MANAGEMENT OF DOCUMENTATION PROJECTS

Three key practices mark the successful management of information projects—planning, estimating, and tracking. The purpose of these practices is to ensure that the final information products meet the needs of the intended users, and that they are accurate, complete, accessible, and usable. AH management activities are thus be directed to achieving these goals. If information is not accurate, users will make mistakes in performing tasks and interpreting results, If information is not complete from the users' perspective, they will not have the information they need to perform tasks or to solve problems. If information is not accessible, users will not be able to find the information they need quickly and easily. And, if information is not usable, that is, clear and understandable, users will not be able to achieve their goals.

MANAGEMENT OF DOCUMENTATION PROJECTS

Unfortunately, many people who are responsible for preparing technical information believe that their task is finished once they have written down what they know. They focus on recording their knowledge of a subject rather than considering the needs of those who will read and use the information. We have all had the experience of trying to use a technical manual to assemble and use a product we have purchased, only to discover that the information provided is not what we need to know. We have read the results of someone's research, only to discover that the methods are unclear and cannot be duplicated or that the conclusions do not appear to follow from the results. Information we need for our own work is simply not available.

Professionally prepared technical information requires that we take into account from the first who will be using the information and what they will want to do with it. This article presents a five-phase process that will assist in conducting and managing an information-development project to ensure the delivery of user-focused information products at the end.

Information planning is the first of the five phases of the information-development life cycle. The five phases to be discussed in detail are

- Phase 1: Information planning
- Phase 2: Content specification and prototyping
- Phase 3: Implementation
- Phase 4: Testing and production
- Phase 5: Evaluation

This life cycle is discussed in detail in Ref. (1). The discussion focuses on explaining the key elements of the information development life cycle as it relates to the activities of the entire information-development team, in addition to the project manager.

PHASE 1. INFORMATION PLANNING—IDENTIFYING THE USERS' INFORMATION NEEDS

The Information Planning phase marks the beginning of the information-development life cycle. The planning phase allows the information designers to gather data that assist them in answering four key questions:

- Who are the potential users of the product or process and its documentation, including users of the interface, the online help, and others, such as those who train and support the users?
- What is their range of knowledge, skills, and experience in the subject matter covered by the documentation? What is their range of skills and experience in the tools used in the product?
- What goals do they want to achieve using the product and the documentation? How do they achieve those same goals today?
- What information styles will be most effective in helping the users to perform and learn?

To answer these questions about the users, information developers consider it critical to interact directly with the information users. This interaction includes observing them in the environment in which they will use the information. This direct observation of users is especially critical when the information is intended to support users in performing specific tasks. For example, operating a machine, using software to operate equipment or perform tasks, maintaining equipment, and using information for design and development, are difficult to describe well without understanding how users approach the task.

Because the goal of information planning is to develop information products that will meet user needs and enable them to achieve their knowledge and performance goals, the greater the understanding of the users and their requirements, the better the information plan is likely to be.

For example, the information developers may discover that the needs of the assembly line personnel are best served by the development of job aids displayed in the workplace rather than lengthy and complex manuals. The information plan would establish the ease for producing job aids rather than manuals. The information developers might discover that their design engineering audience is best served by conceptual information about the relationship between the design tools and their design goals. Similarly, they will make their case for this information design in the Information Plan.

The Information Plan serves as a proposal for the information strategy devised for the project. The strategy ought to be established using first-hand knowledge of users and their needs, not on unexamined assumptions about the users. Several years ago, a team at one of the major semiconductor manufacturers investigated the information needs of the design engineers who purchased microchips from the company. The designers were most likely to be electrical engineers, who often had advanced degrees in the field. The internal design engineers had always assumed that the information needs of their professional cus-

tomers were identical to their own information needs. However, after the team surveyed the customers and conducted site visits, they learned that the customers wanted different information. They wanted to know how the chip might be effectively used in their designs rather than information about how the chip had been designed in the first place. The investigation demonstrated that the existing information design for the manuals was not meeting the customers' needs. To quote a customer interviewed for the study, "We need to know how to use the chip, not how to design it."

Creating the Information Plan

At the end of the investigation, after the users' information needs are well understood, the team of information developers prepares an Information Plan. The Information Plan summarizes the results of the investigation and presents the strategy for meeting user needs. This strategy outlines the role of all the layers of information delivery available. From the information designed into the interface, through context-sensitive help and more detailed conceptual, procedural, and instructional text and graphics, the information designers should explain how each piece of information Will meet the needs of a particular segment of the user population. Included in the strategy should also be discussions of training requirements and ongoing support of users with information provided by field engineers, telephone support, or through continually updated information accessed electronically through Web pages, bulletin boards, fax lines, and more.

The Information Plan presents the architecture of the information solution for the users. In the next phase, Content Specification, the broad brush of the Information Plan strategy is translated into the details of the many types of media that will be designed.

Figure 1 illustrates part of a typical information plan, including a summary of the proposed strategy and predicted costs.

How Long Should Information Planning Take?

In the standard five-phase information development life cycle, it is estimated that Phase 1 should take between 10 and 20% of the total information project time. For example, if you have estimated that the information development project should take 6 person-months or approximately 800 development hours, then the information planning phase should take about 80 h to complete. The calendar duration of the 80 h may be more man 2 weeks because of the logistics in scheduling site visits and other information-gathering activities. For projects that have many unknowns in terms of users and their goals and activities, a higher percentage of project time may need to be allocated to information planning.

Estimating the Cost of the Information Project. The initial estimate of the information project is best made following the development of the Information Plan. If an estimate must be made before any information planning has occurred, it is best made in reference to previous similar projects. For example, if the last project took 750 h over 6 weeks to complete and was similar in scope to the current project, and if the evaluation of the information delivered showed that it met user needs, then the next project is likely to take a similar amount of time. It would be wise, however, to conduct a preliminary analysis of project dependencies to ensure that they also are the same from the previous project to the next project. Conducting a dependencies analysis is explained below.

To estimate the cost of a documentation project requires that

- the scope of the proposed project has been determined
- the level of quality required to meet user needs has been determined
- a history of previous similar projects has been compiled
- the dependencies of the proposed project have been evaluated
- the resources available to complete the project have been examined
- the deadline and milestone schedule requirements of the project have been determined. Each of these estimating requirements is described in the following sections.

Determining the Scope of the Information-Development Project

The scope of an information-development project reflects the amount of information to be developed. The scope should be derived from the Information Plan and from previous experience providing information for similar users. Note that estimating the information scope is often difficult for those inexperienced in information design and development. it may be useful to compare the project being estimated with previous projects, competitors' projects, or similar projects with which you may be familiar from other industries. For example, you may discover that a project similar in scope developed the previous year resulted in a 150-page manual, a 50-page set of error messages and solutions, and 250 online help topics. Then you might initially assume that the new project will have a similar scope.

For a completely new project, you may need to make a rough estimate of tasks to be supported in the documentation and to multiply by a standard such as 5 or 10 pages for each task. It may be necessary to estimate the number of help topics to be included with a software package by calculating the number of help topics produced for a similar project and correlating these with the number of screen displays, dialog boxes, menu items, check boxes, choice buttons, and so on. The number of choices the user has may provide a rough correlation with the user tasks to be documented, as well as the number of context-sensitive help topics.

Depending on the nature of the information media chosen, different units are employed as indicators of the scope of work. Table 1 lists units that are traditionally related to different types of information media.

Experts in each media type typically use units of this sort as scope definitions for estimating purposes. Added to the scope definition is the level of quality and complexity

Table 1. Traditional Information Units for Purposes of Scope Estimates

Information Media	Unit
Printed or electronic text	Pages (approx. 400–500 words)
Stand-alone topics	Topics (approx. 250 words)
Context-sensitive online help	Topics (approx. 250 words)
Graphics	Image type
Video	Minutes of video
Classroom instruction	Hours of instruction
Interactive multimedia	Events (page turn, popup, animation, voiceover unit, and so on)
Sound	Seconds
Quick reference	Impressions (print images)

to be achieved. For example, a simple graphic image may take only an hour or so to create, while an exploded view of a complex mechanism may require 100 hours or more.

A typical estimate of scope for an information-development project might took like Table 2.

Determining the Quality Level Needed to Meet User Needs

In most hardware and software development projects, the quality level is determined by the effort made to reduce the number of defects in the final product delivered to the customer. In a software project, for example, the product spec-

Information plan template (first page only)

Purpose of the Project

In this section, explain the purpose of the technical project. Provide some background explaining the company's motivation for producing the product and its information and training. For example, is it because they have introduced a new product that requires a new approach? In this section it is appropriate to include information about the company's marketing strategies for the product. What is this product's niche? What is special about it that the information should highlight from a sales angle?

Description of the larger project

Briefly describe the larger project of which information development is a part.

Goals for the Information

In this section, describe the goals of learning and use that the proposed information addresses.
For example, will you have a mix of information and training, or will information stand alone as a user's sole information resource? How will the deliverables you are proposing help to achieve these goals?

Project Scope

You have a number of options in describing the scope of the larger project. You may want to list the features and functions that will be included in the product-development effort. You may include descriptions of project hardware to be designed and built and software to accompany the hardware. You may describe a project in which information is the most important outcome, such as a project to develop policies and procedures. Provide sufficient information to identify the project scope characteristics that you will need to guide your estimate of the scope of the information-development project.

Figure 1. (*Continued*)

Project Schedule

Provide an overview of the larger project's schedule, emphasizing key schedule dates that you must take into account. Include information about milestones that you must meet, deadline dates associated with these milestones, and information about the relationship of a particular milestone to the general availability of the product or service.

Milestone	Actual or Relative Date
List the external project milestones that drive your information development schedule, such as feasibility approval, approval to develop, functional requirements freeze, functional testing, systems testing, beta release, final release, and so on.	List an actual date or a date relative to the general availability date for the product release. Provide information about how the date was determined and who is responsible for setting the date.

Project Budget

Provide information about the overall project budget if it is available, especially if your information-development budget is established as a percentage of the whole project budget.

Quality/Usability Goals for the Information

In this section describe the quality/usability goals you have established for the information. How will you ensure that users will be successful in learning and using the product or system? For example, upon completing training and using manuals or online help can you ensure that users are able to perform their tasks within a specified time with as few errors or calls for help as possible?

State the usability requirements of the larger project and the information. This section is especially important as an extension of the customer and audience descriptions in the previous section. You may want to emphasize ease of access to information by an experienced user or the step-by-step coverage for a more inexperienced user. Use the information you have gleaned from any customer studies to inform your assessment of the audience's usability needs.

Product Description

In this section, include a brief description of the product and its basic functions. This information should be kept brief because more detailed information about product functionality is included in the content specifications for the individual deliverables.

Provide as detailed a description as you can for the customer for the product and the audiences for the information. If you have several audiences, include each of them in this section, with accompanying descriptions. Be certain to include in your description your team's assessment of the potential information needs of each audience group. If you have outside sources for your information, such as customer site visits, usability studies, market analyses, or feedback from training and customer support, include that information here.

User Profile

Describe the background and experience of the user(s) for the information. What are their

Figure 1. (*Continued*)

expectations about the product? In what kind of environment do they work? Are there any special circumstances surrounding their use of the product? Include a brief description of the individual user segments. In this description, include only information that will have an impact on the final design and organization of the information for these users. For example, if one user segment contains people with very similar educational backgrounds, this fact may be less important to the information project than the fact that some have no typing experience but will be expected to use a keyboard.

Information Development

In this section, you move from the larger project to the information-development project that you are managing. The purpose of this section is to facilitate the stakeholders' understanding of the information requirements and the scope of your development efforts.

Information-Development Project Vision

Briefly describe the information set you intend to develop for this project. If you are updating existing information, note that here. If you are developing information products for an entirely new project, describe what you hope to achieve in the design. If you intend to make significant changes to an existing suite of information products, describe why the changes are being made.

Project Schedule

Provide an overview of your proposed schedule for the information development activities. Once again, describe each milestone and explain the reason for the actual or relative date. Relative dates describe the dependencies of your schedule on external events that guide the larger project. In this section, note any schedule dependencies for your project.

Milestone	Actual or Relative Date
List each milestone that you propose for the information development project. Define what will be needed to complete the milestone. Don't include in this list your internal milestones such as developmental editing, quality assurance, or copyediting. Those will be included in the detailed project schedule.	Either provide an actual date for the milestone to be completed or state the time relative to an appropriate external milestone from your previous list. You may need to explain the date and any special requirements.

Project Budget

Provide information about your project budget. You may have a total budget amount that you must stay within, or your budget may be calculated as a percentage of the larger project budget. Your budget may be based entirely upon headcount assigned to the project, or it may include additional funding for translation and localization and the production of final deliverables and their distribution.

Figure 1. A representative example of an Information Plan.

Table 2. Typical Scope Definition from an Information Plan

Information Unit	Scope Definition
Users' guide	60 stand alone topics
Online help	200 help topics
Conceptual guide	45 pages
Training class	6 h of instruction
Quick reference card	2 impressions

ification may require that no Level 1 defects remain in the product before it is shipped, defining a Level 1 defect as one that causes loss of data for the user. Following typical testing algorithms, sufficient testing is conducted to estimate with reasonable certainty that no Level 1 defects exist.

The quality level of information products can also be set by the level of effort taken to ensure that no defects exist and that the information meets the usability requirements set by the developers and the users. In some organizations, for example, information-development standards require that all task-oriented documentation be tested with the product to ensure that no errors exist in the instructions. Other organizations require that documents pass the criteria set for usability testing of the documentation with the customers. If the test subjects can perform the selected tasks within a specified amount of time and at an acceptable level of performance (no unrecoverable errors, a stated level of user satisfaction, and so on), then an acceptable level of quality has been achieved.

The quality level set for an information-development project will determine how much effort to devote to ensuring that the resulting products are defect-free and usable. It will take more time to complete a project that requires a high level of quality with regard to user requirements and usability than to complete a project in which defects in the documentation go unchecked and uncorrected. You must determine if lower levels of quality are acceptable to your organization, team, and customers if you choose to reduce documentation effort below a standard of quality. Remember that lower levels of information quality may

Table 3. History of Typical Information-Development Projects

Project Type	Hours to Complete*
Users' guide of 150 topics	562 h (3.75 h/topic)
Users' guide of 234 topics	982 h (4.2 h/topic)
Users' guide of 567 topics	2336 h (4.12 h/topic)
Users' guide of 56 topics	319 fa (5.7 h/topic)

Table 4. A Typical Information-Development Team

Team Members	Percentage of Project Time
Project manager	15%
Writer	50%
Editor	15%
Graphic artist or illustrator	15%
Production specialist	5%

result in greater customer dissatisfaction, higher training costs, higher support costs, and lower product sales. Organizations that tolerate lower quality standards for documentation often also tolerate lower quality standards for their products in general. One general manager of a development organization reported that his company's quality standard was to "ship it because the customer will find the defects before we do."

Other organizations require high levels of quality in documentation going to customers or employees because they recognize the impact of poor quality on their organizations' reputation. They also may be interested in reducing taining costs or reducing the cost of customer support by providing information that permits customers to learn and act independently.

Compiling a History of Similar Projects

The histories compiled of similar projects completed in your organization will provide a base line of data for evaluating the cost of a new project. For example, you may have determined that previous projects completed in the organization resemble those in Table 3.

Hours to complete includes all development time (including planning), information gathering, writing, editing, capturing screen images, creating simple graphics, and managing the project. The hours do not typically include time for reviews by product developers and others not part of the information-development team.

After histories of similar projects have been collected, you must determine if these projects represented the quality standard sought for the current project. The following questions must be considered. Have you surveyed user satisfaction with the information products? Are you aware of the number of support calls attributable to incorrect or unusable documentation? Are you aware of the time required by your customers to train end users of your product? Do you know if your customers are rewriting your documentation because it is inadequate to meet their needs? Are you providing more information than your customers find necessary? Review the section entitled "Phase 5: Evaluation" for ideas about studying the customers and evaluating documentation quality.

Once you have obtained a project history and decided that the project achieved an appropriate standard of quality, the data collected will-help in estimating the next project. If you find that the quality level is inadequate, you may want to increase the metric to allow more time for quality assurance activities and quality improvement, including customer observations, usability testing, and functional testing.

In Table 3, note that the smallest users' guide also required the most time to create in terms of the unit metric (5.7 h per topic). Frequently, efforts made to minimize information and make it more accessible and usable increase the unit metric at least temporarily until the new standard is well understood by the development team. Also note that the average of the four projects is 4.17 h per page. In estimating the cost of a new project, you may want to begin your calculation with 4.17 h per page.

If project histories are not available, you may choose to use industry averages as a starting point or a benchmark with other information-development organizations in the industry.

Be certain, however, that you understand exactly what the managers are counting toward total development time and what level of quality they are working toward. One organization I studied produced high-quality minimalist manuals for a hardware product and averaged 9.75 h per page in doing so.

Another organization average about 4 h per page for task-oriented software documentation. I have found that the development of usable context-sensitive online help typically requires about 2.5 h to 3.5 h per help topic, depending on the experience of the developers and other project dependencies. Classroom-based instructional design and course development is often quoted at between 20 h and 40 h per deliverable hours of instruction. Refer to others in the same industry who are known to track their projects conscientiously to help provide a starting point for project estimates.

Evaluating the Dependencies of the Proposed Project

Even if you have developed an adequate history of previous projects in your own organization, using the metrics of an individual project or even the metrics of an average project may not produce a good estimate of the cost of a new project. Not all projects are equal nor are all projects average. I recommend using the Dependencies Calculator illustrated in Fig. 2 to calculate the effects of several potentially significant factors on a particular project. The Dependencies Calculator weighs the effects of ten typical project dependencies, using the midpoint (a factor of 3) as 1.00 (the neutral point) and assigning each rating above 3 a factor 5% over the previous rating and each rating below 3 a factor 5% below the previous rating.

The ten dependencies on the sample calculator in Fig. 2 represent the typical dependencies we have seen in documentation projects. Dependencies that affect your projects can be added or dependencies that do not apply may be omitted. Nine of the dependencies have increments of 5% above and below the center except for the first dependency, which has a 10% increment above and below the center. This dependency for project stability applies to the stability of the larger development project of which informa-

Multimedia Project

	Average Hours/Page:	5.00
Dependency	Ranking	Factor
Product Stability	1 2 3 4 5	x 0.90
Information Availability	1 2 3 4 5	x 1.00
Prototype Availability	1 2 3 4 5	x 1.00
Subject Matter Experts	1 2 3 4 5	x 1.05
Review	1 2 3 4 5	x 1.10
Writing Experience	1 2 3 4 5	x 1.05
Technical Experience	1 2 3 4 5	x 1.00
Audience Awareness	1 2 3 4 5	x 1.00
Team Experience	1 2 3 4 5	x 1.00
Tools Experience	1 2 3 4 5	x 1.00
	Hours/Page Projection:	5.45

Figure 2. Dependencies calculator.

tion development is a part. For example, a project would be considered highly unstable if you anticipated many functional changes throughout the development life cycle. Such product changes will affect the number of information changes that will have to be made during the information-development life cycle. A stable product with few changes will take fewer hours and cost less to document.

Consider the dependencies calculation for a specific project. Based on an analysis of previous projects with the same team and new information about the current situation, the project manager creates the following set of dependencies. On each five-point scale, 3 represents the average case in the organization, 4 and 5 represent worse than average scenarios, and 1 and 2 represent better than average scenarios, as illustrated in Fig. 3.

On the basis of the calculation and with the starting point of 4.17 hour/page, the project manager calculates the hours per page for this project to be 4.55.

Once the average hours per unit have been determined and the dependencies for a specific project have been calculated, multiply the hours per unit by the number of units to calculate the hours required to complete the project of the scope and quality specified. For example, a project manager knows that previous online help projects have averaged 3.1 h per help topic. The dependencies calculation for the new project results in 3.5 h per help topic. The manager estimates they will need to write 250 help topics based on a comparison with previous projects of similar scope. Therefore, the total hours required to complete the projects are 250 times 3.5 or 875 hours. At an average charge per fully burdened hour of employee time of $65/h, the manager then calculates that developing the online help will cost nearly $57,000 of development time.

Investigating the Resources Available to Conduct the Project

The primary resources required for an information-development project are people—writers, editors, graphic artists, production specialists, project managers, and other specialists depending on the nature of the media selected. The information project manager must evaluate the team resources needed for the project as well as the resources available. In the dependencies calculation, the experience of the team members has already been accounted for in part. If team members change, the dependencies for the project may also change.

Table 4 illustrates a typical team and the percentages of time required per team member for an information-development project. If you decide to assign the project to a single individual, consider carefully if the decision will be cost effective. Can the individual do his or her own quality assurance?

We often find that writers are not the best editors of their own work. Can the individual do the graphics needed for the project? The project may require photographs of equipment.

Does the information developer have adequate skills to take the photographs, taking into account lighting, correct exposures, editing, and digitizing? Is final production better done by a production specialist or by the individual? I argue that using a highly skilled communicator to do production tasks is not cost effective. As information projects become increasingly complex, with many media to choose from, assuming that a single individual can do everything effectively is a mistake.

In addition to evaluating the skills needed for the project, consider the availability of people for the project. Are all the experienced staff members already dedicated to several other projects? What hours are allocated to those projects? Are they available to work full-time on the new project, or only part time?

If the cost of the rest of the projects has not been estimated, it is likely that team members have been over-assigned too many projects. Over-assignment usually means that quality is compromised to meet deadlines. Under-assignment of time does not guarantee quality either. People tend to fill the available time with work that may not advance the quality of the product. In fact, under-assignment to may result in lower quality if too much un-

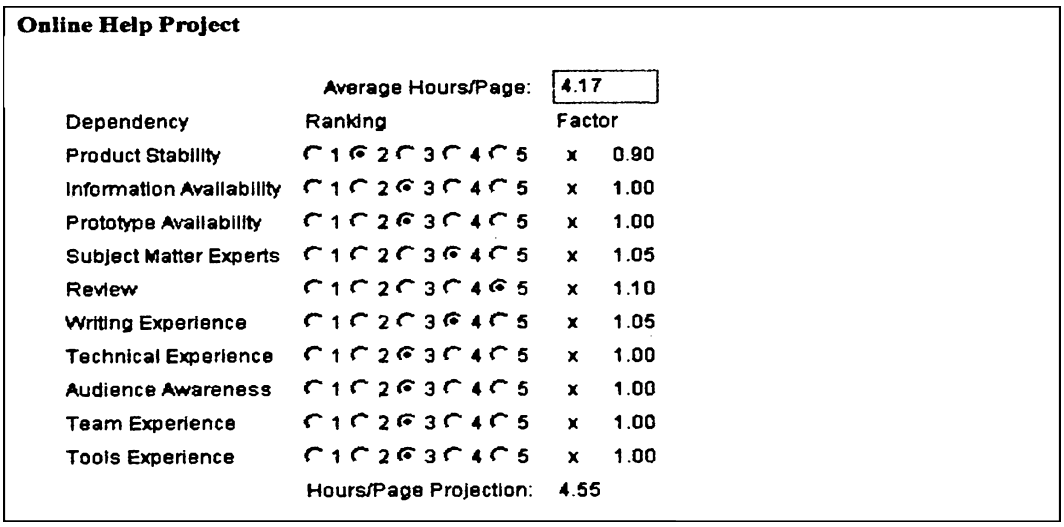

Figure 3. Sample dependencies calculation for a particular project.

Table 5. Milestone Definitions

Phase	Name	Percentage of Total Project Time
Phase 1	Information planning	10
Phase 2	Content specification	20–25
Phase 3	Implementation	approximately 50, depending on Phase 4 requirements
Phase 4	Testing and production	18 or less
Phase 5	Evaluation	2

necessary information is provided. Unnecessary information clutters the document, making it more difficult for users to End the information they actually need. Manuals that are too long are often not used because they are intimidating to users. Online information that is yoluminous often means online searches that result in hundreds of topics selected, making the critical information difficult to separate from the "nice to know" or the completely irrelevant.

The key to maintaining quality at the specified level is to staff projects correctly, based on the estimates you have made. You need to ensure that sufficient staff are assigned from the beginning to take into account information changes that are likely to occur, but you must guard against using more staff than is necessary.

Determining the Project Milestones and Deadlines

Project milestones and deadlines for information-development projects are usually established in response to external factors such as product launch dates and customer requirements. However, to some extent, milestones should be viewed as dependent on your ability to conduct the project phases in a manner that produces a high-quality result. Based on experience with hundreds of projects, I suggest using the following, illustrated in Table 5, to schedule internal milestones.

To estimate Phase 4 requires taking into account the production requirements of the project. For example, a report that is simply reproduced on a copier machine will have an almost negligible Phase 4. But a manual of several hundred pages that will be offset printed and bound may take two or three weeks to complete. In evaluating the Phase 4 milestone, discuss the production techniques with people expert in the media that will be used. Remember that even information delivered electronically takes time to prepare and debug.

In addition, note mat XML-based (eXtensible Markup Language) publishing, which is widely supported, eliminates much of the traditional print preparation work. XML-authored text is format free, using XML elements to markup text without the addition of format information. The format is added through a publishing process that applies style sheets to the unformatted text. The style sheets are designed to support the publishing of Portable Document Format (PDF) outputs, HTML, various help systems, or other output types. As a result of the automation, the percentage of time required for Phase 4 production work may be greatly reduced. However, the testing and translation activities that are an integral part of Phase 4 still require budgeted project time.

Developing a Project Spreadsheet

One of the best and simplest ways of representing your initial view of an information-development project is a spreadsheet. The spreadsheet allows you to staff the project appropriately to meet the interim milestones and the deadline while maintaining the quality level demanded by the users. Figure 4 illustrates a typical project spreadsheet for a project that includes a user manual and an online help system.

Each column in the spreadsheet represents a month or a week of the project. Each row represents the hours al-

Book Name Factor	Skill Level	Projected Sept-97	Projected Oct-97	Projected Nov-97	Projected Dec-97	Projected Total Hours	Projected Hours/Page
User's Guide		60	**Page Count**				
0.12	Project manager	8	8	10	3	29	0.48
	Writer						
0.15	Editor	60	60	40		160	2.67
	Graphic artist			30		30	0.50
	Production coordinator				20	20	0.33
	Subtotal	**77**	**77**	**91**	**26**	**271**	**4.52**
Online Help		150	**Page Count**				
0.12	Project manager	9	20	18	4	51	0.34
	Writer						
0.15	Editor	60	76	60		196	1.31
	Online specialist	10	80	80	30	200	1.33
	Subtotal	**88**	**187**	**167**	**34**	**476**	**3.17**
	Total Hours						
	165		**246**	**258**	**60**	**747**	**3.56**
	Hours/Month 120		136	120	136		
	Full-Time Equivalent/Month		1.94	2.15	0.44		
	1.38						

Figure 4. Sample project spreadsheet.

located to each person working on the project. The total hours per person add up to the total hours required to complete the project as defined in the Information Plan. The spreadsheet can also be used to define the due dates of project milestones, for example, to calculate when Phase 2 is expected to be completed. If Phase 2 represents approximately 30% of the total project time, then the spreadsheet can be used to calculate when 30% of the total hours have been expended.

In addition to using the project spreadsheet to estimate and schedule the project, you can use it to track project progress, measuring hours expended against the percent complete of the project.

PHASE 2. CONTENT SPECIFICATION—PRESENTING THE DETAILS OF THE DESIGN

In Phase 2 of the information-development process, information developers move from the general strategy for meeting user needs sketched in the Information Plan to detailed design plans for the media they intend to produce. The Content Specifications should demonstrate how the results of the user and task analyses will be played out in the design of technical information of all types, including context-sensitive help systems, a series of paper and electronic manuals, online or self-paced tutorials, computer-based training, and even classroom training and other online mechanisms for ongoing user support.

Some information developers may argue that detailed specifications for the design of information deliverables are premature, especially when aspects of the product functionality, the user interface, or the information content may not have yet been determined. This view reflects a mistaken notion of the concept of user- and task-oriented design. In a task-oriented information design, the users' need for information and the tasks the users need to perform should be the focus of the design, not the information content or the tasks performed by the product. Too often, information developers performed by the product. Too often, information developers create superficial user- or task-oriented instruction that simply states information out of context or describes the product functions, rather than providing information that reflects the users' goals and objectives. If the users' goals and objectives have been analyzed in Phase 1, then the results of the analysis should inform the detailed design process of Phase 2. An information design that is based upon user tasks is unlikely to change in a substantial way during the course of the project, while an information design based upon subject matter, system tasks, or software design is likely to change whenever the subjects change or the underlying functionality is rethought.

A detailed content specification of the elements of the information design has several significant advantages over a vague plan in the head of the individual writer:

Example of an Annotated Topic Outline. Section A. Setting up the oscilloscope In this topic, engineers and scientists will learn the setup steps that they must perform so that the instrument can be used. The setup steps will include options that the user can exercise and indicate how those options will affect the types of measurements that can be taken.

- Information developers are likely to consider the design implications of their user and task analyses more thoroughly if they are required to write a detailed specification rather than a simple heading-level outline.
- Reviewers are more likely to understand the intent of the design and its relationship to user needs from a detailed specification than they are from a vague, high-level out line.
- Implementation of the design should not begin until the overall approach to the information is thought through. Remember that many information developers are likely to "just start writing without a Well organized plan in place."
- In case of personnel changes, a detailed plan enables a new information developer more easily and quickly to pick up where the former developer left off.
- Information managers can estimate resources required and plan a detailed schedule of milestone deliverables more effectively around a detailed plan than a vague outline.

A detailed Content Specification should include the following:

- A description of the purpose of each information media that will be delivered
- Measurable usability objectives for each deliverable
- Brief summaries of user characteristics and tasks
- A discussion of the design rationale for each deliverable
- A detailed annotated outline of each topic to be designed, including the associated information type and whether the topic is new or requires-minor, major, or no modification.

The Content Specifications for documents, manuals, and some online help designs include a table of contents for the information with annotations, as shown in the following example.

A table of contents-like outline may be the best way to display the organization of information in a book or a traditional help application. However, other organizational structures may be more effective for planning the details of Web sites, help systems, tutorials, computer-assisted training, and others that have a hypertext rather than a linear structure. These structures are more effectively specified through hierarchical or Web-like models (hierarchy charts, Web maps) with which the designer can show the relationships among the modules more easily than in a linear outline.

A Web map can be used to show the relationship between a topic and the interface objects, facilitating the development of context-sensitive links. Each interface object in the Web becomes a starting point for access into the help system. Each help topic is shown as an object that can be linked to and from or accessed through a browse sequence or through a table of contents, keyword search, or full-text search. A Web map makes all the relationships clear, although it can become quite complex if there are several hundred or thousands of help topics or if the links are random rather than systematic. Systematic links help the users to predict the kind of information they will receive when they pursue a piarticular hyperlinked path. Random links often confuse the users, leading them to abandon references to the help system.

Prototyping—A Phase 2 Opportunity for Rapid Information Design

During Content Specification, the information developers should begin producing prototypes of their design ideas. Design prototypes serve the same function in information design as they do in product design. They permit more effective feedback by other members of the design team and by potential users. Prototypes of manuals, help systems, computer-based training, and others can be reviewed using cognitive walkthrough or heuristic evaluation techniques, or they can be subjected to usability assessments. For example, if an information developer is contemplating a new structure for a Web-based information library, it is possible to test the structure simply by prototyping the sequence of hypertext iinks. Users might be asked to find information and their responses recorded to help decide if the design is usable before the information is finished.

Early prototypes of web-based content might also be created. They can accompany early product prototypes to provide supporting information to assist learners who bring fewer resources to the performance and learning problem. In one early test of interface and documentation, we not only learned that the interface created a flawed conceptual model of the product functions in the users' mind but that the prototype documentation did not help the users correct their misconceptions. Both product and documentation needed to be redesigned.

Prototyping also gives the information developers an opportunity to show concretely how the information will look to the users. The prototype designs should be fully formatted according to the requirements of me Information Plan and the Content Specifications so that the prototypes approximate the final look and feel of the design. In this way, users and team members can judge if the information designs are both usable and attractive. For most people unskilled in Web or book design or the layout of web topics, an abstract description of the intended design fails to communicate effectively the full intent of the design. Only with a concrete representation is the reviewer able to construct a comprehensive mental model of the design and provide useful feedback as to its effectiveness.

Combining Phase 1 and Phase 2 for Revision Projects

For most information-design projects, it is important to keep Phases 1 and 2 of the information development life cycle separate. Phase I, Information Planning, encourages designers to look at the broad issues involved with satisfying user needs. In the Information Planning phase, media are selected, strategies developed, and usability goals established in keeping with the information learned from the users and other subject-matter experts. In Phase 2, Content Specification, the broad outline of goals and objectives is translated into specific information deliverables, each of which is itself carefully specified. Without both phases in filace, information developers are more likely to recreate the status quo, producing the same dull, unusable information year after year without regard to performance issues or changes in the make-up of the user community.

On some projects, however, the information planning may have already been done for a previous version of the product. As a consequence, only Phase 2 specifications may need to be written to add new functionality to an existing structure or to make minor organizational adjustments based on feedback from users, trainers, and customer support. However, care should be taken to avoid endlessly maintaining an existing structure after it has lost its effectiveness. Too often, both product and information developers continue to make changes to an existing structure without ever examining its effectiveness or are afraid to make drastic changes to a structure that they have learned is ineffective. For that reason, it is useful to reconsider Phase 1, information Planning, on a regular and frequent schedule throughout the life of a product.

PHASE 3: IMPLEMENTATION—TURNING DESIGN INTO AN INFORMATION PRODUCT

Some aspects of implementation of the information design begin during the prototyping activities of Phase 2. However, primary implementation work in Phase 3 should not begin in earnest until Phase 2 detailed planning, prototyping, and early usability studies are complete. We recommend that at least 30% of total project hours be devoted to Phases 1 and 2. That is, if a project is projected to take 1200 h, or two people working full-time for six months, then Phases 1 and 2 should consume at least 400 of the 1200 h, In that time, an information-design strategy will be complete and detailed.

During Phase 2, information developers are likely to begin assembling some of the technical content needed for the information deliverables. However, most of that content development should take place in Phase 3, Implementation. Phase 3 will take from 50% to nearly 60% of the total project time, depending upon the amount of time needed for testing and production during Phase 4. The percentage of time required for Phase 4, Production, will increase depending on such factors as printing, translation, packaging, and distribution.

During the Implementation Phase, information developers begin to produce the mformation types outlined during planning. Typically, information deliverables go through at least two formal review cycles, following first draft (alpha) and second draft (beta) development. Often, information deliverables go through at least one more informal review cycle early in Phase 3. In this review, small sections of a document or help system are circulated among informed people for feedback on content, style, layout, and so on.

During Phase 3, the information developers are learning more about how to present the content and how to relate the content to the users' goals. Writers, instructional designers, illustrators, graphic designers, layout specialists, online specialists, video producers, animators, and other individuals representing the wide variety of media we can include will be involved in contributing their expertise to me emerging information.

As the information is created, it should be reviewed be fore every scheduled phase by a developmental editor, an individual skilled in heuristic evaluation techniques and alert for potential problems in organization, level of detail, completeness, tone, format, and more. The developmental editor should be a senior member of the information-development team with considerable experience working with information developers to assist them in ensuring that the project goals are being met. The developmental editor often assumes a teaching role, especially when some members of the team are inexperienced in the information design techniques used by the organization. The editor fulfills a significant quality assurance role by ensuring that goals and standards are met and that best practices are consistently followed. For detailed information on developmental editing, see Ref. (2).

In addition to developmental editing, the information-development team may include individuals expert in copy-editing. The copyeditor ensures that the text, graphics, and layout conform to company and industry standards. Copywriters generally check documents for spelling, grammar, consistency, adherence to regulations, and more. Early copyediting ensures that information does not contain errors that distract reviewers from their primary task of ensuring the accuracy of the information. Also available are automated quality management tools which check a text against style guides, terminology lists, and other internal or international standards and provide a report to the writer and to the management, if desired.

Technical reviews are a standard part of the Implementation Phase but are frequently unsuccessful in helping to ensure the quality of the information delivered. In fact, many information developers consider the current technical-review process to be broken. The primary reason for review problems is a lack of commitment to the review process by the reviewers themselves. A thorough technical review of technical in formation takes time, on the average 5 to 10 min a page. It also takes careful attention to detail to ensure that the conceptual, procedural, and instructional text includes the correct information. It takes even more careful attention to ensure that no information that might help the users learn and perform has been omitted. Too often, those with review responsibilities do not allow sufficient time in their schedules for thorough reviews. As a consequence, incorrect information often finds its way into final information products.

Usability Testing of Documentation and Help

As soon as documentation and help are prototyped, usability testing can begin with actual users. Although the most complete assessment of the usability of the documentation will take place once draft software and the draft information are complete, early tests can take place with early prototypes of interface and information. We might want to learn, for example, if a minimalist approach we have selected for procedural information is sufficient to assist novice users in performing new tasks. With basic procedures in place and an early view of the interface, including paper prototypes, we can ask potential users to perform tasks following the instructions.

More extensive usability testing is performed at the first, or alpha, draft phase. Generally, we divided Phase 3, Implementation, into three sub-phases: first draft, second draft, and production draft. We define each draft by the percentage complete of the information. For example, we might expect the first draft of the information to be 90% complete, with draft graphics in place, a complete table of contents, and a rudimentary index. The second draft may be 99% complete in terms of text and graphics with nothing left to add except the final corrections and a complete index. At the second draft, sections of the documents are often released for translation. The final production draft is ready for shipment to printing or implementation on CD-ROM or as part of a Web site.

Usability assessment becomes a most serious activity at the first draft sub-phase. At this point, you can ask potential users to perform complete tasks with a product and provide the online help and paper documentation to answer their questions. During usability assessments at this point, however, a significant decision must be made. You can ask users to perform tasks with the product and simply make the technical information available without mention, you can remind users that help and paper documentation is available for their use, or you can constrain the task and ask users explicitly to use the help and the paper documentation to complete the assigned tasks. No technique is any more valid than any other, and only the last will provide an explicit test of the documentation. It is entirely possible that the first two choices will give little or no information about the effectiveness of the documentation.

It is a good idea to pursue all three techniques. The first technique, not referring to the documentation explicitly, might be used before any help or paper documentation exists. The second technique will suggest at what point the users turn to the documentation for assistance. The third technique might indicate if the technical information adequately supports learing, especially for novice users.

Tracking the Project

Throughout the course of the project, but especially during Phase 3, you will need to track progress. Tracking progress includes knowing how much time has been allocated to each task, how much time has been used to date, how much time is remaining, and how much work is left to complete the task.

To gather the information, you must know if the project is on track. Each member of the information-development team should be asked to track his or her own progress. They need to know their allocated hours for each task and report how many hours they have expended and how many are remaining. It is best to ask everyone to report their hours weekly, before they lose track.

The most difficult aspect of project tracking is, however, not the hours allocated but the progress of each task toward completion. People are often quite optimistic in reporting how much they have done and how much they have left to do; if they are performing a task they have never done before, they will have little sense of what remains to be done for completion. The project manager will need to assist flrem in evaluating their progress.

The project manager must also be alert for changes to the original scope defined for the project in the information Plan and the Content Specification. If a help system with 150 topics has been specified, remaining on track will be difficult if team members add topics, They need to be aware of the original estimates and how they were made so that they track carefully any changes to project scope. No one should feel free to increase the project scope without approval of the project manager; the project manager must be prepared to estimate the affect of changes on the team's ability to complete the project on time and maintain the level of quality required by the user.

Reporting Project Progress

As the project is tracked, be prepared to report progress to team members and management. Progress reporting should include both oral reports and periodic written reports. In the written reports, include a summary of the progress and plans for the next period. Review the hours used and the hours remaining and estimate the overall progress toward completion. Finally, discuss any problems that have occurred or are anticipated. By dealing with problems immediately, you are more likely to solve them while they are still small. By anticipating problems, you will be able to deal with them effectively and quickly. Always keep the primary goal of the project in mind—to meet the users' information needs.

PHASE 4. PRODUCTION—ENSURING ACCURATE, COMPLETE INFORMATION FOR THE USER

During the 1990s and into the first decades of this century, traditional print production has been largely replaced by electronic methods, notably the Portable Document Format or PDF. Organizations prepare PDF versions of their documents that may be printed by a formal print vendor or an inhouse print shop, made available through on-demand printing services, or published to a website for customer downloading. If formal printing is required, it should be noted that, even when advanced electronic production techniques are used, print production takes time that cannot be truncated. Large print runs of multicolor documents, including the binding and preparation for distribution, may take several weeks to complete. During this production period, no further changes can be made to the information

without incurring considerable expense. As a result, it is very important that ao product or content changes occur. If they do, it is likely that users will be disappointed to learn that something they believe they should be able to do is not possible, or something is possible for which they have no information.

Even if information is distributed electronically, the final electronic files must be prepared. The preparation includes adding hypertext links, creating indexes to facilitate keyword searches, and testing functionality. Context-sensitive help systems, while requiring the same testing before distribution to users, also must have the links between software and help tested to ensure that the correct information appears.

XML-based authoring further automates the publishing process by adding one or more style sheets to a format-free content. Much XML-based publishing is very fast, producing output as PDF, HTML, various help systems, or other output. The implementation of XML-based publishing has reduced the time required for final documentation preparation from weeks to hours or minutes.

Functional testing of electronic information, while it can begin in Phase 3, should become part of the functional testing of the product to ensure accuracy and completeness. Web-based information also requires functional testing to ensure that internal and external links operate as intended.

In addition to functional testing, Phase 4 often includes the most intense period of activity for translation and localization. A lack of discipline in the processes for developing product and information will have a considerable adverse affect on the cost and effectiveness of translation and localization efforts. To facilitate translation and localization, all product and information developers should work with standardized vocabularies, consistent structures for information, and a minimalist approach that reduces the text to what the user needs to know, If the developmental and copyediting functions described earlier have been applied to all the information deliverables, including the product interface, translation and localization will proceed more smoothly and result in more accurate information delivery to a range of user communities worldwide. Once again, the need for a careful and consistent approach to all the information that touches the user will reap benefits for both users and developers.

PHASE 5. EVALUATION—REVIEWING THE PROJECT SUCCESSES AND FAILURES

Since no one likes to review a string of failures, let us hope that following some of the steps outlined in this article will result in a successful project, one in which all information delivered to users its carefully planned and well integrated. Even if the project has been successful, there are always many opportunities to improve. Few projects are completed without communication Challenges, especially when a diverse team of information specialists finds itself working together for the first time. Whenever a project team consists of people with different experience, training, perspectives, and personalities, there will always be opportunities for improvement.

In Phase 5, two sorts of evaluation are recommended—written and oral. Each member of the team may want to write a project wrap-up for the part of the project under his or her responsibility. The wrap-up reports might then be combined by the project manager into a single report. The wrap-up re port should include quantitative information about project activities, including hours used to complete each phase in comparison to the original hours predicted to be used in Phase 1. If the total hours were different than originally predicted, the project manager should account in the narrative for the differences, especially if the project lias taken considerably longer than first estimated. Such an analysis will help the project team to better estimate its time on future projects.

In addition to the wrap-up report, the information-development team, including the product developers, should meet to review the report and discuss ways in which they might be able to work together more effectively in the future. It is better to discuss problems soon after they have occurred rather than allow bad feelings and resentment to linger into the next projects.

Information design and development promises to become an integral part of product development. Even so, the processes need to be improved so that no member of the team is made to feel like a second-class participant. To develop information products that meet the complex needs of a wide variety of users throughout the life of a product, product and information developers must work together effectively. As the responsibility of our organizations for meeting user needs increases, so must our teamwork and our ability to listen and to respect the perspectives of development professionals from diverse disciplines. The development professionals must also learn that teams require collaboration not competition. Through a sound information-development process, such collaboration will be enhanced.

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