

TNO is a Dutch, independent not-for-profit research organisation that conducts contract research including high tech technology support, offers specialist consulting services, and grants licenses for patents and specialist software.

“The V3+ framework highlights the need for early and iterative involvement of end-users and stakeholders to align user requirements and technical specifications.”

— **Marian Schoone**

Consultant, TNO Healthy Living

The Opportunity



Large-area sensor arrays integrated into flexible – even stretchable – thin mats allow long-term, unobtrusive monitoring of vital functions and digital biomarkers. TNO is developing such a [sensor mat](#) for sleep health to support the diagnosis, monitoring, and personalized treatment of sleep disorders.

The combination of heart rate (variability), breathing rate, and posture/activity during the night are relevant parameters for sleep quality assessment that can be collected from the sensor mat, quickly picking up a signal again even if the patient has moved to a different position of contact.



The resource



Early stakeholder and end-user involvement is vital for the successful adaptation of technology and to obtain meaningful information to optimize hardware and software design.

The usability validation component of DiMe's V3+ framework highlights the indirect impact of use specification on technical specification to align technological boundary conditions with user requirements iteratively throughout development. TNO held focus-group sessions with various stakeholders with and without presenting the sensor mat mock-up and its anticipated technical boundaries. Bringing together these user and technical specifications in this way ensured an end product that's not only functions well, but is also acceptable to users and other stakeholders, such as doctors.

The impact



Allowing early and continuous involvement of end-users and stakeholders in the development of the sensor mat maximized alignment with their needs and requirements, improving the chance of meaningful and effective adoption.