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Technical Communication: A Study in Improving Technical Documentation through Professional Audience Analysis

Abstract

The purpose of this research proposal is to understand the evolution of efficacy of Web 2.0 tools in modern technical communication applications. In technical communication, documentation is evolving from the traditional methods of large, printed reference manuals into more interactive tutorials and user-centered online help systems. Members and researchers associated with the *Journal of Visualized Experiments* (JoVE) conduct scientific research in complex environments that contain increasingly intricate technical information and instrumentation. These members also have different roles within their organizations, including technicians, scientists, and managers. Through the use of stratified random sampling, these JoVE members will be surveyed to understand how these professionals prefer to read technical documentation in complex environments, within their individual capacities and collaborative surroundings. These surveys will gather information about a possible consensus among the various roles in technical documentation preferences, and if any of these roles are rarely exposed to the documentation. A proposed conceptual environment of a contingent academic publishing environment will be presented to correlate the importance of collaboration and knowledge sharing within complex environments. The assumption is that these professionals will prefer

modern documentation methods due to the collaborative atmosphere and interactivity of Web 2.0 technology.

Background: Technical Documentation and Audience Analysis

As a technical writer, I have witnessed an evolution taking place in technical documentation in the past few years. This evolution primarily includes a transition from traditional methods of documentation, such as physical reference manuals, into more user-centric, interactive documentation, such as collaborative knowledge bases and context-sensitive online help. For example, instead of manually reading through a large, printed document, users are able to click a "help" button within a software application that produces a help topic relevant to that specific area of the software, such as a dialog prompt. Demands placed on Web 2.0 development and the availability of mapping technology in modern authoring tools enabled this context sensitivity to be established, therefore, elegant documentation can be created by using this technology successfully.

A software company aims to design its applications around the needs of the customer, consistently focusing on improving usability and performance of these applications. Achieving these improvements allow the developer to reduce the amount of support calls they receive, diminish overhead costs, and also help maintain a competitive advantage in business environments where the software is sold and implemented. While the ideal software application will provide a minuscule learning curve, this goal is not entirely possible in the design of software applications that are used in complex scientific environments.

For example, chemists use mass spectrometry (MS) to analyze the chemical compositions within a complex compound. These MS devices are highly complex instruments that rely on precise calibrations and synchronizations between powerful computers. In addition to the complex

instruments, the scientists that utilize these machines also have extensive backgrounds and experience in the scientific fields that use the equipment. Since the complex instruments contain crucial and accurate instructions on their use, I aim to understand how JoVE members prefer to experience and read documentation about the complex instruments and software that they rely on to conduct biological research. Given the availability of technology in authoring technical documentation, I want to understand how a technical writer would communicate this complex information to his or her intended audience, such as a member of the JoVE community.

Background: Contingent Online Academic Publishing Environment

Central to this study is the application of the concept of a contingent environment in academic publishing, as proposed by Brian Whitworth and Robert Friedman. In the first part of their proposal, *Reinventing Academic Publishing Online Part I: Rigor, Relevance and Practice*, Whitworth and Friedman examine the effectiveness of the modern sharing of academic knowledge. They predict a decline of the academic knowledge exchange, due to the expansion of cross–disciplinary research (Whitworth and Friedman, Part I). Multiple academic disciplines intersect at varying fields, and each of these fields represents a category of knowledge in academic environments, as shown in Figure 1:

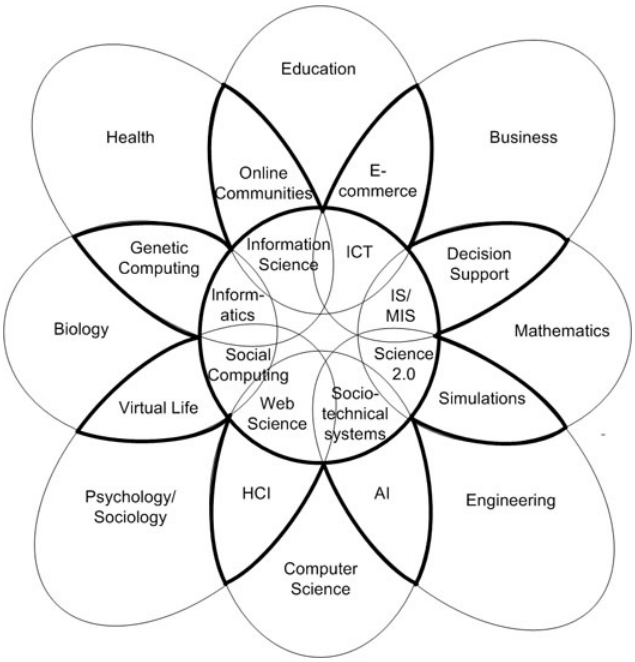

Figure 1: The cross–disciplinary "knowledge flower" of technology use.

Whitworth and Friedman argue that the *knowledge exchange system (KES)* in modern academia has failed in the performance of academic publishing (Part I). Designing an improved KES would be beneficial to all levels of academics, from the researchers, to the peers, to the students, and beyond the realm of academics. In this type of environment, all levels of contributors can increase their understanding of the overall subject matter and produce successful, peer-reviewed academic publications.

Part II of the Whitworth and Friedman proposal designs a model that will improve online knowledge exchange communities where individuals work together and are all recognized for their contributions. The concept contains implicit values such as "activating the academic community as a whole in order to increase common gains" (Whitworth and Friedman Part II). These values are similar to those expressed by the JoVE community, which aims to achieve the following results:

> Capture and transmit the multiple facets and intricacies of life science research. Visualization greatly facilitates the understanding and efficient reproduction of both basic and complex experimental techniques, thereby addressing two of the biggest challenges faced by today's life science research community: i) low transparency and poor reproducibility of biological experiments and ii) time and labor-intensive nature of learning new experimental techniques. (JoVE)

JoVE attempts to achieve these goals through collaboration, similar to how Whitworth and Friedman describe the four socio-technical system (STS) in their proposal (Whitworth and Friedman, Part II). These levels intend to add new perspectives in collaboration. These levels include hardware, software, personal, and communal that each contributes to the whole in that "each system level emerges from the previous, with software data flows emerging from computer hardware events, human cognitions arising from neuronal information flows, and communities arising from people interacting socially" (Part II). The levels presented in the concept also relate to the levels of JoVE community members that I want to survey, specifically technicians, scientists, and managers.

In my experiences as a technical writer during the software development cycle, I must interact with colleagues in every adjacent department, including Development, Quality Assurance, Support, Sustaining Engineering, Localization, Marketing, and Customer Relations. I rely on information from each of these departments when I am authoring technical documentation, in addition to the requirements set by my Technical Publication department. I am not a subject matter expert on every application that requires my documentation efforts because the software is highly complex, and there are many differences presented if I am testing the application on various operating systems, database management programs, and so on.

Essentially, I am the first "customer" because I have to gather the initial information as I am introduced to new applications and functionality that require technical documentation. In order to successfully complete my documentation, I rely on effectively communicating with all departments throughout the development cycle. Similar to how it is proposed in Whitworth and Friedman's concept, interactions with the various departments includes constant peer review from the inception of new functionality, until the final product release. In this way, I am able to produce quality documentation that which every department contributes and reviews individually, and that the customer understands when using the software. I feel that my experiences are analogous to a bridge between the Whitworth and Friedman proposal, and the JoVE community. By conducting this research, I will be able to establish "best practices" in technical communication for modern applications.

Research Design

To accomplish my research objectives, I will assess technical documentation preferences of a group of JoVE members surveyed based on their role within scientific research. JoVE functions as a contingent environment for publishing biological research, so the design developed by Whitworth and Friedman provides an important background for understanding similarities to JoVE. As a technical writer, one of my goals with the research is to understand how JoVE members prefer documentation related to complex processes. In understanding this community, I may create and improve the elegance of technical documentation through the utilization of Web 2.0 technologies.

Variables

The independent variables include the range of common Web 2.0 documentation methods, including a searchable PDF, HTML book, interactive help, knowledge base, and

context-sensitive online help. The subjects will be presented with descriptions of each method, along with typical applications that utilize these methods. The dependent, or outcome, variables include the responses and reactions about each of these methods, including the preferred methods, non-preferred methods, or even unknown methods that the subject may suggest. Perhaps there are even hybrid models that can be established through collaborative consensus, such as discussed in Whitworth and Friedman's proposal (Part II). Figure 2 provides a visual representation of the independent and dependent variables:

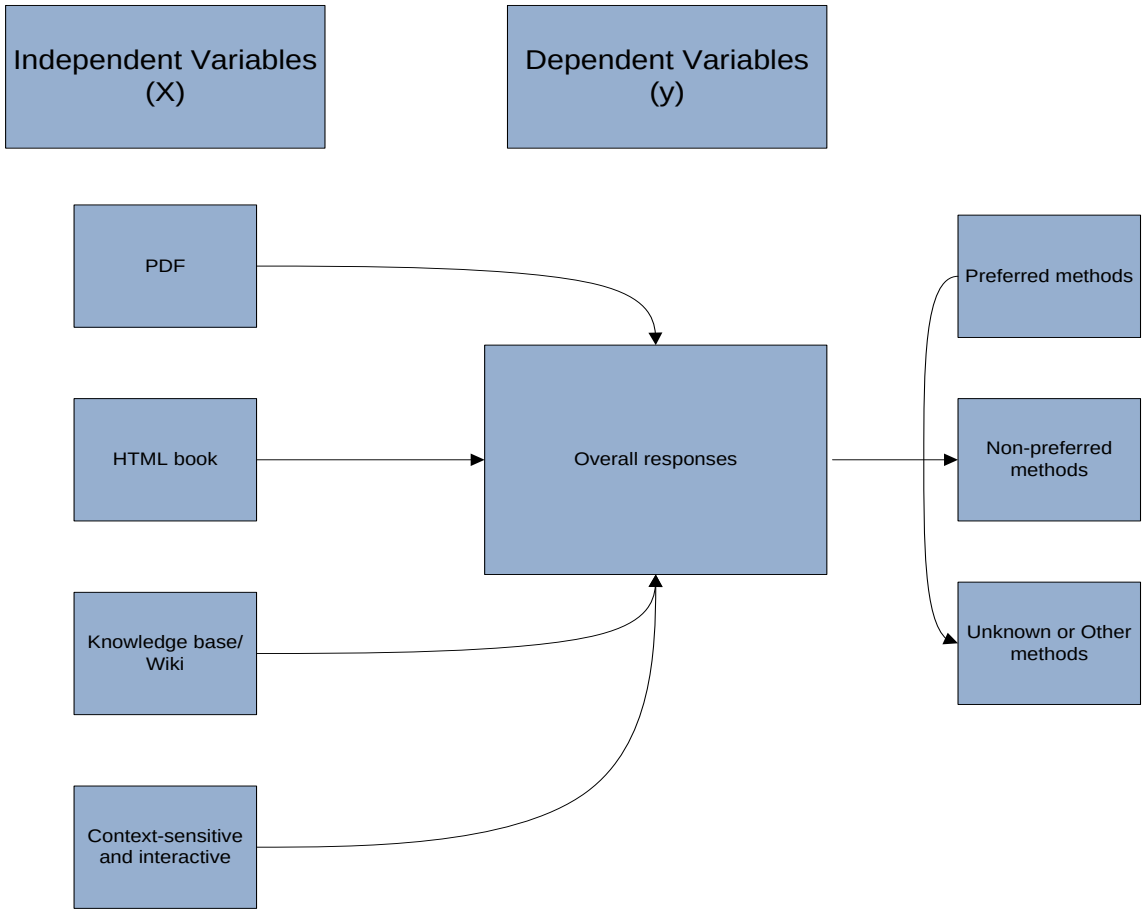

Figure 2: Independent and Dependent Variables

Validity

In support of this research proposal, the following issues of validity are addressed.

Criterion Validity. This type of validity is verified through how the role of the researcher affects their preference of documentation. When the independent variables of the documentation methods are presented to the JoVE researchers, the dependent, criterion variable, describes the reactions of the researchers to the documentation methods. Based on the role of the individual, criterion validity predicts the results rather than explaining them.

Construct Validity. This type of validity is verified through the application of theoretical concepts, such as the contingent academic publishing environment, but most importantly, through the use of the model in Figure 2. This model aims to measure the advanced use of the documentation components in Figure 2.

Content Validity. This type of validity is verified through the survey (Appendix C) and a successful incorporation of each element from Figure 2. This information will help understand the outcome variables and how to improve audience analysis in technical documentation.

Reliability

This project proposes a base-line study. I am not certain if the users would answer the questions in the same way a second time, so further study would be required to establish the reliability of the survey information. Ideal reliability would include consistency in outcome analysis with the research goals and assumptions. For this initial, base-line study, I will attempt to utilize a survey that asks the necessary questions while avoiding useless information. This initial proposal is an important step to develop an accurate audience analysis for developing technical documentation.

Process

To complete the study, I will use with the following process:

1. Establish communications with the JoVE community members and researchers to make them fully aware of my proposal.
2. Send a communication to the JoVE members about the intent of the study, along with an overview of what information I will be seeking, and ask for an initial response to those who are interested in participating.
3. Randomly select participants based on my sampling plan.
4. Distribute the consent form and survey to each participant and inform them of any deadlines.
5. Send polite reminders to participants who are yet to respond.
6. Analyze the results of the surveys. Appendix C contains the survey questions.
7. Present my findings based upon my independent and dependent variables, as well as the significance of the results.

Sampling Plan

My research involves scientists and professionals involved with the *Journal of Visualized Experiments* (JoVE). I will create a survey that asks researchers and readers of the JoVE questions to understand how these individuals prefer documentation related to complex processes. My sampling plan involves the use of stratified random sampling; the most common group among the subjects is the JoVE community. This group can be broken down to researchers who contribute to the journal and readers of the journal.

The readers might also be researchers in neuroscience, immunology and infection, and medicine. I break the groups down further by the roles of the individuals in their fields, specifically technicians, scientists, and managers. As readers of the journal might also be

researchers in fields such as neuroscience, immunology and infection, and medicine, I further describe the levels of JoVE contributors and professionals in these roles as follows:

- *Technicians*: Maintain the complex scientific instruments and perform tasks such as calibrating machines to specific standards required by the scientists.
- *Scientists*: Conduct scientific research by using equipment and analyzing data that are both complex.
- *Managers*: Supervise groups of scientists and are responsible managing acquisition and peer-reviewers of upcoming publications.

For my sampling frame, I will attempt to obtain 50 respondents, but no less than 35, the minimum number of participants needed to use inferential statistics, and I will use survey responses to test the mean of the data sample to determine if this sample likely represents the mean of the population (Bernard 529). In doing so, I will try to ensure that the number of respondents is equal. For example, for the three roles established in my design, I will try to get 12 of each at minimum, which brings the total to 36.

As shown in Appendix C, the survey uses a combination of closed-ended (Likert-type scale) and open-ended questions. Bernard states that the closed-ended formatting has statistically produced more positive responses, but I supplement the Likert-style questions with open-ended questions so that the respondent can elaborate on their opinions regarding the various documentation methods (240). Analyzing the data from these questions will help establish a basis for how more refined research can be designed in the future.

Information Analysis

I will collect the data from the surveys and look to establish connections and any irregularities. Since the sample size is sufficient and each subject is a member of the JoVE

community, I believe the data will be consistent because the subjects probably have similar hierarchies based on my roles, or understanding of professional organizations, but further study may be necessary. Based on the results of the surveys, I will ask myself questions similar to the following:

- Is there a consensus among technicians, scientists, and managers as to which documentation method(s) they prefer?
- Are any of these roles rarely exposed to technical documentation? If so, why?
- Did I fail to account for other methods? If so, what other methods?
- Do the results apply to other academic and professional fields?
- How do I use this information to improve the quality of Web 2.0 technical documentation to my audience?

Survey questions pertaining to the independent variables (Figure 2) contain the following Likert scale:

Very Strongly Agree	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Very Strongly Disagree**

When analyzing the responses about the technical documentation methods, I will score the scale from a value ranging 1-6. The lowest value, 1, indicates that the user selected Very Strongly Disagree, while a value of 6 indicates Very Strongly Agree. I am scoring the most positive response (Very Strongly Agree) with a 6 because I will add up the values per method, per user role in my final analysis and also determine the mean values for each documentation method. For example, one of the survey statements using this scaling states “Knowledge Bases/Wikis are your preferred method of using technical documentation.” After each method is scaled, an open-ended question follows, such as “Based on your experiences or initial opinions, what are the

strengths and weaknesses of Knowledge Bases/Wikis?" These open-ended questions are necessary to help develop more refined studies in the future because they will address specific user feedback about each particular documentation method. I will also give values to each user role, specifically technicians (1), scientists (2), and managers (3). There are two sets of data in this analysis: the documentation methods and each role.

Based on the results, I will use Independent Sample t-tests to compare how each role reacts to each documentation method; 15 t-tests will be calculated. This analysis will determine if any trends and agreements occur between roles, and if there are any disagreements between roles about particular methods. For example, if the technicians prefer PDF guides, while scientists prefer Knowledge Bases, these results indicate that each documentation method is catered towards different audiences and that no single method is the best overall. The null hypothesis is that there are no significant differences in documentation preferences among the roles. The alternate hypothesis is that there are differences in documentation preferences among each role.

Additionally, there will be a Likert scale to score information about how each role favors or disfavors technical writer performance, in terms of their effectiveness in audience analysis. This data will be scored similarly to the independent variables and I will use an Independent Sample t-test to compare how each role rates technical writers' audience analysis. This data will also be used to develop more refined research in the future. Refined research may produce more reliable results, and Regression Analysis will be considered for that design.

Possible Problems

The following list identifies possible problems I may encounter during the research:

- The survey asks too many irrelevant questions.

- The survey lacks adequate follow-up questions to understand the user experience and preferences.
- The survey lacks a confidentiality agreement, enough respondents, or both.
- The data is inconclusive due to lack of survey response quality.

Potential Solutions

To prevent the occurrence of the previously mentioned potential problems, I will allow the users to provide comments or suggestions, in the event that I did not address an issue. I will also consult with colleagues in my field to determine if the questions are adequate for the research. I will also let them decide if they want a voluntary, follow-up interview after the basic survey has been answered.

Time Line

The study would take place over a time period of 6 months. The first 5 months would be used to gather survey and interview information, follow up with any requested subjects, and I would use the final month for data analysis. This amount of time is necessary because these are thorough surveys and might continue to include extended interviews, I would also be trying to understand a bit of the biological subject matter in JoVE.

Significance

The most significant challenge in technical writing involves fully understanding the audience. If I can determine the optimal methods of conveying complex information to the JoVE users, perhaps by breaking down the information into simpler procedures within Web 2.0 authoring tools, it would benefit my field and my career. The complexity of information increases simultaneously with the technology designed to interpret it. By analyzing the preferred documentation methods of the JoVE community, and by discovering the optimal methods to

develop technical documentation, I will be able to expand best practice information about writing documentation using Web 2.0 methods, resulting in elegant documentation. The technical writer may become a more important role within an organization, perhaps considered as an information architect.

Works Cited

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Appendix A

CONSENT TO TAKE PART IN A RESEARCH STUDY

Title of study: Technical Communication: A Study in Improving Technical Documentation through Professional Audience Analysis

This consent form is part of an informed consent process for a research study and it will give information that will help me decide whether I wish to volunteer for this research study. It will help me understand what the study is about and what will happen in the course of the study.

If I have questions at any time during the research study, I should feel free to ask them and should expect to be given answers that I completely understand.

After all of my questions have been answered, if I still wish to take part in the study, I will be asked to sign this informed consent form.

I understand that I am not giving up any of my legal rights by volunteering for this research study or by signing this consent form.

This study is asking me if I would like to be a volunteer in participation. I have the right to decline now or any time during the research.

Why is this study being done?

This study is being done to analyze how members and affiliates of the *Journal of Visualized Experiments* (JoVE) community prefer to receive, read, and experience technical documentation in Web 2.0 environments. By surveying members of this community, the researcher may be able to improve best practices when producing technical documentation about complex concepts when using Web 2.0 documentation methods. The JoVE community was selected because members of this journal are frequently exposed to complex information and equipment, and through audience analysis, the researcher may determine the optimal methods of writing successful technical documentation, or plan a more refined proposal in the future.

Why have I been asked to take part in this study?

As a member or affiliate of the JoVE community, I am frequently exposed to complex scientific concepts and equipment. Typical modern technical documentation aims to break down complex information into task-based information, or it can present documentation more conveniently, such as producing context-sensitive help within specific modules in an application, along with other methods, as described in the proposal.

Who may take part in this study? And who may not?

Anyone may take part in this study that is involved with the JoVE community and has an interest in aiding the research.

How long will the study take and how many subjects will participate?

The study will take place from January 2011 through May 2011 and there will be about 50 participants, but this number may change due to time restraints and availability.

What will I be asked to do if I take part in this research study?

I will be presented with background information provided in the research proposal. This information outlines the various roles that the researcher wants to study, including technicians, scientists, and managers, as well as details about the Web 2.0 methods I will critique. I will then be asked to answer survey questions about Web 2.0 documentation methods, along with my preferences, criticisms, and suggestions. Reading the background information and completing the survey will take about an hour to complete. At any point before, during, or after the study, I may ask any questions related to the research.

What are the risks and/or discomforts I might experience if I take part in this study?

There are no risks in this study and I may choose to keep my name confidential, if I prefer to have an alias, or if I allow you to use my name in the research. The only personal information the researcher requests is my specific role within the JoVE community, specifically a technician, scientist, or manager.

Will I be paid to take part in this study?

No.

Who can I call if I have any questions?

Paul Wozniczka	**Prof. Norbert Elliot, Ph. D.**
91 Berwyn Place	NJIT, Dept. of Humanities
Lawrenceville, NJ 08648	Cullimore 426, University Hts.
609-510-2766	Newark, NJ 07102-1982
pjw3@njit.edu	Norbert.elliot@njit.edu
	973 596 6487
	http://web.njit.edu/~elliot

What are my rights if I decide to take part in this research study?

- I have the right to take part in the study
- I have the right to decline participation
- I have the right to leave the study at any moment

Signature

I have read this entire form, or it has been read to me, and I believe that I understand and questions about this form and this study have been answered.

I agree to take part in this research study.

Subject Name:_____

Subject Signature:_____ Date:_____

Appendix B

Web 2.0 Documentation Background Information

Types of Documentation

- PDF: A searchable PDF document that includes bookmark navigation and an index. This document also can contain links to external sources, such as another PDF document or a support website. Content is typically organized in a hierarchal and logical format (similar to a physical book), beginning with high-level concepts and processes that filter to feature descriptions and procedure examples. PDF documents require third-party software, such as Adobe Acrobat Reader.
- HTML Book: A searchable book in HTML format that includes bookmark navigation and an index, similar to a PDF except that it does not require third-party software, as many browsers are pre-installed on operating systems. HTML books typically work with every major web browser, such as Internet Explorer, Firefox, Safari, Opera, and Chrome, and some users prefer them over PDFs. HTML books also contain hierarchal and logical organization.
- Knowledge Base/Wiki: A repository that includes user-generated and user-approved content, such as a Wiki page or a user forum. This information is typically found through a search that produces results relating to individual tasks. For example, searching for "GCMS 001 pressure calibration" produces a search result about how to calibrate a specific function of the 001model GCMS instrument. Knowledge bases and Wikis additionally contain "tips and tricks" about software that the developers did not discover initially.

- Context-sensitive Help: A help system that maps help topics (such as through Java or HTML) directly to areas of the product. For example, clicking the file menu results in various actions that may be performed. You select one of these actions and are presented with a dialog, but you are unfamiliar with the fields you must input. You click a help icon and a topic specifically written for that dialog appears, along with sample data.
- Interactive Help: A help system that opens an active dialog after you type in a search term. This dialog contains a list of topics or questions about the task it determines you are trying to perform, along with external links to support pages or also knowledge bases. For example, some Microsoft Office products contain an interactive animation that produces these suggestions, and some of their products produce a knowledge base search on the right pane of the screen. You may click these links to view individual topics or external sources.

As a member or affiliate of the JoVE community, your role is described in one of the following categories:

- *Technicians*: Maintain the complex scientific instruments and perform tasks such as calibrating machines to specific standards required by the scientists.
- *Scientists*: Conduct scientific research by using equipment and analyzing data that are both complex.
- *Managers*: Supervise groups of scientists and are responsible managing acquisition and peer-reviewers of upcoming publications.

Appendix C

Technical Documentation Preference Survey

For questions containing a Likert scale, highlight the appropriate answer. When applicable, add additional details in an open-ended format after highlighting your selection. This additional information will be used to further understand your attitudes towards particular Web 2.0 documentation methods and assist the researching technical writer in further understanding the audience analysis successfully.

1. Within the JoVE community, are you a technician, scientist, or manager?

2. Briefly describe your responsibilities in the role(s) that you selected. If you have a combined role, such as being both a scientist and manager, describe why it is combined.

3. Do you have a role that differs from technicians, scientists, or managers? If yes, describe this role.

4. Does your role depend on extensive collaboration, or do you prefer to take charge and complete most tasks yourself?

5. What are the most frequent software applications that you use and how do you feel about their presentation of technical documentation?

6. When you require help with using a software application, what is your initial action? For example, do you immediately browse product documentation, or do you quickly attempt an internet search query, such as Google?

7. What type of technical documentation do you frequently read? You may include examples from consumer electronics, personal software applications, and professional applications and equipment.

8. If you do not read frequently read technical documentation, or perhaps rarely, why?

9. PDFs are your preferred method of using technical documentation.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

10. Based on your experiences or initial opinions, what are the strengths and weaknesses of PDF guides?

11. HTML books are your preferred method of using technical documentation.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

12. Based on your experiences or initial opinions, what are the strengths and weaknesses of HTML books?

13. Knowledge Bases/Wikis are your preferred method of using technical documentation.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

14. Based on your experiences or initial opinions, what are the strengths and weaknesses of Knowledge Bases/Wikis?

15. Context-sensitive help systems are your preferred method of using technical documentation.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

16. Based on your experiences or initial opinions, what are the strengths and weaknesses of Context-sensitive Help?

17. Interactive help systems are your preferred method of using technical documentation.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

18. Based on your experiences or initial opinions, what are the strengths and weaknesses of Interactive Help systems?

19. This survey addresses most of the common types of Web 2.0 documentation methods.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

20. Do you have any suggestions for other types of help systems that you feel technical writers should be using?
    For example, combining two or more of the previously mentioned methods to help you perform daily tasks in your personal or professional environment?

21. Overall, which of the Web 2.0 documentation methods fit your needs the most and least, and why?

22. The research design described the technical documentation methods accurately.

Very Strongly Agree	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Very Strongly Disagree**

23. Technical writers typically address the technical documentation needs of your role successfully.

Very Strongly Agree	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Very Strongly Disagree**

24. Outside of your role (such as in your personal life with technical documentation in general, technical writers address your needs in technical documentation and why?

Very Strongly Agree	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Very Strongly Disagree**

25. How should technical writers understand their audience successfully?
    For example, what process do you feel the writer should follow to begin documenting a complex process within a software application?

Thank you for completing the survey in this study. Your feedback is appreciated and will help provide important insights into the field of technical communication. You may contact the researcher if you have any questions about the research at any time during the study. You may also contact the researcher if you would wish to provide additional information through a live interview.