

# Handout 4: Usability Testing for User-Centered Systems

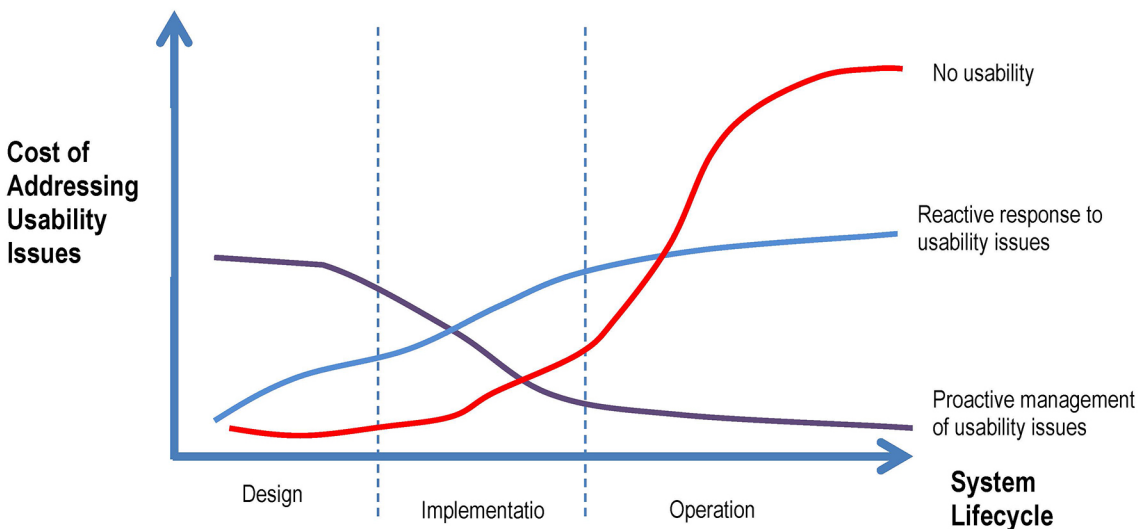
Usability tests are used to find out how easily *users* can perform tasks successfully, efficiently, and without errors. During these tests, data are collected to document where users face challenges in using the system and where the system works well. The results inform the next iteration of a system design so that usability issues may be designed during the system development process—not afterward. Any problems in the workflow and design of the user interface can then be addressed so that users are more likely to accept and be satisfied with the new system. Creating a usable system does not come about by accident—the design process needs to apply a user-centered approach right from the start.

## What Are the Benefits of Conducting Usability Testing?

Implementing usability testing and designing a user-centered system benefits the organization, the system developers, and the end users (including employees and customers). When systems are designed around the users, organizations can spend less money and resources in training staff, employing costly software fixes, or implementing workarounds because the system was designed around how people work (and not the other way around).

Usability studies should be conducted iteratively, throughout the design process. Systems designed with usability considerations from the start can be *100 times* less costly than those that require expensive software fixes after implementation or late in the implementation process<sup>1</sup> (Exhibit 1).

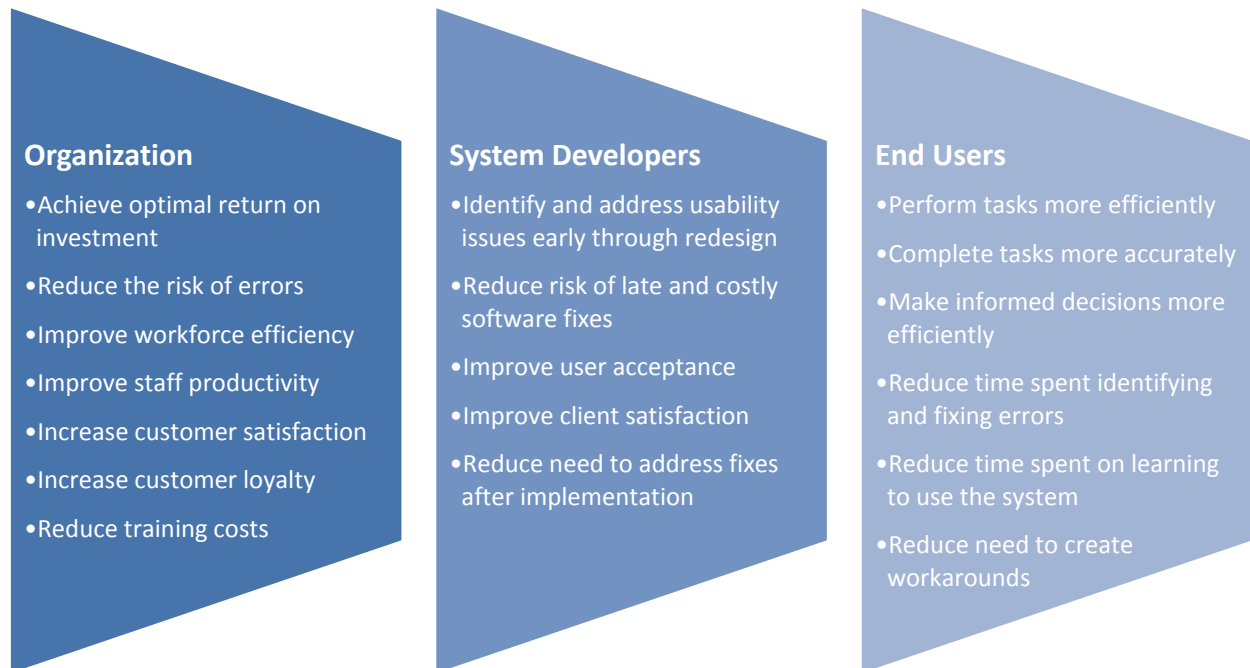
**Exhibit 1. Cost of Addressing Usability Issues Increases as the Design Process Progresses**



<sup>1</sup> EUROCONTROL. (1999). *Human factors module. A business case for human factors investment* (HUM.ET1.ST13.4000-REP-02). Brussels, Belgium: Author.

Usability testing benefits the organization as well as the system developers and end users. Exhibit 2 describes the benefits of usability testing from the perspective of each type of stakeholder.

### Exhibit 2. Benefits of Usability Testing to Each Stakeholder



### When Should Usability Testing Be Performed?

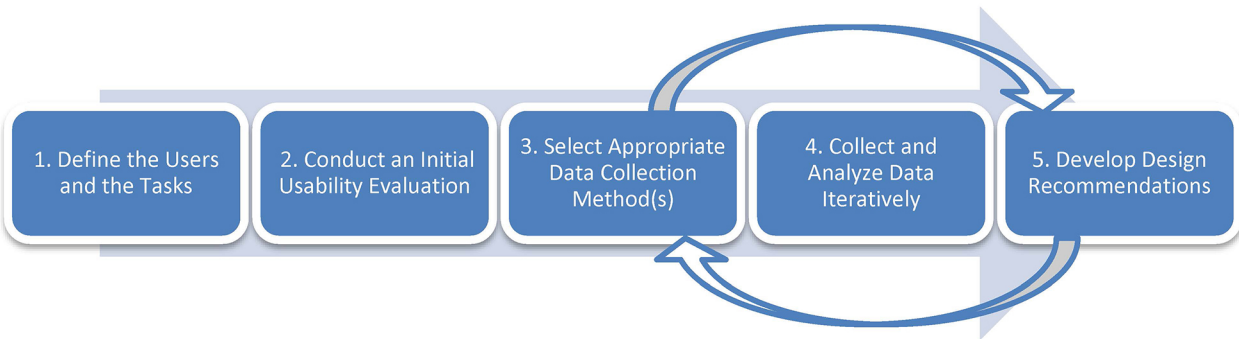
Usability testing should be done several times through the design process. The system does not have to be mature before testing starts; in fact, it should not be. A system can be tested in an early design phase just by using paper prototypes and when the system matures, usability testing can be conducted on a more realistic design. The advantage of testing early in the design process is that potential problems can be found, addressed, and tested before the system is deployed into the real world. Early testing reduces the risk that significant challenges need to be fixed at a later point when redesign is time consuming and expensive.

As the system design matures, perform iterative rounds of usability testing. Iterative tests can confirm whether problems found earlier have been resolved and whether any new issues exist. With each round of testing, there should be fewer and less serious usability issues. Therefore, when it comes time to deploy the system, serious challenges should be resolved and the likelihood of user acceptance should be high.

### How Do I Conduct a Usability Test?

Usability testing can take many forms depending on the maturity of the system and the resources available. This section provides a brief overview of the process. Exhibit 3 describes the steps for conducting usability testing. Note that steps 3–5 occur iteratively so that repeated testing and design improvements will help to gradually refine and improve the usability of the overall system. This iterative process enables major usability issues to be addressed early, when it is less costly and complex to address.

### Exhibit 3. Steps for Conducting Usability Testing



#### 1. Define the Users and the Tasks

In the Discovery phase, you should have defined the sets of people who will be using the system (i.e., the users). These may include customers, data entry staff, and analysts. The usability test should include several (three to five) users from each group. These users should vary because after deployment, real users will too.

Each of these groups will use the system to perform different tasks and have a different goal. Select a few typical tasks that each type of user would be expected to complete. Define these tasks in concrete and measurable terms so that the goal of the task is clear. For example, a task may be to “create and print a monthly report that includes two types of graphs.”

Users may vary by

- Age
- Cognitive abilities
- Physical abilities
- Expertise with the task
- Experience in using similar systems

#### 2. Conduct an Initial Usability Evaluation

During a usability evaluation, a set of general design principles are used to examine the system design; an evaluation is not the same as a usability test. These principles are rules of thumb for creating good, usable systems and are sometimes called [human factors design principles](#). Before spending the time and money conducting a usability test with users, conduct an evaluation to see how well the system reflects good usability design principles. The results will highlight potential usability issues more quickly and more cheaply than conducting a full round of usability testing.

#### 3. Select Appropriate Data Collection Method(s)

The method for conducting a usability study can vary depending on how mature the system design is and what resources are available. Early usability testing can use a paper prototype of the system design to observe how users would expect to use a system. Later, as the system design matures, prototypes that are more realistic may be used for testing.

#### 4. Collect and Analyze Data Iteratively

When conducting the usability test, collect data about where in the tasks users encounter challenges and explain why. For example, users might not be able to figure out how to start a task. This may be because they have assumptions based on their experiences in using other systems that are very different. Support the findings by documenting what users say during the task as well as what they do.

You may want to collect quantitative data as well. For example, aspects of usability can also be measured by duration to finish a task, the number of clicks required, or the number of errors made.

The data analysis activities should identify the themes from the testing. Different types of users may experience different types of usability issues but there may also be commonalities. Document the types of issues found, where in the system design the usability problem occurred, and where serious usability issues exist.

## 5. Develop Design Recommendations

Use the data to explain why the challenges occurred and how improvements to the system design may address the issues. The results from the tests drive the design recommendations. Develop actionable design recommendations for the system developers so that they may improve the usability of the system. It is often useful to prioritize the design recommendations so that developers know which ones are “must do” and which ones are “nice to do.” Once the recommendations have been addressed, conduct usability testing again until the organization is satisfied that the system can support the end users in performing their tasks satisfactorily.

## Resources

The following resources are available for learning more about usability testing and human factors design requirements:

- [www.usability.gov](http://www.usability.gov)
- <http://hf.tc.faa.gov/hfds/>
- [http://hf.tc.faa.gov/hfds/download-hfds/hfds\\_pdfs/Ch2\\_General\\_design\\_requirements.pdf](http://hf.tc.faa.gov/hfds/download-hfds/hfds_pdfs/Ch2_General_design_requirements.pdf)
- <https://www.nngroup.com/articles/usability-101-introduction-to-usability/>
- <http://www.nngroup.com/articles/>
- [http://everyspec.com/MIL-STD/MIL-STD-1400-1499/MIL-STD-1472G\\_39997/](http://everyspec.com/MIL-STD/MIL-STD-1400-1499/MIL-STD-1472G_39997/)