



Federal Ministry
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and Energy

PAiCE

Brief summary of the funding projects

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Digital innovation in the industrial sector – about PAiCE

There are countless ways in which digital innovation can be used in the industrial environment – from robots lending a hand to their human colleagues at the assembly line all the way to using vehicle parts out of the 3D printer. The potential benefits are enormous: digital innovation can help improve efficiency, reduce the use of resources and create products that are tailored to the exact needs of customers. One of the key challenges today is to figure out how digital technology can be transferred from the lab to the market. This requires testing new digital technologies under real-life conditions by undertaking large-scale pilot projects. These are to yield answers to the following questions: Which technologies actually work in practice? Where is additional research and development needed? Which technologies are ready for standardisation? What new business models can be implemented and how will value be created in the future? What are the legal implications, for example in terms of liability and data protection?

In order to provide answers to these questions, the Federal Ministry for Economic Affairs and Energy is carrying out 17 research projects as part of its PAiCE (Platforms/Additive Manufacturing/Imaging/Communication/Engineering) technology programme. The projects bring together more than 100 partners from the worlds of business and science, who are developing solutions spanning the fields of 3D, engineering, communication, logistics and robotics. The Federal Ministry for Economic Affairs and Energy has allocated around €50 million in funding. Factoring in the financing provided by the project partners, the programme volume stands at a total of €100 million.

3D CLUSTER

Add2log

Decentralising production using additive manufacturing and agile logistics

Add2Log seeks to develop a software-based platform that can be used to coordinate the decentralised production of new components and spare parts using additive manufacturing and agile logistics structures. The Add2Log platform serves as the hub for the new value creation network that involves producers, logistics firms and users.

Consortium

Software AG (leader of the consortium), DMG Mori Spare Parts GmbH, FIR e.V. at the RWTH Aachen, Fraunhofer ILT, Materialise GmbH, Top Mehrwert Logistik GmbH

DigiKAM

A digital network for additive manufacturing

DigiKAM is developing a digital platform that will allow additive manufacturing to be used across the entire value creation process. The platform links up companies from different sectors across the entire production process in a way that is both transparent and secure. The platform allows small and medium-sized enterprises that have previously been unable to use additive manufacturing due to a lack of resources to use the technology.

Consortium

Fraunhofer Institute for Mechatronic Systems Design (IEM) (leader of the consortium), Atos Information Technology GmbH, Friedrich Remmert GmbH, Krause DiMaTec GmbH, Miele & Cie. KG

3D CLUSTER**M3D****Mobile 3D scanning for 3D printing directly in the plant**

3D technology is about to revolutionise all steps of the logistics process behind the recognition, procurement and manufacturing of spare parts. Under the M3D project, an entire chain of processes is being developed. From the creation of three-dimensional images of spare parts using a mobile scanning robot and the identification of spare parts using 3D models, all the way to producing the parts using 3D printing directly in the plant if the parts are unavailable or cannot be located in the warehouse. In this last case, a simulation is carried out to find out whether the spare part will maintain its full functionality if it is manufactured using 3D printing. This helps to considerably speed up the manufacturing of spare parts and reduces machine downtime, production shortfalls and logistics costs.

Consortium

Fraunhofer HHI (leader of the consortium), cirp GmbH, cpu 24/7 GmbH, Fraunhofer IGD, Siemens AG, TU-Berlin

SAMPL**A secure data platform for 3D printing**

Under the SAMPL project, a secure platform for additive manufacturing is being developed. The platform covers all stages of the 3D printing process, from the generation of the printing files, the exchange of these files and the licensing of the printing procedure all the way to the actual printing process. The printing process data is to be documented on the platform. In addition to this, the finished components will be labelled, allowing these to be tracked at all times. The documentation and licensing of the printing process is done using blockchain technology.

Consortium

PROSTEP AG (leader of the consortium), 3D MicroPrint GmbH, consider it GmbH, Fraunhofer ENAS, NXP Semiconductors Germany GmbH, Hamburg University of Technology (TUHH) – Institute of Aircraft Cabin Systems, University of Hamburg – Hamburg Research Center for Information Systems, Ulm University – Institute of Distributed Systems

ENGINEERING CLUSTER

DEVEKOS

Consistent engineering practices for secure, distributed and communicating multi-component systems

The DEVEKOS project seeks to develop forward-looking machine architectures in which each and every component exists as a separate digital object. These components provide data and skills that are standardised across different manufacturers. This means that individual components can easily and efficiently be combined into machines that are highly dynamic and variable.

Consortium

FESTO AG & Co. KG (leader of the consortium), ASYS Automatisierungssysteme GmbH, CODESYS GmbH, elrest Automationssysteme GmbH, fortiss GmbH, Häcker Automation GmbH, Harro Höfliger Verpackungsmaschinen GmbH, Ostwestfalen-Lippe University of Applied Sciences, NewTec GmbH, SCHAEFF Maschinen GmbH & Co. KG, Softing Industrial Automation GmbH, Institute of Control Engineering of Machine Tools and Manufacturing Units at the University of Stuttgart

ENGINEERING CLUSTER**EMuDig 4.0**

Integrating digital technology to make massive forming more efficient

The individual steps of the massive forming value chain are currently not very well connected. EMuDig 4.0 seeks to improve networking, flexibility and efficiency across the entire value chain by integrating sensors and analysing sensor data. This will help, for example, to remove errors at an early stage of the product development process (predictive quality) and maintain production equipment more easily (predictive maintenance). The goal is to take a consistent and forward-looking approach to engineering, so that machines, production equipment and products can all be linked up more closely.

Consortium

OTTO FUCHS KG Meinerzhagen, Hirschvogel Automotive Group Denklingen, SMS group GmbH Mönchengladbach, South Westphalia University of Applied Sciences, University of Stuttgart, Centre for Information Services and High Performance Computing (ZIH) at Technical University of Dresden

INTEGRATE

An online platform for collaborative engineering

Under this project, an open platform is being developed that will allow engineering to take place across companies and manufacturers. The development tools that are used in the manufacturing process exchange data via the platform and do so in a secure and synchronised manner; third parties can offer and integrate their own services. The key aspects required for developing such a platform such as data security and rights management are controlled by the

platform. This is to speed up the design process and make it a lot more flexible.

Consortium

inpro Innovationsgesellschaft für fortgeschrittene Produktionssysteme in der Fahrzeugindustrie mbH (leader of the consortium), ABB AG, FZI Research Center for Information Technology at the Karlsruhe Institute of Technology (KIT), logi.cals automation solutions & services GmbH, Otto von Guericke University Magdeburg

VariKa

Connected product and production engineering using the example of different types of vehicle body models

The space available for the car battery is largely dependent on the car's propulsion system. A hybrid car requires a different battery tray than a fully electric car. Under the VariKa project, a model kit for battery trays is being developed and the associated process chain designed. What is special about this is that the trays are mounted to the car using structural components that are printed using 3D technology. Before the trays are mounted, the individual elements are joined into a battery tray without any fixed manufacturing equipment being needed, making the manufacturing of small batches profitable.

Consortium

EDAG Engineering GmbH (leader of the consortium), FFT Produktionssysteme GmbH & Co. KG, FKM Sinter-technik GmbH, Fraunhofer Institute for Structural Durability and System Reliability (LBF), Opel Automobile GmbH

COMMUNICATION CLUSTER**IC4F**

A kit for a reliable industrial communication and computing infrastructure

The IC4F project seeks to develop secure, robust and real-time communication solutions for the manufacturing sector. To this end, it is developing an open reference architecture and technology kit that will allow the implementation of a holistic communication and computing infrastructure for communication and data processing in the industrial sector – a kind of industrial internet of things.

Consortium

Fraunhofer HHI (leader of the consortium) und Fraunhofer IIS of the Fraunhofer Society for the Advancement of Applied Research e.V., brown-ipposs GmbH, Deutsche Telekom AG, Gesellschaft für Produktionssysteme GmbH, MAG IAS GmbH, Nokia, Robert Bosch GmbH, rt-solutions.de GmbH, Schindler Fenster + Fassaden GmbH, Siemens AG, Still GmbH, Technical University of Berlin, Technische Universität Kaiserslautern, University of Stuttgart

LOGISTICS CLUSTER**iSLT.NET**

A cross-company network for smart, modular special load carriers

Special load carriers are used to transport large, bulky or sensitive components such as car engines. iSLT.NET is working to develop a cross-company network for smart, modular special load carriers. The goal is to set up a connected IT and communications infrastructure that will improve transparency across the logistics process.

The special load carriers are equipped with radio technology so that their condition – including temperature and shocks – can be tracked. The new kit makes it possible to reuse special load carriers and to deploy innovative business models such as leasing or pay per use.

Consortium

GEBHARDT Logistic Solutions GmbH (leader of the consortium), BMW Group, Dräxlmaier Industrial Solutions GmbH, Fraunhofer Center for Applied Research on Supply Chain Services (SCS), Landshut University of Applied Sciences, Technical University of Munich

SaSCh

Digital services for connected supply chains

In today's world, many products are part of a complex supply chain that involves a large number of logistics service providers and suppliers. This means that very stringent quality management requirements are needed. Under the SaSCh project, a system is being developed whereby data about the quality of components within the supply chain is being recorded digitally. Both mobile and fixed sensors are being used. The companies involved in the project are provided with digital services based on the data that is being collected, helping them identify transport issues early on. The goal of the project is to develop lean and robust supply chains in which special haulage, rework and production downtimes become obsolete.

Consortium

queo GmbH (leader of the consortium), BIBA – Bremer Institut für Produktion und Logistik GmbH, BLG INDUSTRIELOGISTIK GmbH & Co. KG, GS1 Germany GmbH, Robert Bosch GmbH

BakeR

A kit for the development of cost-effective, modular cleaning robots

The BakeR project seeks to develop a universal service robot. A number of different software and hardware modules can be selected in a way that allows the robot to adapt to individual tasks. To this end, a mobile robot platform is being developed on which a number of different modules for automated cleaning will be made available. The resulting prototype will be tested in the office cleaning environment, where the robot can pick a module depending on where and what it is cleaning.

Consortium

Fraunhofer IPA (leader of the consortium), Dussmann Service Deutschland GmbH, KENTER Bodenreinigungsmaschinen Vertriebs- und Service GmbH, MetraLabs GmbH Neue Technologien und Systeme

QBIK

Autonomous learning logistics robot with gripper and human machine interface

The QBIK project combines human skills and the benefits of autonomous technology. The project seeks to develop a learning autonomous commissioning system that will come in the form of a remote-controlled vehicle equipped with a robotic gripper. The vehicle will be able to find its way through a room without any human interaction, locate its destination and use a gripper to take goods that have been ordered from the shelf. A human machine interface allows the robot to ask for remote support from a human being who can provide this support via a virtual-reality-based user interface.

Consortium

Bär Automation GmbH (leader of the consortium), quattro GmbH, Karlsruhe Institute for Technology, Still GmbH

RoboPORT

Crowd engineering in robotics: an online platform for the development of ideas and prototypes

RoboPORT is developing a platform that can be used by different stakeholders to join together and develop and implement components for service robotics applications. Open innovation and crowd engineering methods have been key to the success of open source software – methods that have the potential to also transform the way in which robotics hardware is developed. The platform makes available a wide range of developer tools, a library for open source robotics and communication and management tools. This means that customer feedback can be taken into account during the development process.

Consortium

Fraunhofer Society for the Advancement of Applied Research e.V. (leader of the consortium), BSH Hausgeräte GmbH, UnternehmerTUM GmbH, General Interfaces GmbH, innosabi GmbH, University of Stuttgart

ROBOTICS CLUSTER

ROBOTOP

An online platform for using robots in the industrial and services sector

Under the ROBOTOP project, an open platform that allows robots to be configured in a way that fits the needs of small and medium-sized enterprises is being developed, with the aim of making services, logistics and manufacturing robots available to the mass market. The platform allows users to select pre-configured solutions based on best practice examples and to adapt these to their own company processes. Once a specific robotics system has been designed, 3D simulations can be used to test whether it fits the company's needs. The platform also helps potential users connect with experienced providers and systems integrators who can help them implement the system. This helps create confidence among users, reduces the time and cost involved in the design process and makes the use of robots accessible and profitable for small and medium-sized enterprises.

Consortium

ICARUS Consulting GmbH (leader of the consortium), Friedrich-Alexander University Erlangen-Nürnberg, Infosim GmbH & Co. KG, Karlsruhe Institute for Technology, Robert Bosch GmbH, Ruhr-University Bochum, SCHUNK GmbH & Co. KG, TU Dortmund University

SeRoNet

A platform for the development of service robot solutions

SeRoNet is developing an open IT platform that brings together users, systems integrators and hardware and software firms that operate in the service robotics sector. The platform allows users to join together to develop software and to choose from a large selection of hardware and software products from a wide range of different firms. The goal is to considerably reduce the time and effort involved in the development of professional service robotics software. Whilst today the development of this kind of software is only profitable if it is used for at least 20 robots, SeRoNet wants to bring this figure down to 1.

Consortium

Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) (leader of the consortium), Daimler TSS GmbH, FZI Research Center for Information Technology at the Karlsruhe Institute for Technology (KIT), Ulm University of Applied Sciences, University Medical Centre Mannheim Dienstleistungsgesellschaft mbH, KUKA Deutschland GmbH, Ruhrbotics GmbH, Transpharm Logistik GmbH, Paderborn University, University of Stuttgart

