

Computer Engineering

ECSE-322B

Winter 2008

Design Project

The Project:

The goal of the project is to research some issues in a certain area (or areas) of technology associated with this course. As you do so, you will notice that today, computer technology exists in many forms other than the traditional laptop and desktop machines that we are most familiar with. Computers are everywhere! This project will have you examine a particular device and marvel at the fact that the concepts that we have discussed in class can be applied to an arbitrary computer system.

In addition to research, the project is meant to be a *design project* – in other words, the research you will be doing is targeted at solving problems related to a design issue. You are not expected to come up with a detailed design – rather the intention of this project is a first stage design or feasibility study. You are expected to try to predict the progress of technology over the next three or four years and determine what might be feasible at a commercial level.

The following describes the background for the design project:

The use of information processing technology permeates every aspect of modern life from domestic appliances to entertainment systems to communications devices. Over the last two decades, the processing power per dollar has increased almost exponentially while, simultaneously, the size and power requirements have reduced. Pocket sized devices now exist which can replace many of the roles that paper based systems used to (and often still do) fulfill from diaries to books to personal accounts, etc. In addition, the possible ubiquitous connection to wireless information delivery systems can allow access to almost any information at any time. It is likely that such systems will continue to increase in power over the foreseeable future.

However, one of the big issues with these devices is that the small size might also be considered a disadvantage in that the screens cannot display a large amount of information and the keyboards for text input are difficult to use. For these devices to increase in popularity, work needs to be done in resolving these problems.

The scenario being considered is as follows:

Traditional paper-based books have provided a method for the mass distribution of information of a variety of forms ever since the invention of the printing press. However, such systems involve the use of natural resources (paper) and have an environmental impact in their creation and distribution. However, they remain popular because of their capability of presenting information at any time and wherever a user (reader) desires. Searching is simple and they require no power or special facilities.

Given the capabilities of modern information processing, it is possible to deliver much of this information wirelessly to a small device about the size of a conventional paper-back book and, indeed, e-book readers, as they are known, have been appearing sporadically for several years. The problem with these is two-fold. The first is that there has to be a sufficiently large library of books in electronic form which are easily accessible; the second is that the device must require, essentially, no power and be usable in almost any environment from the kitchen table, to the aeroplane, to the beach or swimming pool. It is clear that e-book readers are set to become a much more mainstream technology but the question is when? Does the technology exist to really replace the functionality of a conventional book? Can this be done cheaply enough that a sufficiently large market will be created? The factors which will control the answers to these questions are clear and amongst them are:

- Cost
- Battery life
- Display size
- Input system
- Memory and processor capabilities
- Etc.

A market survey has shown that there could be a huge demand for these devices if solutions to many of these problems can be found over the next few years. Consequently, a new high technology company is to be formed to develop and market a next generation e-book reader. Such a system must provide wireless connectivity to information and communication systems whenever possible; have an effective method for displaying a book with a flexibility which matches a current book structure.; be no larger or heavier than an average paper-back book of today; be robust enough to survive in a relatively hostile environment (humidity, mechanical shock, etc.); provide a battery life of several days and has a cost below about \$300 Cdn. The target release date for such a system would be about four years from today, with a prototype being available in about three years (i.e. in 2011).

The first stage in designing the new system is a feasibility study. The goals of this study are to determine what technologies will exist at the target prototype date that would be useful in the new device, what the cost of these technologies is likely to be and what the device would be able to do. The results of the feasibility study will be passed to a marketing and sales team as well as management to determine if the project should be pursued further. If the decision is positive, the design will move to a detailed level.

This project is concerned with the feasibility study. Each group will research the areas of technology involved in the proposed e-book reader and produce a report both detailing the technologies which will be used and the overall architecture of the system. Management will then consider these reports to make its decision on the final design. The system requires several areas of technology to be researched. These are:

1. **Processor Technology/ Operating System** – the reader will be a fairly complex computer system and will require a processor and operating system. What are the requirements on the processor and operating system? What is likely to be available?
2. **Memory system** – Some level of memory will be needed both for the operating system and for storing books and preferences. How much memory? What speeds? Volatile or non-volatile? Removable or not?
3. **Bus Structure** – with Input/Output devices including a tablet and/or keyboard and display; wireless communications; and a memory system plus, possibly, extra plug in devices, what bus might be useful?
4. **Input/Output system** – The proposed device will need an I/O system, but will this be a “conventional” display and keyboard or could it use alternate systems? For example, it might also use voice input and output as well as allowing some type of pen input as is found on tablet PC’s currently.
5. **Communication and expansion** – As mentioned above, a wireless capability is seen as a fundamental requirement. Should only one system be implemented – or should the machine be given Bluetooth and infrared capabilities as well as IEEE 802-11?

Each team should address each of the above issues and produce an overall, possible design for a prototype device for 2011. The goal is to look at trends over several years and predict ahead. *Note that for delivery to consumers in 2012 the design (and prototype) has to be complete in mid 2011 (i.e. about 3 years from now) and the technologies to be used should be those that will be available at around that time (remember that processor power, memory, etc., double about every 18 months).* Also critical in this application is robustness (i.e. reliability). The weight of the device is a consideration.

The results of the technology survey and a proposed design/feasibility study for the subsystem should be submitted on or before April 4, 2008.

For the project in ECSE-322, *each group should propose a suitable solution or set of solutions.* This proposal should include:

1. an extended set of specifications for the design being considered by the group;

2. the current state of the art for the components in the design and a forecast of the state of the art in 2009 (the target design time for a prototype);
3. the size, weight and power consumption;
4. a proposed design for the device along with the potential costs (note that the price given above may be considered to be that before marketing and sales costs are added and it is assumed that there should be some cost savings through large scale production);
5. recommendations for the component(s) (hardware and software) to be used and why.

Any questions regarding the project should be emailed to me at david.lowther@mcgill.ca using the subject heading "*Question for ECSE322 Project*".

Note that the time to be spent on this project should be about 10% of the time available for the course or about 10-11 hours per student. Assuming 5 members of each group (the recommended number), the project should occupy no more than 50 hours maximum. As part of the report, each group should detail the hours spent by each group member on the project (in terms of each week and the hours put in by each member). Week 1 is considered to be the week starting February 18, 2008.

Each of these proposals should be reported in about 12 pages including references. The survey should come up with a recommendation for your part of the design. Note that marks will be deducted for overlength reports.

D.A.Lowther
President
Paperless Books Inc.

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Report Structure

The information here is a repeat (and slight expansion) of the information given at the end of the project description.

The report should consist of sections as follows:

1. **Introduction**

This should explain the rationale behind the project (feasibility study), the methodologies used and the goals being set. (max 1 page)

2. **Extended Specifications**

The specifications given in the project description are, essentially, very vague. Some rough requirements have been set – i.e. the weight and overall size and the cost. However, nothing has been said about accessing books, the battery life, the display structures, etc. You need to work through these and develop a larger set of specifications which you will design to. (In effect, for those who have done 211, this is the User requirements definition.). However, note that this should not take more than 2 pages since the entire report (excluding appendices) should be no more than 13 pages (marks will be deducted for overlength reports)

3. **Current State of the Art**

for the components in the design. A brief statement should be given of the state-of the art in each part of the design. Note that this shouldn't be more than a couple of paragraphs and the total ought to be about 2 pages.

4. **Forecast of the State of the Art**

This is the interesting part. What is likely to be available in 2011? Where are the developments going? You could do a prediction by tracking developments for, say, the last decade and then extrapolating. Note that you are interested in developments which affect the e-book reader design and capabilities – not general purpose developments – for instance, the availability of 128 core machines may be interesting but is it really useful? Again, keep this relatively brief and no more than 2 or 3 pages.

5. **Proposed Design**

high level details of the design plus estimated costs of the components. A system block diagram would be helpful here. The estimated cost of the components is difficult to do but you will have to try to extrapolate from today. Usually, the latest technology is expensive but if it is a year or two old, the price drops dramatically. Again, keep this to about 2 pages.

6. **The Size Weight and Power Consumption**

Very briefly address this – it might be best done in a simple table – about half a page.

7. **Recommendations**

why did you choose the components you did? What were the other choices? i.e. a rationale for the decisions you made. Highlight the choices but on;t use more than about two pages.

8. **References**

these should be real references used in the text, not just a bibliography. So, references should use the IEEE style, i.e. in the text a reference will be put in as [1], and then in the reference section, it will be given as” [1] Author,A, “the first reference,” IEEE Spectrum, vol x, 2008, pp.1-15.”

Please note that marks are given for doing this right. If the references are not referred to in the text, marks will be deducted. If there are no references, there will be no marks given (footnotes on pages do not count as references). This should be no more than about 1 page.

9. **Timeline**

A timeline, i.e. a table or graph showing each week and which tasks were accomplished by each team member during the week (and how many hours were spent by each tem member). This will be used to allocate the marks to each team member. It is expected that each member should put in the same number of hours over the entire project. The timeline should show the total number of hours put in by each team member and this should not exceed 12 hours per member. Note that about 10% of the marks on the project report will be given for a clear timeline.

The total report should not run to more than 13 pages of 10 point Times New Roman font single spaced – excluding appendices (which can contain material which is relevant but will not be marked), the cover page, the table of contents, and the timeline

Note that marks will be deducted for overlength reports. 5% will be deducted for each page over the limit.

The report must be signed off by all the team members, i.e. their signatures must appear on the cover page and, in particular, on the timeline page. Marks will be deducted if they do not appear on the timeline page.