Hick's Law

The time it takes to make a decision increases as the number of alternatives increases.[1]

Hick's Law states that the time required to make a decision is a function of the number of available options. It is used to estimate how long it will take for people to make a decision when presented with multiple choices. For example, when a pilot has to press a particular button in response to some event, such as an alarm, Hick's Law predicts that the greater the number of alternative buttons, the longer it will take to make the decision and select the correct one. Hick's Law has implications for the design of any system or process that requires simple decisions to be made based on multiple options.[2]

All tasks consist of four basic steps: (1) identify a problem or goal, (2) assess the available options to solve the problem or achieve the goal, (3) decide on an option, and (4) implement the option. Hick's Law applies to the third step: decide on an option. However, the law does not apply to decisions that involve significant levels of searching, reading, or complex problem solving. For example, a complex task requiring reading sentences and intense concentration with three options can easily take longer than a simple stimulus-response task with six options. Therefore, Hick's Law is most applicable for simple decision-making tasks in which there is a unique response to each stimulus. For example, if A happens, then push button 1, If B happens, then push button 2. The law is decreasingly applicable as the complexity of tasks increases.[3]

Designers can improve the efficiency of a design by understanding the implications of Hick's Law. For example, the law applies to the design of software menus, control displays, wayfinding layout and signage, and emergency response training—as long as the decisions involved are simple. As the complexity of the tasks increases, the applicability of Hick's Law decreases. For example, Hick's Law does not apply to complex menus or hierarchies of options. Menu selection of this type is not a simple decision-making task since it typically involves reading sentences, searching and scanning for options, and some level of problem solving.

Consider Hick's Law when designing systems that involve decisions based on a set of options. When designing for time-critical tasks, minimize the number of options involved in a decision to reduce response times and minimize errors. When designs require complex interactions, do not rely on Hick's Law to make design decisions; rather, test designs on the target population using realistic scenarios. In training people to perform time-critical procedures, train the fewest possible responses for a given scenario. This will minimize response times, error rates, and training costs.

See also Errors, Fitts' Law, Progressive Disclosure, and Wayfinding.

[1] Also known as *Hick-Hyman Law*.

[2] The seminal work on Hick's Law is "On the Rate of Gain of Information" by W. E. Hick, *Quarterly Journal of Experimental Psychology*, 1952, vol. 4, p. 11–26; and "Stimulus information as a determinant of reaction time" by Ray Hyman, *Journal of Experimental Psychology*, 1953, vol. 45, p. 188–196.

[3] The Hick's Law equation is $RT = a + b \log^2(n)$, where RT = response time, a = the total time that is not involved with decision making, b = an empirically derived constant based on the cognitive processing time for each option (in this case ≈ 0.155 seconds for humans), n = number of equally probable alternatives. For example, assume it takes 2 seconds to detect an alarm and understand it's meaning. Further, assume that pressing one of five buttons will solve the problem caused by the alarm. The time to respond would be $RT = (2 \text{ sec}) + (0.155 \text{ sec})(\log^2(5)) = 2.36 \text{ sec}$.

File
New ...   ⌘ N
Open   ⌘ O
Open Recent Files   ▶
Revert
Close   ⌘ W
Save   ⌘ S
Save As ...   ⇧⌘ S
Save a Copy ...   ⌥⌘ S
Save for Web ...   ⌥⇧⌘ S

40 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
41 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
42 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
43 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
44 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
45 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
46 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
47 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
48 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
49 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
50 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
51 ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐

R   G   B

TO EAST   TO WEST
NORTH   TO   31   31
601   219   NORTH   →
TO   281   TO SOUTH
985   ↑   ↑   281
←   ←
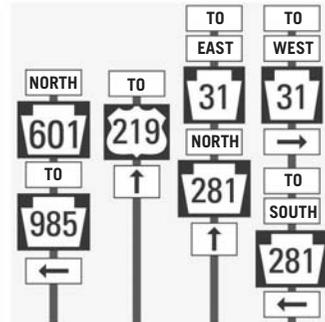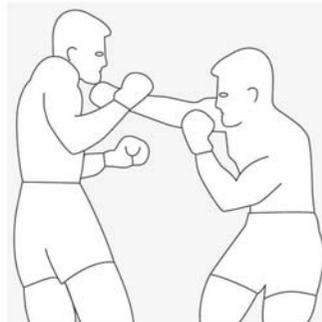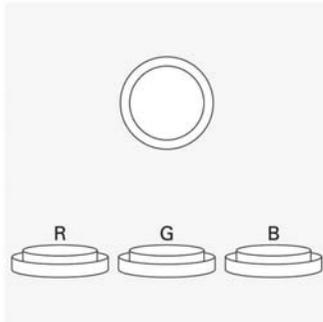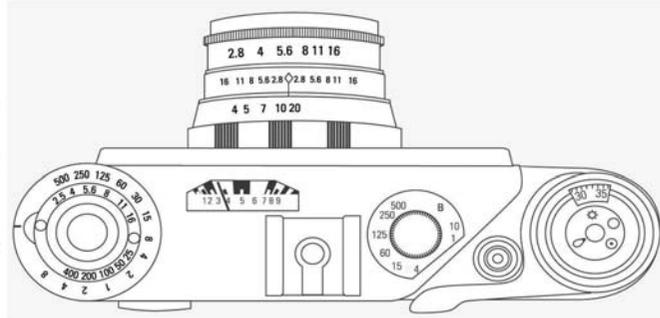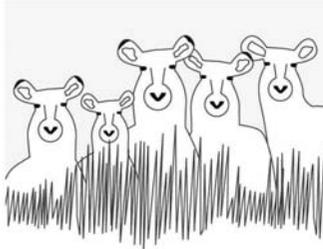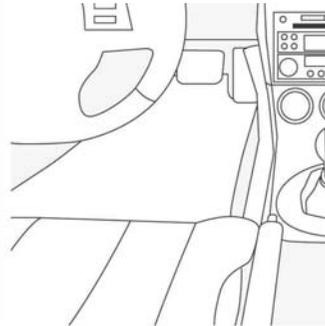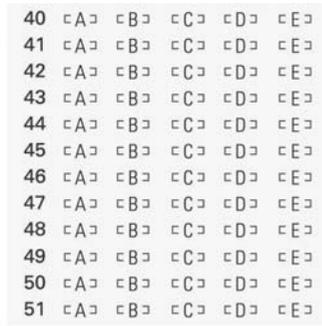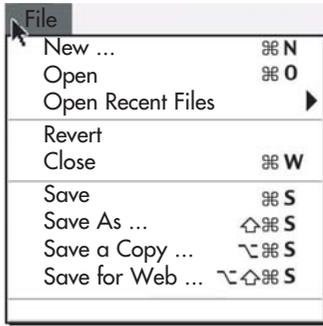
Menus
The time for a person to select an item from a simple software menu increases with the number of items. However, this may not be the case for more complex menus involving a lot of text or submenus.

Predatory Behavior
The time for a predator to target a prey increases with the number of potential prey.

Simple Tasks
The time for a person to press the correct button (R, G, or B) depending on the color of the light (red, green, or blue) increases with the number of possible colors.

Test Options
Hick's Law does not apply to tasks involving significant levels of reading and problem solving, as in taking an exam.

Device Settings
The time for a person to make simple decisions about adjustments on a device increases with the number of controls. This may not be the case for more complex decisions or combinations of settings.

Martial Arts
The time for a martial artist to block a punch increases with the number of known blocking techniques.

Braking
The time for a driver to press the brake to avoid hitting an unexpected obstacle increases if there is a clear opportunity to steer around the obstacle.

Road Signs
As long as road signs are not too dense or complex, the time for a driver to make a turn based on a particular road sign increases with the total number of road signs.