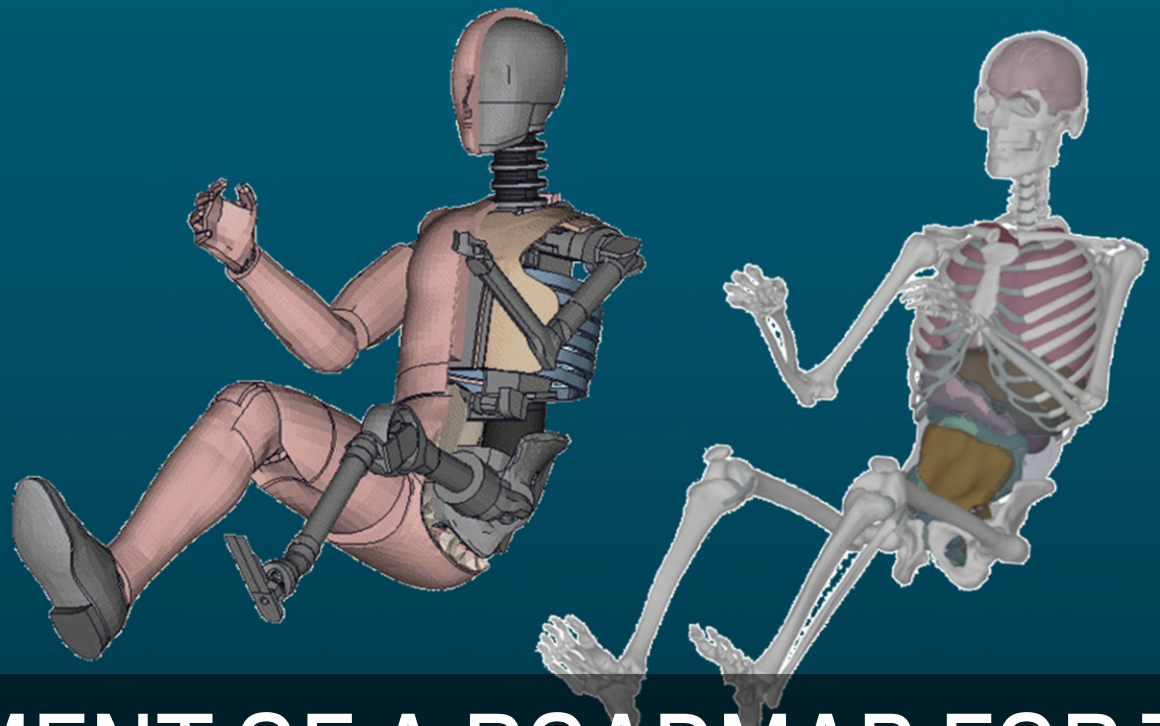


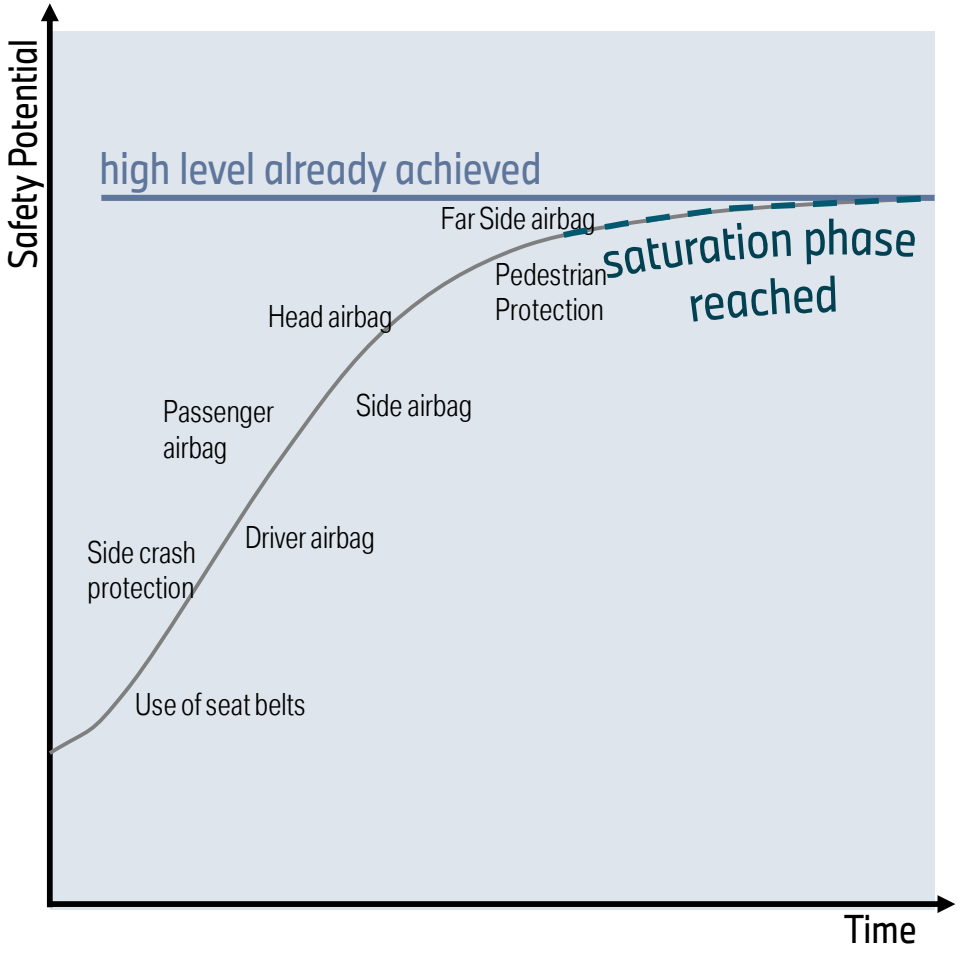
HBM4VT DEVELOPMENT OF A ROADMAP FOR THE USE OF HUMAN BODY MODELS IN VIRTUAL TESTING

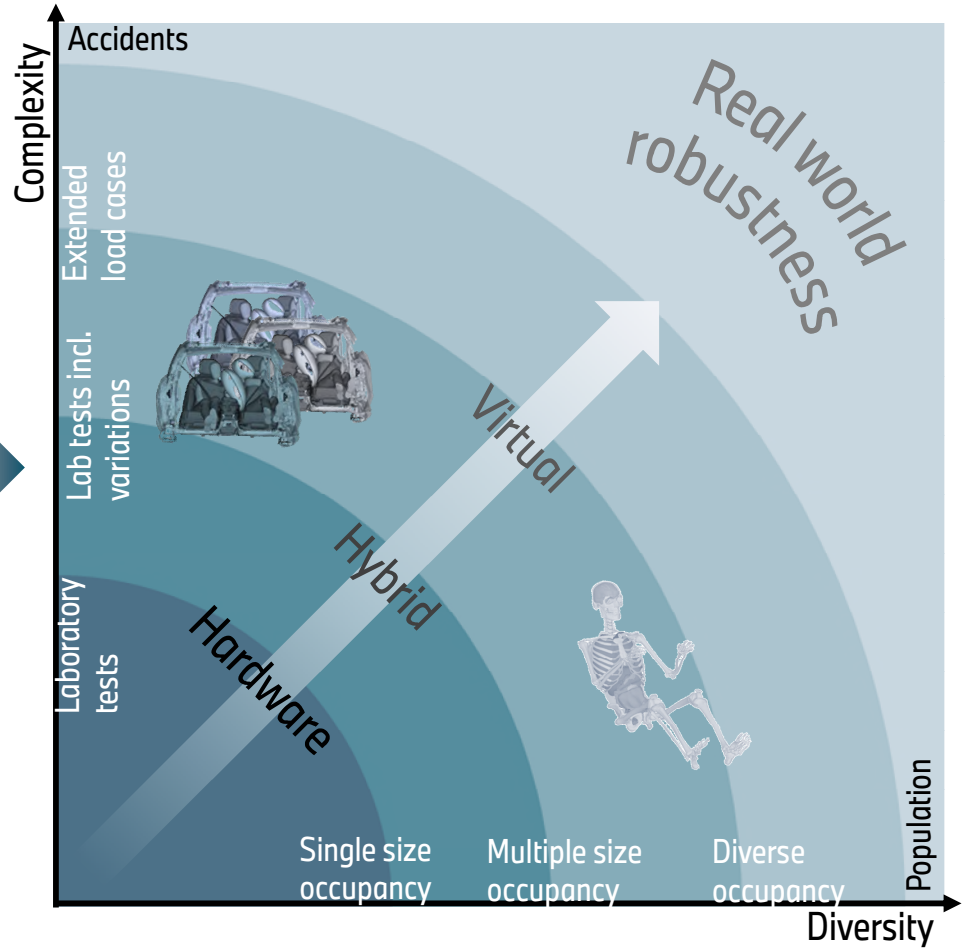
MOTIVATION, CURRENT STATUS AND NEXT STEPS

HBM4VT

All claims expressed in this presentation are solely those of the presenters and do not necessarily represent those of all HBM4VT participants.

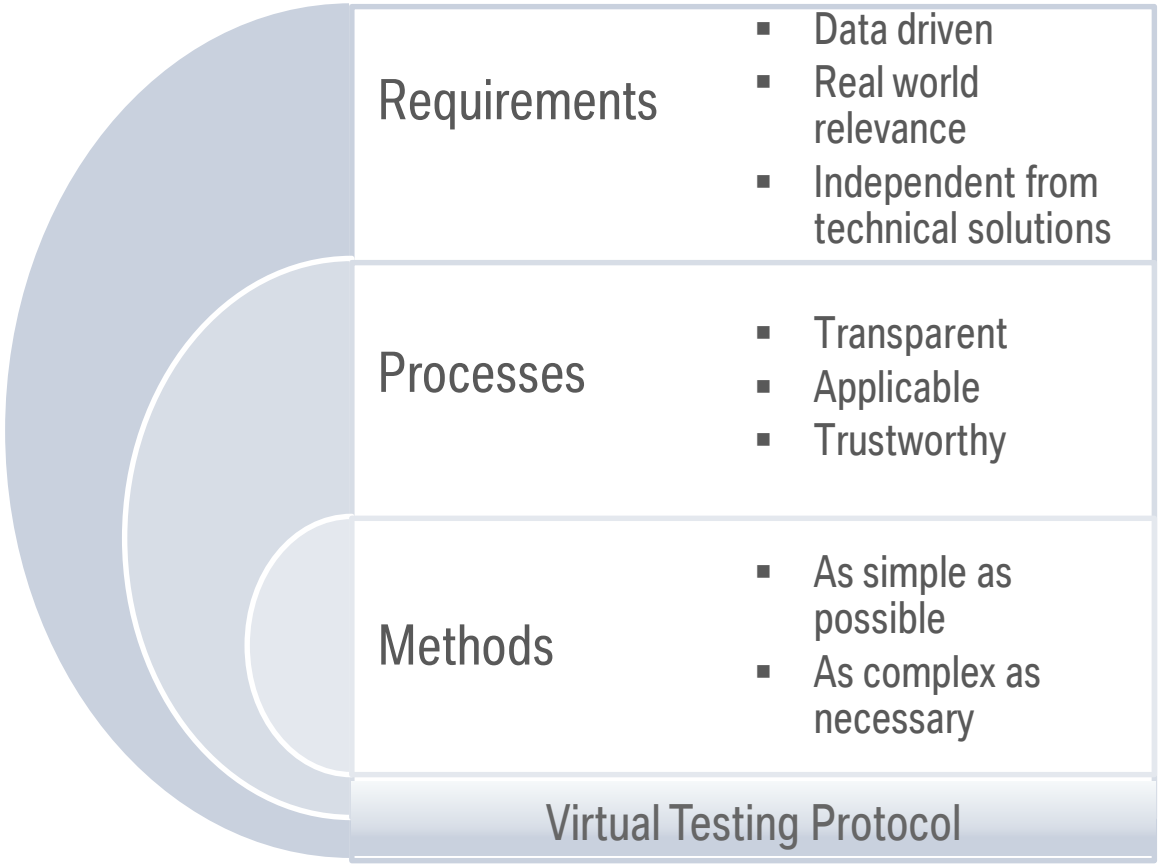
PASSIVE SAFETY OF VEHICLES. STATUS AND WAY FORWARD.

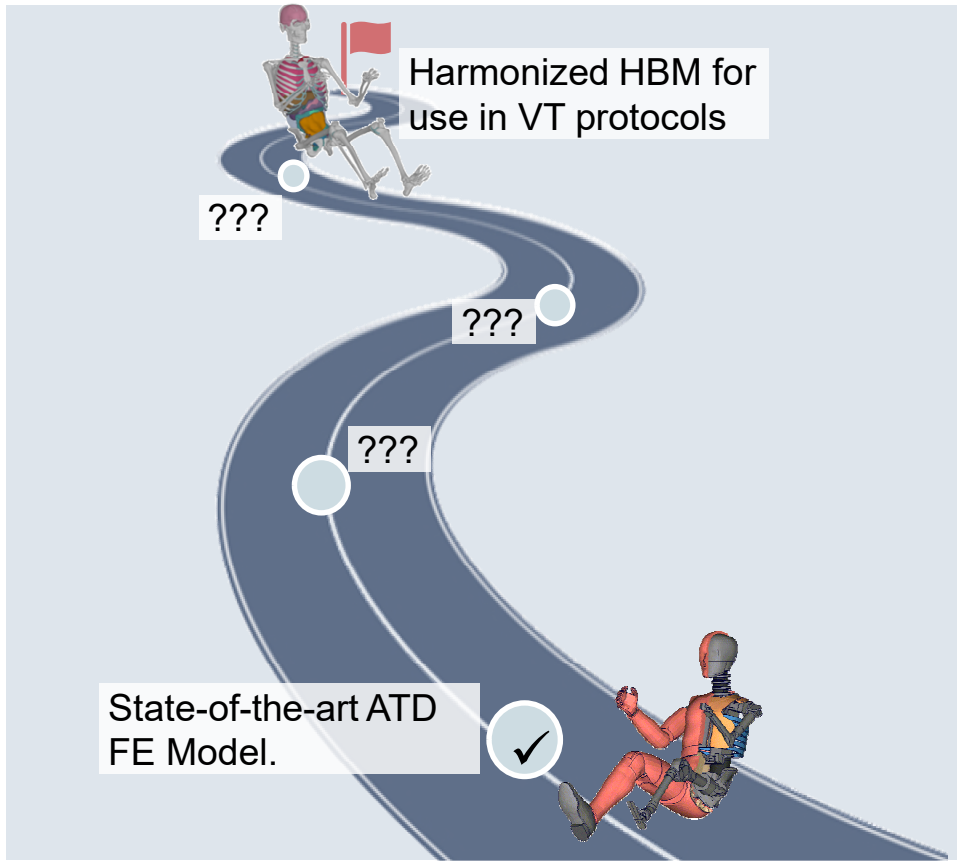




- **Passive Safety has achieved a high level** resulting in very **low numbers of fatalities** but is reaching its saturation phase.
- **Complementary virtual testing** offers the potential **to increase robustness and effectiveness** in **real world** scenarios.

VIRTUAL TESTING PASSIVE SAFETY. CHALLENGES.





- Identification of safety related focal points must be based on data analysis and cost benefit considerations.
- Suitable processes are necessary to build **trust** in virtual testing application.
- Development and use of virtual occupants is needed to address the limitations of ATDs.

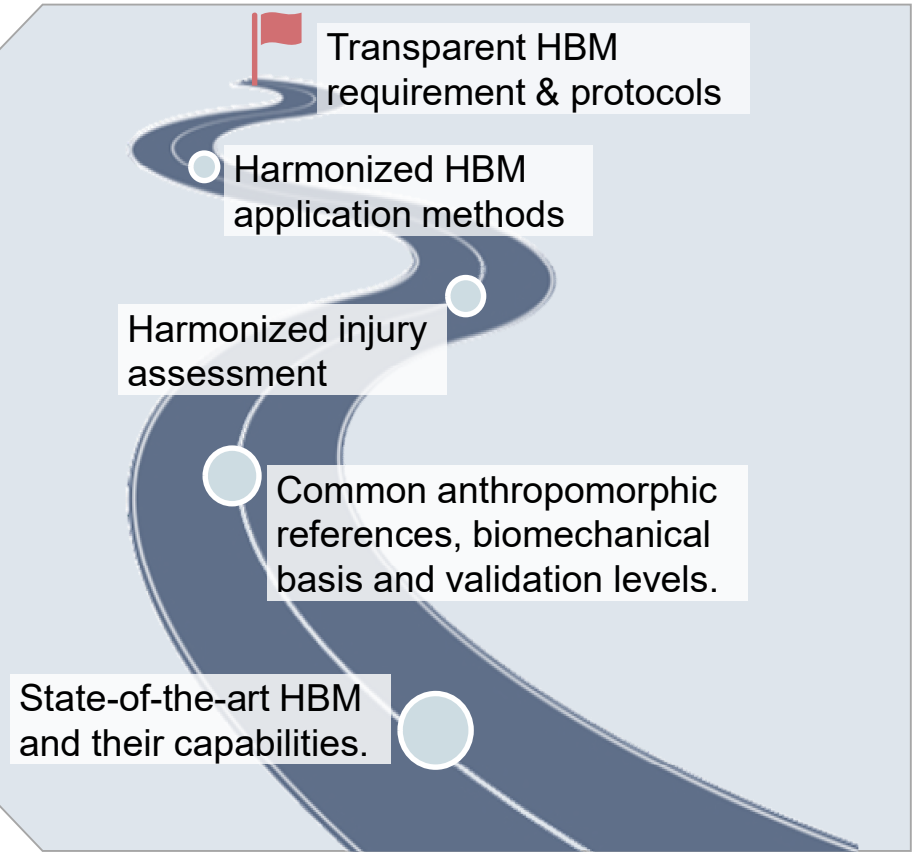
VIRTUAL TESTING PASSIVE SAFETY.
HUMAN BODY MODELS.

Benefits:

- Superior biofidelty to current ATDs.
- Diverse population could be represented (e.g. age, size, BMI, gender, ...).
- Improved biomechanical basis for injury risk prediction.
- Omni directional validation and response.

Challenges:

- Agreed anthropomorphic targets and reference postures.
- Pre and Postprocessing: development of adjacent tools.
- Harmonized validation and certification catalogue.
- Standardized injury risk prediction.



- Human Body Models offer many opportunities for enhanced assessment of injury risks in vehicle accidents.
- To develop transparent and harmonized HBM protocols, many challenges have to be solved.

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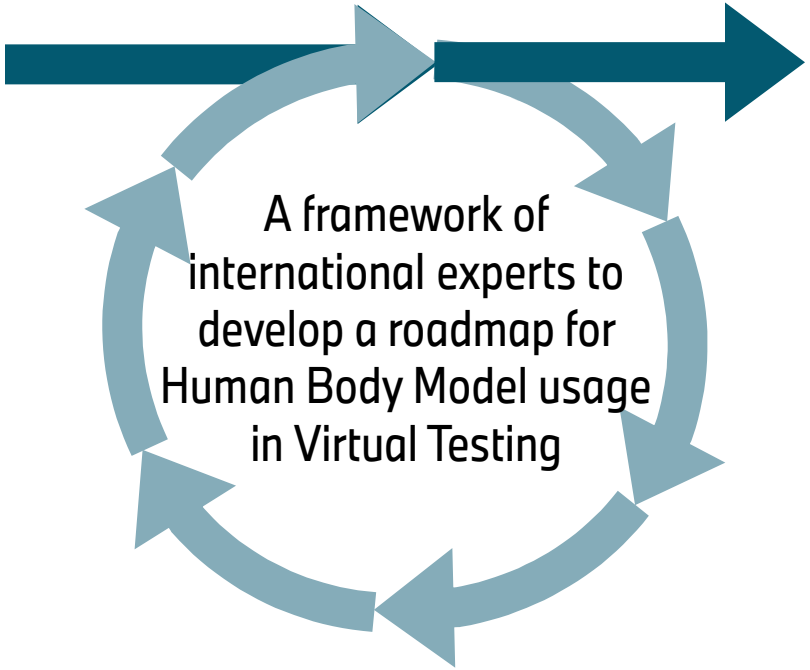
MOTIVATION.

Status Quo HBM landscape

- Scattered expert activities worldwide.
- No common international platform to discuss use of HBM in vehicle safety development / assessment.
- Different FE software packages / code versions.
- Different model supplier.
- All models are “validated” – however no harmonized definition of validity.

Evolving visions from authorities

- Address limitations of current ATDs.
- Increase robustness for real world scenarios.
- Momentum from “spot testing” towards for diverse population.



- Industry, academia and authorities need to join forces to develop methods, methodologies and tools to pave the way for usage of HBM in consumer testing protocols.

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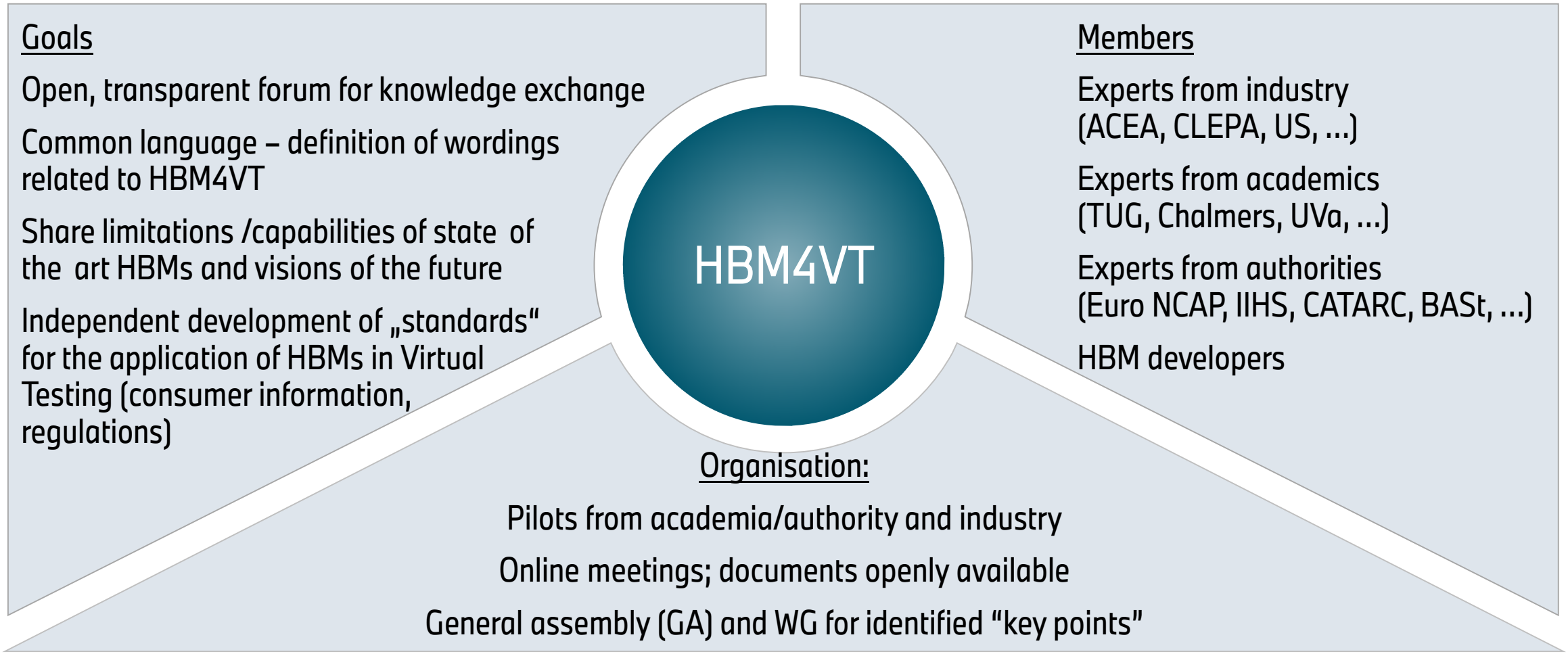
LAYOUT.



- International experts working together to develop transparent requirements and standardized procedures for application of Human Body Models in virtual testing assessment protocols.

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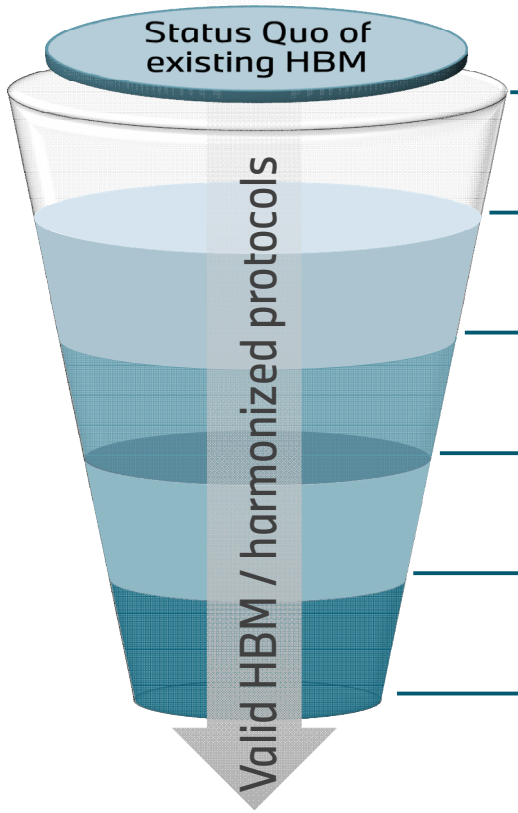
OBJECTIVES & FOCAL POINTS.

Objectives

- Define procedures for the application of HBMs, which makes sure that
  - HBMs are biofidelic and comparable
  - HBMs are applied in a comparable way
  - Procedure is user friendly
  - HBM adds value to assessment procedure (compared to ATD)

- What is feasible in short term? Mid term? Long term?
  - Loading / injury assessment
  - Population

Focal points



Identification of relevant injuries based on accident data bases

Assessment procedures / metrics

Anthropometric requirements from 50%M towards diverse population.

Validation / comparison load cases and model development

Protocol development for validation / comparison.

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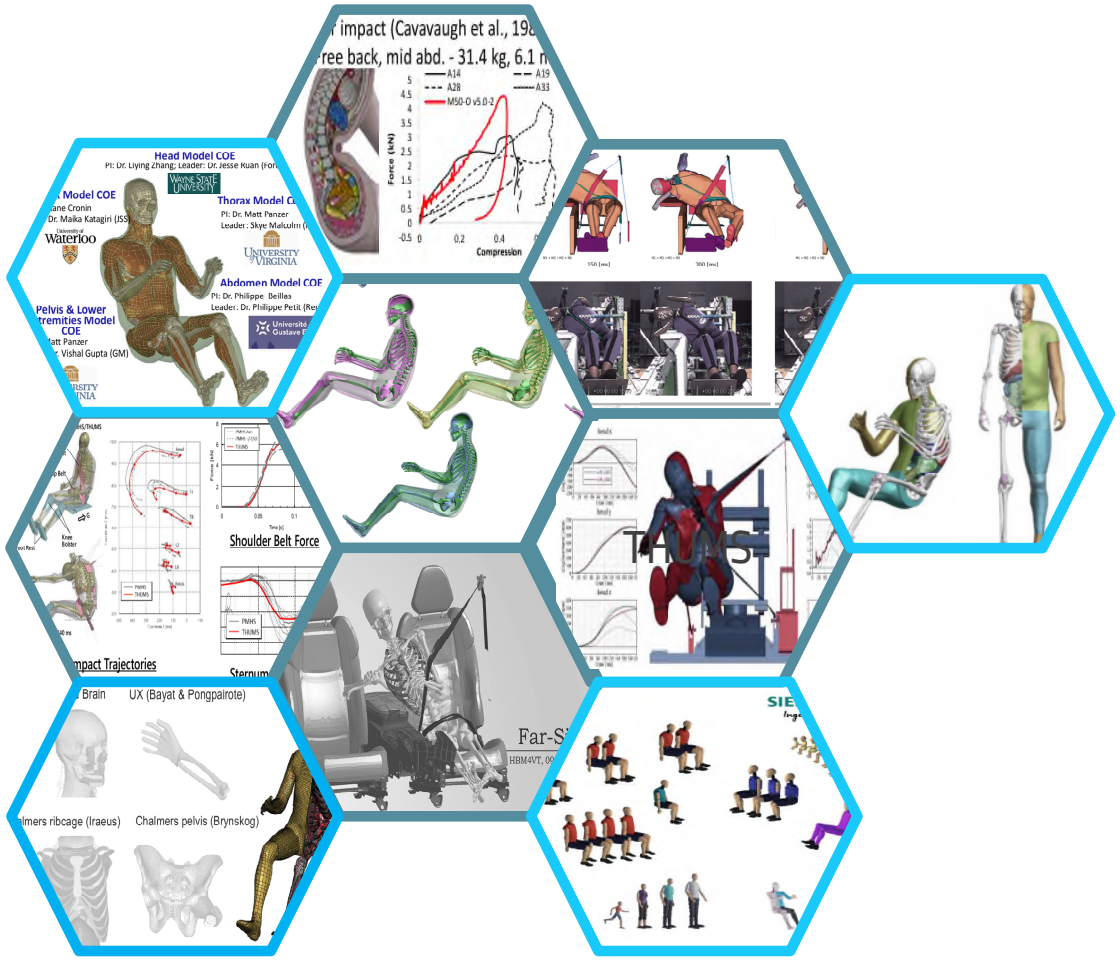
CURRENT WORK ITEMS.

Status Quo of existing HBMs

- Status presentations of model developer on validation in general and for far side specifically.
- User presentation on first far side impact application in sled environment for validation purposes.
- Compilation of a list of validation data to identify first candidates for harmonized load cases.



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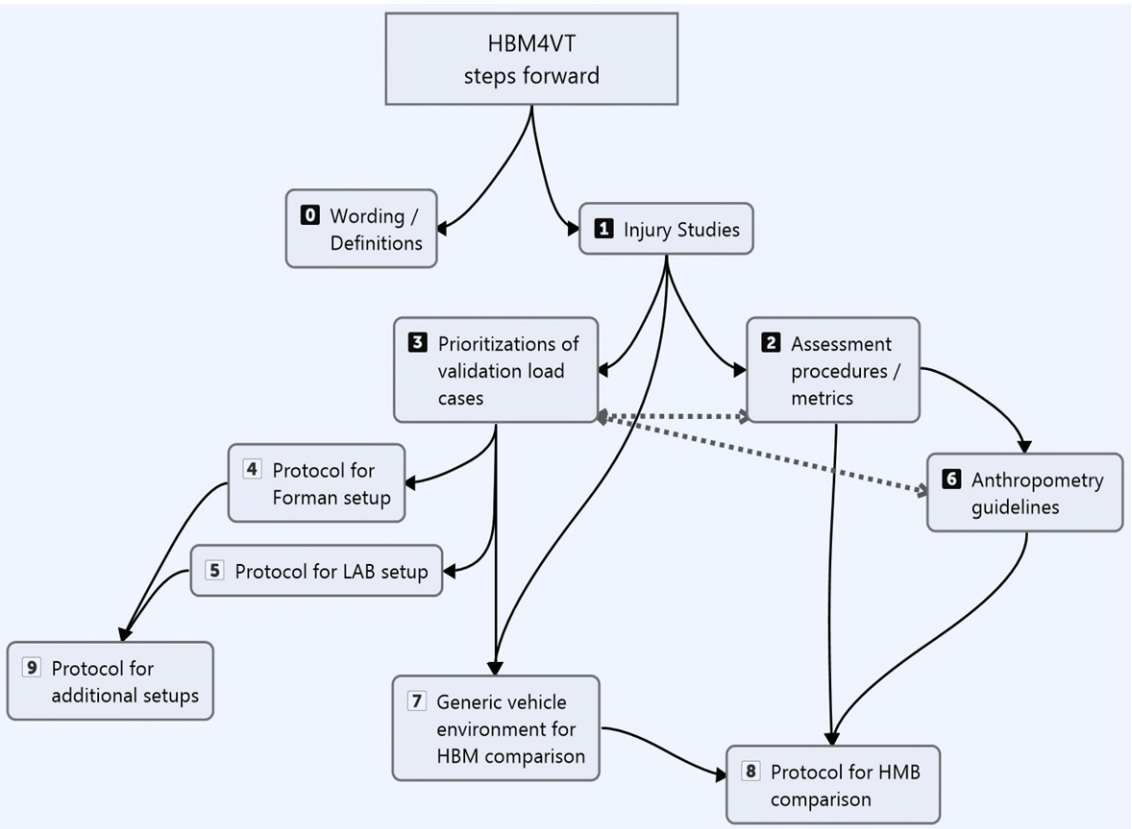
CURRENT WORK ITEMS.

Overview working groups



Status of WGs

- WG0: Wording / Definitions
  - General definitions / processes proposal will be presented for acceptance in next GA meeting.
- WG1: Injury Studies
  - Analysis of different data bases, results will be presented at IRCOBI 2022 conference.
- WG2: Assessment procedures /metrics
  - 3 levels: kinematics, kinetics and injury assessment
  - Evaluation of differences in rib fracture prediction ongoing for different HBM and methods.
- WG3: Prioritization of validation load cases
  - Identification of relevant load cases for WG2
- WG6: Anthropometry guidelines
  - Relevance for load case as well as assessment metric.

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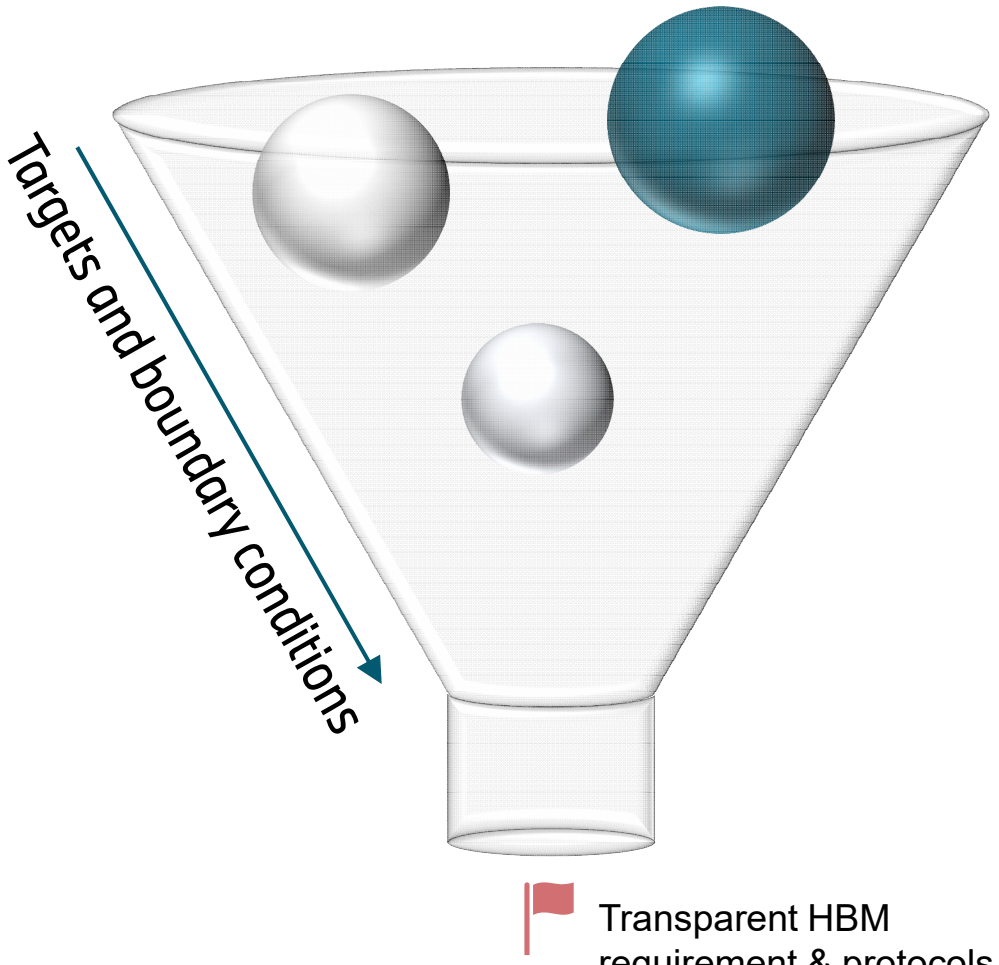
WAY FORWARD.

Expectations from consumer testing protocols

- Identification of **focal points** of future safety protocols based on **real world relevance**.
- Develop load cases with well **defined boundary conditions** suitable for FE modelling.
- Establish **transparent processes** to built **trust** and consumer acceptance.
- Define assessment criteria based on " as **simple** as possible and as **detailed** as necessary".



HBM4VT actions and deliverables

- Develop **HBM focused validation** and **certification** process.
- Identify **existing** load cases addressing body loading seen in chosen load cases.
- Create **anthropometric** guidelines to represent **diverse population**.
- Develop and install **biomechnicallly sound** assessment criteria to address **relevant** injury mechanism.

THANK YOU.

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