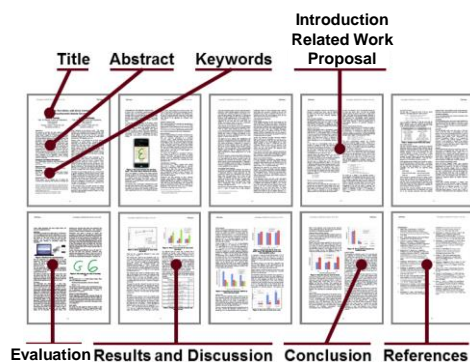


## Context

- Publication is the final (and essential!) step in a research project
- And so, we finish with a chapter on writing and publishing a research paper

# Parts of a Research Paper<sup>1</sup>

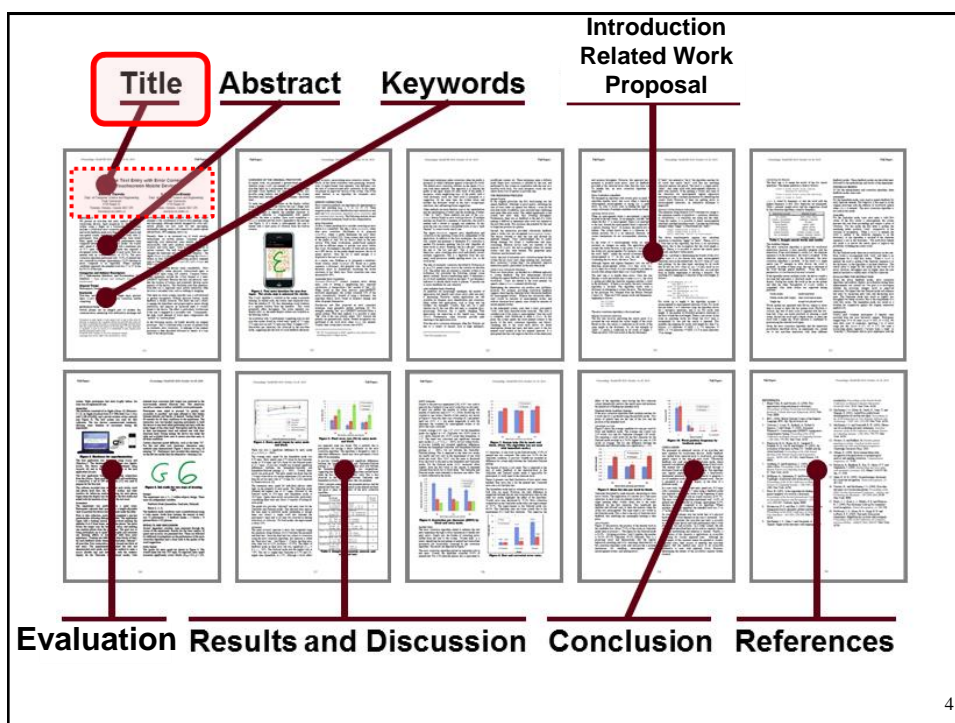
## Backdrop paper



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

<sup>1</sup> 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.

3



4

# 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

5

# Authors and Affiliations

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

Download the SIGCHI template file (for conference papers)

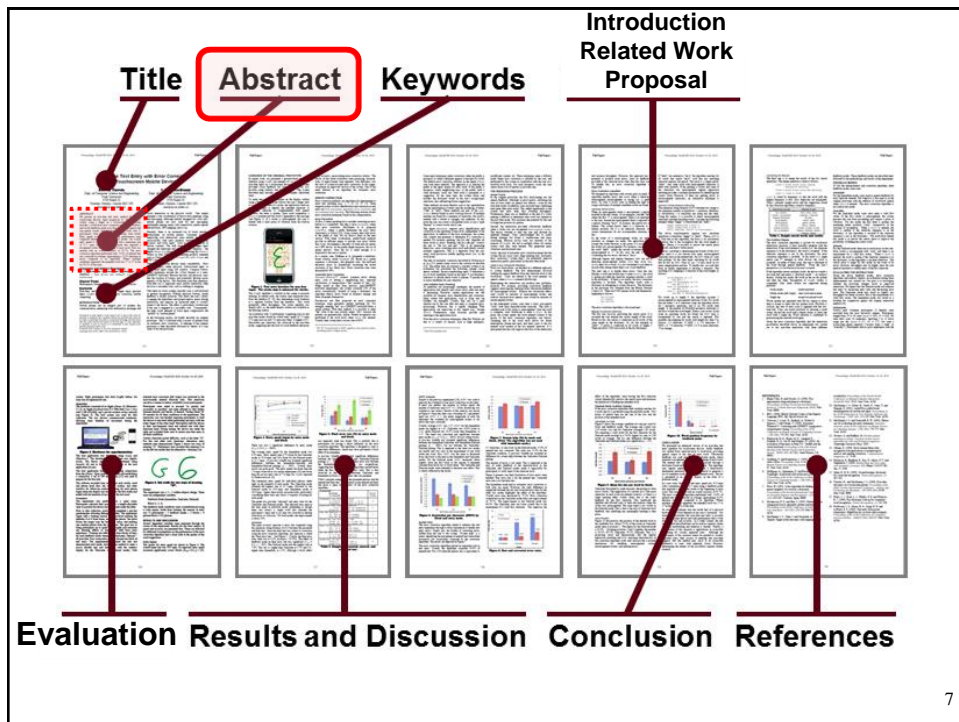
(proceedings.tex)

From the SIGCHI template file...

SIGCHI Conference Proceedings Format		
<b>1st Author Name</b> Affiliation Address e-mail address Optional phone number	<b>2nd Author Name</b> Affiliation Address e-mail address Optional phone number	<b>3rd Author Name</b> Affiliation Address e-mail address Optional phone number

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

6



7

## 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!)

8

# Abstract Example<sup>1</sup>

## 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.

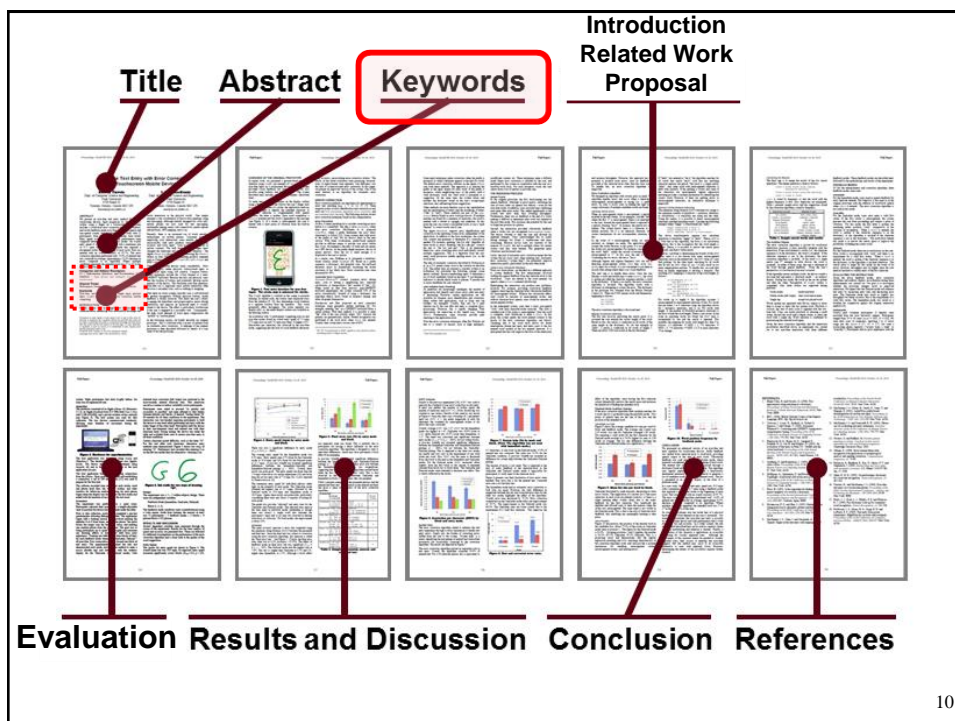
Experiments show that users are able to use the strategy after a few minutes of instruction, and that some subjects enter text without help after three hours of practice. Further, the experiments show that text can be input at a mean rate of 5.9 words per minute (9.9 words per minute for the fastest 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

<sup>1</sup> 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.

9



10

## 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.

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## 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**

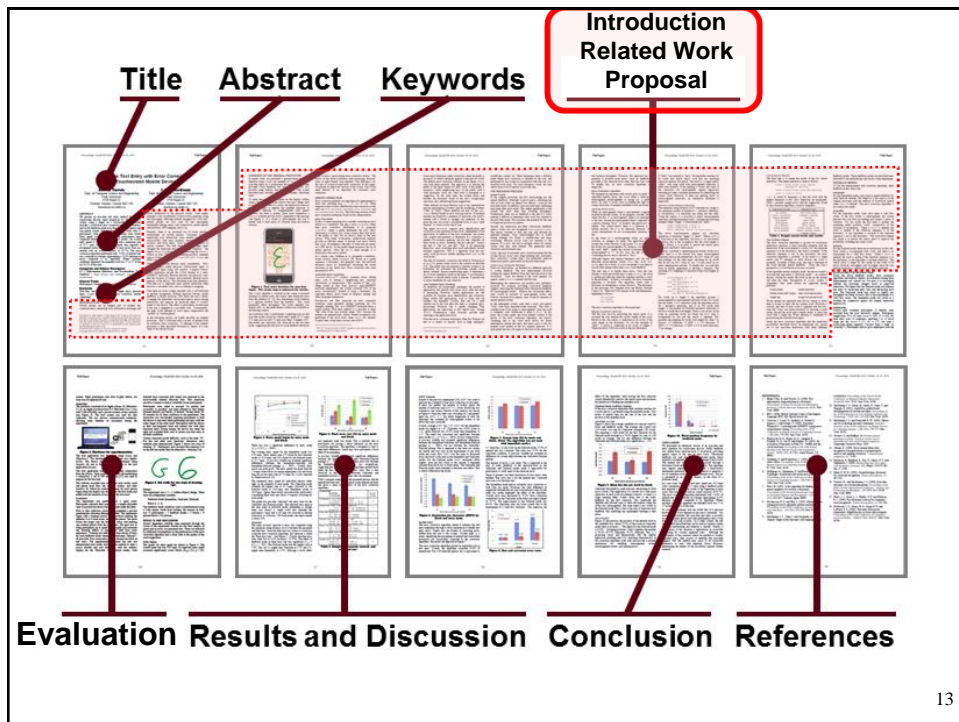
H.5.2 [Information Interfaces and Presentation]: User Interfaces – *input devices and strategies (e.g., mouse, touchscreen)*

### **General Terms**

Performance, Design, Experimentation, Human Factors

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

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## Introduction

- Opening section of the research paper
- Headings vary (e.g., Introduction, Background, ...)
- Expected Content:
  - Introduction to the topic of research
  - UI problem or challenge statement
  - Citation of most notable (if existing) solutions
  - Contribution of the work
    - What is novel and interesting about the research?
    - Anticipation of the impending solution (which is developed and evaluated in the rest of the paper)
  - Overview of the paper

## Overview of Paper

- Usually an overview of the entire paper is given at the end of the introduction
- 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.

(5<sup>th</sup> paragraph)

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## Related Work

- Literature review: discussion of related work
  - Shortly describe each work
  - Highlight differences and similarities with your solution
- Include citations (with full bibliographic information in reference section at end)
- Possibly include a table summarizing the main features of related work
- Organization: possibly classify related approaches according to a common important feature
- Usually, in short papers the section is not present and a small number of related work is summarized in the introduction

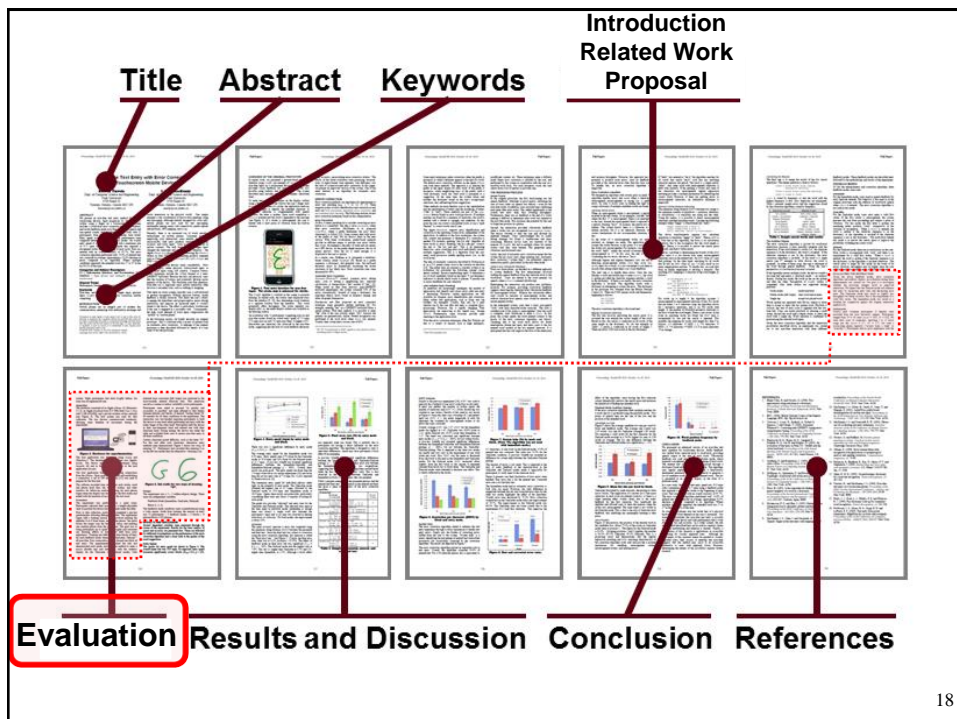
16



# Proposal

- Describe in details the proposed solution
- An interactive technique can be difficult to describe
  - Use images
  - Reference a movie (e.g. on Youtube)
- Sections and sub-sections
  - No rules (organize in any manner that seems reasonable)
  - It's your story to tell!

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## Evaluation

- Tells the reader how the experiment was designed and carried out
- Headings vary (Evaluation, Method, Methodology, Experiment, User Study, ...)
- In style, the evaluation section must be straight-forward: simple, clear, predictable (like a recipe)
- Research must be replicable (as already noted)
  - The section must provide sufficient information that a skilled researcher could replicate the experiment if he/she chose

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## Predictability

- The organization of evaluation 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

20

## 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...

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## 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”)

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## 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.

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## 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!)

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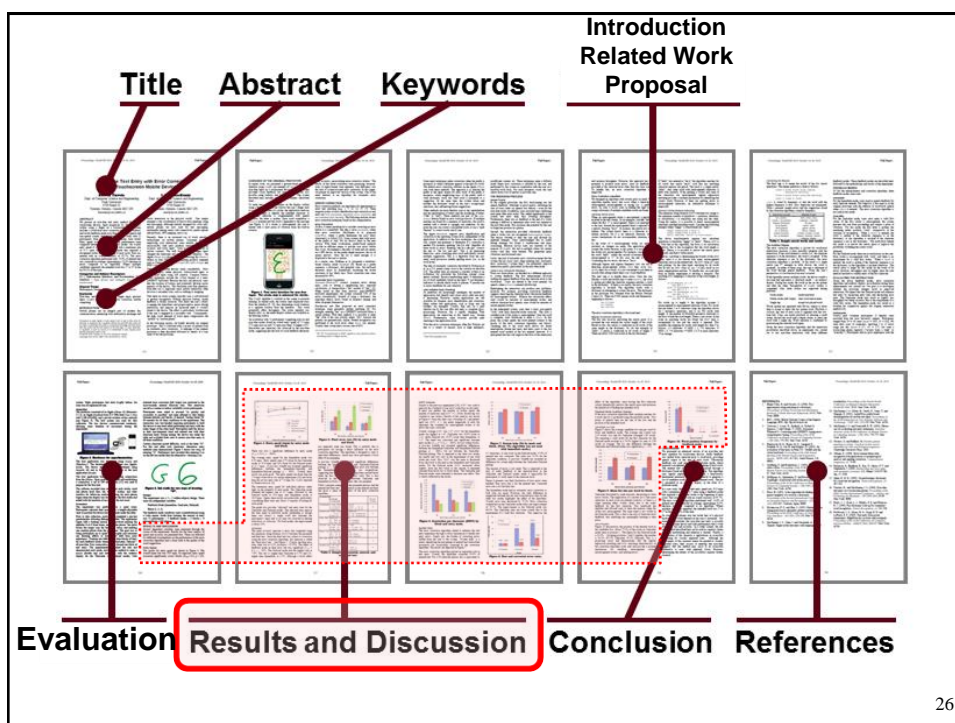
# Design

- 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  $3 \times 2$  within-subjects design...”
- Conclude with a big-picture summary:

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

(Backdrop paper)

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## Results and Discussion

- Results and discussion are usually combined
- Same level heading as Evaluation (results are not part of the evaluation)
- If there were outliers or any data filtering or transformations, state this up front
- Statistical approach and tests sometimes conveyed in an opening paragraph
- No strict rules, but a common approach is to organize this section by dependent variables, beginning with the most important (e.g., speed, task completion time)

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## Results and Discussion (2)

- For each dependent variable, begin with a broad observation, then progress to finer details
- Give the effect size in absolute and/or relative terms:

The mean task completion time for method A was 2.7 seconds. Method B was 9.1% slower with a mean task completion time of 3.0 seconds.

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## Results and Discussion (3)

- Report results of statistical analysis

As expected, entry speed increased significantly across blocks ( $F_{2,18} = 6.2, p < .05$ ). There was also a significant difference by entry mode ( $F_{2,18} = 32.3, p < .0001$ ).

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## Results and Discussion (4)

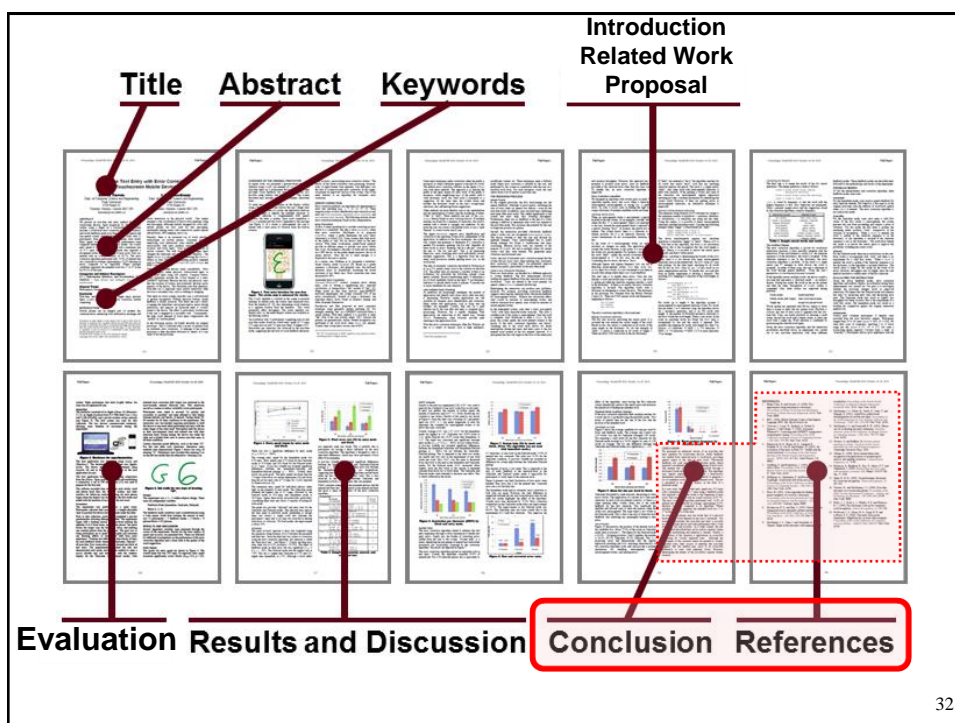
- Discuss and explain the results:
  - What caused the differences in the measurements across experimental condition?
  - What detail in the interaction cause one method to be faster/slower than the other?
  - Did one condition require more input actions?
  - **Important:** report *limitations* of the proposed approach and of the experimental methodology
    - Were participants confused?
    - Was the method hard to learn?
    - Did participants experience fatigue or discomfort?
    - etc.

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## Results and Discussion (5)

- Do not give too many results
  - It is your job to distinguish what is important and relevant from what is unimportant
- Compare
  - Draw comparisons with related work (cited, of course)
- Visuals
  - Use as appropriate, to illustrate and create interest
  - Line charts, bar charts, etc.
- Participant feedback
  - Interviews, questionnaires, etc.
  - Analyse, discuss

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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!)

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## Preparing the Manuscript

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## Formatting Rules

- Consult template files or other requirements for conference or journal submissions
- A good source: APA Publication Manual<sup>1</sup> →
- 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](http://www.apastyle.org/learn/faqs/) to view FAQs about APA style (if Internet connection available)  
(<http://www.apastyle.org/learn/faqs/>)

<sup>1</sup> APA. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: APA. 36

## 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](http://www.merriam-webster.com/) 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

38

### 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 1<sup>st</sup> 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.

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## 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...

It was proposed by Smith and Jones [5] that...

\*\*\* Incorrect \*\*\*

\*\*\* Correct \*\*\*

Exception (within parentheses):

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

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## 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.

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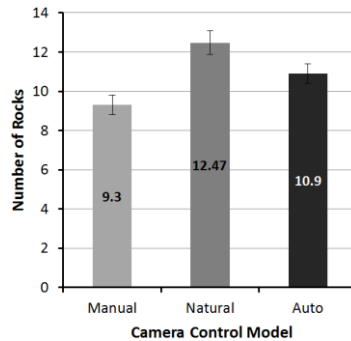
## Visual Aids

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

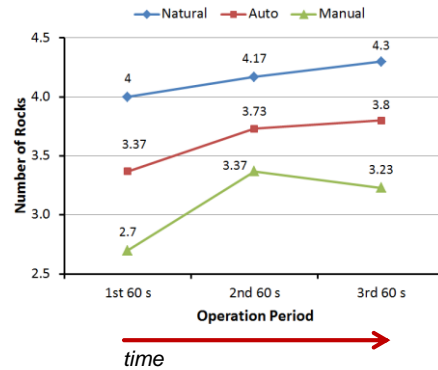
44

## Results

Bar chart



Line chart



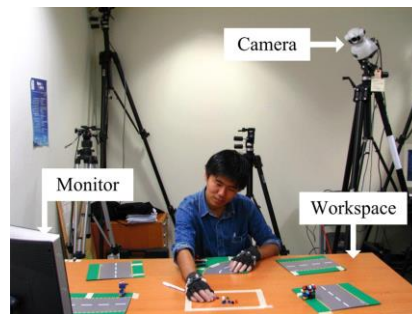
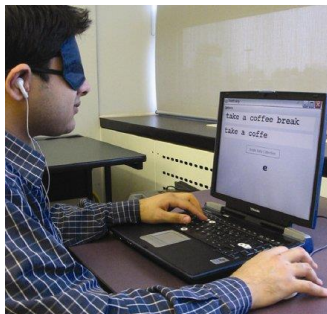
Independent variable

Dependent variable

45

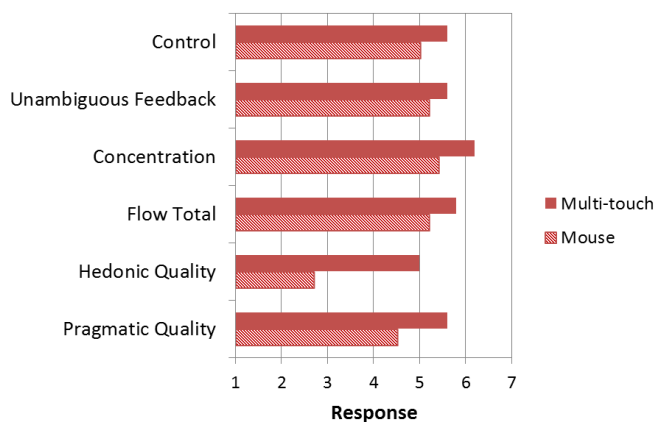
## Experiment Procedure

- A photo provides clarity about the experimental procedure



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## Questionnaire Responses



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## 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<sup>1</sup>*
- From the SIGCHI template file under Language, Style, and Content...
  - *Write in a straightforward style*
  - *Avoid long or complex sentence structures*
- Easier said than done

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

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## 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
... in mind	... in mind
Two different ... of ...	Two different ... of ...
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 )

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## Resources

- On the craft and art of scholarly writing, the following are recommended: (1<sup>st</sup> 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.

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# Thank You

