ITEA 4

Project Profile

SmartEM

Driving the shift from data spaces to model spaces

The ITEA project SmartEM (Open reference architecture for smart engineering model spaces) will design a reference architecture for engineering model spaces and develop AI-assisted methods to create and recombine surrogate models from heterogeneous data sources.

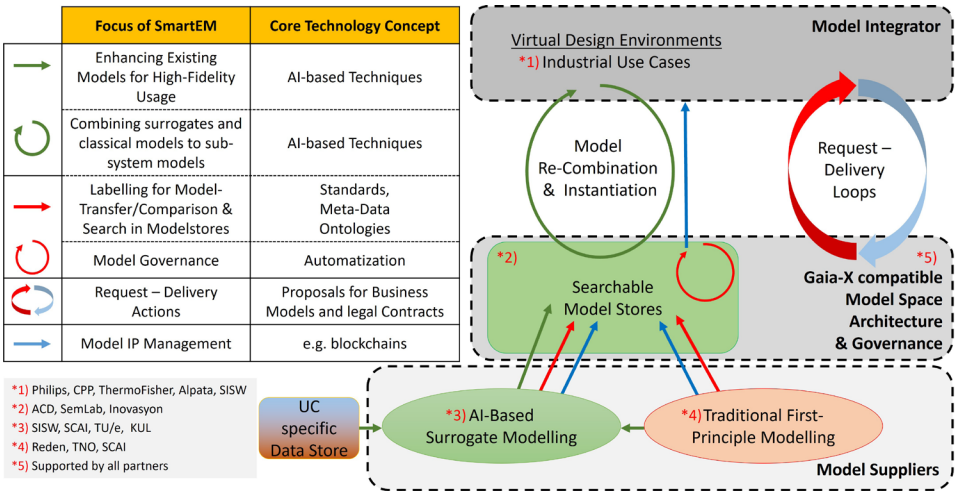
Addressing the challenge

Although computational engineering models have led to improvements in design and analysis processes, their reuse, exchange and integration into larger system-level digital twins or subsequent designs remain limited. Combining models from different sources is still largely a manual task with many functional limitations or is avoided altogether due to inadequate IP management. Currently, most simulation models lack performance, interoperability or flexibility as they are derived from a variety of data sources and existing classical models and are realised using different methodologies. Model behaviour, interfaces and context information are not fully specified, while runtime performance numerical simulations may be too low for optimisation. The exchange of models in digital innovation and supply chains is long overdue and requires organisation.

Proposed solutions

The goal of SmartEM is to develop a joint methodology leading to domain-optimal model store implementations that function reliably according to the same rules, structures and interfaces. First, the project will design an open reference architecture that covers all aspects of searchable model spaces, which are used to organise reusable, transferable technical models for an application domain. By doing so, it will provide rules for model labelling and governance concepts to increase the usability of model spaces, as well as IP management to enable commercial exploitation of the models. Secondly, SmartEM will develop AI/ML methods to create surrogate models from heterogeneous data sources and support their recombination within a domain, offering a much faster runtime while delivering an acceptable level of accuracy.

	Focus of SmartEM	Core Technology Concept
→	Enhancing Existing Models for High-Fidelity Usage	AI-based Techniques
↻	Combining surrogates and classical models to sub-system models	AI-based Techniques
→	Labelling for Model-Transfer/Comparison & Search in Modelstores	Standards, Meta-Data Ontologies
↻	Model Governance	Automatization
⇄	Request – Delivery Actions	Proposals for Business Models and legal Contracts
→	Model IP Management	e.g. blockchains



SmartEM solution concept

Projected results and impact

SmartEM represents a shift from data spaces to model spaces, serving as an enabler of a much broader data and model economy in manufacturing. For end-users, a major benefit is that they can significantly reduce development times by recycling, recombining or retraining first-principle, data-based and hybrid models. For example, SmartEM aims to reduce the average time for surrogate creation and execution – which can currently take weeks – by 50% across its use-cases. As for business exploitation, companies providing AI solutions see commercial opportunities by broadening the service offering of existing AI/ML solutions to support surrogate models, thereby bridging the gap between data scientists and engineers to attract new customers and upsell opportunities. Engineering service providers can also integrate the newly developed AI models into their own frameworks to create smart surrogate solutions, leading in one case to a predicted 35-40% increase in yearly R&D revenues. Finally, the reusability of SmartEM's models and data reduces the need to create new prototypes, enabling less resource usage and a lower carbon footprint. These factors leave the project well-positioned to achieve shorter development times, more efficient solutions and greater flexibility across the world of systems engineering.

Project partners

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22009

The Netherlands

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TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

PHILIPS

REDEN

SemLab

ThermoFisher SCIENTIFIC

TNO innovation for life

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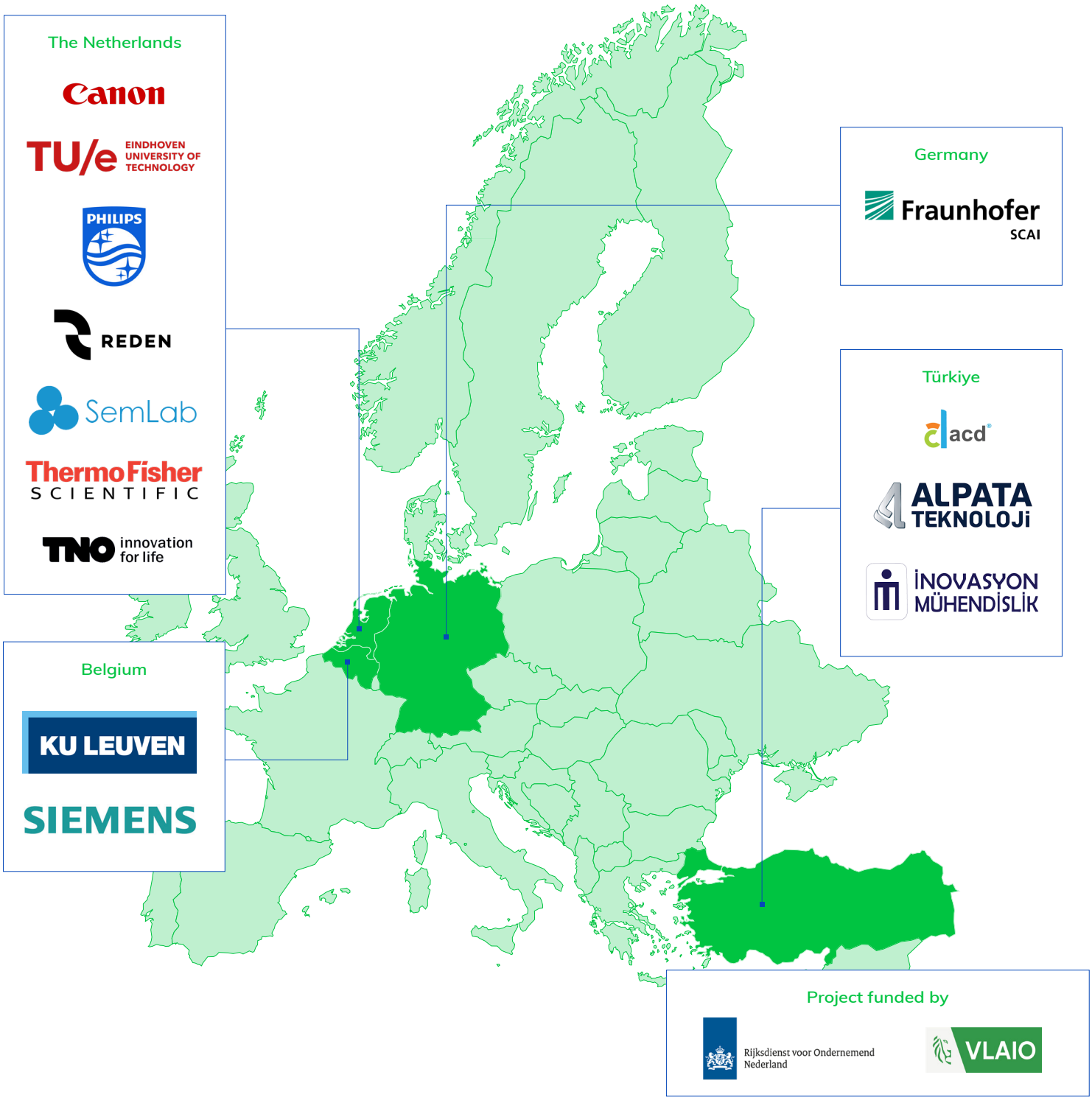

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ITEA is the Eureka RD&I Cluster on software innovation, enabling a large international community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. ITEA is part of the Eureka Clusters Programme (ECP).

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