EECS 4441 Human-Computer Interaction
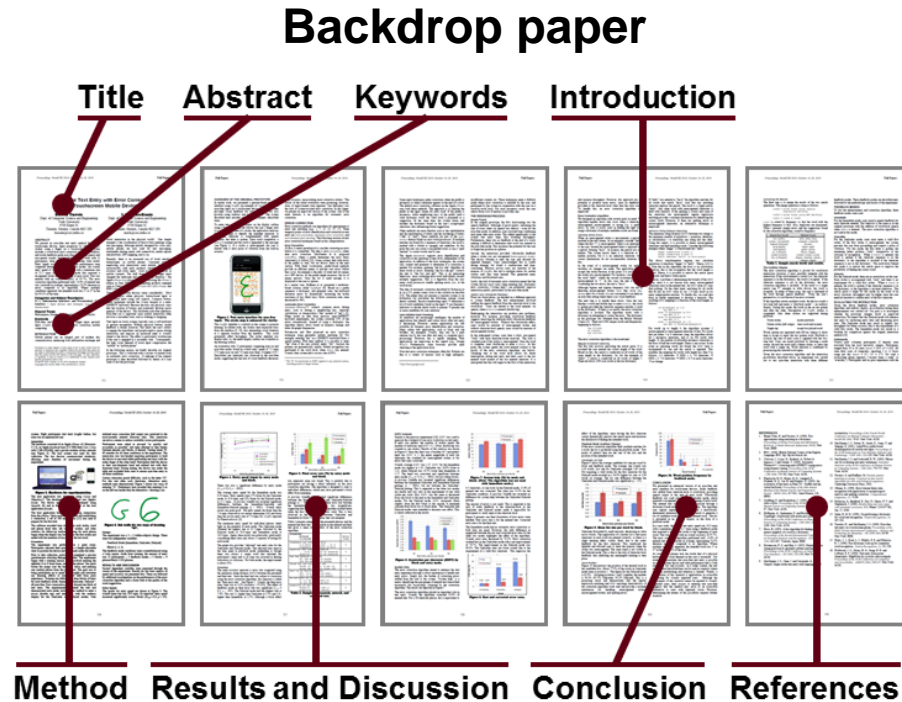
Topic #6: Parts of a Research Paper

I. Scott MacKenzie

York University, Canada

Parts of a Research Paper[1]

Backdrop paper

Title   Abstract   Keywords   Introduction

Method   Results and Discussion   Conclusion   References

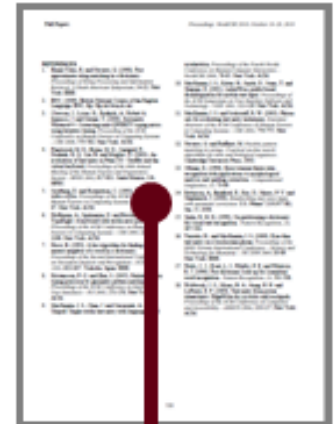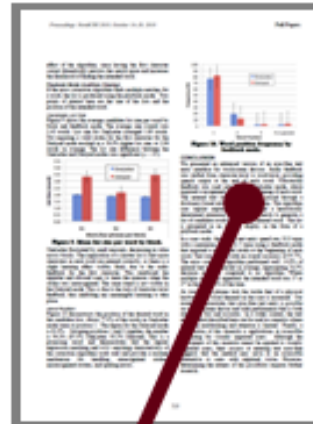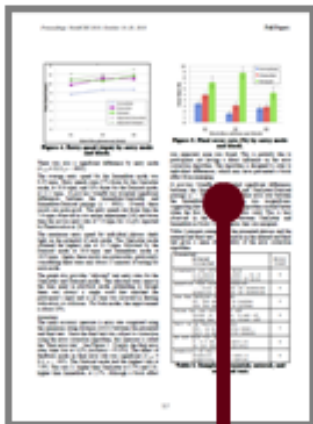[click here] to view the backdrop paper
(`nordichi2010.pdf`)

[1] Tinwala, H., & MacKenzie, I. S. (2010). Eyes-free text entry with error correction on touchscreen mobile devices. *Proc NordiCHI 2010*, 511-520, New York: ACM.

Title

Abstract **Keywords** **Introduction**

Method **Results and Discussion** **Conclusion** **References**

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Title

- Every word tells!

- The title must…
  - Identify the subject matter of the paper
  - Narrow the scope of the work
  - (A title should be neither too broad nor too narrow.)

- Backdrop paper title:

Eyes-free Text Entry with Error Correction on Touchscreen Mobile Devices

Subject matter
(in a general sense)

Narrows the scope

Title (2)

- A title may include a sub-title, usually following a separator, such as a colon (no rules here)

- A title may strive to catch the reader's attention:

  Silk From a Sow's Ear: Extracting Usable Structures From the Web[1]

- A title may include an invented keyword (good for subsequent searches):

  TwitInfo: Aggregating and Visualizing Microblogs for Event Exploration[2]

[1] Pirolli, P., Pitkow, J., & Rao, R. (1996). Silk from a cow's ear: Extracting usuable structures from the Web. *Proc CHI '96*, 118-125, New York: ACM.

[2] Marcus, A., Berstein, M. S., Badar, O., Karger, D. R., Madden, S., & Miller, R. C. (2011). Twitinfo: Aggregating and visualizing microblogs for event exploration. *Proc CHI 2011*, 227-236, New York: ACM.

Authors and Affiliations

- … follow the title
- Format as per the template file

[click here] to view the SIGCHI template file (for conference papers)

Title

Authors and affiliations

From the SIGCHI template file…

SIGCHI Conference Proceedings Format

1st Author Name	2nd Author Name	3rd Author Name
Affiliation	Affiliation	Affiliation
Address	Address	Address
e-mail address	e-mail address	e-mail address
Optional phone number	Optional phone number	Optional phone number

Details matter! Ensure the font family, font size, font style, and positioning are correct.

Title **Abstract** **Keywords** **Introduction**
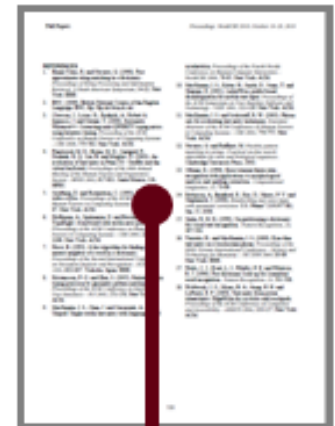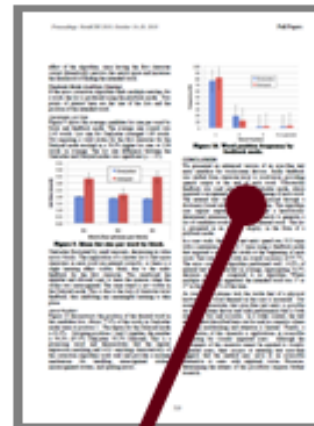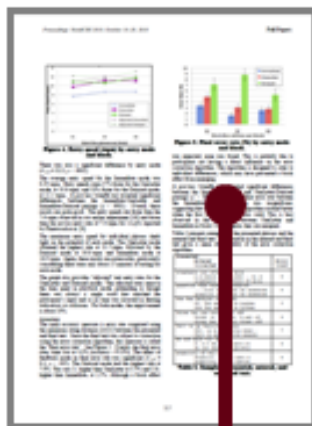

Method **Results and Discussion** **Conclusion** **References**

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Abstract

- Written last

- Typically a word limit (e.g., 150 words)

- A single paragraph, no citations

- The abstract's mission is to tell the reader…
  1. What you did
  2. What you found

- Give the most salient finding(s)

- Common fault:
  - Treating the abstract as an introduction to the subject matter (don't!)

Abstract Example[1]

What was done

This study addresses to what extent spatial mnemonics can be used to assist users to memorize or infer a set of text input chords. Users mentally visualize the appearance of each character as a 3x3 pixel grid. This grid is input as a sequence of three chords using one, two, or three fingers to construct each chord. Experiments show that users are able to use the strategy after a few minutes of instruction, and that some subjects enter text without help after three hours of practice. Further, the experiments show that text can be input at a mean rate of 5.9 words per minute (9.9 words per minute for the fastest subject) after 3 hours of practice. On the downside, the approach suffers from a relatively high error rate of about 10% as subjects often resort to trial and error when recalling character patterns.
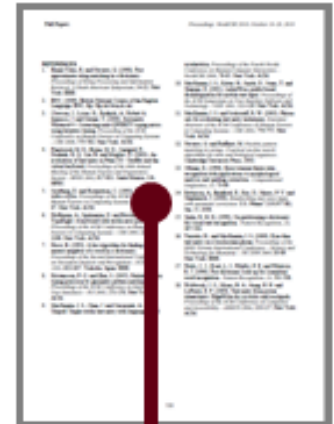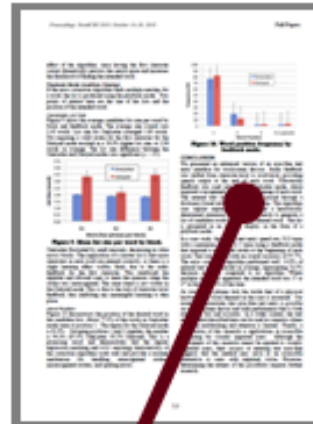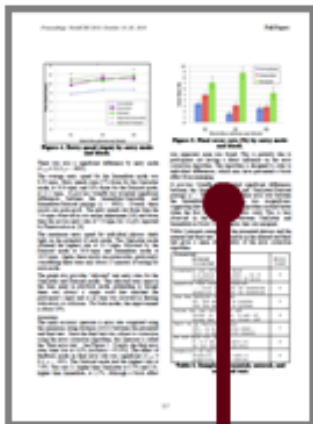
(144 words)

What was found

[1] Sandnes, F. E. (2006). Can spatial mnemonics accelerate the learning of text input chords? *Proceedings of the Working Conference on Advanced Visual Interfaces - AVI 2006*, 245-249, New York: ACM.

Title **Abstract** **Keywords** **Introduction**

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Keywords

- Used for database indexing and searching

- Chosen by the author(s)

- Backdrop paper:

Keywords
Eyes-free, text entry, touchscreen, finger input, gestural input, *Graffiti,* auditory display, error correction, mobile computing.

Computing Classification System

- Since 1998, ACM conference and journal papers are required to also include categories, subject descriptors, and general terms (the latter are optional for conference papers)

- Provided by the ACM (not the author)

- Backdrop paper:

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – *input devices and strategies (e.g., mouse, touchscreen)*

General Terms
Performance, Design, Experimentation, Human Factors

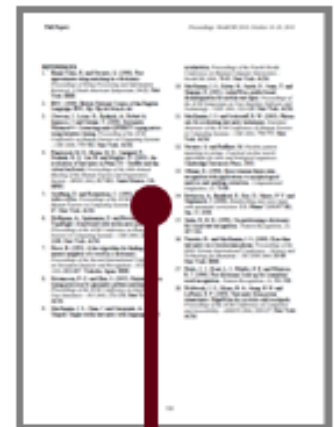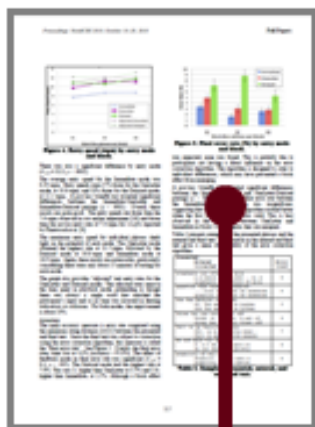Click here to view the ACM's how-to guide (if Internet connection available)
(http://www.acm.org/about/class/how-to-use)

Title **Abstract** **Keywords** **Introduction**

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Introduction

- Opening section of the research paper

- Headings vary (e.g., Introduction, Background, …)

- Gives the context for the research

- Opening comments characterise the state of the art

- A UI problem or challenge is noted and the reader is alerted to the impending solution (which is developed and evaluated in the rest of the paper)

Overview of Paper

- Usually an overview of the entire paper is given early on, at a convenient place

- Backdrop paper:

> In the following section, we briefly describe our original prototype. This is followed with a review of related work on automatic error correction. A redesign of the original prototype is then described followed by details of a user study to test the prototype.

(5th paragraph)

Expected Content

- Contribution of the work
  - What is novel and interesting about the research?

- Literature review
  - Discuss related work (how it is similar and how it differs)
  - Include citations (with full bibliographic information in reference section at end)

- Technical details of the proposed solution

- Sections and sub-sections
  - No rules (organize in any manner that seems reasonable)
  - It's your story to tell!

- Aids
  - Use formulae, photos, drawings, screen snaps, sketches, or any appropriate visual aide to help the reader

Title **Abstract** **Keywords** **Introduction**

Method **Results and Discussion** **Conclusion** **References**

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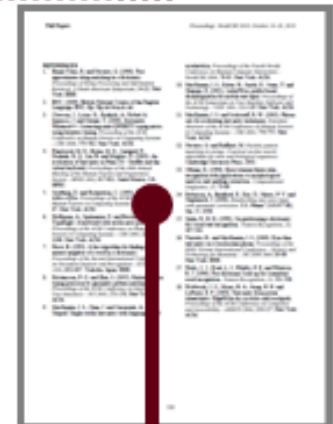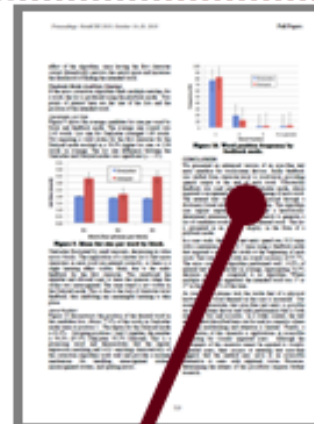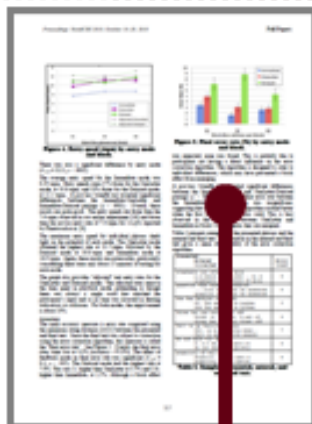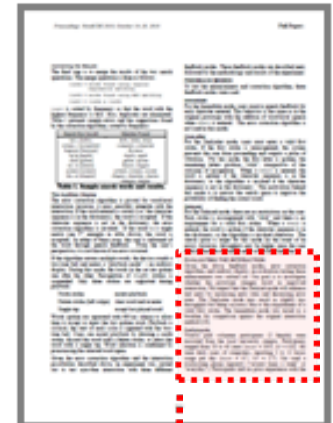
Method

- The Method section tells the reader how the experiment was designed and carried out

- Headings vary (Method, Methodology, Experiment, User Study, Evaluation, …)

- In style, the method section must be straight-forward: simple, clear, predictable (like a recipe)

- Research must be replicable (as already noted)
  - The Method section must provide sufficient information that a skilled researcher could replicate the experiment if he/she chose

Predictability

- The organization of method section must be predictable

- Allows a reader to scour papers quickly to find key points in the design of the experiment

- Convention dictates that the method section contains the following sub-sections (and in the following order):
  - Participants
  - Apparatus
  - Procedure
  - Design

Participants

- The Participants sub-section tells the reader the number of participants and how they were selected

- Were they volunteers or were they paid?

- Demographic information is also given (e.g., age, gender, related experience, …)

- Other details, as appropriate (e.g., income, highest level of education, visual acuity, …)

- This section is usually short, however…
  - If a property of the user is an independent variable (e.g., expertise in judging web sites for accessibility), more detail is needed

Apparatus

- The Apparatus sub-section describes the system (hardware and software)

- Headings vary (e.g., Materials, Interface, …)

- Reproducibility extremely important
  - Give all the details necessary

- Use screen snaps or photos of the interface

- If technical details were disclosed in the Introduction, just refer the reader back to an earlier section (e.g., "the software included the algorithm described in the preceding section")

Procedure

- The Procedure sub-section tells the reader exactly what happened with each participant

- Things to note:
    - Instructions
    - Task description
    - Demonstration or practice
    - Questionnaire administering
    - Trial repetitions, rest breaks, total time
    - etc.

Experiment Task

- Procedure section describes the task:
  - What was the task?
  - What was the goal of the task?
  - When did timing begin and end?
  - Were errors recorded?
  - Were participants instructed to, or allowed to, correct errors?
  - How were errors corrected?
  - Did participants correct errors at their discretion?
  - Were rest breaks allowed, encouraged, or enforced?
  - Etc. (give all the details!)

Design

- The Design sub-section summarizes the experiment in terms of the variables, assignment of conditions, etc.

- For short papers, these details are sometimes given in the Procedure section

- Common beginning…
  - "The experiment was a 3×2 within-subjects design…"

- Conclude with a big-picture summary:

> Aside from training, the amount of entry was 12 participants $\times$ 3 feedback modes $\times$ 3 blocks $\times$ 4 phrases/block = 432 phrases.

(Backdrop paper)

Title **Abstract** **Keywords** **Introduction**
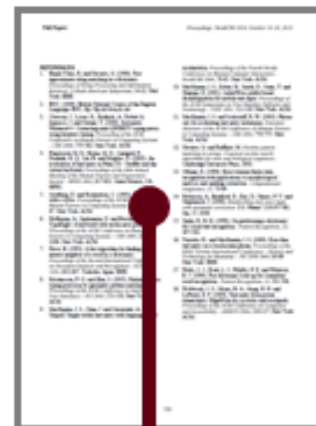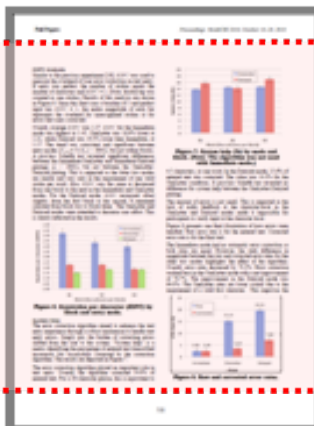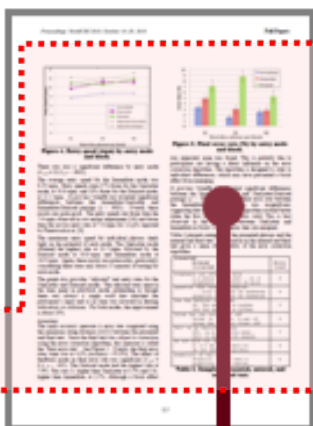
Method **Results and Discussion** **Conclusion** **References**

Results and Discussion

- Will be cover in Topic #8

Title   Abstract   Keywords   Introduction

Method   Results and Discussion   Conclusion   References

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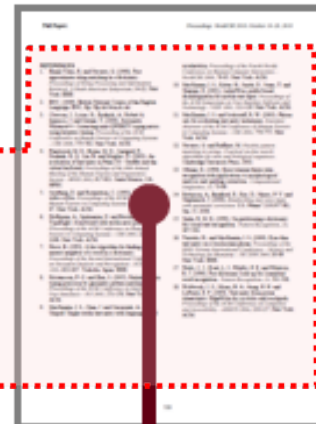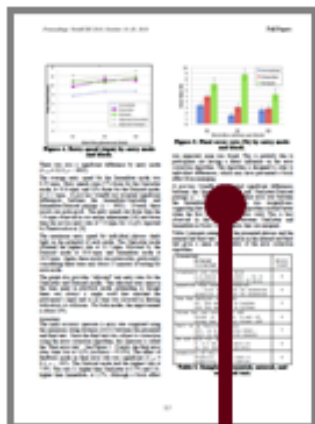
Conclusion, References

- Conclusion
  - Summarize what you did
  - Restate contribution and/or significant findings
  - Identify topics for further work (but avoid developing new ideas in the Conclusion section)

- Acknowledgment
  - Optional (thank people who helped, funding agencies)

- References
  - Full bibliographic information for papers cited
  - Format as required (details matter!)

Preparing the Manuscript

Formatting

- Goal: Let the story of the research come through

- The presentation
  - Must be properly assembled and delivered
  - Compromised if there are formatting flaws
  - Formatting flaws distract the reader

- Details matter! Details…
  - Punctuation, spelling, capitalization, italics, quotations, abbreviations, numbers, variables, sentence structure, tone, economy, etc., etc., etc.
  - Get the formatting right, actually… perfect
  - So perfect, the reader doesn't even notice!

Formatting Rules

- Consult template files or other requirements for conference or journal submissions

- A good source: APA Publication Manual[1] →

- APA's on-line FAQ:
    - *When do you use a comma?*
    - *When do you use double quotation marks?*
    - *Do you use brackets in the same way you use parentheses*
    - *When are numbers expressed in words?*
    - *etc.*
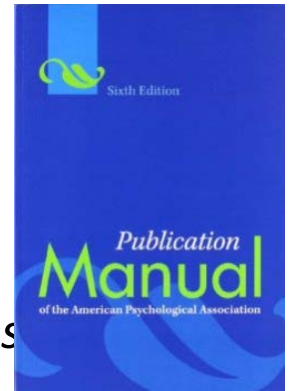
Click here to view FAQs about APA style (if Internet connection available) (`http://www.apastyle.org/learn/faqs/`)

[1] APA. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: APA.

Dictionary

- The final source for spelling
  - British or American spelling fine; be consistent

- Also, use a dictionary to determine…
  - When to capitalize (*Internet*)
  - When to use a hyphen (*e-mail*)
  - When not to use a hyphen (*online*)
  - When to set as two words (*screen snap*)
  - When to set a single word (*database*)

Click here to view Merriam-Webster dictionary (if Internet connection available) (http://www.merriam-webster.com/)

Citations and Reference Lists

- Format citations and references as required for the type of submission

- Next slide gives examples for typical conference proceedings

REFERENCES

1. Aula, A., Khan, R. M., and Guan, Z., How does search behavior change as search becomes more difficult? *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems - CHI 2010*, (New York: ACM, 2010), 35-44.
2. Brajnik, G., Yesilada, Y., and Harper, S., The expertise effect of web accessibility evaluation methods, *Human-Computer Interaction*, 26, 2011, 246-283.
3. Brown, T., *Change by design: How design thinking transforms organizations and inspires innovation*. New York: HarperCollins, 2009.
4. Buxton, W., There's more to interaction than meets the eye: Some issues in manual input, in *User centered system design: New perspectives on human-computer interaction*, (D. A. Norman and S. W. Draper, Eds.). Hillsdale, NJ: Erlbaum, 1986, 319-337.
5. ESA, Electronic Software Association, *Industry facts*, http://www.theesa.com/facts/, (accessed February 4, 2012).

Conference paper

Journal paper

Book

Book chapter

Internet document

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Checklist (see previous slide)

- References are numbered.

- References are ordered alphabetically by 1st author's surname.

- For each author, the surname comes first, followed a comma, then the initials for the given names. Include a space between the initials if there is more than one (e.g., "Smith, B. A." not "Smith, B.A.")

- For the title of the publication, only capitalize the first word, the first word in a secondary title (e.g., after a colon), and proper nouns.

- Always include the year. Substitute "in press" for accepted but not-yet-published papers.

- Always include pages (except for complete books or web pages).

- For the name of the publication, set in italics and capitalize all keywords (e.g., *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems – CHI 2011*).

- For journal publications, include the volume number in italics.

- If space permits, use the full name for conferences and journals. If space is tight, use abbreviated names for conferences and journals (e.g., *Proc CHI '99*). Do not mix full and abbreviated names; use one style or the other. If using abbreviated names, be consistent.

- Give the location and name of the publisher for conference papers and books (e.g., "New York: ACM"). Use the most economical yet understandable expression of the location (e.g., "New York," not "New York: NY"; but use "Cambridge: MA") and publisher (e.g., "Springer" not "Springer Publishing Company").

- Use *align left* (ragged right) for the reference list. (Note: The rest of the manuscript is justified.)

- Only include works that are cited in paper.

- Study and imitate!

- Be consistent.

Citation Examples

Basic citation:

> A previous experiment [5] confirmed that...

Group multiple citations together:

> Our results are consistent with previous findings [e.g., 5, 7, 12].

Do not treat citations as nouns:

> It was proposed in [5] that...   *** Incorrect ***
> It was proposed by Smith and Jones [5] that...   *** Correct ***

Exception (within parentheses):

> There are many user studies on this topic (see [6] for a review).

Citation Examples (2)

Quotations require a page number:

Smith and Jones argue, "the primary purpose of research is publication" [14, p. 125].

Include page numbers when citing a point from a book:

Norman defines six categories of slips [15, pp. 105-110].

Use "et al." if there are three or more authors:

Douglas et al. [5] describe an empirical evaluation using an isometric joystick.

Reference Management Software

- Put in the effort to get citations and references correct

- Important for databases, citation counts, etc.

- Difficult (impossible?) to do manually

- Recommended:
  - Reference management software,
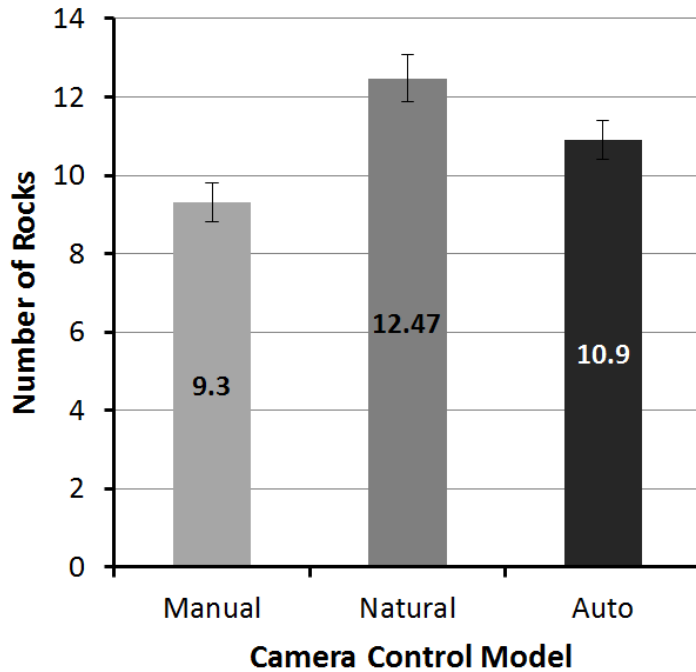   such as Thompson Reuters' *EndNote* →
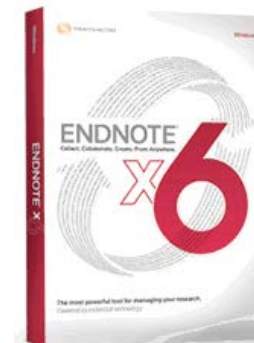
Click here to view web site for EndNote (if Internet connection available)
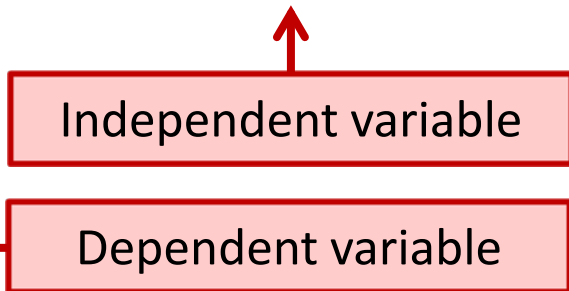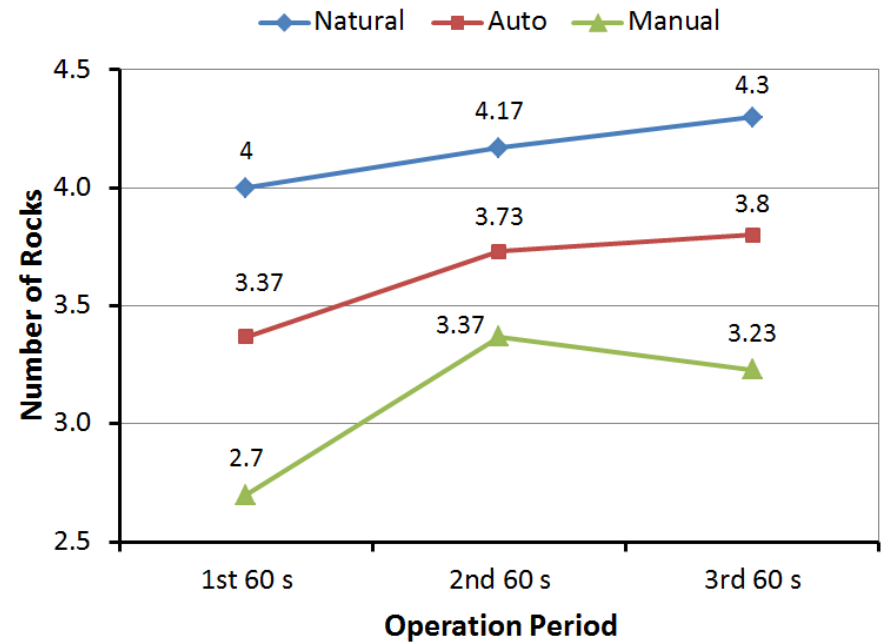(http://www.endnote.com/)

Visual Aids

- Visual aids include charts, photos, drawings, sketches, etc.
- A powerful way to convey ideas and results
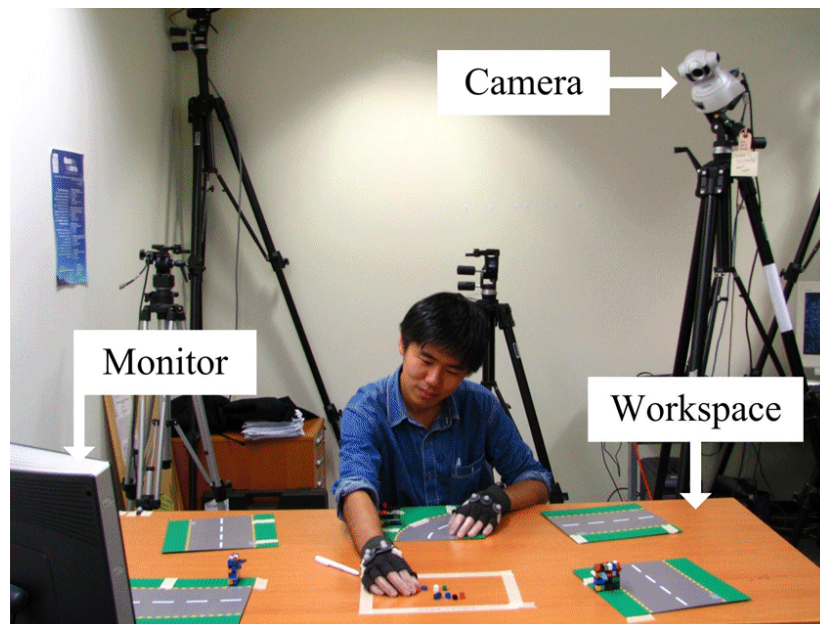- Use generously
- Examples…

Results

Bar chart

Line chart

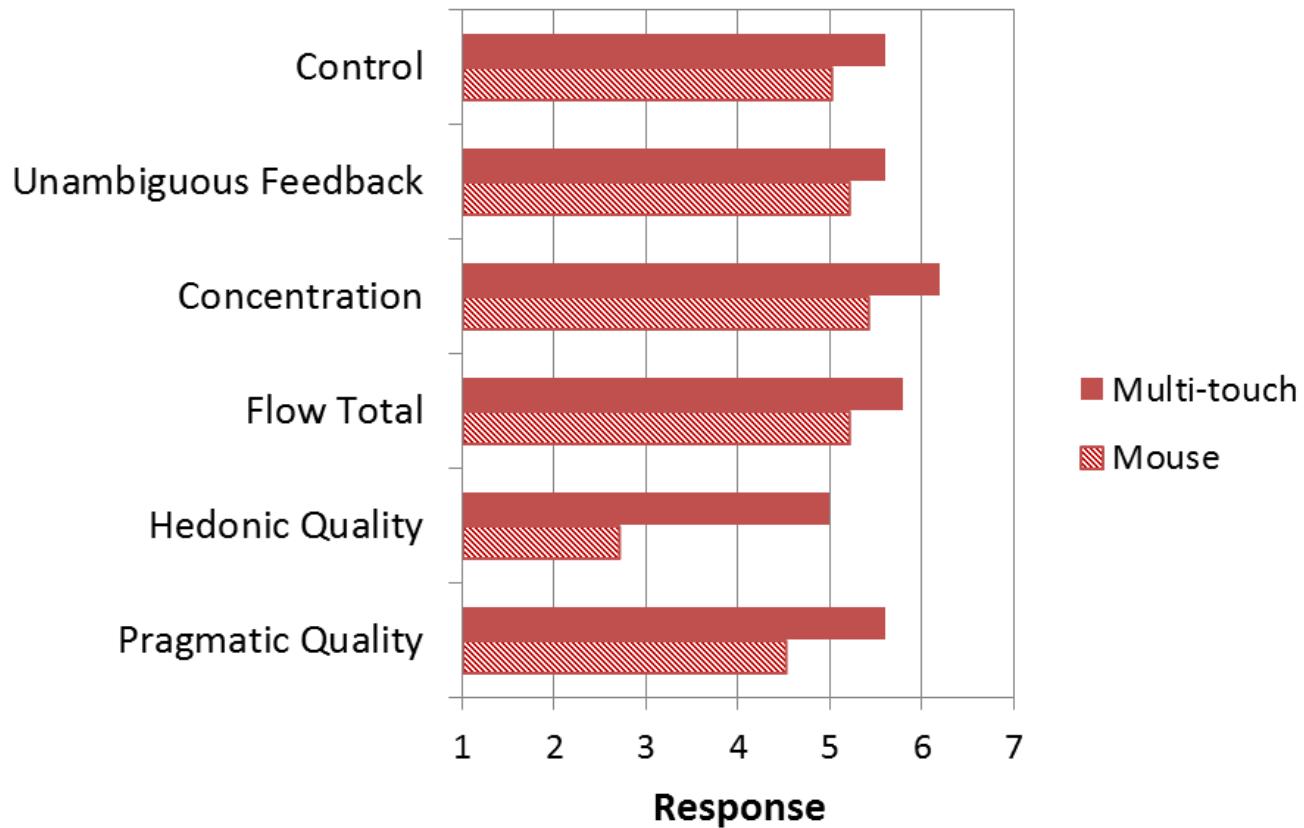*time*

Independent variable

Dependent variable

Experiment Procedure

- A photo provides clarity about the experimental procedure

Questionnaire Responses

Writing for Clarity

- The goal in writing a research paper is communication

- Effective communication demands clarity:
  - *A clear mind attacking a clearly stated problem and producing clearly stated conclusions*[1]

- From the SIGCHI template file under Language, Style, and Content…
  - *Write in a straightforward style*
  - *Avoid long or complex sentence structures*

- Easer said than done

[1] Day, R. A., & Gastel, B. (2006). *How to write and publish a scientific paper* (6th ed.). Westport, CT: Greenwood Publishing.

Resources

- On the craft and art of scholarly writing, the following are recommended: (1st three also good for research methodology)

1. APA. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: APA.

2. Day, R. A., & Gastel, B. (2006). *How to write and publish a scientific paper* (6th ed.). Westport, CT: Greenwood Publishing.

3. Martin, D. W. (2004). *Doing psychology experiments* (6th ed.). Pacific Grove, CA. Belmont, CA: Wadsworth.

4. Strunk, W., Jr., & White, E. B. (2000). *The elements of style* (4th ed.). Needham Heights, MA: Pearson.

Get Rid of Clutter

- Probably the most important advice to consider

- Strunk and White:
  - Rule #17: Omit Needless Words:
    - *A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts.*

- APA:
  - *You can tighten long papers by eliminating redundancy, wordiness, jargon, evasiveness, overuse of the passive voice, circumlocution, and clumsy prose.*

Click here to lookup *circumlocution* (if Internet connection available)
(http://www.merriam-webster.com/)

Examples

Original	Revised
In order to do this	To do this
Should be able to understand	Should understand
The software used was our	The software was our
Stacking objects one on top of the other	Stacking objects
Prior gaming experience	Gaming experience
~~al in mind~~	~~mind~~
Two differen~~t~~ ~~ods of imp~~	~~thods of imp~~
We ran an exploratory pilot study	We ran a pilot study
At their own discretion	At their discretion
Studies conducted in the past have found	Studies have found

Click here to see complete list

`(OmitNeedlessWords-Rule_17.doc )`

Thank You