

# ergonomie & technologie (e&t) GmbH

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## Ease of Use as an Important Factor for Safe, Reliable, and Efficient Processes

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**Abstract:** ergonomie & technologie (e&t) GmbH is a spinoff company of the Swiss Federal Institute of Technology (ETH) Zürich. Since 1993 ergonomie & technologie has supported numerous research and industrial development projects. Established shortly after the opening of Technopark Zürich, ergonomie & technologie's usability-lab is the first and the most experienced in Switzerland. User-centered design, quality of use and user satisfaction take center stage in daily business. The main asset of ergonomie & technologie is its team of six usability-engineers, behavioral scientists, psychologists, linguists and communication scientists. The team's know-how is based not only on the science and research background but also on the experience gained in many projects over the years.

**Keywords:** Ergonomics · ergonomie & technologie (e&t) GmbH · ETH Zürich · Laboratory equipment · Usability · User-centered design

### Competence and Experience in User-centered Design

For many years and in numerous projects, ergonomie & technologie has been supporting research and industrial projects in user-centered design and usability. Established in 1993 in the Technopark Zurich as a research group of the Institute for Hygiene and Applied Physiology of the Swiss Federal Institute of Technology ETH Zürich, ergonomie & technologie (e&t) GmbH is now a spinoff of the ETH Zürich. e&t looks back on more than 15 years of professional experience. Its usability lab has been modernized constantly over the years. The main asset of ergonomie & technologie is the broad expertise of its team which guarantees high-quality input for all kinds

of user-centered development projects. Day-to-day work requires sound theoretical and even more practical knowledge of ergonomics, behavioral science, psychology, linguistics and localization.

### Many Ways to Optimize the Quality of Use

ergonomie & technologie offers competent and efficient usability-engineering support for soft- and hardware development projects to lower development costs and ensure high user satisfaction: Product- and system analyses provide the basis for the user-centered development of interactive products. ergonomie & technologie identifies development needs for usable and ergonomic man-machine-interfaces. User- and task analyses help to discern the users' needs and give explicit insight in how users are handling your product in contrast to how you expect them to do so. Different ways to look at concepts and prototypes allow for efficient exploration of the quality of use and hence lead to the effective optimization of the development process. In this respect, usability-review, inspection

and walkthrough are very specialized and effective methods.

In the usability-lab real users are observed while performing preset tasks on devices, on software or with Internet applications. Usability-testing discloses weaknesses of a product from the users' point of view. This method also allows the comparison of development stages (status and progress) and user acceptance of the new or improved products.

Furthermore, ergonomie & technologie offers coaching throughout the whole development process and performs workshops for designers, project managers and developers to boost user-centered design culture and know-how within the clients' teams.

### Easy To Use: Inspired by the Users

Whenever interactive products are developed, the users have to be taken into account. The International Organization for Standardization ISO issued guidelines No. 13 407 which supports development and project teams in efficiently and effectively introducing the users' perspective into the

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development process. The user-centered design process is an iterative process and includes three stages: Requirements analysis, prototyping, and evaluation. These elements, embedded in the process, help to gradually optimize the quality of use of the product. Proceeding in accordance with the user-centered design (UCD) process depicted in Fig. 1 can save a significant amount of time during the development stage. In larger projects, UCD can render one or even more iteration loops redundant, cutting costs significantly.

ergonomie & technologie's neutral perspective and the many years of experience with soft- and hardware projects provides it with an optimal basis for bridging the gap between the developers' view and users' requirements and expectations.

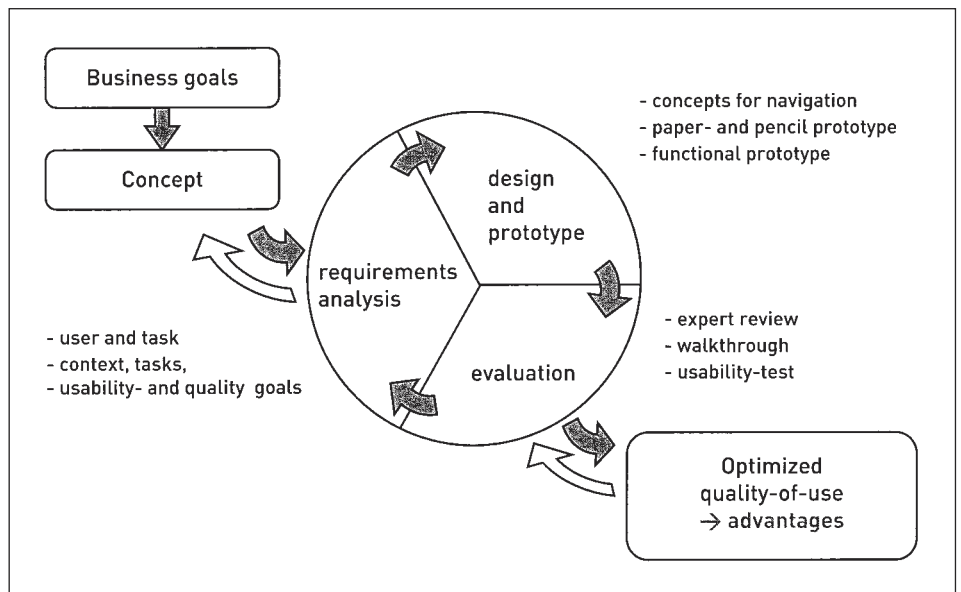


Fig. 1. User-Centered Design process (adapted from ISO 13 407): Requirements analysis includes user and task analyses. The three stages, requirements analysis, prototyping, and evaluation are elements of an iterative process in order to gradually optimize the quality of use of the product.

### Testing in the Usability Lab

Usability testing is a highly efficient method for measuring the level of user friendliness and acceptance of a new product. Observing typical present or future users working through a set of tasks identifies weaknesses as well as positive aspects of any device or software application. As a consequence valuable insights are collected for a focused and cost-effective optimization of the product under scrutiny.

In the usability-lab, subjects are observed while performing predetermined tasks on the interactive system to be tested. The test session is recorded on videotape in order to facilitate detailed step-by-step analysis. The important components of the usability-lab are the test room which is soundproof and equipped with video cameras and a microphone and the observers' room from where the performance and reactions of the subject can be followed. Fig. 2 shows the set-up of a typical high-end usability-lab such as the one from ergonomie & technologie in Technopark Zurich.

The usability test requires real or future users taking part as the measure for the product's quality of use. Recruiting suitable subjects is an arduous task but is essential for the quality of the test. Although the subjects must fit the typical user profile, elaborate screeners are sometimes less efficient than subjective criteria fixed by the client's team in cooperation with the usability engineer. Usability testing does not – unlike marketing research – rely solely on quantities and statistics. It is the qualitative aspects which usability engineers focus on.

The subjective rating is measured using questionnaires and interviews. The subjective aspects of a product are one important

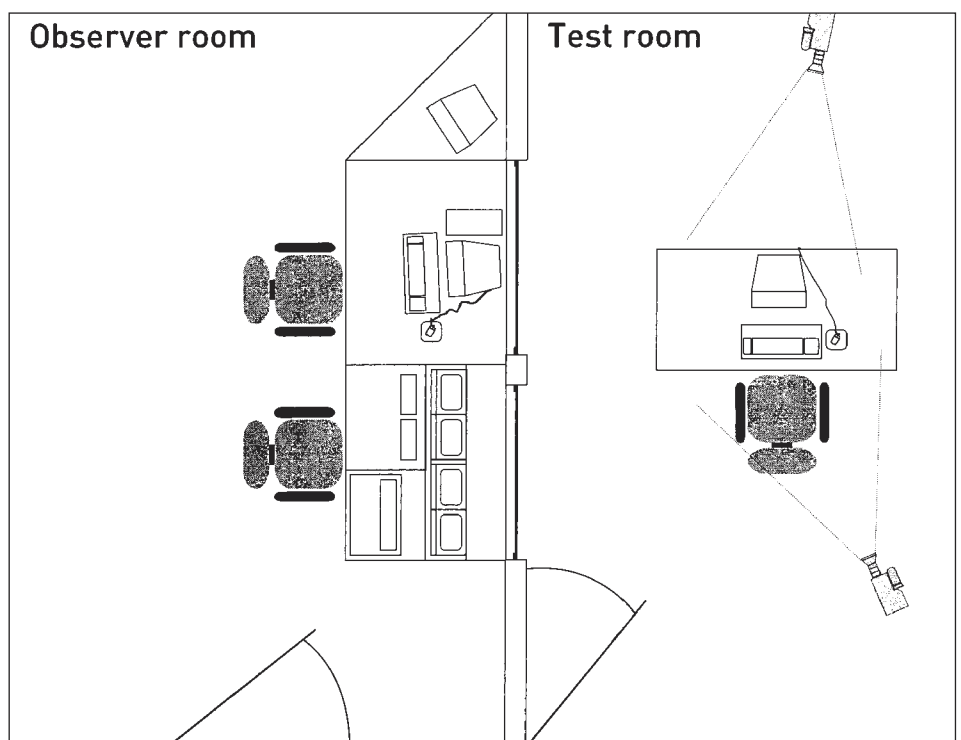


Fig. 2. Set-up of the usability-lab (ergonomie & technologie, e&t GmbH, Zürich): The test chamber is equipped with two video cameras. A one-way mirror window separates the control room from the test chamber. Thus the subjects can be observed without being distracted by the observers.

source for gathering information on how and where to optimize the quality of use of the system tested. The other source for such information is the somewhat more objective rating of the actions by the usability engineers observing the subjects. The synopsis of both the subjective and the objective ratings and the answers from the post-test questionnaires help to identify concrete, practicable and efficient means on how to improve or optimize the quality of use of the initial designs, prototypes or Beta-releases.

The results of the usability analyses are discussed with the development team. In this so-called realization workshop, the project members elaborate the conclusions and prioritize the next steps in the process to ensure the effective optimization of the interactive product. In addition, a written protocol of the workshop summarizes the results and the measures planned.

### Success Stories: Easy To Use Laboratory Equipment

Technical equipment in the laboratory is subjected to special requirements. It is used in critical environments (around fluids, whilst wearing protective garments *etc.*) and the degree of training can be variable. For this reason special attention has to be given to the quality of use for these products.

In the development process of a titrator it could be demonstrated that application of the UCD process has a positive influence on the quality of use. An in-depth user analysis and their specific needs was conducted. It was found that the actual users were more interested in an easy to use system than in impressive technical sophistication. Subsequently a user interface was developed together with the client that was optimized for everyday and routine operation. Programming and configuration options, which are not often needed, were placed less prominently, whereas frequently used functions were designed as easy to access and intuitive to apply. This product was a big success for the client, last but not least because of its ease of use and its optimal fit to the task.

In the area of medical technology quality of use is of similar if not even higher importance. The touch-screen interface of an experimental automated anesthesia system was optimized in several development cycles. Users of the current interface were interviewed and their comments taken as a basis for further development. In several iterative cycles the interface was optimized to fit the users' expectations and require-

ments. In a first static prototype the functions were cleaned up and the screen organized using an invisible grid for the elements. The subsequent feedback by the users was positive and in the next step the color scheme was developed. Additionally relocating information only needed for set-up and configuration to a dedicated menu reduced the screen complexity. Again user feedback was gathered and used for the last step in the development. Interactivity was added and the color scheme refined. Also a set-up wizard was developed to support initializing activities needed for every operation, and features for individualization added (*e.g.* selection for a right-handed or left-handed user, a selectable actions palette for specific operations). The final version is at present being prepared for testing in a simulation system, and will be used in real operations in the near future. The project has benefited greatly from the UCD approach and users are very satisfied with the new interface.

Consistent consideration of user needs and expectations were the key to success and paid off in these two examples.

### Usability – Motor of the Next Kondratieff-Cycle [1]?

Ever faster and ever smaller, the secret of success for so many products launched during the last decade is losing momentum. The quality of use will be the deciding factor for the future. And since the users – the future customers – decide the success of the product, the importance of quality of use will grow. Design and usability are not mutually exclusive. Good design is an important aspect of the quality of use and usable products can be aesthetically pleasing as well. 'Having fun' looking at, handling and using a product is equally important as the ease of use. Tools, software, websites and consumer electronics which take into consideration the customers' culture and even mentality raises the acceptance level and user satisfaction and thus promotes sales. Technology enables many people to do things and reach goals which were once accessible only to a few. But still, accessibility and usability are an intractable barrier for many. With regard to the digital divide, this gap must be bridged and this can be achieved by introducing user-centered design to all development projects where man-machine interfaces are designed to fit technology to the users' needs and not the other way round. And what would the world be like if technology in every respect supported the users, if it would not be necessary to learn how to use technology but that

technology would be a working medium to attain one's goals? If we get to that point or even if we are halfway there, quality of use will be an important motor for the next Kondratieff-cycle.

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- [1] Kondratieff was a Soviet economist who was asked by Stalin to determine how long it would take for capitalism to fail. Unfortunately, after he studied historical commodity prices, trade and industrial production in the capitalist countries, he discovered a long business cycle that would ebb and flow, but couldn't break. Since this was not what Stalin wanted to hear, Kondratieff was thrown into a gulag where he perished.