

Analytical Evaluation

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WHAT IS IT?

An analytical evaluation is performed by experts using models and formulae to make predictions on performance time – unlike most other evaluation methods; this one does not rely on expert judgement. The most common analytical evaluation is based on the Keystroke Level Model (Card *et al*, 1983) – a model of GOMS:

- **Goals** – what the user is trying to accomplish.
- **Operators** – the elementary perceptual, motor or cognitive actions that are used to accomplish the goals, e.g. double-click mouse.
- **Methods** – the procedures that describe how to accomplish goals, e.g. there is more than one way to delete a word in a document.
- **Selection** – specifies which method should be used to satisfy a given goal, based on the context. The selection rule depends on the situation, e.g. if the word to be deleted is less than 3 lines away from the current cursor location, then use the use-arrows-delete-word-method, else use the use-mouse-delete-word method.

It works on the principle that if we have a task description it is possible to predict the overall performance time.

WHY DO YOU NEED IT?

Although quite academic and rarely used outside of educational establishments, there are some key benefits:

- Predicts the time taken to perform a task.
- Good for comparing alternative sequences/modes/designs.
- More costly than a heuristic evaluation but cheaper than conducting usability testing.

WHEN DO YOU NEED IT?

This method would be performed early on, ahead of design implementation and any user testing.

HOW DO YOU DO IT?

Assumptions

- You are evaluating routine rather than complex cognition-intensive tasks.
- The user would demonstrate expert behaviour in an error-free performance.
- The method is selected using the KLM operators (each has a fixed time associated with its use based on empirical evidence):
 - K-Keystroke, B-Button mouse press, P-Point: move mouse target, H-Homing mouse/keyboard, D-Drawing, M-Mentally prepare and R-Response from system.

The Process

1. Prepare a design specification or interactive prototype.
2. Prepare a task to be performed.
3. The evaluator writes out the action sequence for the task in natural language.
4. They select the operators needed to complete the sequence.
5. Finally the operator times are added together to calculate the predicted total task performance time, e.g.

$$T_{\text{execute}} = T_K + T_B + T_P + T_H + T_D + T_M + T_R$$

By looking at different designs to complete the same task, you can predict which will be most efficient.

WANT TO KNOW MORE?

The KLM was first presented in this 1980 paper before being published in 1983 in the book *The Psychology of Human-Computer Interaction*:

<http://iihm.imag.fr/blanch/ens/2010-2011/M1/EIHM/cours/1980-Card-KLM.pdf>