Seven Plus or Minus Two: Put to the Test

Matthew Ellison Consulting

matthew@ellisonconsulting.com

The magical number seven, plus or minus two

- What do most of us know (or think we know) about this number?
  - "It effects everything we do as writers"
  - "It concerns the human brain's limitation in processing information"
  - "It has something to do with short-term memory"
  - "It came from research by George Miller in the 1950s"
  - "It is a cornerstone of the Information Mapping® method"

The real origins of seven, plus or minus two

- Article by George Miller in The Psychological Review, 1956
- Discussion of three fields of research:
  - experiments in absolute judgment
  - subitizing (number recognition)
  - span of immediate memory

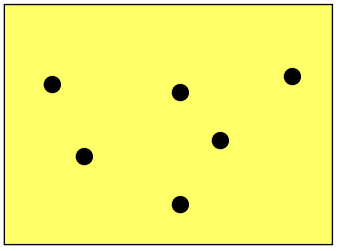
Absolute judgment

- Number of different tones played – each assigned a number
- Tones varied in pitch from 100 to 8000 cps in equal logarithmic steps
- Subjects asked to identify tones
- With five or more tones, confusions were frequent

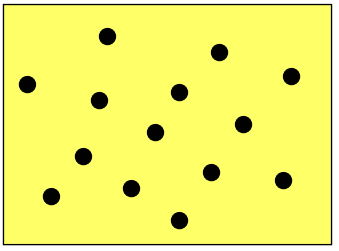
Absolute judgment: conclusion

- There is a clear limit to the accuracy with which we can identify absolutely the magnitude of a one-dimensional variable (pitch, loudness, brightness, saltiness, etc.)
- "This limit is usually somewhere in the neighbourhood of seven"

Subitizing



How many dots?



How many dots?

- Below seven, most people *subitize* (recognize the number immediately)

Span of immediate memory

- There is a finite span of immediate memory
- For a wide range of test materials, this span is about seven items
- Each item can have multiple "bits" of information
- Miller calls an item a "chunk"

Some truths about seven, plus or minus two

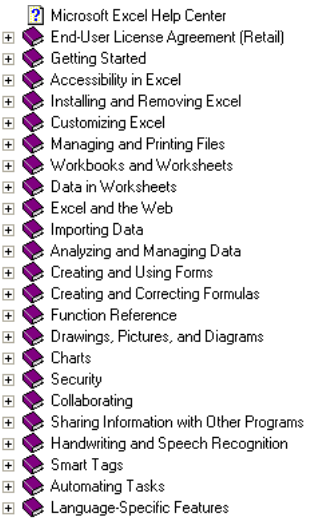
- The experimental research did not concern:
  - User interface design
  - Instructional design
  - Printed (let alone online) text
- It has been the subject of much debate and controversy since 1956
- Even Miller suggested that the significance of the number seven in all three fields of research may be a coincidence

So should we ditch our 7 ± 2 rule of thumb?

- What relevance do absolute judgment, subitzing, and span of immediate memory have to information design?
- Is a poor/unreliable rule of thumb worth using?
- Are there better rules of thumb?

TOC, menus, lists, and procedures

- What limit should we impose on the number of items or steps?
- Is this necessarily a "bad" TOC?



TOC, menus, lists, and procedures

- Is this necessarily a "good" list?

The path of a node is

- the name of the element if the node is an element,
- `#text` for a text node,
- `#comment` for a comment node,
- `#processing-instruction` for a processing instruction node,

preceded by the path of its parent element.

The best number to choose…

…depends on many factors, including:

- Target user type
  (novice, intermediate, etc.)
- Objective of the information:
  - Select
  - Follow instructions
  - Remember
  - Remember in sequence
- Nature of the information

Objective: select

- 512 information items,
  3 different navigation systems:
  - $8 \rightarrow 8 \rightarrow 8$
  - $16 \rightarrow 32$
  - $32 \rightarrow 16$
- "…subjects performed best with the $16 \rightarrow 32$ hierarchy and worst with the $8 \rightarrow 8 \rightarrow 8$ hierarchy."
  - Larson & Czerwinski, Microsoft (1998), "Web Page Design: Implications of Memory, Structure and Scent for Information Retrieval"

Links and columns

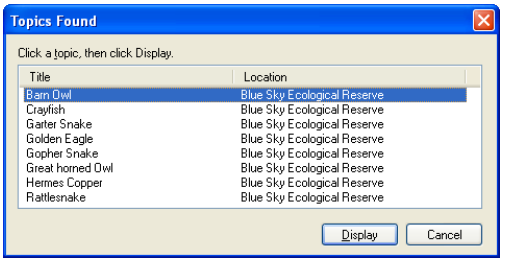
- Scanning a horizontal list of links is significantly slower than scanning vertically arranged links
  - Nygren, E. and Allard, A. (1996). "Between the clicks: skilled users scanning of pages." In Human Factors and the Web/HTML Conference. Albuquerque, NM: Sandia National Laboratories.

What is the primary role of a TOC in user assistance?

- Navigation?
- Location?
- Indication of scope?
- Mental map?

Topics Found dialog

- Used for Index and "Related Topics" links
- Effectively the final stage of a multi-level navigation system
- Dialog accommodates 8 items without scrolling



Lists

- What is the audience type?
- What is the purpose of the list?
- Do we need the user to remember the items?
- Is the sequence of items critical?

Objective: remember

- Critical factors:
  - Complexity of vocabulary and language
    (Hulme, Maughan, & Brown, 1991)
  - Graphical content
    (Childers, Heckler, and Houston, 1991)
  - Environment
    (LeCompte, 1996)

Objective: remember

- Critical factors (continued):
  - visual patterns

  - Opportunities for **recoding**, which reduces the effective number of items

    33549841582

    +33 (5) 49 84 15 82

  - Relationships between items

Examples of recoding and relationships

- January, February, March, April, May, June
- March, April, May, June, July, August
- October, February, August, June, May, April
- fox, Cairo, potato, because, William, open

Procedures

- Critical factors for success:
  - Is the user doing the task as they read?
  - Is the user aware of the scope and length of the task?
  - How familiar is the user with the domain and context?
  - How well does the user understand the underlying task flow?
- All these may have an impact on the optimum number of steps

Which of these procedures is easier to follow?

Send a message

1. Click the **Create Mail** button.
2. In the To field, type: `matthew.ellison@email.com`
3. In the Subject field, type: `Tomorrow's meeting`
4. In the body of the message, type: `Here is the agenda for the meeting.`
5. From the **Insert** menu, select **Signature** and then **Internal**
6. From the **Format** menu, select **Plain Text**
7. From the **Tools** menu, select **Request Secure Receipt**.
8. From the **Insert** menu, select **File Attachment...**

   The Insert Attachment dialog box appears.
9. Scroll to the right, and select the file named **Meeting Agenda.doc**
10. Click the **Attach** button.
11. Click the **Send** button
12. From the Tools menu, select **Send and Receive** and then **Send All**

Use the calculator:

1. Enter `19672` in the display.
2. From the **View** menu, select **Hex**.
3. Click the **M+** key.
4. From the **Edit** menu, select **Copy**.
5. Click the **Or** key.
6. Enter `87234` in the display.
7. Click the **=** key.
8. Enter `5678` in the display.
9. Click the **x^y** key.
10. Click the **MR** key.
11. From the **View** menu, select **Word**.
12. Enter `1236` in the display.

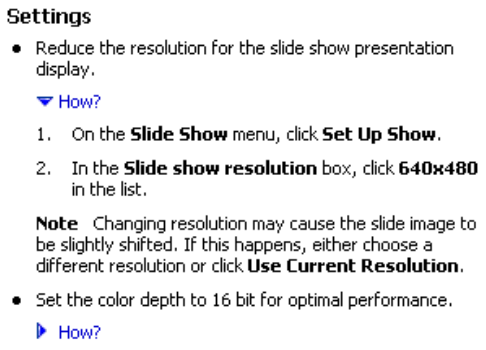
Which is easier to remember?

Number of mouse clicks

- Some users have trouble with tasks that require three or more clicks
  - Mead, S. E., Spaulding, R. A., Sit, B. M. and Walker, N. (1997). "Effects of age and training on World Wide Web navigation strategies." In Proceedings of the Human Factors and Ergonomics Society 41st Annual Meeting, 152-156.

Practical information design tip #1

- Cater for multiple user types by making information items available on request
- It's important to provide a good information "scent"



Settings

- Reduce the resolution for the slide show presentation display.

  How?

  1. On the **Slide Show** menu, click **Set Up Show**.
  2. In the **Slide show resolution** box, click **640x480** in the list.

  Note Changing resolution may cause the slide image to be slightly shifted. If this happens, either choose a different resolution or click **Use Current Resolution**.

- Set the color depth to 16 bit for optimal performance.

  How?

Practical information design tip #2

- Educate users to recognize and understand recoding systems
- This makes it easier for them to learn and remember instructions
- Use:
  - Introductions
  - Overviews
  - Quick Reference content
  - Getting Started materials

What about Information Mapping®?

- First described by Robert Horn in 1966
  - documented in Information Mapping for Learning & Reference (Horn, Nicol, Klienman & Grace, 1969)
- A way of visually presenting information and a method for analyzing information
- Proposes seven fundamental types of information, but does not reference Miller
- Supported by research (example: County of San Diego, 1994)

Alternative magical numbers

- One
- Two
- Three
- Eight
- Forty two
- Thirty billion

Conclusion

- Miller's paper does not provide a sound basis for universal application of the 7±2 rule in information design
- The optimum number of items in information design depends on a number of factors including:
  - Target user type
  - Required action (select, follow, remember, map, etc.)
  - Language and vocabulary
  - Information content
- For really critical information, consider using three as a limit

Questions?

Matthew Ellison
Consulting

matthew@ellisonconsulting.com