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Engineering and Automation IPA

Human-centered Quality in the Workplace

D²UNA – Data Driven User Needs Assessments

Video recordings of the workplace, of tasks and of eye movements are coupled with machine data to help identify user needs.

Human-centered quality in the workplace: with the help of data-driven user needs analyses

Tomorrow's workplaces will entail multi-faceted human-machine interactions in networked and constantly changing work environments. Performance indicators like overall equipment effectiveness have long since ceased to be the main criterion when it comes to sustainable optimization measures for workplaces and machines. Rising demands on employees call for an even greater emphasis on human-centered quality.

Human-centered quality is the extent to which requirements for usability, accessibility, user experience and avoidance of harm from use are met (Ergonomics of human-system interaction – Part 11: Usability: Definitions and concepts (ISO 9241-11:2018).

Workplaces that compromise quality features of human-centered design have a direct impact on the behavior, performance and motivation of employees. Therefore, it is essential that workplaces are designed to meet the quality requirements of the user, thus enabling employees to work more efficiently in the long term through positive user experience (UX).

With this in mind, designers and developers first need to gain a detailed understanding of the employees, their work tasks and goals in terms of use. Common procedures for this include User Needs Assessments, which identify user requirements with the aid of qualitative and quantitative methods. First, it is important to find out why employees make certain decisions and why they behave the way they do. At the same time, it is also essential to have a detailed overview of how interactions take place, and which other elements affect the context of use.

Different camera perspectives make it possible to assess the assembly process in detail.
Source: Timo Leitritz, Future Work Lab at Fraunhofer IPA at the MonSiKo demonstrator

In particular, partially automated workstations offer the possibility of including machine data and comparing it with user data. The results of the User Needs Assessment can be implemented in many ways and help directly to:

- gain a detailed picture of the target group, e.g. through persona
- obtain a detailed map of the process, e.g. in user journey maps
- detect problems in the current process
- derive ideas and concepts for development and optimization measures
- enable goal-oriented communication among all stakeholders
- shorten development times through fewer misguided development cycles
- provide decision-making aids for further UX organizational strategies

Example: analysis of a partially automated workstation

In a project at Fraunhofer IPA, voice and touch inputs are recorded at the MonSiKo workplace on the user side, and "thinking aloud" is used to document thought processes and feelings that are not visible. Eye tracking is used to record eye movements and "areas of interest" (AoI), while additional cameras record posture and tasks at the workplace from various perspectives. On the machine side, the states of the robot arm and the welding machine are recorded over the observation period in log files, together with outputs from the digital assembly manual and evaluations of the integrated, automatic quality control (visual and audio inspection).

The data is then plotted over time, making it possible to evaluate in detail the dependencies of the various values, the areas of interest and the processes on each other by studying the respective image sections. "Blickshift Analytics" software facilitates the analysis of the basic data. This allows the scalability of concrete measures for optimizing the digital assembly manual and the process itself to be derived.

Our services

Performance by applying user-centered software

Fraunhofer IPA helps companies design, evaluate and implement sophisticated human-machine interactions.

The D2UNA sensor toolbox was specially developed for carrying out user needs analyses on complex work environments and provides all the necessary tools for mobile measurements. With our support, you can define key performance indicators and UX metrics and develop the interfaces you need in order to record machine data according to requirements. Together with your organization, we record all the necessary data in strict compliance with data protection guidelines.

At the end of the project, you receive concrete analysis results and recommendations for optimization, enabling you to further improve your human-centered workplace.

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