# Producing a Book using TEX: How the Process Works

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**Abstract**

The steps required to carry out the production of a book using TEX will surely vary somewhat depending on the author and publisher. However, many aspects will be similar. In this paper, we will trace the production of a two-color introductory statistics book that was typeset using TEX and some PostScript. Since the book was produced in earlier editions using traditional methods, we will also discuss some of the advantages and disadvantages of producing a book using TEX.

## Introduction

As any author will attest, writing a book is a difficult, time-consuming, and often frustrating process. But the completion of the final manuscript is only the beginning! After that, the book must go through a production cycle in which a design is composed; the art is drawn; the text is copy edited, typeset, and dummied; and the book is manufactured.

In the traditional method of typesetting, a compositor is given a copy-edited manuscript to typeset. The next thing that the author sees is the galley proofs, long pages of typeset material with no art in place and no multiple columning. Depending on the quality of the compositor, the galleys can vary from being an excellent rendition of the manuscript to an absolute disaster.

After publishing several books using traditional methods, my sentiments were very close indeed to those expressed by Robert Adams [1990]: "...It was my second book done by the *old method,* and I resolved at the time never to write another book!"

Then in 1986, as fate would have it, I saw a magnified page out of *The TEXbook* (page 77, I think) that was posted on a bulletin board. Upon investigation, I discovered that there was this wonderful program called TEX that could be used to typeset technical manuscripts with amazing typographical precision — and it could be done on a personal computer!

My wife Carol and I decided to give TEX a try by first using it to produce some supplements to a textbook that had just been published. With the help of Professor Thomas Sherman and Carol's incredible insight, we published the TEX-produced supplements. I was delighted with the look of the supplements and with the control that I maintained over their production. It was then I decided that, if at all possible, my next textbook would be done using TEX and that it would be typeset by Carol and me.

Thanks to the faith that our publisher had in us, we were given the opportunity to use TEX to typeset the third edition of the book, *Introductory Statistics* [1991], by Matt Hassett and me. This paper traces the steps that were taken to produce the book.

## The Design Stage

The first step in the production of the book was the design stage. After preliminary discussions with us (Carol and me) and the publisher, the designer constructed the design specifications, called the "specs," based on the previous edition of the book. If the book had been a first edition, the designer would have used the manuscript as the basis.

The purpose of the specs is to provide a complete description of every aspect of the design. This includes the trim size, margins, color separation, fonts, and detailed instructions for all elements — chapter openers, first- and second-level heads, definitions, tables, figures, etc. The designer also provides a coding for the elements that is used by the copy editor and the macro writer. For instance, the following portion of the specs for the introductory statistics book gives the details for setting the examples and their solutions:

```
EX  word EXAMPLE and its Arabic double
number cmssi 12/12 fl right in margin
col. 15pts bb above to a 1pt rule x 7.
Print head and rule color. Base align
with ET.

ET  example title
cmssi 12/12 C/lc fl left x 30, rr.
33pts bb above, 18pts bb below to
example text (basal). 24pts bb below
to SOL; or (if no solution), use
square per end of SOL and 9pts bb
below to end 1pt rule x 30 (color)
which normally follows SOL. Min 30pts
bb below this rule to basal.

SOL  solution
cmssi 9/12 caps fl right x margin col.
Base align with first line of solution
text (basal). Print color. 24pts bb
above. Set a solid 6pt square fl r x 30,
base aligned with last line of SOL.
Clear 1em to left of square. Print color.
9pts # below to 1pt rule x 30 (color).
Min 30pts bb below rule to basal.
```

Let me interpret the first two of the three design specifications displayed above. EX is the code used for "example." In this case, the word EXAMPLE is to be set in all caps followed by its Arabic double number (e.g., EXAMPLE 8.12). The font to be used is `cmssi12`, twelve-point computer modern sans serif italic. Also, the word EXAMPLE is to be positioned flush right in the margin column (which is 7 picas wide) with a 1-point-high and 7-pica-wide rule over it, and a 15-point baselineskip. The word EXAMPLE, its double number, and the rule are to be printed in color, and the word is to have the same baseline as the example title.

ET is the code for "example title." It is to be set with ragged right margins and flush left in the text area (which is to the right of the gutter and 30 picas wide) using the same font as that used for the word EXAMPLE, with a 12-point baselineskip if more than one line is required. There is to be a 33-point baselineskip from the last line before the example title to the first line of the example title, and an 18-point baselineskip from the last line of the example title to the first line of the example text (which is set in the basal font, `cmr10`). Furthermore, there is to be a 24-point baselineskip from the last line of the example text to the first line of the solution text. However, if there is no solution, then there is to be a 6-point solid color square, base aligned with the last line of the example text and flush right in the text area, followed by a 1-point-high by 30-pica-wide color rule set 9 points, baseline to baseline, below. There is to be a minimum 30-point baselineskip below this color rule to the basal text.

*Note:* The designer also provides *layouts,* which present a graphical display of the written specs.

Once we and the publisher perused the specs and layouts, potential modifications were discussed and referred to the designer. Then the designer drew up a revised set of specs, taking into account all agreed-upon changes.

## Implementation of the Design Specifications: Writing the Macros and Obtaining the Sample Pages

Upon receipt of the revised specs, we began writing the macros. We aimed to include all the macros that would be needed for the entire book. In retrospect, however, a more realistic goal would have been for the initial set of macros to cover all of the design elements, and to write additional macros on the fly.

After completion of the (original) macros, we typeset a document that would show how the various design factors actually looked on paper. This document was output on a 300-dpi laser printer and was called the *laser sample pages.* The laser sample pages were sent to the publisher for inspection. As might be expected, we and the publisher found several design items that sounded good in theory but did not work out well in practice. So, it was back to the designer for a final revision of the specs.

When we received the final version of the specs, we first effected the necessary changes to the macros. Then we re-TEXed the sample-page document and printed the revised copy on our laser printer. At this point, we also prepared a floppy disk containing the latest `dvi` file for the sample pages. The floppy disk and revised laser sample pages were returned to the publisher.

The publisher then arranged for the creation of the *printed sample pages* to give a true picture of what the book would look like. To obtain the printed sample pages, the same steps were taken on a small scale that would be taken on a much larger scale for the final book:

- The `dvi` file was processed using a phototypesetter to produce the repro (high-resolution output on specially coated paper).
- Repro was shot and separated for color breaks.
- Art, supplied in film form, was integrated.
- Plates were made.

- Text was printed on the designated paper (in this case, 45# New Era Matte).

It was a thrill for us to see the printed sample pages — we could now imagine the appearance of the final book, although it was over a year away. There were some minor changes that occurred to us and the publisher after reviewing the printed sample pages. The required modifications were made to the macros and we were ready to begin the typesetting of the book.

## Typesetting the Manuscript

While typesetting the manuscript, we kept a printout of the source code for the sample pages handy for reference purposes. This made it easier to remember which control sequences did what. Of course, we also had a printout of the macros available to consult whenever necessary.

We found that for the initial typesetting (which produced the galley proofs) it was convenient to include exactly one section per file. Thus, we named the files by chapter number and section number (e.g., `2-3.tex`). At the end of each file, we employed a macro called `\enddocument` which printed the values of the various registers used to keep the chapter number, section number, chapter title, example number, etc. Those values were then input at the beginning of the next file.

The design called for the exercises to be double columned in nine-point type. But we followed the traditional method of not multi-columning at the galley stage. This saved time and allowed more space for marking corrections. It is important to note, however, that we did set the exercises in nine-point type using the 18-pica width specified for each column of the double-columned text.

As we typeset the manuscript, we often found it necessary to write new macros, especially macros for complex formulas and displays that occurred numerous times in the text. These macros were added to the file `is3macs.tex`, the macro file for the book, as they were written.

Since the majority of the art used for the book was "pick-up" from the second edition, we made no attempt to do the art electronically. The design called for each piece of art to be displayed between two half-point horizontal rules (either 30 or 38 picas wide, depending on the width of the art) with nine points of space beneath the top rule and above the bottom rule. So, in the macro for the figure legend and these rules, we allowed for a parameter specifying the height of a figure. Then the required space was allocated automatically. In a few instances, some changes were made to the height of figures. These changes were incorporated into the source code before dummying.

## The Galley Proofs (Laser Output)

The first hard copy of the typeset manuscript was done on an Apple LaserWriter Plus (300-dpi). Carol and I both proofread this copy, marked corrections and changes, modified the source code appropriately, and printed out a revised copy. This was done on a section-by-section basis to minimize any fatigue that might ensue from continual typesetting or proofreading.

We sent final galley proofs to the sponsoring editor in batches of three or four chapters. He then made photocopies of the proofs and sent them to the reviewers. It was a tremendous advantage to have the reviewers see the text in a form that showed the design of the book, for it provided them an opportunity to comment on the design before the book was printed. In the traditional method of production, the reviewers usually see only a typed version of the manuscript. Any problems with the design not discovered by the author or publisher are there for the duration of the edition!

Although it is propitious to have the reviewers examine the text in a form displaying the design, one might consider it dangerous to do all of this typesetting prior to the reviewing process; however, in this case, it wasn't — for several reasons. First, the book was in its third edition and so considerable reviewing had already been done in previous editions. Second, the publisher had arranged for extensive pre-revision reviewing with the idea that most of the major issues would be resolved before the galley proofs were set. And, third, because we were using TEX and the original typeset text was not dummied, it really wasn't that much of a problem to make even extensive revisions.

## Final Text Review, Revision, and Dummying

When all the reviewers had returned a given batch of chapters to the sponsoring editor, he forwarded a copy of their comments and suggestions to me. The editor and I discussed the reviews in detail and decided on final revisions. Subsequently, I went to work making the necessary changes and Carol altered the source code as required.

After all of the final revisions had been completed, we commenced *dummying*. This is the stage

in which the final pages are formed. There were many details to attend to during the dummying stage — so many that we decided to make up check lists to ensure that we didn't forget anything.

Actually, before we began dummying, we measured the final art (or art dummy, in some cases) to make absolutely sure that all was as it should be. We also took care of some last-minute modifications and checked that the miscellaneous corrections marked on the galleys had been executed.

As mentioned earlier, we did not double column the exercises during the galley stage but, of course, we needed to do so at this stage. To make the transition easy, we defined the following two pairs of macros, `\beginsc` and `\endsc`, to begin and end single-column exercises, and `\begindc` and `\enddc`, to begin and end double-column exercises. The two pairs of macros were identical in every respect, except that the first pair typeset the exercises in single-column format (18 picas wide), and the second pair typeset the exercises in double-column format (two 18-pica columns, with a 2-pica gutter). When we were ready to dummy, we simply changed from the first pair of macros to the second pair.

We used a variation of `\midinsert` to handle the placement of tables, figures, and computer printouts. Although the placement is done automatically, changes in text must be made to account for referencing whenever an insertion does not fall in its natural position.

There were other items that required consideration during dummying. For example, the design specified that our *procedure boxes* be color screened. This called for special treatment when a procedure split from one page to the next.

## The Page Proofs (Phototypesetter Output)

Once a chapter was dummied, we copied the `dvi` files onto a floppy disk. That floppy disk was sent to the publisher along with hard copy (done on our laser printer). The publisher, in turn, made copies of the hard copy and sent the floppy disk and a copy of the laser output to the company that was doing the phototypesetting.

After the publisher received the repro, photocopies were made which, for convenience, we will call the *page proofs*. Page proofs were sent to us and to two proofreaders. The proofreaders also received a copy of the laser output just in case they couldn't read something on the page proofs or there appeared to be some problem on the page proofs. It should be emphasized that the proofreaders' job was to peruse the page proofs, not the laser output. This was because we wanted the proofreaders to check what would eventually constitute the pages in the book.

Theoretically, the repro should be identical to the laser output except for the difference in resolution. However, that doesn't always happen in practice, so care must be taken. In our case, we found the first ten chapters of the repro to be an exact replication of the laser output; but, in the repro for Chapter 11, we found some strange things indeed: All of a sudden, vertical rules were missing, kerning was often incorrect, and footnotes extended into the margin area. This caused everyone great concern. Fortunately, however, the problem turned out to be simply that the `dvi` files had been processed using a different computer than previously and there were some compatibility problems. We went back to the other computer and everything worked out fine.

We didn't expect the proofreaders to find too many errors since the text had already been scrutinized. But we had two excellent proofreaders and they did find items that required correction. Those corrections were made by Carol, who then sent in new `dvi` files as required. She also constructed a chart showing which pages in each `dvi` file needed to be rerun.

## The Blues Stage and Beyond

When the final repro for a chapter was ready, it was sent, along with the corresponding art, to a pre-press house. That house had responsibility for shooting the repro and separating for color breaks; integrating the art, which had been supplied to them in film form; and stripping the film to the printer's imposition.

We and the publisher each received a set of *page blues*. The page blues are proofs of the negatives that show what the final pages will look like. In making the blues, the black portion of the page is overexposed and thereby shows up in a darker shade of blue than the color portion. This allows for verification of the color separation.

On the blues, we checked the color separation, looked for any stray marks that required cleaning, and verified the figure placement (traditionally, this last item is done in page proofs). Once all corrections marked on the blues had been done, the imposed film was sent to the printer. Plates were then made and the book was printed.

## Comparison of TEX with the Traditional Method

Since the introductory statistics book had been produced twice before using the traditional method, I would like to compare, from this author's point of view, the traditional method with the TEX method. To begin, I should say that, personally, I truly enjoy the production phase of a book — from the design stage through to the blues stage. Furthermore, I like writing the macros for the design. Thus, my comments will undoubtedly be somewhat biased.

Probably one of the most compelling reasons for an author to use TEX is that by doing so he or she maintains almost complete control over the production of the book until page proofs (phototypesetter output). Prior to the page proofs, the author is essentially free to make whatever changes that are desired. The publisher really doesn't care whether the author makes changes here and there as long as they enhance the text and are not an expense borne by the publisher.

Another good reason for an author to use TEX has to do with proofreading. Using the traditional method, many authors (me included) must proof the text three times: once each for the manuscript, galleys, and page proofs. On the other hand, with TEX, it is probably only necessary to proof the text *at most* twice; and once might suffice if the original version does not require extensive revision, as was the case with the introductory statistics book.

Whether it takes more time and energy on the author's part to produce a book using TEX really depends on several factors. For example, with an excellent compositor, it may take both less time and less energy with the traditional method; but a poor compositor can significantly increase the time and energy that an author must expend (not to mention the added frustration).

A possible advantage of the traditional method over TEX might arise when considering the intensity of the project. I am referring to the fact that when an author uses TEX, there are rarely any breaks in the action. With the traditional method, however, the author generally gets a respite between the completion of the manuscript and its copy editing, between submission of the copy-edited manuscript to the compositor and receipt of the galley proofs, and between the galley proofs and the page proofs.

All in all, for me the choice between TEX and the traditional method is clear — I choose TEX. But, of course, each author will have to balance the pros and cons of using TEX based on his or her own personal experience.

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