Writing Scientific Reports

Steve King

CSW 2009

Partly based on a 2007 lecture by Helen Petrie

Finding your scientific voice

- It’s not a highly personal narrative

  “I studied different sources in the library. I attended a course run by my supervisor …”

- It doesn’t have to be very convoluted, full of complex terms

“If skin deformation is a critical factor for roughness perception (Taylor and Lederman, 1975), then it would seem reasonable to argue that roughness perception in virtual reality might be more similar to roughness perception in the physical world via a probe, than via a bare finger.”

[46 word sentence - I have to draw breath, that’s not a good sign]

Keep it as plain and simple as you can

- Try to find a way of writing that is somewhere in the middle, that you are comfortable with
- A certain amount of use of the first person is fine
- Keep words short and simple as possible - except for technical terms
- Keep sentences short *always* (break the argument down into its logical parts for the reader to understand)

1 sentence - > 1 paragraph

Skin deformation may be a critical factor for roughness perception (Taylor and Lederman, 1975). Roughness perception in the physical world is usually undertaken with the bare fingers and thus involves skin deformation; sometimes it may be undertaken with a probe or other device, and no skin deformation is involved. Therefore it is reasonable to argue that roughness perception in virtual reality, which inevitably uses a probe, is more similar to roughness perception in the physical world via a probe than via a bare finger."

Readability

- Original sentence: Flesch Ease of Reading Index 27 (out of 100: high is good)
- My (initial) re-write: Flesch 44.5%

These reading indices are not very good, but can occasionally be a useful tool

Online tools are available: see eg http://www.editcentral.com/

Don’t go all literary, darling

- Don’t feel that you are expected to write in some very literary style - in fact, avoid most literary techniques
- Don’t vary terms for interest (see defining terms later)
- Don’t suddenly vary topic, or deliberately keep the reader in suspense etc etc

Precision and vigour

- A scientific style is usually as *precise* as possible
  - Avoid vague terms “the web users tended to …”
  - Make sure you know the meaning of complex words you use
  - Avoid colloquial/culturally specific expressions (“training wheels interfaces …” - I had no idea what this meant)

Precision and vigour

Your text should still be interesting to read!

Active, clear sentences, easy for the reader, move the action along.

You could do much worse than aiming for a ‘journalistic’ style - model yourself on Raymond Chandler:

“The man walked in the door with a gun in his hand.”

Positive writing

Write positively about what you have achieved: ‘This project did X’, rather than ‘This project tried to do X’

Too much self-deprecating underplay may sow doubts in the reader’s (marker’s) mind

But don’t over-play your achievements …

Think about your reader(s)

- Some people can only write from the beginning (at least of a major section), because they try to hold in my mind the reader's view - what will they understand at this point, what have they been told, what do they need to be told at this point
- That may mean that early sections need to be re-written, once the whole story is there
- You need to persuade your reader that this is an important/interesting document/project and lead them through the information

Think about your reader(s)

- Don’t discuss a concept for three pages and then define it - reader needs a definition at the beginning of a discussion of the concept
- Don’t spend three pages discussing a particular line of research without making it clear how it is relevant to your project
- Provide plenty of introductory/bridging sentences/phrases: ‘scaffolding’

“The next section will introduce concepts of web accessibility and usability in order to establish the criteria for evaluations of websites by users”

Think about your reader(s)

- Also think about the structure at each level
- Does this section have a clear introduction, elaboration, conclusion?
- Does this paragraph have a clear introduction, elaboration of an idea, conclusion (I often get to read paragraphs with completely unrelated ideas jammed together)?
- Does this sentence have a clear structure?

Define terms (and abbrev.s) and stick to them!

- Early in your write-up, define any technical terms you need to, set up abbreviations and then stick to them
- In the case of technical terms, if you vary them, the reader may think you mean something different (web user, evaluator, participant, tester ..are these all the same group of people?) (physical reality, the “real” world, …versus virtual reality)

Abbreviations and acronyms

- Specifying an abbreviation (abbrev) and then not using it is just irritating for the reader – the last thing you want
- Make a list of abbreviations as you go along; at the end, check that you have introduced them on the first instance of their use
- Make sure that any acronyms or abbreviations that you use without explanation really are understood in the field
- Don’t use too many abbreviations - again, think of the mental load on the poor reader

If there's disagreement about terminology, key concepts

- Do discuss different researchers' definitions, concepts if appropriate
- But make it clear where you stand - you are now an expert!

"According to Jones (2001), web accessibility is …. However, Smith (2004) defined web accessibility as …. In this thesis, I will follow Jones

Or: In this thesis, accessibility will be defined as …

Or: In this thesis, I will define accessibility as …

Conceptual analysis and definition of new terms may well be an important part of your contribution to the field

Politically correct interlude

- If writing about human beings, use non-sexist terminology

Not: “The web user was shown a scale on which to rate the usability of each site. He was asked to study this …”

- Easy way out - use the plural!

But: “Web users were shown a scale on which to rate the usability of each site. They were …”

If writing about particular groups of humans, personalize them

Not: “The elderly cannot see colours with the accuracy …”

But “Elderly people cannot see ..” (but elderly is a very broad term - can you be more specific?)

How to start … how to get over writer's block

- If you find it difficult to write - start by completely ignoring all these ideas
- Just sit down and write/type as quickly as possible all the ideas, thoughts, words about the topic you are trying to write about - then you can re-organize, analyse etc
- or work on the structure - I make little blobs for the sentences with just one or two key words
- Then I can concentrate on writing each sentence without having to worry about the overall structure

Using other people's words

- This might be something about plagarism, but let's think of this in another way
- If you literally use the words of other authors, it isn't your own voice, and will lead inevitably to a very uneven style - a bit from one author, a bit from another, or worse, a bit from X, a bit from you, a bit from X
- One thing you are being assessed on is the ability to explain other people's work in your words

Quotations

- So … keep quotations fairly rare and keep them brief
- Save them for really key points
- Particularly where the original author’s words are critical
- Of course, always acknowledge the source of material (Petrie, 2008)

Headings

- Use them (they help the reader), make them informative
- “Background research” - not very informative!
- “Previous research on web accessibility and usability”
- (some supervisors like only the standard headings like “Introduction”, “Methodology”)

Headings

BEWARE: don’t assume the reader has read the headings on the way through (may seem odd, but it’s definitely true)

So, don’t follow a heading

> “Research on Web accessibility and usability”

with

> “This area of research received little attention until the late 1990s.”

Must be:

> “Web accessibility and usability received little research attention …”

Figure and tables

- People seem scared to use them in project reports - but they can help a reader enormously
- It is OK to use a figure/table from a published source, if it’s acknowledged (usually in the caption)
- Each figure/table should have a clear, stand-alone caption
- Each figure/table must be referred to in the text (otherwise how will the reader know when to study it?)

Designing figures and tables

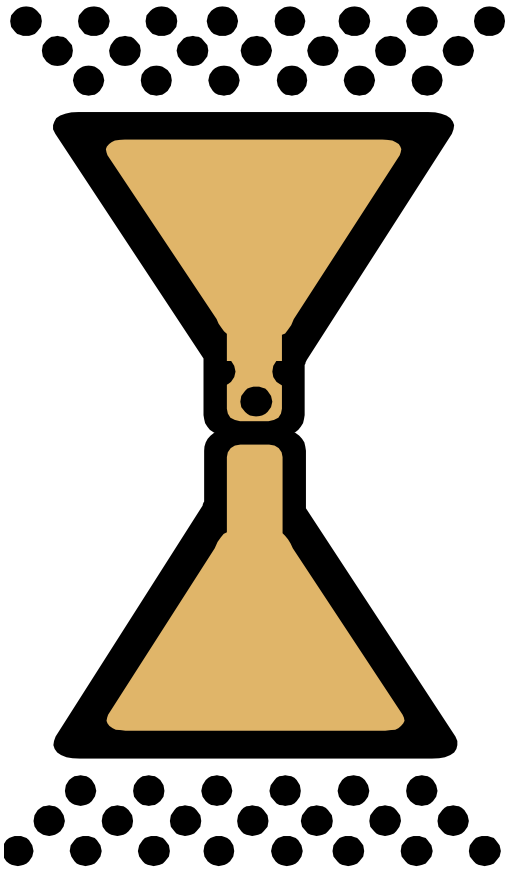
- Make sure they are sufficiently rich in information (would it be simpler to give some words?), but not too cluttered
- Are axes, objects all clear?
- Zobel has a good section on good and poor design
- Give figures/tables to a colleague and ask them what they mean

Allow (as much time as possible) for checking, proofing

- Use spell checks, but remember they are dumb, dumb, dumb
- Read yourself, out loud if at all possible
- Have someone else proof read if possible
- Remember, you won’t fail for the odd spelling mistake, but you want your report to look as professional as possible

Petrie's patented double funnel model of project reports

- Start general (but not too vague!) - what the project is about
- Get progressively more specific, to your specific project work
- The specific work of the project
- Discussing the project - relating to previous work, the general issues
- Conclusion - back to the most general level



Report marking

- You should know the criteria against which your report will be marked
- See link to Marking Sheets on http://www.cs.york.ac.uk/projects/index.php
- If you are going to deviate from ‘standard’ chapter headings, make sure the markers can find what they need

Report structure

- Title page
- Abstract
- Acknowledgements
- Contents
- List of figures / tables
- Main body
- References
- Appendices
- Glossary

Report structure

- Main body
  - Introduction
  - Literature review
  - ‘the core’
    - Requirements
    - Design
    - Implementation & test
    - Evaluation
  - Conclusions / Future work
- Relationships: V-model

Ethics and project reports

- Since Spring 2008, all CS project reports have been required to contain a *Statement of Ethics*, even if it is null: ‘There are no ethical implications …’
- Ethical principles:
  - Do no harm
  - Informed consent
  - Confidentiality of data
- http://www.cs.york.ac.uk/projects/Ethics.php

Writing an abstract

- Not just a contents list!
- Brief summary of the work, the context, how and major findings
- In general, it allows the reader to decide whether to read the whole thing!
- No references, no jargon or acronyms
- Context / Gap / Contribution

Tips on Writing (Dawson 2005)

- Set deadlines
- Write regularly
- Create a rhythm for work
- Write up sections when they are ready
- Stop at a point where it’s easy to re-start
- Get all necessary material together before starting to write
- Get feedback from supervisor

Sources of information

- Zobel *Writing for Computer Science*
- Strunk and White *Elements of Style*
- Dawson *Projects in Computing and Information Systems*
- For the specifics of constructions etc (if you are not confident) - Fowler's Modern English Usage, grammar, punctuation books
- Read literature critically for style - re-read papers, chapters that you found easy to read