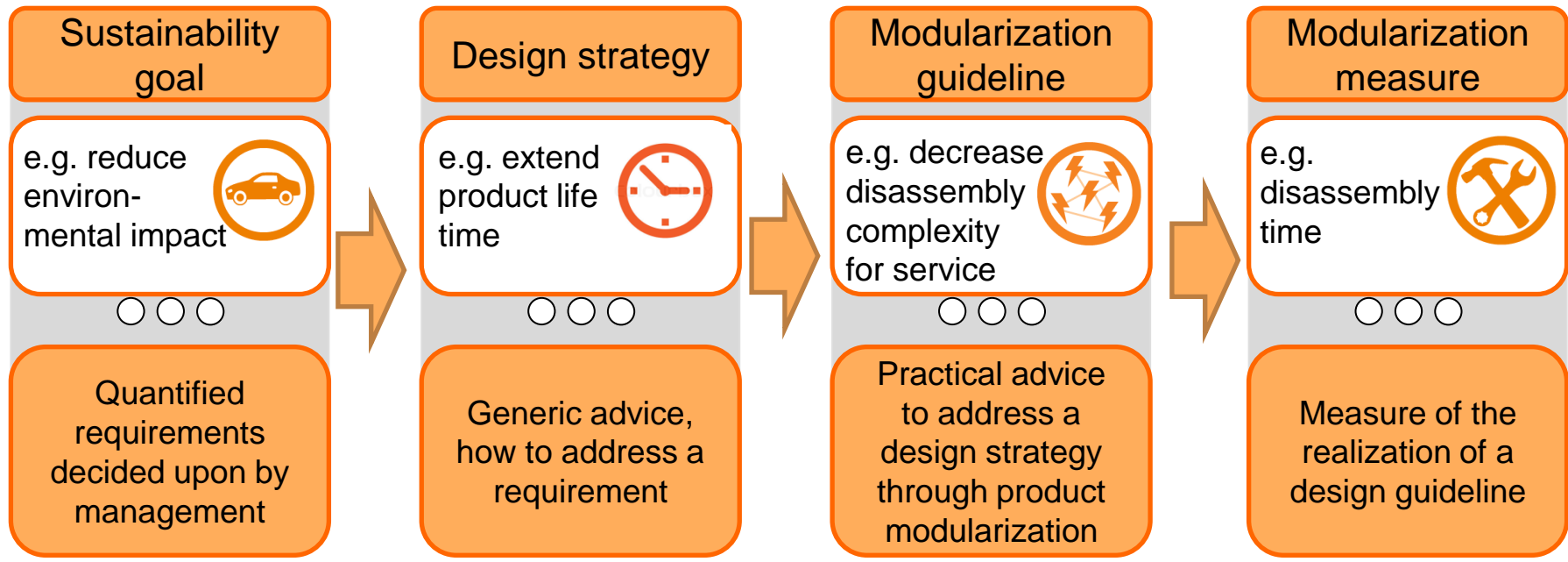
# Decision support for conceptual design

- ▶ Interdependence of sustainability goals and product properties captured in a ontology based knowledge model
  - ▶ Example: Interdependence of CO<sub>2</sub>-emissions, pipe radius and wall thickness of a bicycle frame in the early product development process phase (until stage of wrought material production)
- ▶ Knowledge model enables evaluation in multiple ways, e.g.
  - ▶ For a set of given product properties the effects on sustainability goals can be derived
  - ▶ For a set of given sustainability goals the possible constellations of product properties can be derived
  - ▶ For a mixed set of sustainable goals and product properties possible effects on other sustainability goals and product properties can be derived



# Addressing sustainability design goals through *specific* product modularization

A relation diagram has been created, which connects sustainability design goals with modularization guidelines and measures:



## Method for Sustainable Product Modularization

methods in modularizing products for sustainability are under development to assist design engineers : modularization measures are used as an input,