DESIGN RULES related to HCI

- **Digit Span (7+/-2) Rule - Miller (1956)** -- famous article -- '**The Magical Number Seven, Plus or Minus Two**'
- Seven 'items' in short-term memory, plus or minus two.
- **Short-term memory stores 'chunks' of information** rather than individual numbers or letters.
- Recall items like mobile phone numbers, which contain more than 7 digits / remember as group / chunks
- **[countrycode ;areacode; serviceprovider;customerno]**
- 919445214567 – 94452 is bsnl service provider
- **CS perspective –** Linux commands (with options included) generally follow this 7+/-2 rule!
- Menu Lengths also generally follow this trend

DESIGN RULES related to HCI

- **PRIMACY & RECENCY**
- Recency effect is the tendency to remember the most recently presented information best.
- Serial position effect, a phenomenon in which the position of items on a list influences how well those items are recalled.
- Short term memory recall dominated by recency effect
- Human (memory – STM) remembers (recall point of view) items / things that come / appear in the beginning (PRIMAL!) and the ones that comes towards the end (RECENT!)

- Example – MS Word **we recall options such as File, Print, Save, Saveas (Primality) and End, Quit, etc. (Recency)**
- **Inbetween items we generally don't recall**
- **How does this help Design (say Menu..)** most important items / options keep either in the primal half or in the recent half…**definitely not in the middle of the list…**
- Also connects with Millers Law of Short Term Memory load described next slide
- Primal Info in LTM and Recent Info in STM….middle items ??
- First Time and Last Time learning needs to be done right!! Very difficult to unlearn from a human psychology point of view , more so first time learning!!!

- **Fitts' Law:** Paul Fitts described a way to mathematically predict how long it will take to "acquire" a target based on its distance and size.
- States that the amount of time required for a person to move a pointer (e.g., mouse cursor) to a target area is a **function of the distance to the target divided by the size of the target**.
- The longer the distance and the smaller the target's size, the longer it takes.
- **Applied in UI and UX Design**

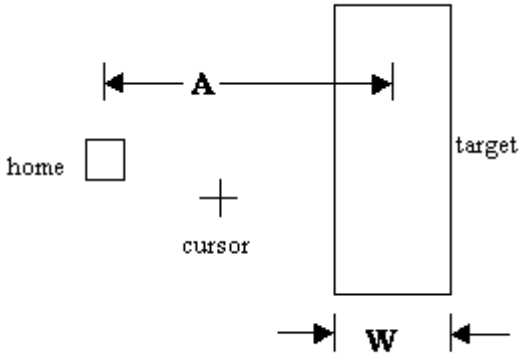
- In Interface design, this law means that it takes users longer to point to links and buttons on a screen if the objects are smaller in size or farther away from the home position.
- **Interactive buttons large** (especially on finger-operated mobile devices)
- **Smaller buttons are more difficult** (and time-consuming) to click
- Distance between a user's task/attention area and the task-related button **should be kept as short as possible**

$$MT = a + b \log_2 (2A/W)$$

- **Parameters of interest are:**
- a. The time to move to the target

  b. The movement distance from the starting position to the target center

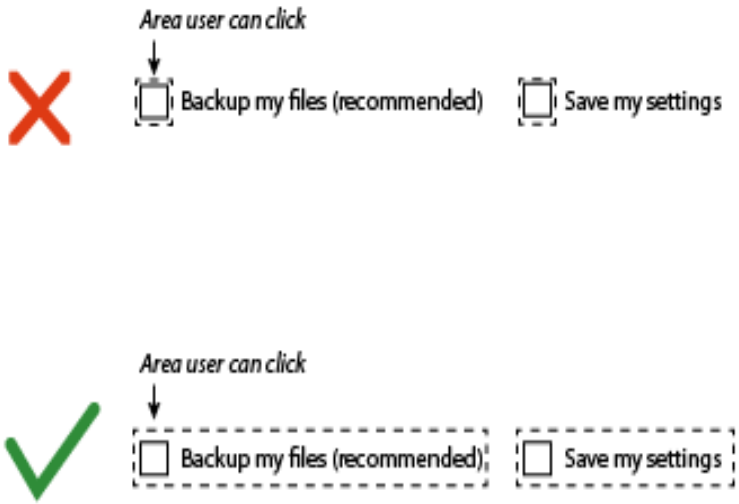
  c. Target width

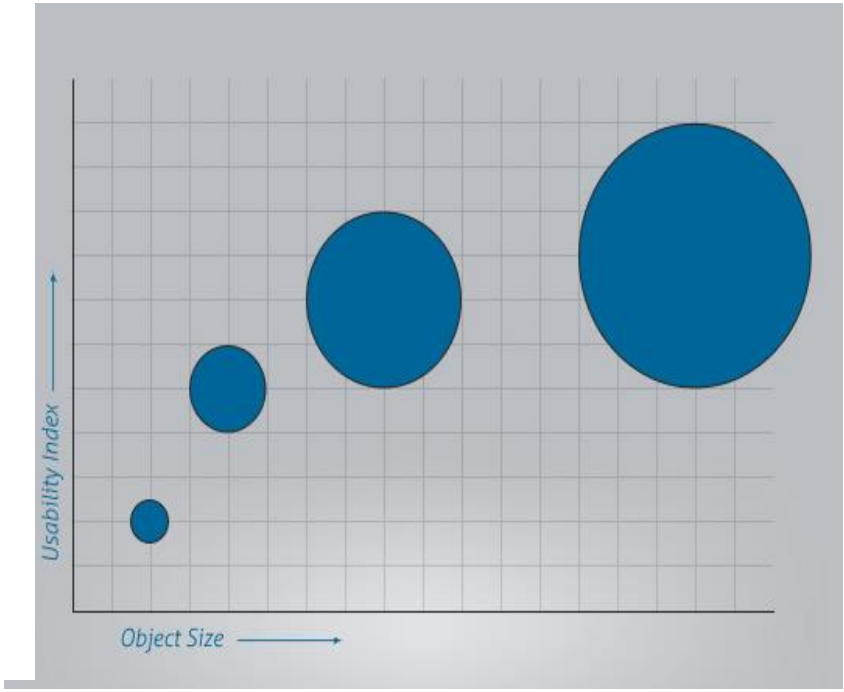


- MT --movement time to hit the target, **a** and **b** -- empirically determined constants.
- A represents the amplitude, which is the distance of the center of the target from the starting location and W is the target width which is shown in Figure.

•Increasing link size when hovering over items, as in Apple Macbook's menu bar, is useful for increasing usability index.

•law can also be used for undesired actions, such as delete buttons, decreasing their target size and placing it further away from mouse position reduces the likelihood of making mistakes



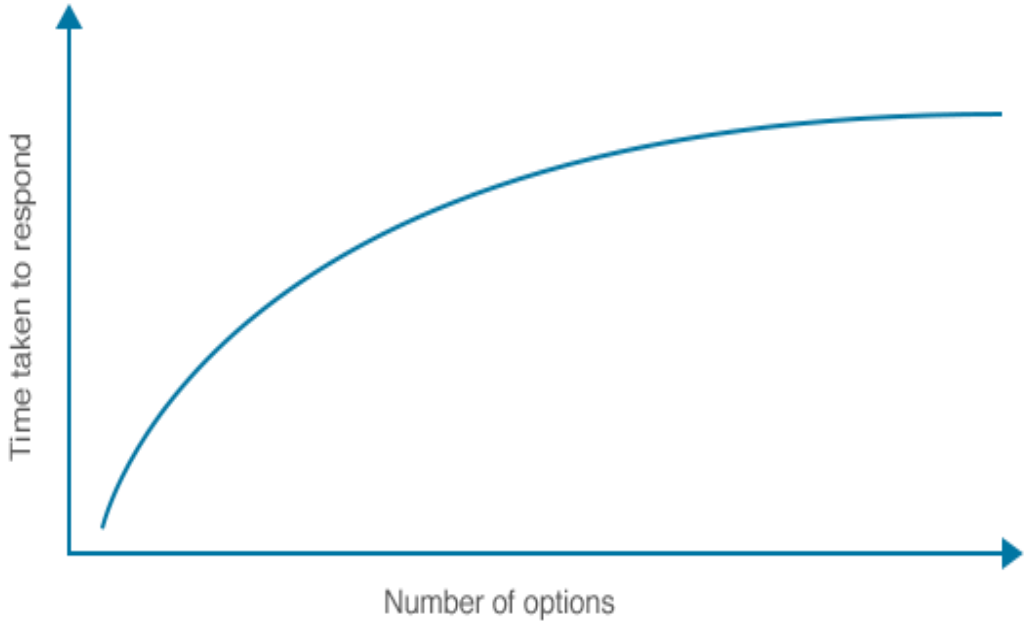


HICK AND HYMAN LAW

- time it takes for a person to make a decision based on the number of choices available.
- People subdivide the total collection of choices into categories, eliminating about half of the remaining choices at each step, rather than considering each and every choice one-by-one, which requires linear time.
- Hyman later found that a linear relationship exists between **reaction time and the information transmitted**.

$$T = b \cdot \log_2(n + 1)$$

- Hick's law states that the time it takes for users to make a decision increases as the number of choices offered increase.
- make the target action as simple as possible while ensuring maximum benefit out of it.
- Instead of providing all the navigation options immediately, give users broad categories to start off with, then break them down into further subcategories

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"JUST CLICK!"
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...IN THE WORLD!
You can't find a car?
Apply for a CAR QUOTE
AS SEEN ON TV
BBC TWO
DRAGONS DEN
Richard Farleigh - "I wanted to invest; I was amazed by Ling's complete lack of nerves, and also by her business acumen."
Duncan Bannatyne - "I wanted to invest... but ye turrn'ed me dooon!"
Deborah Meaden "Harrumph! I'm out!"
I AM ATTACKED BY MIKE BREWER FROM TV'S "WHEELER DEALERS"
"HAVE YOU READ THE TONS OF BAD REVIEWS YOU GET? DON'T WORRY I'LL FIND SOME & POST THEM UP FOR YOU"
VIZ
Ling is OFFICIAL VIZ ethnic business ambassador!
PLAY STUPID CRASH GAME!
CHEAP INSURANCE
Google Spider Food --->
Close (X)
ASK
THE BEST FAQs IN THE WORLD!
JUST CLICK
Close (X)
LIVE
关闭
CLOSED

POWER LAW OF PRACTICE

Power Law of Practice:

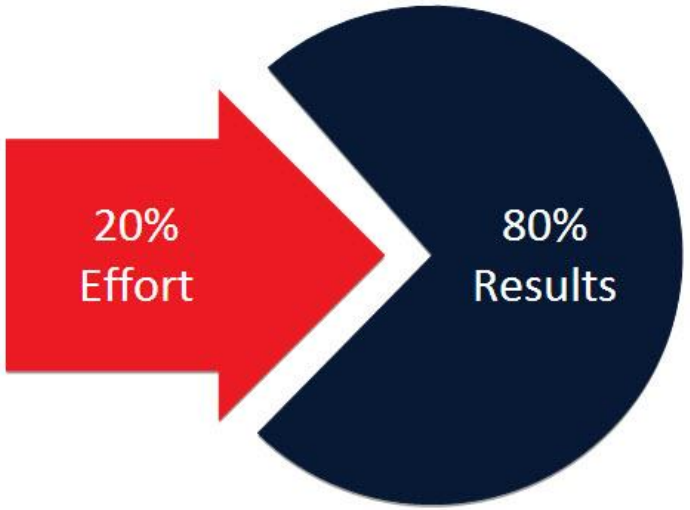
- Proposed by Newell and Rosenbloom,
- states that the time to complete a task decreases linearly with the number of practice trials taken when both are expressed as logarithms.
- Famous "learning curve" is derived from this.
- If you know absolutely nothing about a topic, you can **learn 50% of the information quickly.**
- When you have 50% less to learn, it takes **more time to learn that final 50%.**

Pareto and Zipf Laws

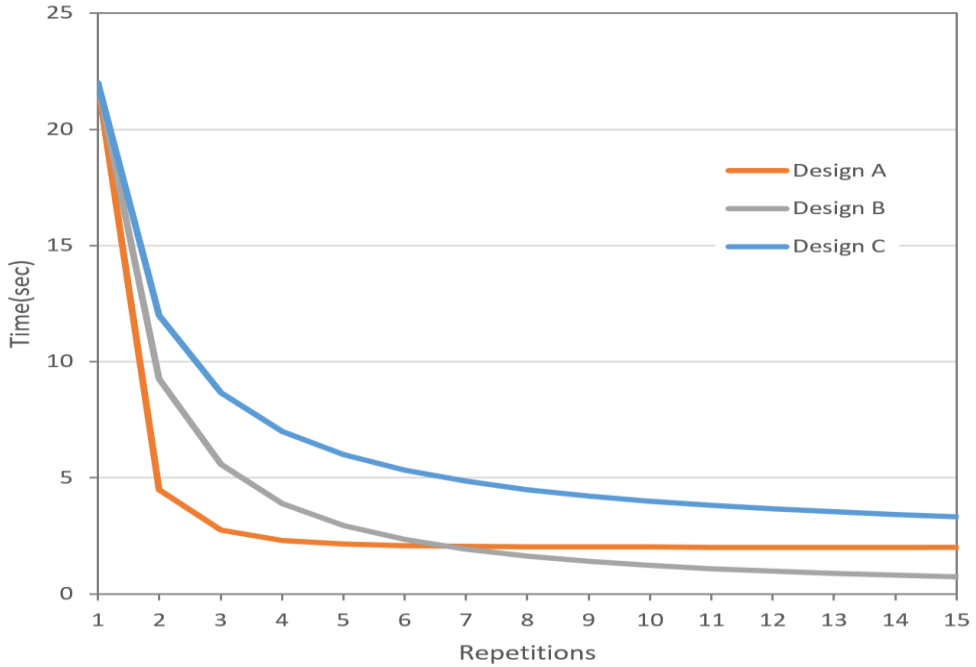
- Pareto principle is named after the Italian economist Vilfredo Pareto, who found that a majority of the land in 19th century Italy was owned by the minority of the population.
- the **law of the vital few,** or the **principle of factor sparsity** states that, for many events, roughly **80% of the effects come from 20% of the causes**
- 80/20 rule, applied to the most profitable customers and most critical usability problems, identifying top tasks.
- **80% of the occasions users use only 20% of the features supported in a product!!.** Designers to note – the key features should be visible, easily locatable and not hidden in the UI

Pareto Optimality Principle

- Law of the Vital Few, states that just 20% of the work that you have done to achieve something is responsible for 80% of the results that you've achieved.
- Simply put, you only need to fix a little in order to get a lot of positive change.
- Prioritising your efforts on the small portion that could have the biggest impact
- Trying to tackle and perfect all your issues at once is overwhelming and yields diminishing results



- Related to the Pareto law is Zipf's law,
- After a linguist who noticed that the most frequent word will occur approximately twice as often as the second most frequent word, three times as often as the third most frequent word, and so on.
- It also applies to customers for product types, word frequency in a verbatim analysis and the frequency of commands used in software such as MS Word
- Zipf's Principle of Least Effort : People want the most outcome for the least effort
- Most useful behaviors are performed frequently, and become easier and quicker over time due to this. users do not want to spend a lot of time and effort deconstructing your innovative navigation labels.



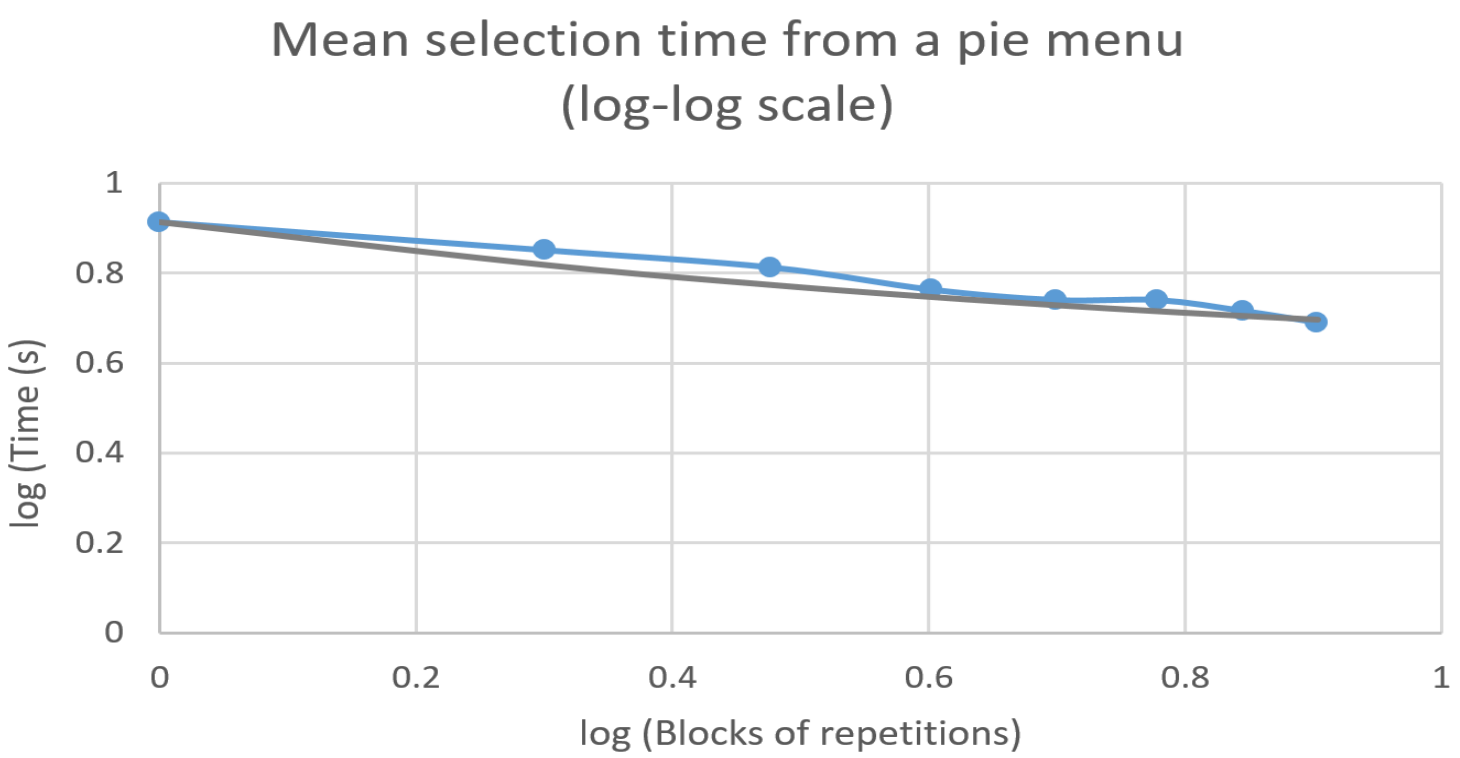
✓Design A is much faster than designs B or C.

3rd repetition design A speeds up even more, and after the 4th repetition the reaction times reach a plateau; the curve flattens out ;

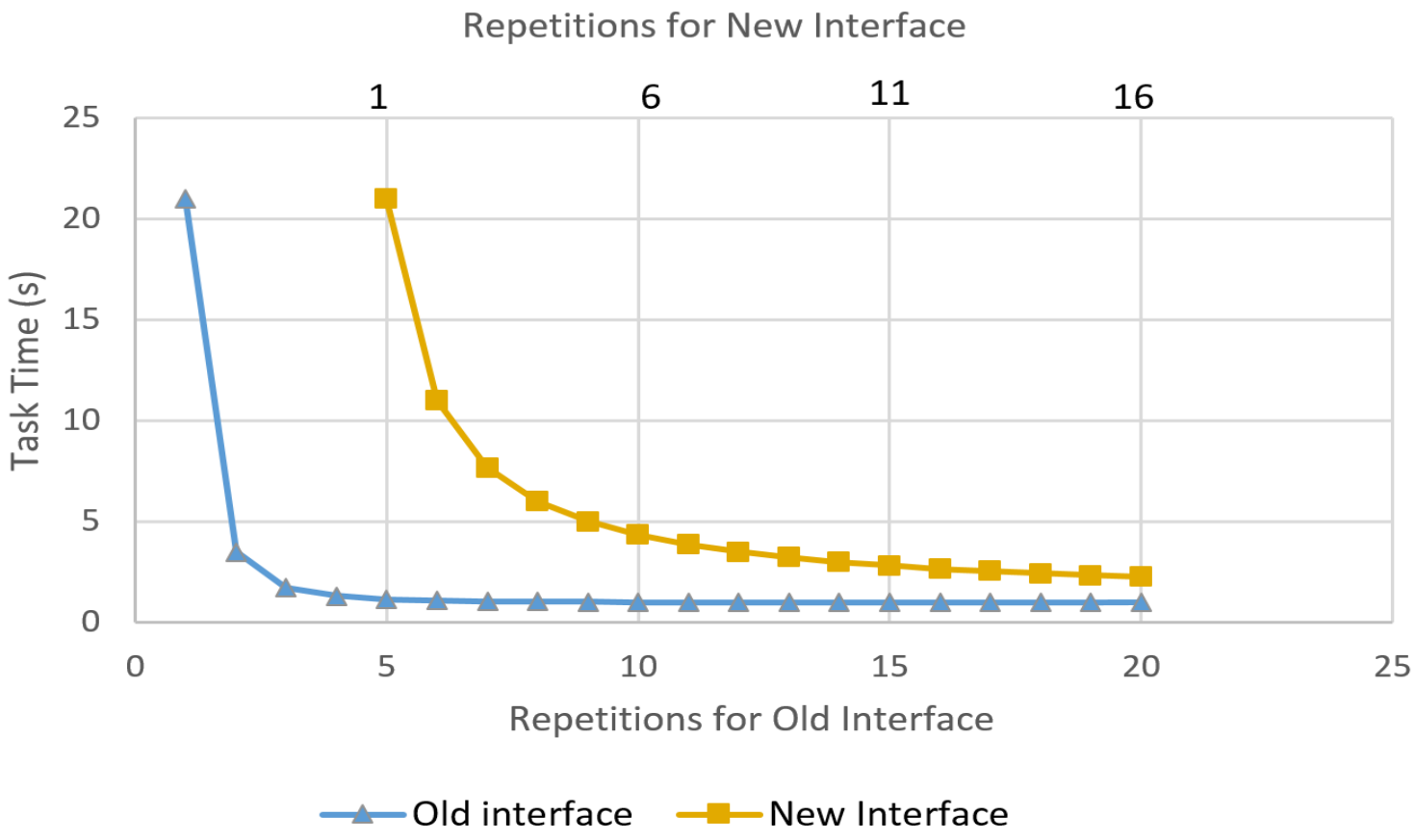
Users have learned the interface as much as possible.

no more improvements to be expected, and extra repetitions will only decrease the reaction time insignificantly.

With design A, **learning is saturated after the 4th repetition** (or that 4 is the saturation point for design A

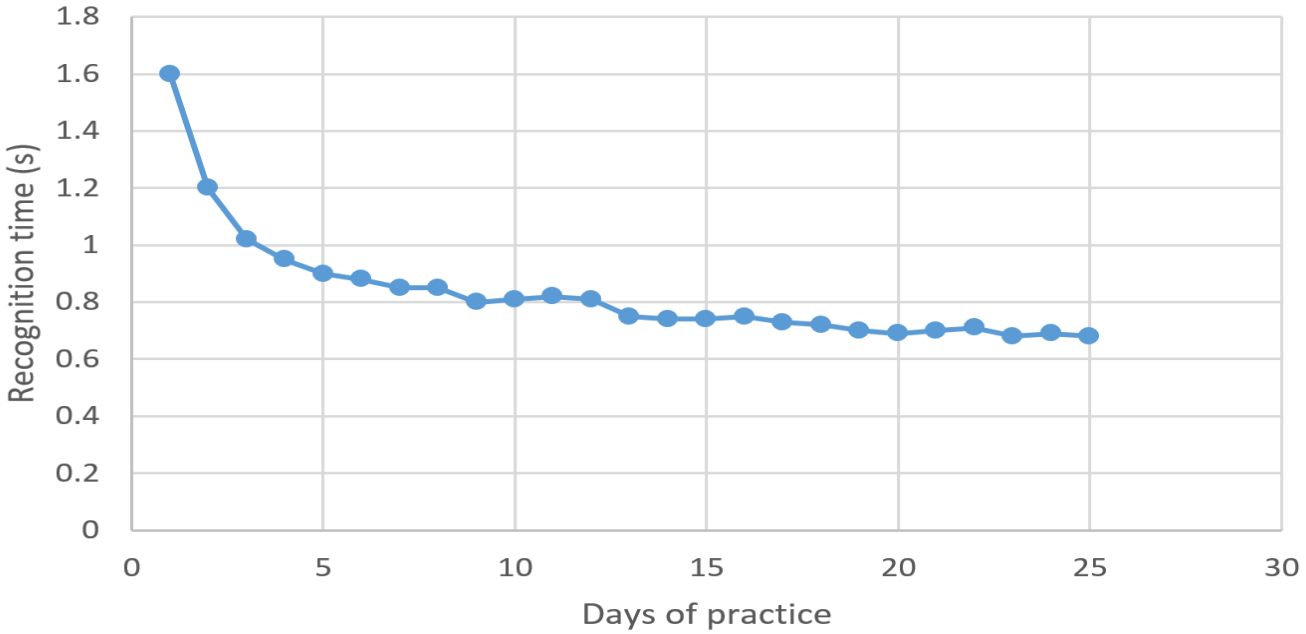


- *learning curve - Ahlstrom's menu experiment - described by a power law; plotted in log–log scale, well approximated by a straight line.*
- **The power law of learning** : (1) time it takes to perform a task decreases with the number of repetitions of that task;
- (2) the decrease follows the shape of a power law.



•*Learning curves for two different interfaces: when the new interface is introduced, old one is already at saturation level (repetition 1 for the new interface corresponds to repetition 5 for the old one).*

•*Takes a lot more time & good will for the user – with new suboptimal interface than to continue using the old one.*



- Romans - "repetition is the mother of learning"
- *Peter Pirolli & John R. Anderson , time it took participants to recognize facts that they had studied decreased with # days they had practiced those facts.*
- *curve follows a power law and reaches a saturation level approximately around day 12.* power law of learning says that the time it takes to retrieve a piece of information from memory depends on how much we've used that information in the past, and this dependence follows a power law