

Purpose

- *Report* on best design option
- *Present* supporting evidence
- *Request* feedback

Format

- *Short* report (3-4 pages)
- Memo, *not* letter
 - Addressed to *project manager*
 - *Meaningful* subject line
 - *Initialed* by one person
 - Whole team must *approve* and *initial* on last page
- Use *headings*, subheads
- Remember *white space*
- Include *references*, IEEE style

Introduction

- *Define* history (*briefly!*)
- *Describe* development of solution
- *Summarize* constraints and assumptions
- *Define* team goals clearly

Body

- *Describe* team's actions to date
- *Discuss* design alternatives
- *Refer* to sketches as appropriate
- *Number* Figs, Tables (Fig. 1, Fig. 2, ..., Table 1)
- *Explain* decision-making criteria
 - Show *decision matrix*
- *Demonstrate* to project manager validity of your decisions

Summary

- *Discuss* scope of work
- *Describe* implementation strategy
- *Revise* timeline
- *Request* manager's approval to continue

Oral presentation

- Present project plan *orally*
- With visual aids
- Different presenters!
- Everyone presentable!!

(See – no, *read* – page 4-7 in Student Guide and GWE pp. 93-108)

Memorandum for: Deanna Young, Project Manager
From: Matt Young, Handyman Extraordinaire
Subject: Interior lighting of living room
Date: February 11, 2004

The purpose of this memo is to present my plan for supplying efficient lighting for the living room at 1000 Pitchblack Road in Boulder.

[Problem statement, from clarification memo or letter of understanding.] The problem is to replace the lighting system in the living room, an area of approximately 18 x 15 feet. The living room houses a small couch, 4 rocking chairs, an antique carpenter's chest, and an assortment of sideboards such as an antique dry sink. The lighting is to be

- as efficient as possible and
- white, that is, a color temperature of 2700 K or more

In addition, there are constraints:

- a single, central ceiling light is prohibited,
- glare must be minimized,
- the old color photographs on the walls must be protected from short-wavelength light, and
- the cost must be less than \$200

[From letter of understanding, updating information in clarification memo.] I understand that two individuals will have to read at one time, but the room will have to be lit well enough for a dozen or more to engage in conversation without directly viewing a bare bulb, and that you plan to rearrange the furniture in the room constantly.

[From LOU but updated.] As you know, I have considered task lighting that uses incandescent bulbs [1], compact fluorescent bulbs [2], and low-pressure sodium lamps [3] in reflecting fixtures. Low-pressure sodium lamps are the most efficient, but I have ruled them out because of their color. I have, however, added quartz-halogen bulbs [4], which are best used in track lighting.

I have retained the compact fluorescent bulbs because the photographs are all under glass, but I caution that the photographs should never be exposed directly to a compact fluorescent bulb.

I considered translucent reflectors in order to illuminate the room away from the task-lighted areas. Finally, I considered mounting the bulbs on portable fixtures (floor lamps) or on several tracks in the ceiling because of your penchant for rearranging the furniture each week.

[New material.] The first decision I had to make was to choose the type of bulb. I drew up a decision matrix, as shown in Table 1. [Insert Table 1 somewhere below its first citation but within 1 page. Make sure it does not cross a page boundary.]

[Explain every element in the decision matrix.] The initial cost of an incandescent bulb is lower than that of a compact fluorescent or a halogen bulb [5], so I assigned a value of

4. A halogen bulb is slightly more expensive, and compact fluorescent bulbs are several times more expensive when measured in dollars per lumen. Incandescent bulbs are the most expensive to operate, so I assigned a value of 0. Quartz halogen bulbs are only slightly more efficient, and compact fluorescent bulbs are approximately 4 times more efficient. [Leave white space above and below the table. Note the formatting of the table: 3 rules, centered columns.]

Table 1. Choosing a light bulb.^{a, b}

Type of bulb	Initial cost	Operat-ing cost	Color	Glare	Total
Incandescent	4	0	3	4	11
Compact fluorescent	0	4	2	4	10
Quartz halogen	3	2	4	1	10

^a Scale of 0 to 4, with 4 the best

^b Sodium lamp has been ruled out because of color

Halogen bulbs have a higher color temperature than incandescent, so they render color slightly better [6]; hence I assigned values of 4 and 3. Compact fluorescent bulbs are not bad but measurably poorer, so I gave them a value of 2.

Finally, halogen bulbs are point sources in small reflectors. If I use them at all, I will put them in the ceiling, where the filaments will be visible; hence, I rated them 1 for glare. The other bulbs are diffuse or have diffuse envelopes, so they do not cause glare. In addition, they may be placed in reflectors. Hence they both got 4 for glare.

[Draw a conclusion based on the evidence of the matrix.] Surprisingly, the incandescent bulb wins by a small margin, but the values are too close to permit a definitive conclusion. If, however, we consider the lifetime cost or the energy consumption of the bulbs to be a tie breaker, we will choose the compact fluorescent bulb, whose energy use more than offsets its initial cost [6]. We can achieve the same result by refining the decision matrix and assigning the "Operating cost" column a weight of 2.

[If this had been a harder decision, I could have drawn up another decision matrix.] Compact fluorescent bulbs cast a relatively diffuse light, so they have to be located comparatively close to the work area. Additionally, you want extreme flexibility in locating the light sources. We have therefore ruled out wall-mounted fixtures in favor of floor lamps. These will use translucent lamp shades to reduce glare yet diffusely illuminate the room. The bulbs will be located approximately 125 cm above the floor to facilitate reading. Figure 1 shows the proposed locations of the lamps, given the floor plan of the moment.

[From LOU.] Here is a list of deliverables:

- project plan (oral presentation and written report)
- subsystem analyses
- preliminary drawings of floor plan showing locations of lighting fixtures
- lighting fixtures assembled and installed according to the floor plan of the day

Table 2 is a proposed time line. [You will probably want to revise your time line and show each subsystem individually, presuming that some activities depend on others.]

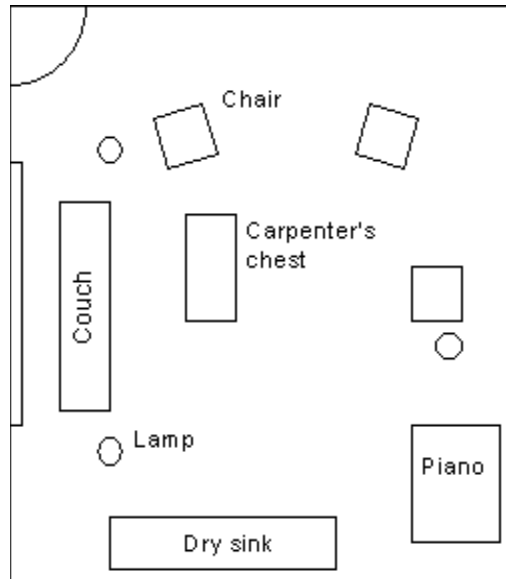


Figure 1. Floor plan, showing locations of lamps (circles) with respect to chairs (squares and other furnishings).

Table 2. Revised time line.^a

Task	Year	2004	2005	2006	2007
Submit project plan		xx			
Define subsystems		xxx			
Choose bulb (wattage)			xxxx		
Choose lamp shades				xx	
Provide drawings			xxx	xx	
Buy hardware					xxx
Assemble, install fixtures					xxxx

^a Each x represents 1 month.

I am confident that you will find the lamps and bulbs more than satisfactory, and I cannot tell you how much I am looking forward to another 40 years of dishwashing. If you have any further concerns, please contact me by e-mail at mmyoung@mines.edu.

References

I have supplied dummy reference numbers in what seemed like appropriate places but no actual references. Please use IEEE format for references. You may find that format described in your Epics handbook. See also *GWE*. References 2 and 4 in Figure 6-9 on p. 151 of *GWE* are formatted incorrectly. The bibliographies at the ends of chapters provide better examples, but they are not in IEEE format. Here are some sample references in IEEE format:

Journal article:

[1] William Bialek and David Botstein, "Introductory Science and Mathematics Education for 21st-Century Biologists," *Science*, vol. 303, no. 5659, pp. 788-790, 2004.

Magazine article:

[2] Michael A. Golub, "Laser Beam Splitting by Diffractive Optics," *Optics and Photonics News*, February 2004, pp. 36-41.

Book:

[3] Matt Young, *The Technical Writer's Handbook: Writing with Style and Clarity*, Mill Valley, Calif.: University Science Books, 1989.

Web page:

[4] Thomas J. Schneider, "Information is Not Entropy, Information is Not Uncertainty!" <http://www.lecb.ncifcrf.gov/~toms/information.is.not.uncertainty.html>. Accessed 6 December 2001.

Note where italics and quotation marks are and are not used (it's spelled out in *GWE*, p. 150). Note the use of article titles and inclusive pagination (first and last pages). Do not write "WWW document" or "Online document" when you cite a URL. If a Web page has no author, begin with the title. If the reference is in an online journal, treat it as a journal article but give the URL. Do not hyphenate a URL if you have to break it at the right margin, but break it in a sensible place such as a period or a slash.