

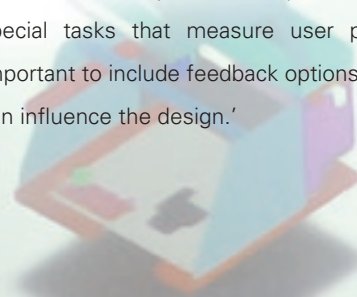


Jan Miedema and Frank Meijer

Designing a product in a 'synthetic environment' means introducing all stakeholders to the product before the first prototype has even been developed – all the way to the end user, who can help decide on the design. In this process, mechanical engineer Jan Miedema and psychologist Frank Meijer work closely together.

## Synthetic environments provide the full look-and-feel

The Virtual Reality lab is the playground for researchers of synthetic environments. 'There we have every opportunity to experiment,' Jan Miedema explains. 'That begins with new brainstorming methods, with mindmapping software that directly registers everything you say. We estimate that the equipment in the lab will become affordable for medium and small-size enterprises in the not too distant future. One of our central objectives is that companies will have the chance to introduce synthetic environments in their own business.' Mechanical engineer Miedema is mainly interested in applications in his own field, while Frank Meijer focuses more on the user. As a psychologist, he wants to know what cognitive effort is required in a simulated environment in order to be able to imagine what the product will look and feel like in reality. 'The greater the cognitive effort, the less suitable the VR application is. I also want to know how the user experiences the product. For that, you can use questionnaires or integrate special tasks that measure user performance. It is important to include feedback options, because the user can influence the design.'



A user can already experience the look and feel and the quality of a product in the lab. But what products are suitable for this kind of user-centered approach? Frank Meijer says, 'It is easy to imagine a glass of water when you see it on paper. In a case like that, this approach would have no added value. However, it's the more complex products that people find difficult to imagine.' Jan Miedema adds, 'These can also be existing products of which a certain aspect needs improvement. This often comes paired with rather vague design criticism, such as "the lid is not rigid enough". The choice of materials is decisive for the quality someone perceives. Our first case focuses on just that, a complex machine in which a tray filled with cups is to be placed. The lid must be transparent yet stiff. These are contradictory requirements, but they are not hard and fast rules. So our idea is to let the user experience it and give us feedback.'

The researchers are currently building their first synthetic environment for this case, as a small finger exercise. A haptic master will simulate the opening and closing of the lid. This device can generate forces that the user experiences as either more or less resistance. Moreover, the lid itself is also simulated on screen, while the machine's user interface is shown on a tablet pc screen. The tray with the cups is real instead of simulated. 'Wherever you can work with "the real thing", you don't have to bother simulating it. We will ask the designers as well as the users who will be using it in practice.'

Jan Miedema is constructing the haptic environment, Frank Meijer is formulating the questionnaire and a list of secondary tasks, while a colleague from Delft is responsible for software and visualisation. Frank Meijer says, 'True, these are three entirely different disciplines, but that's what makes this project so interesting. Working on processes such as these in a team was the decisive factor for me. I figured that it would be much more interesting than conducting doctoral research all by myself.' Miedema agrees, 'We complement each other well.'

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The first case is to be followed by a second one. Although not yet defined, it will certainly not be a run-of-the-mill subject. The researchers hope that, in the end, they will have increased knowledge of the design process at a high level so that the methods will become available for medium and small-sized businesses. The VR lab is ready to go.

