

Education

Delft University of Technology

Improved human modeling means better designs

Product

Tecnomatix

Business initiatives

New product development

Business challenges

Importance of ergonomic considerations in product design

Wide variation of human sizes and shapes

High cost of physical prototypes

Keys to success

Upgrade from wireframe human modeling to Tecnomatix Jack

Jack user-friendly interface

Ability to input design geometry from department's CAD system into Jack

Access to data from anthropometric databases

Results

Students learn Jack quickly

Ergonomics evaluations done in early stages of design

Fewer costs associated with physical prototypes

Students can focus on design quality divides

Tecnomatix Jack lets students focus on design quality while reducing the need for physical prototypes

Product design and more

To a great extent, the success of a new product is determined by its design. Design is not the only aspect of product development, however. Technical and commercial aspects play just as big a role in a product's success. After all, who wants a fancy looking product that is difficult to use and fails to meet expectations?

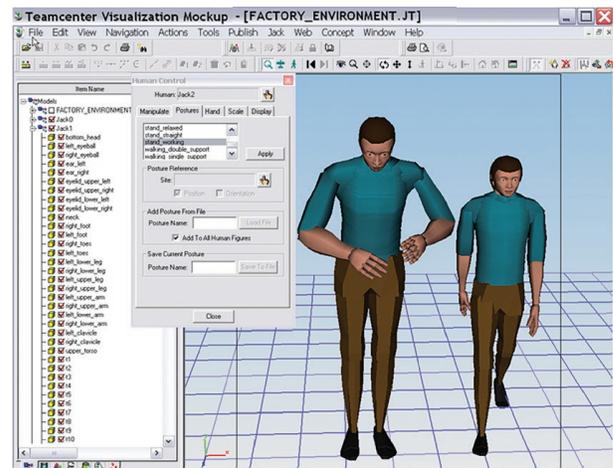
The Industrial Design Engineering Department at Delft University of Technology teaches students how to combine design, technology and business in the development of new products. The department has been in existence since the late 1960s, having originated from the department of Architectural Engineering. More than 3,200 engineers in industrial design have graduated since industrial design became a separate course of study. "Due to the broad spectrum of the training, these graduates end up working in design departments as well as in a number of management functions," says Johan Molenbroek, Associate Professor of Applied Ergonomics in the department. "Our graduates often can be found holding

executive positions, including that of a chief designer with major car manufacturers."

Need for digital humans

Molenbroek's course aims to make students understand that, when designing a product, the future end-user must be taken into account. "And people can be very different," he explains. "As an introduction to the course, I invite over the tallest and the shortest inhabitant of the Netherlands to make my point clear. It is startling to see that there is a 113 centimeter difference in height between these two individuals."

This demonstration makes it immediately obvious to the students that if they want to take into account the physical features of their user, they can never do that with

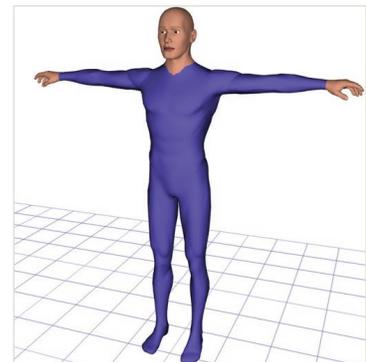
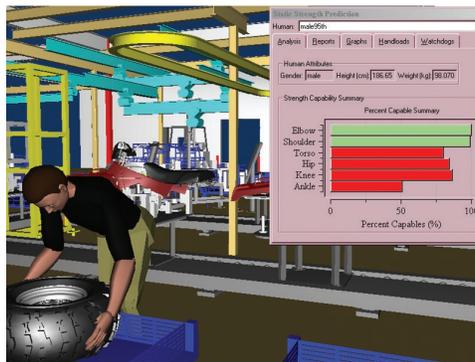
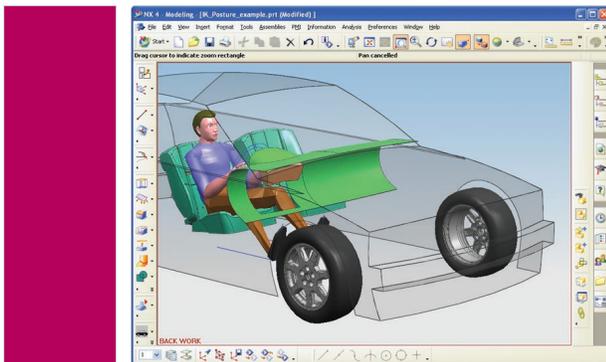


“Jack is very appropriate for most assignments. It can be easily learned and it permits a 3D design to be rapidly placed in the ergonomic context.”

Johan Molenbroek
Associate Professor of Applied Ergonomics
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physical prototypes if they hope to keep costs realistic. And Molenbroek resolutely discards the notion that it is possible to work with an “average” human. “The average man or woman does not exist,” he says. “At most, an average can be determined on the basis of one feature such as body height. The individual then almost never has an average weight or an average shank length. As a result, it does not make sense to design for an average human. The student industrial designer is trained to look at the distribution of relevant features. It is more important for designers to ascertain who is excluded from the product and which alternatives are offered to remedy that.”

All this makes the use of digital human models very important during the course. A design cannot be properly validated if it is not possible to change the main features of the digital human model rapidly. “This is why long ago we developed our own human modeling application,” says Molenbroek. “Called the Anthropometric Design Assessment Program System (ADAPS), it was developed by a staff member and is based on wireframe models. It is easy to use, but the functionality and the design no longer meet the requirements that we have set for students’ work. Because the capacity to further develop the application was insufficient, we decided to look for a successor.”

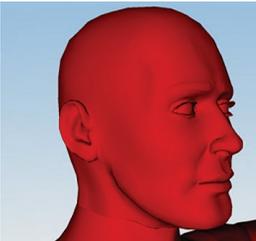


Short learning curve

According to Molenbroek, it was during a conference on digital human modeling that an inventory was made of applications that could replace ADAPS. Based on his experience, Molenbroek established a number of criteria for the new software. First, because the software was to be used in education, the learning time needed to be short since there is little time for learning applications during a course. Second, it needed to be compatible with the design software used in the department.

Third, students' and researchers' projects involve products used around the world and there is a large variation in the anthropometric properties of different ethnic groups. An "average" Chinese head is not the same as an "average" Dutch head. The department wanted software that would make it possible to easily add measurements, including those from individual projects. The final major requirement was that it should be possible to manipulate

this data easily to reflect the various stages in a person's life. "Our market study showed that the Tecnomatix® Jack human



modeling and simulation software from Siemens PLM Software was the only one to meet our requirements unreservedly," says Molenbroek. "Requirements that, in my opinion, should apply to almost every user."

A good choice

Jack human modeling and simulation makes it possible to create digital human models that have features corresponding to that of the target group. Various public databases containing the most up-to-date anthropometric data are used for that purpose. "An example of such a database with 1D and 2D measurement results can be found at www.dined.nl, which gives colleagues access to data from individual projects," says Molenbroek.

Not only do the digital human models have the correct physical measurements,

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Solutions/Services

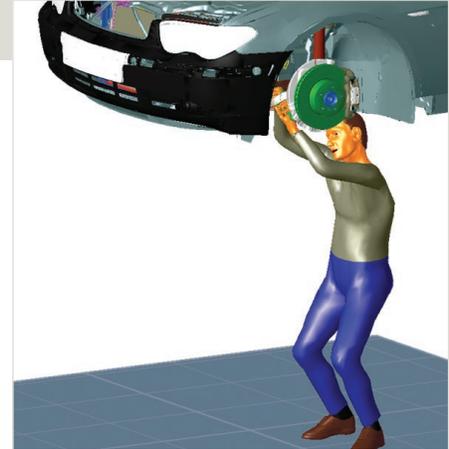
Tecnomatix Jack
www.siemens.com/tecnomatix

Customer's primary business

The Industrial Design Engineering Department at Delft University of Technology trains students to become industrial designers.
www.io.tudelft.nl

Customer location

Delft
The Netherlands



they can also perform tasks while the student assesses the performance. "In addition to whether someone really fits in the user environment, it is also possible to assess if the use is associated with too big a load and if the user sees everything that he should see," Molenbroek adds. "Furthermore, movements can be simulated with digital models."

Jack is accessible on all 200 computers provided for design assignments within the department of Industrial Design Engineering. "At the beginning we allowed a number of student assistants to work with the software to get them acquainted with it," Molenbroek notes. "At that stage, a short instruction manual was written to help read in the design geometry. Jack offers excellent opportunities to read in the CAD file models from the 3D design system used in the department."

Students can choose which of the department's two human modeling programs they wish to use for their assignments.

Jack has not been heavily advertised and it is being offered along with the department's own application. "The projects we're now receiving from the second-year students prove that we made the right choice in selecting Jack," says Molenbroek. "Jack is very appropriate for most assignments. It can be easily learned and it permits a 3D design to be rapidly placed in the ergonomic context."

The department plans to extend the use of Jack for graduation projects and teaching. Graduation projects are supervised intensively and in this respect Molenbroek wants to take digital ergonomic analysis to a higher level. "The issue of ergonomics receives a lot of attention because it has the possibility of speeding design, even for us at an internal level," he says. "It can also reduce the number of physical prototypes, with cost reduction as a result. The future engineer can thus dedicate more time to the quality of the design."

Siemens PLM Software

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