smart4i Demonstrator

The smart4i Demonstrator makes Industrie 4.0 tangible and shows that even today, manufacturing processes can be made Industrie-4.0-compatible by efficient use and combination of technological components. With the smart4i Demonstrator, customers have the chance to order an individualized power bank. Color, wrapping, and label can be adapted to the customer's personal preferences and wishes. The order is processed immediately by the Demonstrator, and the selected parameter values pass to the modules. The specialty of the Demonstrator is the consistent crosslinking from the Cloud to the field devices, which is ensured at any time by uniform interfaces (OPC UA) and information models.

Project goals:

- **Making Industrie 4.0 tangible:** Illustrate complexity and interdependencies with a concrete project example
- **Prototype development:** Implementation of a modular manufacturing plant as a vivid fair exhibit for individualizing power banks
- **Practical education:** Interdisciplinary project work in a team and in cooperation with industrial partners
- **Tool-based systems engineering:** Application of agile mechatronic development methods, e. g. Scrum, and tool-based engineering

Supported by:

The Team

An interdisciplinary and international team of 36 dedicated students has realized the smart4i Demonstrator within only 36 weeks. The students come from five universities which are very distant geographically (Dresden, Aalen, Munich, Augsburg, Gran Canaria).

About ITQ GmbH

ITQ GmbH consults and supports during all phases of software development, allowing for special mechatronic problems in mechanical engineering. The core competences, besides software engineering (comprising analysis, design, implementation and test) are process improvement, project and crisis management as well as consulting and coaching. One particular focus of the company is suitable and forward-looking training concepts. For that reason, the company fosters young academics in practice-oriented assignments such as the project „smart4i".

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ITQ
competence in mechatronics
software and systems engineering

smart4i Demonstrator

innovative education

The Project:

From the Cloud to the personalized power bank

- Individual products: Batch size 1
- Real-time order tracking
- Directly from the internet to the shop floor
- Highly modular design
- Uniform interfaces/consistent cross-linking
- Service-based controller for fast and simple exchange of modules
- Interaction of virtual and real modules (Digital Twin)

Project management
ITQ GmbH

- Organization, coordination and coaching of an interdisciplinary and international team
- Definition and monitoring of the agile development process

Transport module (B&R SuperTrak)
B&R/ITQ GmbH, Munich/Gran Canaria

- Transport of wrapping and power bank between modules / between production stages
- Movement of the "pallets" in a circle on which the wrapping (blister) and the power banks are mounted

Modularity and communication

- Functional abstraction of the individual modules using "skills"
- Uniform platform-neutral information model, implemented using an OPC UA interface

Lid module
Hochschule Aalen

- Carton lid storage
- Dispensation of the lid and application to the blister

Output module
Fraunhofer IGCV

- Intermediate storage and extraction of the finished orders from the Demonstrator
- Ejection of the order by pushbutton

Sealing module
TU Dresden/watttron GmbH

- Sealing lid and blister

Order in the Cloud

- Customers can enter their order via internet, and the order is immediately saved in a Cloud platform
- The Demonstrator's order management and process control gather the orders directly from the Cloud and relay the parameter values to the modules

Laser module
ITQ GmbH/RWTH Aachen/TRUMPF

- Individual labeling of the power banks and marking with a data matrix code
- Engraving by TRUMPF laser

Blister module
ITQ GmbH

- Separation of blisters and insertion into the carrier of the transport system
- Transfer to the cable module or directly to the laser module
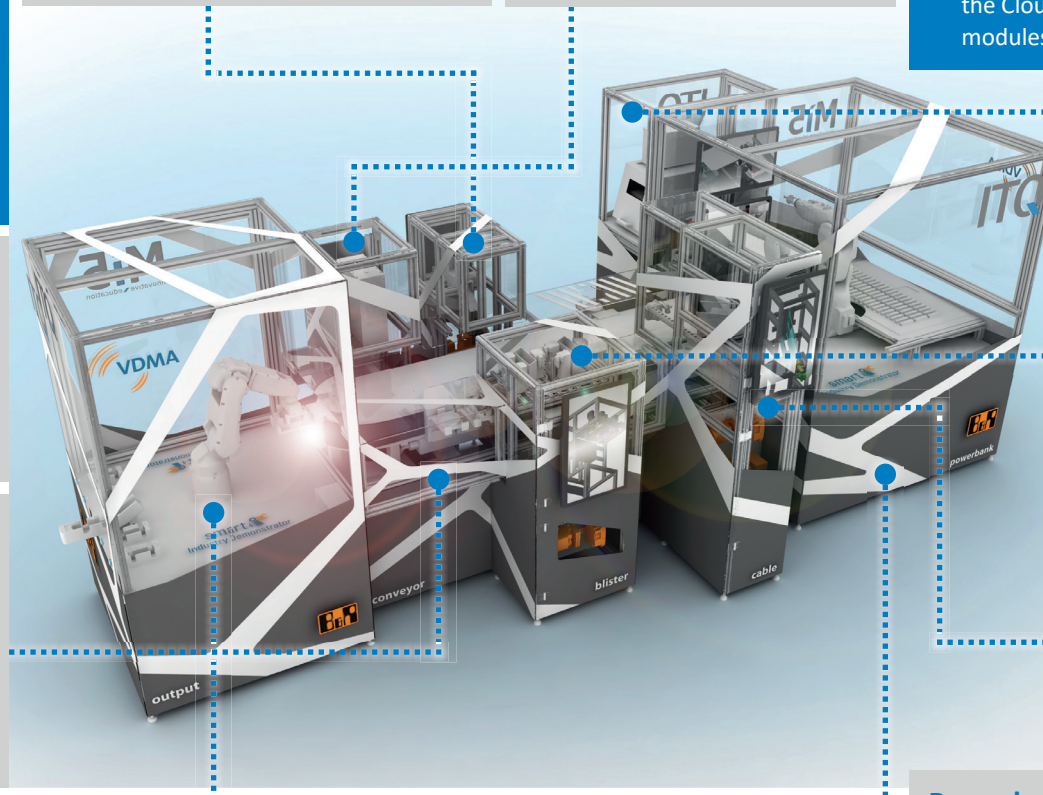
Cable module
Hochschule Aalen

- Power bank storage
- Insertion into blister

Powerbank module
ITQ GmbH, Munich/Gran Canaria

- Gathering a power bank with the right color from the magazine
- Issuing onto a pallet of the transport system
- Use of Comau robot and FIPA gripper
- Controlled by B&R hardware