Commercial and military software documentation: Different steps to a common goal

by FAYE C. BUDLONG
Wang Laboratories, Incorporated
Burlington, Massachusetts

ABSTRACT

Talking about creativity in software documentation may seem like a paradox, but it exists. Even a functional specification for a new product has an element of creativity: It outlines a product that will require the creative endeavors of several developers over a period of time. Further, user manuals require ingenuity to reduce many complex functions to a series of simple, identifiable steps that the user can understand and follow. Training documents require creativity to develop examples that new users can understand and to reinforce a learning curve that allows the reader to become proficient using a new product. And reference manuals require perseverance to ensure that all functions of the product are defined and explained clearly and concisely.

This paper is an overview of the development process for software documentation from concept to initial release. It lists much of the documentation required for each major software development step and compares documentation for commercial projects with that required to meet military project standards.
INTRODUCTION

The documentation required for different kinds of users in different environments, for example military documentation vs. user documentation in a commercial environment, may vary considerably, and these differences often are difficult for development personnel and technical writers and editors to understand. This paper is arranged logically in the order of the development cycle to help define and compare the steps required in the military and commercial environments to complete the documentation process successfully and on time.

IDENTIFYING A NEW PRODUCT: THE FIRST STEP

In the commercial environment, market research personnel maintain records of what types of computer systems and applications users demand and what trends appear to be unfolding. From this information, the market research personnel identify products that should be profitable for the company to develop and outline the functions the products should possess. They give this information to the research department where a team uses it to perform a feasibility study, which will examine the possibility of creating the software and obtaining the manpower required to complete the project in a timely manner. The research team refines and builds upon the outline until all functions the software should contain have been identified. This team also determines how difficult and time consuming the project is likely to be. At this point, the research group (sometimes with the help of technical writers) produces a functional specification that details their plans.

Members from the market research group meet with members from the development group to discuss how the project should proceed. When an agreement is reached, the functional specification is made final and a project time line with identifiable milestones is established. The main questions that arise during this early phase in the commercial development cycle are:

1. How well will the product fill an identifiable user need?
2. Will it be ready for release at a time that will ensure its market acceptance?
3. Can it be developed using manpower and materials that will help guarantee its profitability?
4. Will the new product support the existing product line?

If the product will fulfill these requirements, the functional specification becomes the product baseline and the development effort proceeds. The appropriate representatives meet regularly to track the project's progress, identify problem areas, outline necessary changes, and identify the groups the project will use to market and support the new product.

At this point, the company's technical writers may become involved in planning the documentation necessary to accompany the product at release. Nonetheless, all written documentation is still informal and subject to major revisions before it is ready for the marketplace.

Military projects develop differently. The earliest stages in product definition generally result from a need defined by the Department of Defense or through research on a new system or weapon. An example could be the need for a fault-tolerant, real-time control system for fighter aircraft.

The military describes an overall program goal and issues a request for proposal (RFP) that defines the project—and the time allowed to present a proposal—to firms interested in obtaining a military contract. Then the military contracts a company to define the requirements and phases of the project and, perhaps, to produce the end product. The contract is usually awarded on the basis of a competitive bid that responds to the RFP. Since contracts are awarded on the basis of proposals, professional documentation personnel begin their project involvement while the proposal is being developed—long before detailed specifications or product documentation are considered. (For clarity, the military organization that awards the contract is referred to as the "contracting organization" and the company that holds the contract is referred to as the "contractor" throughout this paper.)

Generally, a company must produce substantially more documentation to win a federal contract based on an RFP than it requires to launch its own new product. This documentation is required because the military needs to compare different companies' proposals for the project outlined in the RFP without having the ease of direct communication that commercial developers and market research personnel enjoy.

Military projects require development documentation that often is much more complex, and more standardized, than that needed for purely commercial applications for a variety of reasons, including the following:

1. The military contracting officer on any contract may have to administer several contracts simultaneously.
2. The contracting officer is remote from the contractor and must have some form of formal documentation to track the contract's progress.
3. When the project is complete, the contracting organization owns the software developed under the contract. This means that the contracting organization must have enough documentation to maintain and modify the product with minimal support from the contractor.
The main questions a military contract officer resolves when awarding a contract are as follows:

1. Are the contractor's proposed funding requirements competitive?
2. Does the proposal cover all areas of the RFP?
3. Does the company that produced the proposal have a proven record for completing projects on time and within the budget allowed?
4. Do the proposed subcontractors, if any, have a record of completing their project phases successfully?

When these questions have been answered and the contract is awarded, the contractor has its research team complete a preliminary functional specification. Writers and editors usually are involved this early in the developmental phase because the documentation standards most military contracts require are complex and sometimes difficult to understand. One example of complex standards is MIL-STD-490, *Military Standard Specification Practices*, which defines the contents of each paragraph of a product specification and how certain words, like "will" and "shall," are used in each specification.

When the preliminary functional specification is complete, members of the military contracting organization meet with the contractor's representatives to review the functional specification and contract time line. This meeting, often called a preliminary design review (PDR), determines areas of agreement between the contractor and military. The considerations of the PDR include the changes the functional specification must undergo to be acceptable to the contracting organization. The PDR also determines what changes, if any, are necessary in the project time line to complete the project in a timely manner.

Upon completing the PDR, the research team and technical writers revise the preliminary functional specification to meet the new or revised requirements determined during the PDR. They produce a detailed design specification, which is the design submitted to the contracting organization for review. Then representatives from the contracting organization and the contractor meet for a critical design review (CDR), which is similar to but more formal than the PDR.

The revisions required as a result of the CDR are incorporated into the detailed design specification, which then becomes the formal baseline from which the product is developed.

At this early phase of development, documentation for military contracts is more complex, detailed, and formal than that required for a commercial project. It also demands more pure attention to detail than commercial documentation. Generally, commercial companies can maintain informal contacts and documentation longer than is possible in the military because the individuals responsible for product development are more available in the commercial environment. Also, the company developing the product creates its own procedures for reporting progress.

**PRODUCT DEVELOPMENT: THE SECOND STEP**

As a product develops in the commercial environment, it evolves from the original functional specification into a marketable commodity. Any fundamental changes are outlined in memos from the research team to representatives of the market research and marketing groups. The market research group decides what basic documentation will accompany the software at release. They also meet with technical documentation managers to determine the time and manpower required to fulfill product requirements. The documentation that exists at this point usually consists of:

1. The functional specification
2. Any memos that define fundamental changes to the product
3. A market and audience analysis
4. Marketing plans and support policies

A technical documentation team, which at Wang Laboratories, Inc., consists of writers, editors, and artists, is assigned to the project. The team members work with their managers to determine the documentation milestones necessary to meet the product release date. The company has guidelines for the documentation team, but they are usually somewhat flexible to allow for creativity in manual design and presentation.

Often, the language used in reference manuals and training guides differs substantially. Even the language used in training guides will differ depending on the audience addressed. For example, the tone of a user's manual written for a computer programmer will be different from the tone of a training manual written for a first-time user of applications software. Thus, in many instances, the documentation team has the freedom, and the responsibility, to determine the scope, tone, and presentation of the materials they produce.

Technical writers meet with members of the research team to learn about the new product and how it works. The writers also learn to use the new product so they can define it accurately for customers. Then they outline the required documentation and work with editors to determine the most logical presentation. When the writing process is complete, the document is sent to the research team (and any other appropriate reviewers) to determine if it is technically correct and meets all corporate requirements.

After the revisions generated by the technical review have been incorporated into the document, an editor reviews and revises it. The editor and writer work together to prepare it for graphic arts and production.

The software documentation cycle is different in the military environment. From the time the detailed design specification is accepted as the product baseline, the military usually requires the project to be placed under configuration control by the contractor.

The role of configuration control is to identify all changes to the product formally—and in great detail. In other words, any deviations from the detailed design specification that occur during software design or coding must be reported using a discrepancy report (DR). Then, if a change to the software appears to be necessary, a software change request (SCR) is begun.

A software design review board (SDRB) meets regularly to review all SCRs, and if they are significant, submits them to a software change control board (SCCB) for final disposition.
When the SCCB decides that the software change is necessary, all relevant documentation is changed or revised formally (even changes and revisions are defined separately in some military standards), and all changes are noted on the change and revision pages in the document's front matter. Compared to the commercial configuration management some companies use, military configuration control is both extremely detailed and rigid.

Technical writers and editors working on a military contract spend much of their time during the software development cycle tracking changes to the product baseline. The changes and revisions require detailed attention to maintain the accuracy of the documentation and conformance to the applicable standards.

The formality of military documentation requires more time and attention during the development cycle than that required by commercial projects. Some military contracts even mandate a certain level of reading skill to be used for any user documentation and have reading specialists check the documents submitted under the contract to ensure that those requirements are met. Further, most military contracts require that members from the contractor's development team meet with members from the contracting organization, on a regular basis, to present their findings and review the project's progress compared to the scheduled project milestones.

This added formality allows contract officers to maintain more control over each project than they would have with fewer requirements, and it allows them to stay up to date with each project with less effort than would be needed if less formal requirements were enforced.

PRODUCT RELEASE: THE FINAL STEP

When a commercial software product is ready for release, the support documentation must be ready as well. Sometimes, the task of producing timely documentation becomes very complex during the last stages of product development because of the flexibility allowed in the commercial environment.

Writers and editors must ensure that the documentation accurately reflects the final software product, and the designers must present the information in a form that will be acceptable to the target audience.

This is the period that requires the most effort by commercial technical documentation personnel because they must have whatever manuals or specifications required ready for distribution at the same time the product is ready for release. Now, the documentation team must complete any appropriate revisions, produce mechanicals for printing, and make sure that the printing cycle proceeds on schedule under very tight deadlines.

The final product represents the company to customers and prospects, and the documentation is part of that final product. Commercial firms often want to maintain a particular image within their documentation. Writers and editors are responsible for assuring that the corporate image is maintained as well as making sure the documentation is complete, accurate, and presented appropriately.

Since military specifications are updated often and conform to military standards, specifications that accurately reflect the software product exist during most phases of product development. Thus, most manuals (even training manuals) can be outlined and written early in the development cycle and updated as the product matures.

Many military requirements outline exactly what the documents they specify will look like upon delivery. Consequently, there is limited or no flexibility in the visual presentation or in what will be covered in any given document. In the military contract environment, artists create illustrations for the documentation required. The artists are mainly responsible for ensuring that mechanicals are prepared correctly for the printing process the contractor will use. They have little input about how the final product will look because usually the design of the documents created is outlined in the military standards that apply to any given project.

Deadlines are tight because development personnel sometimes fall behind the contract schedule. However, much of the documentation needed to complete the contract and release the product already has been through numerous revisions and often is near completion before the software product is ready for release.

The job in this case is to complete whatever is necessary to comply with contract requirements by the time the contract expires. This is especially important because the military could use an overdue completion date as a reason to use a different contractor when it issues a new RFP or take other punitive action against the contractor for failure to comply with the terms of the contract.

Often, even printing is simplified because the government specifies the grade and size of paper to be used. Also, some military agencies request only mechanicals and a few photocopies of the required documentation to produce the printed versions in government print shops.

CONCLUSIONS

The main differences between the documentation process in the military and commercial environments are how decisions are made about the required documentation and how the companies involved produce that documentation.

In the commercial environment, producing a software product and documentation that will be accepted in a competitive atmosphere is the main concern. Thus, commercial companies try to tailor both the content and appearance of their documentation to the particular audiences they are trying to attract. This takes flexibility and creativity to achieve. Also, commercial companies are more flexible in early product documentation because the people responsible for a project are on-site and the product may be altered to reflect changing market needs.

The documentation required to fulfill a military contract, on the other hand, is specified in the contract. Contractors must produce accurate documentation that reflects the changing state of the software being produced from the time the detailed design specification is accepted as the product baseline until the final product is released. Thus, contractors respond to given documentation requirements rather than create their own requirements from any felt market need.
The differences between the military and commercial documentation environments appear in every phase of a development project, from inception to final release. The different requirements imposed in each atmosphere require skilled professionals to maintain the quality of the final documentation products. The challenge to produce quality documentation in a timely manner crosses all technical documentation environments. However, the steps used to meet that challenge often require different skills to achieve the goals defined within the requirements specified.

ACKNOWLEDGMENT

The author thanks her co-workers at Wang Laboratories, Inc., for their help and support during the development of this paper. Special thanks go to all those who reviewed the paper and suggested revisions to make it more effective.

SUGGESTED READING

4. OD 45748, Ordnance Data Documentation Guidelines for TRIDENT I, MARK 5, USN.