Performance Load

The greater the effort to accomplish a task, the less likely the task will be accomplished successfully.[1]

Performance load is the degree of mental and physical activity required to achieve a goal. If the performance load is high, performance time and errors increase, and the probability of successfully accomplishing the goal decreases. If the performance load is low, performance time and errors decrease, and the probability of successfully accomplishing the goal increases. Performance load consists of two types of loads: cognitive load and kinematic load.[2]

Cognitive load is the amount of mental activity—perception, memory, problem solving—required to accomplish a goal. For example, early computer systems required users to remember large sets of commands, and then type them into the computer in specific ways. The number of commands that had to be remembered to perform a task was the cognitive load for that task. The advent of the graphical user interface allowed users to browse sets of commands in menus, rather than recalling them from memory. This reduction in cognitive load dramatically reduced the mental effort required to use computers, and consequently enabled them to become mass-market devices. General strategies for reducing cognitive load include minimizing visual noise, chunking information that must be remembered, using memory aids to assist in recall and problem solving, and automating computation- and memory-intensive tasks.

Kinematic load is the degree of physical activity—number of steps or movements, or amount of force—required to accomplish a goal. For example, the telegraph required people to communicate letters one at a time through a series of taps on a mechanical armature. The number of taps to communicate a message was the kinematic load for that task. Samuel Morse designed Morse code to minimize kinematic load by assigning the simplest codes to the most frequently occurring letters; the letter E was expressed as *dot*, and the letter Q was expressed as the longer *dash dash dot dash*. This approach reduced the physical effort (kinematic load), dramatically reducing transmission times and error rates. General strategies for reducing kinematic load include reducing the number of steps required to complete tasks, minimizing range of motion and travel distances, and automating repetitive tasks.[3]

Design should minimize performance load to the greatest degree possible. Reduce cognitive load by eliminating unnecessary information from displays, chunking information that is to be remembered, providing memory aids to assist in complex tasks, and automating computation-intensive and memory-intensive tasks. Reduce kinematic load by reducing unnecessary steps in tasks, reducing overall motion and energy expended, and automating repetitive tasks.

See also 80/20 Rule, Chunking, Cost-Benefit, Hick's Law, Fitts' Law, Mnemonic Device, and Recognition Over Recall.
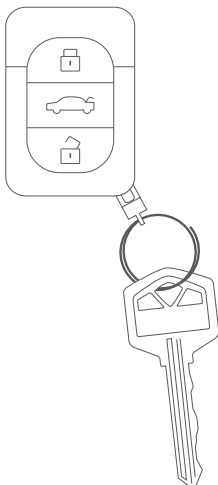
[1] Also known as the *path-of-least-resistance principle* and *principle of least effort*.

[2] The seminal works on performance load are *Cognitive Load During Problem Solving: Effects on Learning* by John Sweller, *Cognitive Science*, 1988, vol. 12, p. 257–285; "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information" by George Miller, *The Psychological Review*, 1956, vol. 63, p. 81–97; and *Human Behavior and The Principle of Least Effort* by George K. Zipf, Addison-Wesley, 1949.

[3] "Frustrations of a Pushbutton World" by Harold Thimbleby, *Encyclopedia Britannica Yearbook of Science and the Future*, 1992, p. 202–219.
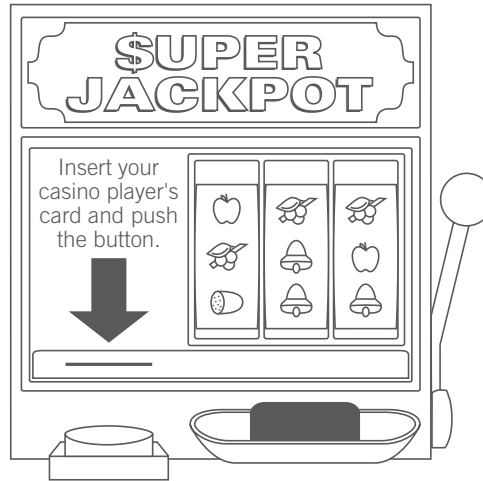
Modern slot machines no longer require the pulling of a lever or the insertion of coins to play. Inserting a charge card and pressing a button is all that is required, though the lever continues to be retained as a usable ornament. This reduction in kinematic load not only makes it easier to play the slots, it makes it easier for casinos to make money.

People can easily save their favorite Internet destinations in all modern browsers. This feature replaces the more load-intensive alternatives of remembering destinations, or writing them down.

Remote keyless entry enables people to lock and unlock all doors of a vehicle at the press of a button—a dramatic reduction in kinematic load.

The use of Universal Product Codes, also known as bar codes, dramatically reduces the performance load associated with consumer transactions: products no longer need price tags, cashiers no longer need to type in prices, and inventory is automatically updated.

9 788058 975266