Organization

A paper usually has the following basic sections: Introduction of problem, previous work, proposal for new ideas, results, future work and conclusions.

1. State what needs to be done and how you will accomplish it.
2. State the goal for the research in the first paragraph. This is so important. If I started telling you something without any introduction, you would have a hard time knowing how to listen to it: Is it a joke? Do I have a question? Do I want your opinion? Am I going to ask you for money? If I precede the story with, "I was wondering what you thought of this idea for making money." or "Would you be willing to contribute to a good cause?" you would listen differently - instead of wondering, "Why is she telling me this?"

Your reader never wants to wonder what you are trying to accomplish. You should make it very clear.

3. Help the reader understand where you are going and why they care. Often times the reader can't figure out what you really intend to do as there is just a mass of facts in the paper. State your goal early in the paper. Refer to it often. At the end, summarize what you have told us.

Tell us what you are going to tell us, tell us, then tell us what you have told us.

Think of it as writing a good novel. When an author writes a novel, he gives lots of clues as to how the pieces of the story fit together. If he wrote the whole book and it ended up that the murderer was someone never referred to in the story, it would be considered a poor plot. If the writer told you lots of things that were not important, it would get boring. The writer sets the stage so you can see the end coming.

Your writing should be like a novel. Give us lots of clues as to where you are going. Only tell us what is germane to your project. Every time you give us a fact, let us see how this helps to develop your plot. Even when you are giving previous work, tell us what the deficiencies are - so that when you present your ideas, we have a desire for a solution. Create in us a desire to know.

4. Space is a premium. Use it to build the case for your ideas. Don't squander it. If your paper relies heavily on a given technique (in the previous work section), discuss it thoroughly. If your paper doesn't use a technique (in the previous work section), refer to it briefly.

I heard a successful store manager say, "I dedicate shelf space in proportion to the popularity of the item. If I sell the most white paint, I have more shelf space devoted to it so that people can find it easily. If I sell very little green paint, I have a little shelf space devoted to it." You should do the same thing in your report. Use the lines of your report
in proportion to the importance of the contents. Don't waste a lot of lines on something that is not something the reader is looking for.

Don't showcase the ideas of others - but yours! Some of you are clearly looking for filler. You wander aimlessly between semi-related ideas. Don't. Such an approach is obvious.

5. Define unfamiliar terms. Skip the definition of familiar terms.

Know who your reader is. You don't want to insult the reader by defining a computer nor confuse him by not defining other terms.

6. When you criticize the ideas of others, do not discount your own ideas. Many said things like, "This is just my own opinion. It may be wrong. Feel free to ignore it."

Writers are supposed to give their own ideas. Everyone understands this. The reader always feels free to ignore advice he doesn't agree with. Don't give others an increased opportunity to ignore your comments. Demand to be listened to.

7. Be bold. If you aren't excited about what you have done, no one else will be. Don't understate your accomplishments (or goals).

Writing Specifics

1. Define unfamiliar terms before you use them. Present your ideas in a logical order. Don't use a term pages before you define it. Layer the material so the reader can understand complicated material. This seems like an obvious concept, but because you are so familiar with the material and write the paper over many weeks, it is easy to create a paper which violates basic order rules.

2. When you are defining a new term, italicize the word the first time you use it. Do not italicize it in other uses.

3. Stay in the present tense. Instead of saying, "There was a possibility of transmitting." say "There is a possibility of transmitting."

Instead of saying, "Compressing the digital signals decreased memory space" say "Compressing the digital signals decreases memory space".

Instead of saying, "Smith specified a way of computation" say "Smith specifies a way of computation".

4. Watch capitalization. Don't capitalize words that aren't capitalized when you find them in print. Use the original documents as a guide.

5. When you have a list of things, put commas between them. (Don’t omit the last comma.) This is especially important when individual terms can be compound. For example,

“The results are fast, repeatable, and important.”
“The menu lists hotdogs, liver and onions, chicken, and steak.”

6. Make sure that items underneath a header make sense without reading the header.

   For example, instead of

      Section 5: Communications
      This is important because...

   say

      Section 5: Communications
      Communication is important because...

6. Make sure a page break (or column break) doesn't occur immediately after a header.
7. Make sure a figure isn’t separated from its label.
8. Use a parallel form. Instead of saying “I enjoy eating, pop of all types, and cooking." say
   "I enjoy eating, drinking, and cooking."

   Instead of saying "These services evolved from being educational to commercial web sites." say "These services evolved from educational web sites to commercial web sites."

8. Watch subject verb agreement.

   Instead of saying "Each of these frames are independent." say "Each of these frames is independent."

9. Don't over-use non-specific subjects such as "this" or "it". Sometimes it is much clearer if you just restate the subject. This is particularly important if it isn't clear what the subject really is.
10. Don't use "I" in formal writing. Don't begin a sentence with "But" or "So" or "And".
11. Don't use contractions such as "don't". Write out the word.
12. Don't use etc. or e.g. a lot. Don't use a lot of footnotes - place things inside the text.
13. Don't use a lot of parenthesis. Work the item into the main sentence where possible.
14. Watch commas. Read about where they go. Poor use of commas is the most common problem I see.
15. Don't put a comma between a subject and verb.

   Instead of "Any person who knows how to handle data, can easily tamper with it." say
   "Any person who knows how to handle data can easily tamper with it." or "Any person, who knows how to handle data, can easily tamper with it."

16. Use symbols for numbers greater than 10, but use words for those under 10. Instead of saying "I found 1 or 2 ways." say "I found one or two ways."
17. Watch trite or folksy phrases (such as "I don't want to put the cart before the horse" or "nowadays"). This is a different mode of communication. Your writing needs to be more formal.
18. If you are not a native English speaker, you must hire a copy editor to read your paper. Your instructor wants to read your paper for content - not grammar.

Similarly, a good friend doesn't have the skills or the time to correct grammatical errors. To fix all the errors in a 50 page paper can take twenty hours or so. Just pay to have it done. Everybody will be happier - including you. If you write quite well, it won't cost you much as few changes will be needed. If you don't write well, the money will be especially well-spent. It will be much faster and far less frustrating. The writing center has a list of professionals who can help you with editing. Use tables, figures, charts, and examples to give variety to your paper. Pages and pages of pure text is hard to read.

19. When you present results or insert a figure/table, tell us what the results mean - don't assume it is obvious from reading the table. Make sure we are interpreting the results the way you intended.

20. Creating new notation or a new term for an idea often make writing about the idea easier. You can have special symbols or abbreviations for ideas which make writing more concise and clear.

21. When you introduce new notation or a new term, make sure the notation or term has a future (can be used in all the contexts you need it for), is extendible, lends itself to use in a sentence (as both a noun or a verb, for example), applies to a variety of contexts, is consistent with commonly used notation for similar things. Your notation may be very clear to you, but it may not be as clear to others. Be sure to state what the notation means.

22. Be careful with your use of acronyms. If a writer uses lots of acronyms that are unfamiliar to the reader, it can be quite distracting and make reading very difficult. Limit the use of acronyms to the ones that are important to your paper. Even then, occasionally you should write out the acronym - for variety as well as for clarity.

23. When you are given an article format to follow, follow it exactly. You must match font size, column width, font type, spacing, the way of referencing, etc.

**Using the references**

1. We use citations to give credibility (show you know what you are talking about and are aware of recent research) and to give proper credit to others. You should have at least seven citations from recent work that is publicly available.

2. Look at journals to learn how to reference citations. Do not place the whole reference within the body of the text.

3. Make sure the references are from refereed sources (not just trade magazines). Sometimes this information is not on the printed article, but MUST be present as you reference it.

4. Make sure references are current (the majority should normally be from the last five years).

5. If you find material on a web page that also exists in printed form, reference the printed form. Avoid too many webpage references for the following reasons:

   1. The webpages may disappear over time.
2. The articles may not be refereed or of high quality.
3. It appears that you did your research by doing a google search rather than going to established, peer-reviewed sources.

6. **Be careful about plagiarism.** On written work:

1. You may never quote exactly from another source without including the quoted text in quotes or italics and specifying the source. You should not have a lot of quotes from other papers.
2. If you use ideas (or figures or program segments) from another source, you must give credit in each paragraph where you refer to their ideas. (The reader cannot tell how many paragraphs are referred to with one reference.) **You are not allowed to copy figures in your thesis/report without written permission from the author.**
3. You are not allowed to use word phrases from another source - unless they are well established ways of describing something. When you don't copy word for word, but the order of presenting and much of the wording is a lifted from another source, there is no way of properly identifying this: quotes aren't appropriate and a simple reference doesn't convey the degree of copying. *The safest thing to do is avoid this type of copying totally.* Shut the reference and explain what you have read in your own words. If your paper includes words that are not part of your vocabulary but are words the original author uses, it is inappropriate.
4. You are not allowed to use figures without citing the original source as the source of the figure.
5. Don't quote others, especially when there is nothing special about the quote.

**Common Problems on Proposals**

1. Propose something. You can't just talk about what others have done. That is a survey paper, but not a research paper. We use the term "research paper" to mean YOUR research, not someone else's. You must propose something that is new.

2. Ask yourself, "Why hasn't this been done in the past?" If you are proposing something obvious, you need to consider why no one else has thought of it.

3. Ask yourself, "If I run these tests, what am I likely to discover?" As a researcher, you must design experiments which have the most potential for interesting results. Sometimes you are proposing a simulation study in which the results are obvious. You code agents to behave in a certain way, they do, and the results are known as they can be computed mathematically. You don't need to run tests to discover what will happen. For example, in class we discovered that with n bidders with uniform distribution, the bid with the most utility had a given formula. If you run tests with this setup, you are just going to discover the formula is true. You need to do something more interesting. For example, what if the bidder's evaluation changed (based on demand), the bidder learned his behavior (becoming
more aggressive based on past success/failure), sniping extended the deadline of the auction, etc. Look to recent papers to get an idea of the kinds of things others are researching.

4. Avoid too many direct quotes – especially for ideas that aren't that unique. For example, I would want to quote the following: Robert Hughes said, "A fair price is the highest one a collector can be induced to pay."[2]

However, I wouldn't need to quote Jeffrey Archer as saying, "I am currently doing about 30 charity auctions a year." Rather, I could say, Some people do many charity auctions a year. In Jeffrey Archer's case, the number is nearly 30 [2].

In both cases, I give credit to the source – I just don't always quote exactly.

5. Use your references throughout the paper. I couldn't say "Some people do many charity auctions a year." without citing a reference UNLESS the fact is generally known. Citing others does the following:

a. Gives others credit for their ideas.
b. Shows you are NOT claiming the ideas as your own.
c. Sets you up as someone who is well-read in the area.

However, if you always cite the same one or two sources, it backfires. People think, "Why should I be reading Olsen's paper? The real authority is Smith. I'll just read that author."