The Undergraduate Report and Essay: An Analysis of the Relevance of Each Genre to the Writing Skills Required by a Professional Engineer*

HEATHER SILYN-ROBERTS
Department of Mechanical Engineering, The University of Auckland, New Zealand

This paper analyses the placement of information and the purposes of the report and the essay, and examines the relevance of each genre to the development of the skills needed by a professional engineer.

Reports and essays are different in both structure and purpose. Reports are often skimmed or selectively read; therefore the order of placement of information and the formatting critically affect the reader's ability to be able to access the required information. In contrast, essays present an argument in a linear form, and are meant to be read from beginning to end. Formal letters serve the same purpose as a report and although unformatted should thus be written according to the same principles.

Professional engineers often use the principles of essay writing when designing reports, making it difficult for the reader to access the information. It is argued that we may be disadvantaging most engineering students—those to whom writing holds no intrinsic interest—by requiring them to write in two different ways.

1. BACKGROUND

THE CURRICULA of engineering schools often require students to write in two different genres: the report on technical areas of the curriculum; and the essay, often required in the broad-based general studies aspects of the curriculum. The essay is usually required to be a 'proper' essay—visually unformatted (i.e. no headings), and showing the writer's presence in the development of an argument.

Analysis of the professional engineer's attitude to writing [1, 2] has shown that their view of it—and indeed their often deliberate choice of science subjects—has been deeply shaped by their school experiences of English lessons. In particular they believe that they lack writing skills; they also have a deep-rooted dislike of the word essay. Moreover, it has been found that the psychological types common amongst engineers fall largely into bands that devalue communication [3].

This paper asks whether we are confusing most of our students about professional requirements, and doing most of them—and their future employers—a disservice by requiring them to write in both report and essay formats. It examines the structural requirements for the report, the essay and the letter from the point of view of the necessary skills for the professional engineer. Only the structuring of information is addressed

here; the question of stylistic elegance of word choice is not.

2. THE DEFINITIONS AND REQUIREMENTS OF A REPORT, AN ESSAY AND A LETTER

The report

The aim of a technical report should be to maximize the ease of retrieval of information by the reader. It should not have to be read from beginning to end; it should be structured so that readers are able to extract only the information that they need.

The essay

According to Williams [4], 'the minimum definition of an essay [is] that it is a piece of prose... which is not devoted to narrative. The essayist's usual role is that of the social philosopher, the critic, the annotator'. The primary function of an essay is to present a persuasive argument, in which the writer's presence can often be strong. The argument is developed linearly, and is not visually formatted by the use of headings and subheadings. An essay is therefore designed to be read from beginning to end.

The letter

A formal letter of the sort required from a professional engineer is similar in function to a

report; it is essentially a short report, the function of which is to transfer information. Therefore, even though it is visually unformatted, it should be written according to the principles of report writing.

The essential differences between a report and an essay are given in Table 1.

With these differences in mind, we will now consider the features of a well-constructed report, one that maximizes the ease of information retrieval by the reader.

3. THE TWO ASPECTS OF A REPORT THAT MAXIMIZE INFORMATION RETRIEVAL BY THE READER

Professional engineers admit to rarely reading the whole of any report, and to employing a strategy for retrieving information that can be described as hierarchical [1, 2]. The following processes are used, in the order given:

1. The Summary/Abstract is first sought out, whether it is at the beginning or end of the report.
2. The Recommendations, where present, are next read.
3. The Contents page, where present, is analyzed for the report's structure.
4. The Introduction/Background may be briefly scanned.
5. The section headings are scanned, and the ones relevant to the reader are identified.
6. The material in the selected sections is scanned.
7. The graphics are often scanned.

This reading strategy, though often not consciously employed, is one that first identifies an overview of the substance of the report, and which then progressively narrows down to the identification of only that information that the reader needs. This reflects a pressing need to obtain overviews at successive stages so that the rest of the material can then be assessed.

Therefore, to make it as easy as possible for a reader to retrieve information from a report, the writer should use two strategies: (1) the order of presentation of the information, and (2) formatting.

Strategy 1: the presentation of material in the order in which the reader expects it

A reader is best able to evaluate information if it is presented in the order in which he or she expects it [5]. This important concept in cognitive psychology is only now being appreciated in its application to technical writing. In simple terms, readers are better able to evaluate a body of information if they know beforehand the outcome of that information.

The most obvious example of this concept is the principle of placing a summary at the beginning of every report. A summary serves two functions, one obvious, one less so.

1. The *obvious function* is to give an overview of information for the reader with no time to read the whole report.
2. The *less obvious function* is to prime the reader with the overview and outcome of the material so that the body of the material may be better assessed.

The justifications for a report's decisions will always be better assessed if the reader knows at the very beginning what those decisions are. This is therefore strong support not only for having a

Table 1. The report and the essay: differences in structure and purpose

The Report	*The Essay*
A form of professional writing. Its aim: to maximize the ease of retrieval of information by the reader.	A more literary form of writing. Its aim: to develop a linear argument.
Often skimmed or selectively read	Must be read from beginning to end.
Should be designed so that a reader does not have to read an entire report to extract the necessary information. Heavily formatted.	No text formatting, i.e., no headings, subheadings, bold-facing, bullet-points, etc.
Its information should be presented in the order in which the reader finds easiest to assess: overview and outcome first, followed by the justifications.	The material is presented as a linear argument, with the climax often appearing at the end.

Summary at the beginning, but also for placing the Recommendations section immediately after the Summary (which is a suggestion that many organizations readily adopt), and even for following it with the Conclusions section (which is less acceptable to many).

This principle can be applied not only at a whole-report level, but also at a lower level; section summaries when present are used by readers in this hierarchical reading strategy.

Strategy 2: formatting techniques

These techniques, too well-known to need detailed description, may be summarized as follows:

- Using headings and subheadings.
- Using the decimal system of numbering headings and subheadings
- Making the headings and subheadings informative in themselves so that they form a brief summary of the section
- If sections are long, placing section summaries at the beginning of each.
- Making the headings stand out by the use of centering, bold-facing, using capitals, initial capitals or small capitals, and indenting material below the headings.
- Making specific points in the text stand out by bold-facing key words, or listing within the text by bulleting (dot-pointing) or numbering.

There are two results of visual formatting: (1) the reader can readily find and extract the required information, and (2) reports do not present the reader with pages of black text. This psychological aspect—that of making a report look other than daunting—is of the utmost importance for the reader.

Conclusions about the report as a genre

- Its aim must always be the maximum ease of information retrieval by its reader.
- A writer of a report should never expect that it will always be read thoroughly from beginning to end. It is far more likely to be skimmed or selectively picked through, using a hierarchical form of information extraction.
- Its information is presented in the order in which the reader expects it: overview and outcome first, justifications next.
- It is a document that is heavily formatted, using a variety of formatting strategies.

4. IS WRITING ESSAYS OF VALUE TO ENGINEERS?

The essay, in contrast to a report, is designed to be read from beginning to end. Its purpose is the development of a logical argument without the aid of visual formatting, relying only on word choice to present that argument. Indeed, this is its prime justification as a form of assignment. An essay is read in its entirety; the reader does not skim-read an essay, nor selectively extract sections.

It is sometimes argued that the essay is valuable because it teaches students to write letters. It is proposed in this paper that this is based on a fallacy—the belief that because a letter is visually unstructured, then it must be like an essay. It is not. A formal letter is a report in miniature; its information should be structured in the same way as a report—for maximum ease of information retrieval. However, in the absence of visual formatting, the only strategy that can be used to aid information retrieval by the reader is that of presenting the information in the order in which the reader expects it. The message —even if it is negative to the reader [1, 2]—should therefore come at the beginning with the justifications following.

Attitudes of professional engineers to writing

The writer has now run courses in report structuring and wording for more than 600 professional engineers and technical specialists. Data gathered from this work show that engineers spend far more time writing than they ever imagined as undergraduates: a new graduate engineer will spend at least 30%; this will rise within 5 years after graduation to 50–70%; and senior management can spend as much as 90–95% [1, 2].

They thus spend a considerable amount of their professional life engaged in an activity where many of them feel inefficient and unprepared. It is useful to examine their attitudes, and also their methods of approaching writing. Professional engineers' innate feelings about writing are often molded by their early educational experiences, even after years of professional practice.

The attitudes that are common to many professional engineers and engineering students are:

- They disliked writing at secondary level education.
- They think of all writing as somehow allied to literary writing, and therefore feel that they are intrinsically poor at it.
- The very word essay, with its literary connotations, has a negative effect on them.

The concept of essay-writing therefore colours their attitude to report writing. Armed with little or no formal instruction in their undergraduate years in the requirements of report writing, and with a pressing need to justify their decisions, many senior engineers resort to ill-remembered precepts of essay writing learnt years ago in school. Their methods, often automatic and without a conscious strategy, may be summarized as follows:

- open the document with the background information, often lengthily;
- develop the argument, often chronologically;
- come to a conclusion, often hidden within the text;

- finish the document with a paragraph akin to the concluding paragraph of an essay.

A reader finds accessing the information in such reports difficult. They may be minimally structured under sparse headings, but they are designed like an essay—to present a linear argument. They are not easy to skim read, neither can information be selectively extracted from them.

Most report writers who adopt this style acknowledge that they are not writing with the reader's need for information access in mind. Once the requirements of the reader are discussed, they readily acknowledge that it is far preferable to structure according to the principles described in Section 3 above.

5. CONCLUSIONS

In the absence of instruction, professional engineers tend to use the principles of essay writing when structuring the information in reports. Even when the document is visually structured by the minimal use of headings, the structure is that of an essay—the development of an argument in linear form. Such a structure is poor for the retrieval of information by the reader.

Essay writing cannot be justified as being good practice for letter writing. Letters are reports in miniature; like reports, their function is that of information transfer. Therefore, even though they are visually unformatted, the order of presentation of information should follow the same principles as those for reports.

When we require our students to write both essays and reports, we are asking them to adopt two separate styles of writing that are very different in the structuring of the information. Most engineers will frequently have to present a reasoned argument in the form of a technical report, yet will never have to write an essay again after they graduate.

Most engineering students are not interested in writing for writing's sake. They are not concerned with the arcane subtleties of the differences between the two genres; to them, writing is only one of a number of tools that they will have to use in their professional life. Instead they want clear guidelines about something that will help them become good engineers. The better students undoubtedly take essay-writing in their stride and may even be interested in it as a genre. But the less able students are often resentful of the essay and confused about what is required for professional writing.

We therefore have to ask ourselves whether we are disadvantaging many students by teaching them essay-writing skills. If we are convinced that we can teach all students—not only the more aware students—in such a way that they clearly see what is needed in their professional writing, then perhaps we are justified in asking them to write in both genres. If so, I would still suggest that the word essay is not used as a description for the assignment. To students who perceive themselves to lack writing skills, the notion of an essay has too many negative connotations.

However, if we believe that the future needs of the majority—and of those of their employers—are better served by giving them a set of pragmatic and unequivocal principles by which to write, then we should question the value of essay writing in the engineering curriculum.

Perhaps we should instead be asking ourselves: if engineering students are required to write a discussion of the incorporation of cultural values into the practice of engineering, or of the influences on art of twentieth century history, could they not present their reasoned argument just as convincingly and usefully in the form of a research report?

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Heather Silyn-Roberts, B.Sc. (Hons), Ph.D., is Lecturer in Engineering Communication at the School of Engineering at the University of Auckland. She is responsible for developing communications skills programmes at all undergraduate and postgraduate levels in the school, and also lectures in the Department of Mechanical Engineering. Her research interests are in the fields of biomaterials and engineering education. She has run more than 65 one- to two-day in-house courses on technical writing for professional engineers, scientists, local authorities, and media groups, and has written a textbook for engineering and science undergraduates, published by Addison-Wesley Longman, on the writing of reports and essays. She is now gathering material for a book for German-speaking scientists on the writing of papers in English.