MANAGEMENT ORIENTED DOCUMENTATION OF SIMULATION

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ABSTRACT

Simulation documentation for management is the written report that describes what a simulation does. It acts as a communications medium between the simulation modeller and the recipient of the report.

The major problem with most management reports is the level of difficulty that reader faces. Wading through paragraph after paragraph of turgid prose makes a management report difficult to read.

This problem can be overcome by careful attention to the rules of good technical writing. It is best handled by a documentation specialist rather than the simulation modeller, because the skills required for clear documentation are different from the skills required to design and program a simulation.

Management oriented documentation is oriented toward the presentation of conclusions and recommendations. It will add about 10% to the cost of a simulation project. But without good documentation the project may be wasted.

INTRODUCTION

Documentation is communication. To document a simulation means to describe the way a simulation works. We can talk about the simulation model. We can talk about the results we get from the model. We can talk about model assumptions, and model validation, and the way we tested the model. But all of this talk is wasted if nobody listens. Therefore, to document is to communicate a simulation to users.

There are many users of the simulation documentation. Modellers use it to change the model. Programmers use it to change programs. Operators use it for run instructions. And managers use it to make decisions. Here, in this paper, I will focus on this last group of users.

Managers need to understand the simulation before they can use it. Communication is the first step in understanding. But to understand a simulation takes more than just understanding the simulation model. Understanding means knowing how the simulation fits into the user's area. It means knowing how to use the model as an aid in solving problems. It means being able to make trade-offs with confidence. Hence, to the extent that documtation helps to build understanding and confidence, the documentation task improves the model.

In the following sections, I will look closer at the role of documentation in communication. I will start by talking about the general setting. Then I'll look at the problem of writing and how to improve it. I'll close by giving you some idea of the costs of making your documentation more understandable.

THE CONTEXT OF SIMULATION DOCUMENTATION

This section gives you the setting for the discussion of management oriented simulation documentation. It identifies the main actors. It places the documentation as a bridge between the manager and the modeller, and as a bridge between the problem and the simulation model. As such, this section shows the role that documentation plays in communication.

Figure 1 summarizes the relationships between the documentation (management report) and the other major elements in a simulation problem context.

FIGURE 1: RELATIONSHIP OF THE MANAGEMENT REPORT

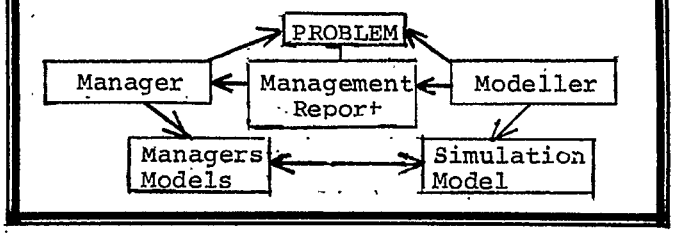

Figure 1 shows a management report as the central item between two major actors: manager and modeller. Actually, both manager and modeller stand for groups of people. The manager stands for all the people who have to use the simulation model. The modeller stands for all the people who create the simulation model and who write the documentation (the management report).

The management report also stands between the problem and the simulation model. Here the problem stands for any application area. The simulation model is the symbolic image of the problem area. The management report shows how the problem has been translated into the simulation model.

The manager and the modeller see the problem from two different viewpoints. Each creates his own model of the problem. Only if the manager and the modeller are the same person will their view of the problem be the same. Since this is not normally the case, two models of the problem exist.

But the two models overlap. Some items of the simulation model are the same in the managers model. Some items are unique to each model. The models are the same to the extent that the problem shows the same facet to both the manager and the modeller. The models are different because they are based on different viewpoints. The models are different because they are talked about in different languages. They are also different because they serve different goals.

The management report is one way for modeller to tell what the simulation does. The manager does not see the simulation model itself. He sees only what the report tells him about the model. We cannot hope that a manager will look at the model and understand it. We must tell him about the model in the managerment report. And just as the map is not the territory, the report is not the model.

Here lies the problem of simulation documentation: how to tell the manager about the model so that he will understand. We put words on paper, hoping that they will carry our meaning. We join words into sentences. And with sentences we build paragraphs. But while the ideas are clear in our mind, the intractable rules of the written word let our thoughts hide behind the limitations of our language. It is not easy to talk in layman's language about technical matters.

Not only is it difficult to write the management report, the report is also difficult to read. The following section shows how difficult it is for the reader.

MEASURING READING EASE

The manager complains that the reports he gets are not understandable; that they are written in computer and statistical jargon; that they are overly detailed and difficult to read (3,5). Such complaints are true.

The ease of reading a piece of writing can be measured. In 1949 Rudolph Flesch made up an index for testing reading ease (8,9). This yardstick has been used in many cases (13). It is valid.

Reading ease is an estimate of the ease with which a reader is going to read and understand what you have written. It is measured by the formula:

$$R.E. = 206.835 - 1.015SL - 0.846SP$$

where R.E. is the reading ease score

SL is the average sentence length in words;

SP is the average number of syllables for 100 words

The reading ease score places a piece of writing on a scale between zero (practically unreadable) to 100 (easy for any literate person). Table I shows the general level of writing for a reading ease score.

I used the reading ease formula on ten articles (1,2,6,10,11,13,14,15,16). The articles were selected at random from the application sections of the 1976 and 1977 Winter Simulation Conferences. The reading ease scores for these articles are summarized in Table II.

Of the ten articles:

One scored at the standard level of reading ease

Two scored at the fairly difficult level

Seven scored as difficult

Ten articles, and seven of these ten were difficult to read. Remember that these articles were selected from the applications sections of the Winter Simulation

TABLE I - LEVELS OF READING EASE

R.E. Score	Level	Example	Average Sentence Length	Average Number of Syllables
90-100	very easy	Comics	8	123
80-90	easy	Pop Fiction	11	131
70-80	fairly easy	Slick Fiction	14	139
60-70	standard	Time, Newsweek, Mass Non-Fiction	17	147
50-60	fairly difficult	Harpers, Atlantic	21	155
30-50	difficult	Academic & Scholarly	25	167
0-30	very difficult	Scientific & Professional	29	192

TABLE II - READING EASE SCORES FOR TEN ARTICLES

	Reading Ease Score	Number of Words/Sen	Number of Syl/100 wds
Average	47.276	21.857	162.38
Range	61.85-37.96	18.08-25.38	144.6-176.6

Conference. The methodological sections are even more difficult and complex. So if seven out of ten applications articles are difficult to read, what about the methodological ones? And simulation reports do contain sections on methods and procedures.

Since these ten articles were presented at a professional conference, you could argue that the results will not hold in a real situation. But a brief look at some actual reports shows that the papers mirror reality.

Try it yourself. Take a sample of writing from your firm and calculate its reading ease score. You will see that, on the whole, the complaints of management are true. The reports that managers receive are not easily understood.

HOW TO IMPROVE READABILITY

Is the title of this section a question or statement? We don't know because there is no punctuation at the end of the title. We expect that this section contains guidelines for better writing. But note, the ambiguity of the title is not clear until it has been pointed out.

The same is true with the reading ease formula. Let me point out that the formula is not just a yardstick for reading ease, it is a guideline for writing. You can get a higher reading ease score by cutting the length of your sentences. You can also get a higher score by using words with fewer syllables.

Both shorter sentences and shorter words keep your writing simple. Simple sentences are short sentences. Simple words are short words. (But not all short words are simple words). So the Flesch formula says: Keep it simple.

"Keep it simple" is the basic suggestion in any text on technical writing (4). It is said in many ways, such as:

Use active instead of passive voice;

Remove redundancies;

Break up your sentences.

But keep in mind that simple words and simple sentences alone do not help the reader to read. Our thoughts get lost if we fail to focus on our reader and if we fail to focus on our purpose (8).

Words that are simple to us may be gibberish to the reader. And if we lose track of our purpose, we may get sidetracked.

To focus on the reader means that you need to know who your reader is. We need to learn as much as we can about our readers.

A management report goes to a manager. What is he like? What is his education, age, sex, occupational background? His reading habits and interests? His goals and needs in the simulation problem context?

Find out! Take him to lunch. Talk to him during coffee break. Read a book in his field. Learn the words that he uses. Knowing your reader helps you to tailor your writing for him. It makes your writing clearer, more understandable.

Focus on your purpose. What do you expect your reader to do? Be sure of what you are trying to do and write accordingly.

We want the manager to use the results of our simulation model. Don't we? Then let's start with the results rather than hiding them at the end. Place conclusions and recommendations at the beginning. And say it plainly:

> Do..., because it will...(impact on bottom-line).

If the model explores a problem area, then structure your writing accordingly by:

> If you do..., then... will happen;
>
> or
>
> If you want..., then you must...;
>
> or
>
> When you do..., then you also increase/decrease...

But, however you phrase it, do it early in the report. Placing results late in the report buries them. (Of course, early placement of results will probably go against most of what you've learned. Typically results came after an explanation of the model, the data collection procedures, the model validation, etc. (5) But this is an academic or literary way of writing. You must grab the managers attention. His time is limited. If you don't get his attention early; if you bore him with jargon; if you overwhelm him with detail; then he will file the the report for a later that never comes.)

Format of presentation also helps a reader to read. Here I'm talking about title page, table of contents, headings, tabs for sections, etc. These are dull subjects, but they are guideposts for the reader. They tell him what to expect and where to find them. Format should not be forgotten, but format alone will not make your thoughts stand out. Only good writing can do that. And good writing is rewriting, and rewriting, and rewriting.

Now you say: "Sure. I agree. Of course, but I don't have the time and I don't really know how and I have another project on the back burner."

Right. No argument.

But let's look at an analogy. If I want to write to a person who is blind, then I can:

a. learn Braille

b. get somebody who knows Braille

c. have somebody read to the blind person.

Option A is out of the question. It takes too much time, and time is short. Option B is the same as getting a technical writer. It is viable, but it costs. Same with Option C. It is the same as funnelling your report through a managers staff (although some of them are as blind as the intended reader), and here again costs become an issue. But these two options may be the best way to handle the problem.

There are other alternatives. We could teach the blind to see. Management science courses in a business school are an example of that approach. Or we could get a seeing eye dog. Would a consultant fit this mold? Or we could...you think about other alternatives!

But for now, let's leave it at that. You can write the report yourself, in which case you should keep it simple, focus on your reader, and focus on your purpose. Or you can get a technical writer to help you (my recommendation) in which case he should keep it simple, focus on the reader, and focus on your purpose. Either way, the rules of good writing apply.

COST OF SIMULATION DOCUMENTATION

I was sitting across the desk from a manager.

"How much did the simulation cost?" I asked.

"About $25,000," he said.

"What did you get for it?"

"This," and he pushed a stack of papers and computer printouts toward me.

"What's in it?"

"I don't know," he said, "I don't have the time to find out."

So I went to the simulation project director. And after the normal preliminaries, I asked him:

"How much did you spend on the documentation?"

"A lot," he said, "I spent all of last weekend writing it up. And I missed the ballgame on TV. Gotta meet the deadline, you know."

Does this scene sound familiar? (The case is true, although the principals would like to remain anonymous).

Documentation is a dreary task to create and even worse to decipher.

More time, energy and money would help. Using other systems project as a guide, documentation will take about 15-25% of the time and from 10-20% of the money spent on a project. User reports (and a management report falls into this category) run from $3,000 to $10,000. The costs are even higher for technical documentation.

But if the project is wasted, then the opportunity cost due to lack of documentation is even higher. Unfortunately, there is no account code for "costs incurred due to inadequate documentation." Therefore we will never see its impact on the bottom line. We can see the waste when a report gathers dust and cobwebs. We can't see the opportunity loss.

Most technical writers make between $15,000 and $20,000 per year (7). They are involved in writing, editing and rewriting. Expecting people who are primarily designers and implementers of models to write may be too much to ask for. It takes different skills. But why can't a documentation specialist be part of the simulation team?

Management gets what it pays for. But it's our responsibility that they understand what the model does. We must tell them the cost of documentation. If we don't, they may become so disillusioned with simulation that they won't fund another project. And what would we do then?

SUMMARY

In this paper, I've tried to combine guidelines and examples. You'll note a number of unusual things:

Short sentences;

Pronouns;

Incomplete thoughts;

Conversations.

All of them were included to make you think about alternatives to the current deplorable state of simulation documentation.

I think that most documentation for management is bad because it is not geared to management. It looks at the model, not at the problem. It is full of technical matters, best left in an appendix. It creates confusion instead of understanding.

Only when we face our own limitations and get help from people who know how to write will management reports serve our needs and the needs of management.

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