

The human-machine interface in the production environment

Executive Summary



Modern, user-friendly operating systems increase efficiency in production environments

Build it in.

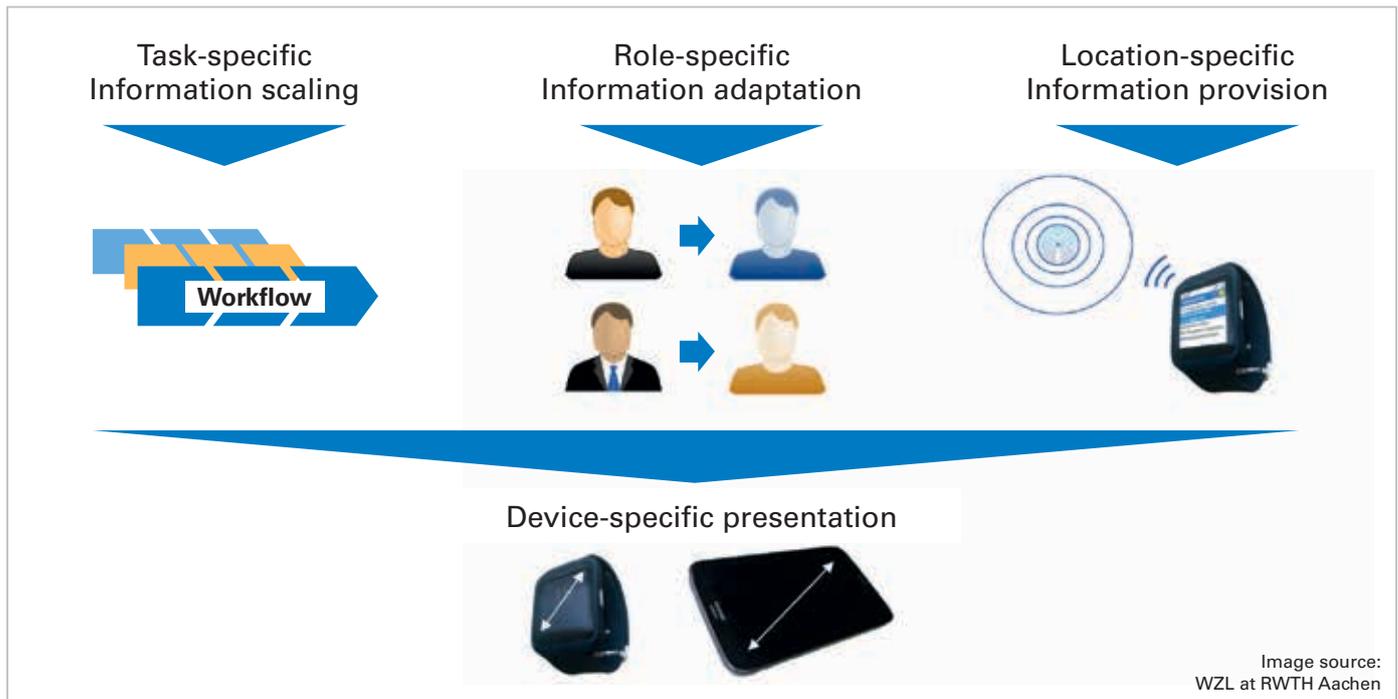


The past few years have seen production environment controls constantly increase in complexity. Not to mention the machine-user concepts that require long training periods for employees because of their non-intuitive structure.

Challenges to user concepts come from both employees who are being trained and from a generally aging population. Age and cultural differences are bringing user needs into greater focus. Intuitive control systems - much like those in the consumer market - are needed in industrial environments. In this white paper, Professor Christian Brecher, Markus Obdenbusch and Simon Sittig describe how modern human-machine interfaces can be designed for increasingly complex production processes. This significantly simplifies the user experience for each user according to their role and the relevant situation. Mr. Sittig is a research assistant in the control technology and automation department (headed by Markus Obdenbusch) at the Chair of Machine Tools (headed by Professor Christian Brecher) at the WZL machine tool lab at RWTH Aachen University.



Powering Business Worldwide



As part of a study, the Fraunhofer IAO surveyed 661 companies about production work. The result: The interface between humans and machines is becoming increasingly significant. This, in turn, is making efficient interfaces ever more important. As part of Industry 4.0 the number of sensors installed in machines will continue to increase. The additional data will allow for an ever better integration of the context into information processing, but it also carries the risk of overloading users with unnecessary volumes of data. The core challenges in developing a user system therefore include user friendliness, usability, and tailoring the system to personal preferences and task assignments.

The development of a usable human-machine interface is an iterative process where the focus from the outset should be on planning for the tasks that are to be performed. In step two, the usage context for every user group must be understood and described as a so-called role. Based on this, the information requirements for the user can be individually defined and scaled. In step three, the usage requirements are specified for the relevant roles, for example, in terms of whether operations can also be carried out with work gloves or whether safety-related functions require special switch mechanisms. In step four, design solutions are developed to meet user requirements for specific tasks and roles.

In addition to the duties and role profiles, location information is required in order to produce a complete description of the usage context. This allows for the automatic opening of dialogs when entering certain areas, localization of errors using iBeacons and Bluetooth Low Energy (BLE), or the definition of zones for (de)activation of specific notifications.

Operators also need to ask where the context-specific data for the relevant roles is provided. If the data is directly provided from the machine, regardless of location, this is very confusing for users who, for example, work on multiple machines at the same time. A smart device, which reacts only to location-based triggers without external controls and assignment of tasks, is less process-dynamic and the user thus needs to receive the information about the next task to be performed from another source. In other words, the dynamic distribution of tasks to various suitable roles requires a superordinate system. A solution-based approach involves providing the data via the cloud, where external service providers can be integrated in certain work processes.

In order to find out in more detail how modern user concepts can significantly increase efficiency in the production environment, download the white paper: www.Eaton.com/en/HMI