**Research Campus ARENA2036**

The innovation platform for mobility and production of the future

**The Research Campus ARENA2036 is a novel co-creative innovation environment.** The proximity of researchers and developers from more than 50 partners within the 10,000 m² research factory enables higher speeds on the way from idea, to project, to transfer. Dr Clemens Ackermann, research coordinator at ARENA2036, explains that the goal of the Research Campus ARENA2036 is to foster an excellent, interdisciplinary fundamental and applied research – to produce potentially disruptive and leap-frog innovations and to transfer them to industry.

**INTERDISCIPLINARY APPROACH** Underpinned by its excellent interdisciplinary fundamental and applied research, ARENA2036 aims to produce potentially disruptive and leap-frog innovations that can be transferred to industry and contribute to the transformation of work, mobility, and production. With partners in various disciplines such as aerospace technology, industrial science, textile and materials research, as well as the automotive industry, Dr Ackermann explains that the interdisciplinary and trans-institutional approach of the various fields is an essential component of the Research Campus. This interdisciplinary linking of the diverse stakeholders is reflected in the close cooperation of all actors under the umbrella of ARENA2036.

Moreover, the proximity of researchers and developers from more than 50 partners within the 10,000 m² research factory shortens the interval between the conception of an idea and its transfer to industry. While combining various stakeholders and their ideas is of great value, another unique selling point of the ARENA2036 Research Campus is the sharing of risk among all participants. This creates an opportunity to research issues that do not necessarily have to be included in the next model cycle, as they can potentially "reach far into this century" (Ackermann, Fechter & Froeschle, 2021).

**INDUSTRY 4.0**

The Fourth Industrial Revolution, known as Industry 4.0, has emerged with the emphasis on taking digital technology to a new level. Originating as a national strategic initiative from the German government, it focuses on driving digital manufacturing forward by increasing digitisation and the interconnection of products, value chains, and business models. It is also aimed at supporting research and encouraging networks of industry partners along with standardisation. Using smart technology, Industry 4.0 brings the Internet of Things (IoT) into manufacturing with the ongoing automation of manufacturing and industrial practices. Intelligent manufacturing environments are proposed through the development and implementation of Cyber-Physical Production Systems made up of cooperative independent elements that are integrated into the Industrial Internet of Things to create Smart Factories. ARENA2036 is setting the pace for Industry 4.0, offering an interlinked and holistic approach to manufacturing.

**DATA INTEROPERABILITY**

The partners are using common data modelling and standardised communication parameters to ensure data interoperability and transparency. They are also employing uniform information models and semantic parameters to describe various application demands within the automotive industry use-case. Asset administration shells, in the form of standardised interfaces, extend the conventional physical assets to interconnected production. Data for all products and production resources are potentially accessible to every user and asset within the ARENA2036 Research Campus. In providing both data transparency and interoperability, ARENA2036 is enabling new data-driven business models in smart production and as well as new marketplaces for virtual data properties in the product domain.

Researchers are also exploring data interoperability within the domains of product development and production system design, aiming to significantly reduce the time taken by product development and market introduction. This has particular importance for the ongoing transformation processes within the automotive industry that require increasingly flexible manufacturing processes. These are characterised by the incorporation of new product and production technologies into serial production at ever shorter intervals and present immense challenges for product design alongside corresponding production systems.

**HOLISTIC SEMANTIC MODELLING**

Dr Ackermann describes how the basic ideas of innovation design incorporated at the Research Campus ARENA2036 offer a platform for joint research in a pre-competitive environment. These joint research projects are the foundation of ARENA2036 and enable all partners to pave the way for the mobility of the future. The holistic modelling of integrated product and production development, particularly in the joint research projects Fluid Production and Digital Fingerprint, exemplify decisions relating to conventional, rigidly linked production lines. These production systems no longer meet the requirements of today's changeable demands, growing numbers of product variants, ever-decreasing product lifecycles, and unpredictable technological developments. Fluid Production draws on an analogy between a fluid adapting its shape according to the pressures acting on it, and a cyber-physical production system optimally adapting to current requirements and demands. Fluid Production enables the system, design and set-up to be moved as close as possible to the start of production, thereby minimising the uncertainties involved in forecasting market demands and applied technologies. It also reduces possible discrepancies between product design and production.

Fluid Production involves all production facilities being broken down into location-flexible modules. These modules are designed with an anthropocentric focus so that, with
The Digital Fingerprint delivers a foundation for Industry 4.0 applications and provides a link between all ARENA2036 joint projects. The Digital Fingerprint merges product design, system integration, and production together with the benefits of cyber-physical systems throughout the products lifecycle. FlexCAR’s rolling chassis is a paradigm for the semantic modelling approach of ARENA2036. In addition to being a customised road vehicle, the modular rolling chassis can – over the course of its production – also replace automatic guided vehicles by navigating the production autonomously, transporting goods to workstations, and delivering energy supply to remote production applications. The rolling chassis concept offers new solutions for transport and production within an automotive factory. TOWARDS THE MOBILITY OF TOMORROW ARENA2036 is facilitating co-creation within the automotive industry and the delivery of smart, integrated solutions. The success of ARENA2036 is evident in the growing network of partners together with the steadily increasing number of projects. Dr Ackermann credits the dynamics created at the Research Campus ARENA2036 to ‘the proximity of basic science, application-oriented industrial research and the tinkering spirit of the start-up scene’. This combination of industry and academia unites the most diverse competencies in a co-creative innovation environment, making it possible to actually develop innovative potential in such a way that disruption becomes conceivable.

The Digital Fingerprint delivers a foundation for Industry 4.0 applications and provides a link between all ARENA2036 joint projects.