MACHINE DESIGN

Testing the ergonomics

A product with the best technology might still fail if the user interface isn't easy to use and intuitive. There are ways to make sure it is.

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The leading-edge technology and software might have been tested individually and together, and found to be robust, reliable, and bug-free. The final product could meet all customer needs uncovered in up-front market research. The budget and schedule might even have been met. So why is the product on the fast track to failure?

A LACK OF SYSTEM THINKING
You may have noticed the failure to consider one of the most important system components needed for the product to perform in the above scenario, the person using it. The product with the slickest technology, the most reliable hardware, and ultrasophisticated software still involves a human. Users must interact with a device to make it perform and interactions must be smooth for it to perform well. User interfaces that are outright hostile, or just seem hostile, frustrate people, make them feel inadequate, and lead them to bad-mouth the product to friends, driving them to a competitor's product.

To keep products from failing in the marketplace, companies and designers need to go beyond just testing the software and hardware. They must also check user interactions with the product. The mistake of not testing the interface probably stems from initial specifications-that detailed hardware and software-requirements, but simply said the finished product should be "user friendly". There are several well-defined methods that can be used during development to inject usability into products and test for it. One of the most widely used methods is usability testing. It helps resolve those endless arguments about using text or graphical legends, how to arrange buttons on the control panel, and the different ways to adjust settings, arrange information on the screen, word messages, and navigate from screen to screen.

Interface testing in a usability lab usually involves a person operating a new device while designers watch from behind a two-way mirror.

Usability testing is a hands-on approach to discovering specific difficulties people have when using a product. Improvements, based on results, remove those difficulties. Usability testing should ideally be done repeatedly early in development. Early testing identifies problems before they become so ingrained they are difficult and costly to remove. If necessary, early testing can be done on representations of the user interface. For instance, a "paper and pencil" usability test of an interface requires only sketches or printouts of proposed screens. Another method is the so-called "Wizard of Oz" method which substitutes a person "behind the screen" for software that isn't yet written. Later in development, testing can be done on prototypes or engineering models.

It is not wise to wait until a product is finished to test it. By then it is too late to modify usability. An interface expert or consultant can advise you on strategies for testing specifics such as timing.

Usability testing evaluates interfaces by focusing on interactions and perceptions. Procedures are basically the same regardless of where testing is done or the tools used.

1. Assemble a team of in-house staff and outside experts.
2. Recruit participants who are similar to people who will use the product. 3. Identify real tasks that exercise the interface being tested.
3. Administer the tasks in a suitable environment and closely observe participants' performance.
4. Encourage participants to "think aloud" while performing some tasks. Solicit feedback after each task.
5. Analyze data to find interactions that caused difficulties for most participants and identify causes of the difficulties.
6. Modify the interface to remove causes of the difficulties.

In some companies, testing is done in a usability lab where cameras capture each session. Such labs often have an observation room with one-way glass that lets engineers and others see how well their designs are mastered by users. However, such a lab is not necessary. A small camcorder mounted on a tripod in a conference room with a live feed to a remote observation room will do.

Exactly what data is collected during testing depends on the purpose of the test and such issues as the prototype's robustness. Time-on-task and number of errors can be compared with results from usability tests of previous products to evaluate improvement. Testers' observations and user comments reveal difficulties in operating the product. Preference data is obtained with subjective scales. For example, participants can be asked to rate the ease or difficulty of performing specific tasks on a scale of 1 to 10, corresponding to "easy" to "difficult."

Additional data can be collected from tests on products similar to the one being developed. For instance, a great way to know how a product might be perceived in the marketplace is to do a comparative usability test on your device and the equivalent model from a leading competitor. And usability testing applies to products for the marketplace as well as those for internal use.

With proper testing, your product can have a "swearless" user interface that prevents user frustration.

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