

Certification/Adoption Workgroup

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Renaissance Washington Dupont Circle Hotel
1143 New Hampshire Avenue, NW, Washington, DC

Testimony by

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Panel 4: Measuring & Improving Usability

- ***What is the state of art of measuring usability? What can and cannot be measured?***

The following is the definition of usability in the TURF framework developed by the SHARP-C project funded by ONC: *Usability refers to how useful, usable, and satisfying a system is for the users to accomplish goals in the work domain by performing certain sequences of tasks.* There are three major dimensions of usability under TURF. All three dimensions of usability can be measured. The first two dimensions (usefulness and usable-ness) can be measured systematically and objectively and they are based on solid scientific methodology and empirical evidence. The third dimension (satisfaction) can also be measured systematically, though it is less objective than the first two dimensions.

1. Usefulness – whether the system supports the work domain. A system is useful if it includes the domain and only the domain functions that are essential for the work, independent of implementations. 100% usefulness is the ideal goal and it is rarely

- achieved in real systems. Usefulness also changes with the change of the work domain. Usefulness can be measured by
- the percentage of domain functions that are in the system over all domain functions (those in the system and those not in the system)
 - the ratio of domain functions vs. overhead functions.
 - structural complexity of the work domain
2. Usable-ness – A system is usable if it is easy to learn, easy to use, and error-resistant. Usable-ness can be measured by the following metrics.
- Learnability – ease of learning and re-learning. Learnability usually correlates positively with efficiency but it could be independent of efficiency and sometimes correlates negatively with efficiency (e.g., an easy to learn interface may not be optimized for efficiency).
 - Efficiency – the effort required to accomplish a task. This is usually measured in terms of task times, task steps, mental effort, etc.
 - Task time: the time it takes to complete a task
 - Task steps: the number of steps (mental and physical) needed to complete a task
 - Mental effort: the percentage of mental steps over all steps (physical and mental)
 - Error – the ability of the system to help users prevent and recover from error. Error can be measured by
 - Frequency of errors
 - Recovery rate of errors
3. Satisfaction – user’s subjective impression of how useful, usable, and likable the system is. This is typically collected through questionnaires with Likert scale, percentage, and other measures. Unfortunately, this aspect of usability is often the only understanding of usability among many people, who are not aware that there are objective measures of usability like those in (1) and (2) about usefulness and usable-ness.

- ***What are the areas of usability measurement which we know enough to be helpful to industry?***

The measures of efficiency in terms of times and steps are well established, highly reliable, and operationally realistic. At the National Center for Cognitive Informatics and Decision Making in Healthcare, we have been conducting systematic evaluation of EHR usability along the efficiency dimension for commercial systems. The results are comprehensive, reliable, and comparable.

The measures of effectiveness are operationalized under the TURF framework, and they are being validated for a few EHR systems. At this time the measures of effectiveness can be performed, but the resources needed to do it are still overwhelming.

The measures of satisfaction are well established. However, one caution should be noted: these satisfaction measures are rather subjective, they do not provide details that can be used to address usability problems, and they do not often correlate with the objective measures of effectiveness and efficiencies.

- *What areas of usability measurement are still theoretical and not ready to be applied in a commercial setting?*

For all three major dimensions of usability (effectiveness, efficiency, and satisfaction), there are measures that are ready for commercial use. The most mature one is the set of measures for efficiency. The measures for satisfaction are also well established and widely used. The measures of effectiveness are less developed, but some of the measures are ready for commercial use.

- *Can usability be measured in a way that does not stifle innovation?*

This is a wrong question to be asked. Usability never stifles innovation. In fact, usability accelerates innovation. Specifically, the measures of effectiveness under the TURF framework give designers and developers access to a bigger design space that may stimulate more innovations.