Measure for Measure: Using Measurement and Analysis to Improve the Technical Communication Process

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Executive Summary

With corporate pressures to increase quality and customer satisfaction, reduce cycle time and costs, and lower defects, technical communicators often grapple with key questions: How do I better understand our technical communications process? How do I measure it? How do I achieve process and product related goals, and how do I prove that I've achieved these goals? Measurement and analysis can help us answer some of these questions. Measurement and analysis can give us a baseline of where we are, reveal strengths or weaknesses in our process, and they can be compared with current data to show improvements. In this paper, we will look at some common and not-so-common technical communication measures. We will talk about their characterizations and indications. Finally, we will review some methods for collecting these measures and applying them to the technical communication process.

Define Measurement & Analysis

We will define measurement and analysis in two ways: in general terms that relate to technical communication, and in terms of the Software Engineering Institute's Capability Maturity Model for Software[SM] (CMM[SM]).

In General

Generally speaking, a measurement tells us something about an object. A measurement characterizes a particular aspect of an entity. Twenty-three hundred years ago, Plato divided what he called the art of measurement into two sections:

> "One section will comprise all arts of measuring number, length, depth, breathe, or velocity of objects by relative standards. The other section comprises arts concerned with due occasion, due time, due performance, and all such standards as have removed their abode from the extremes and are now settled about the mean."[1]

In this century, Fenton and Pfleeger, in their book *Software Metrics: A Rigorous & Practical Approach*, define measurement as "…the process by which numbers or symbols are assigned to attributes of entities in the real

[1] Hamilton and Cairns, *Plato: The Collected Dialogues*, (Princeton University Press: Princeton), p. 1052.

world in such a way as to describe them according to clearly defined rules."[2] Measurement represents a fundamental element of scientific, technological, and mathematical disciplines. However, it also dominates more practical aspects of our everyday life. Consider these examples of measurement:

- Gallons of gas
- Price per pound
- Speed limits
- Clothing and shoe size
- Time

Measurements always surround us, occasionally stupefy us, and often overwhelm us. They are fundamental elements of our world and part of the key to successful process improvement.

Importance of Measurement & Analysis

Measuring our shoe size is one thing, but measuring our process is another. Often there is an aversion to measurement because unfortunately, measurement has often been used inappropriately in the workplace and even in the world in general. JoAnn Hackos observes, "'Productivity measures' has a frightening sound to it—reminiscent of company goons watching worker progress through video cameras or recording the number of keystrokes per minute entered into a computer."[3] It is no wonder such Orwellian characterizations of personal measurement meet with some resistance and create high levels of anxiety. However, the context of measurements can be made positive. Consider these measurements:

- Weight
- Miles per Hour
- Time to run the Boston Marathon

Measurements such as these may be intimating, cause anxiety, or meet with some resistance. However, when interpreted accurately and in context, measurements can be very positive. Review Table 1 to see how the aforementioned measurements can meet with positive interpretation. Note the measurement within context.

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[2] Fenton and Pfleeger, *Software Metrics: A Rigorous and Practical Approach*, (ITP: Albany, New York), p. 5.

[3] Hackos, *Managing Your Documentation Projects*, (John Wiley and Sons, Inc.: New York) p. 553.

Table 1. Measurements and Possible Connotations		
Measurement Type	***Metric***	***Within Context***
Weight	400 lbs.	**Bad** for an average person **Good** for a Sumo wrestler
Miles Per Hour	55	**Good** for an average driver **Bad** a Daytona 500 contender
Time to run the Boston Marathon	6:23:34	**Bad** for a marathon runner **Good** for the author of this paper

Each of these measurements is personal; each one measures a specific characteristic about a person and compares that characteristic to a mean, average, or baseline. (Note that these measurement examples align more with Plato's second division of measurement.) This paper focuses on measuring processes, not people. With the software development process, the Software Engineering Institute (SEI) places special significance on measurement and analysis. The SEI characterization of measurement and analysis can certainly be applied to the technical communication process. Before we examine measurement and analysis in technical communications, we will bring the concepts into perspective from within the SEI Capability Maturity Model for Software (CMM).

Basic Outline of the Capability Maturity Model

The Software Engineering Institute developed the Capability Maturity Model for software development. This model contains a set of guidelines for improving the software development process. The CMM model contains four fundamental elements:

- Levels of Software Process Capability
- Key Process Areas
- Key Practices
- Common Features

Levels of Software Process Capability

Each level (from two to five) builds successively on the previous level. According to SEI, a process maturity level is "…a set of process goals that, when satisfied, stabilize an important component of the software process."[4] The five levels of maturity are as follows:

1. Initial
2. Repeatable
3. Defined
4. Managed
5. Optimizing

[4] Carnegie Mellon University SEI, *The Capability Maturity Model: Guidelines for Improving the Software Process*, (Addison-Wesley: Reading, Massachusetts) p. 15.

Relating the CMM to Technical Communication

JoAnn Hackos borrowed the CMM process maturity levels from SEI and developed characteristics specific to technical communication. She outlines a five-level publication maturity model like this: [5]

1. Ad Hoc
2. Rudimentary
3. Organized and Repeatable
4. Managed and Sustainable
5. Optimizing

Key Process Areas

The SEI outlines key process areas for each of the five levels of process capability. Key process areas "…indicate where an organization should focus to improve its software process. Key process areas identify the issues that must be addressed to achieve a maturity level."[6] Table 2 lists the key process areas for each level of software process capability: [7]

Table 2. Key Process Areas By Process Level

Process Capability Levels	***Key Process Areas***
Initial	None (processes are ad hoc)
Repeatable	Requirements Management Software Project Planning Software Project Tracking & Oversight Software Subcontract Management Software Quality Assurance Software Configuration Management
Defined	Organization Process Focus Organization Process Definition Training Program Integrated Software Management Software Product Engineering Intergroup Coordination Peer Reviews
Managed	Quantitative Process Management Software Quality Management
Optimizing	Defect Prevention Technology Change Management Process Change Management

[5] Hackos, *Managing Your Documentation Projects*, (John Wiley and Sons, Inc.: New York) pp. 47-48.

[6] Carnegie Mellon University SEI, *The Capability Maturity Model: Guidelines for Improving the Software Process*, (Addison-Wesley: Reading, Massachusetts) p. 32.

[7] Ibid. p. 33.

Key Practices

The SEI outlines specific activities and infrastructures that support implementation and institutionalization of each KPA. Among the 18 KPAs, SEI cites 316 key practices. To effectively complete a KPA, an organization should apply these practices.[8] Here are some examples of key practices for software project planning: [9]

- The project follows a written organizational policy for planning a software project.
- Responsibilities for developing the software development plan are assigned.
- Adequate resources and funding are provided for planning the software project.

Common Features

Because there are so many Key Practices, SEI organizes Key Practices into Common Features. Common Features are, "…attributes that indicate whether the implementation and institutionalization of a key process area is effective, repeatable, and lasting."[10] Measurement and Analysis are listed together as a Common Feature. Figure 1 illustrates this CMM Model and its elements.

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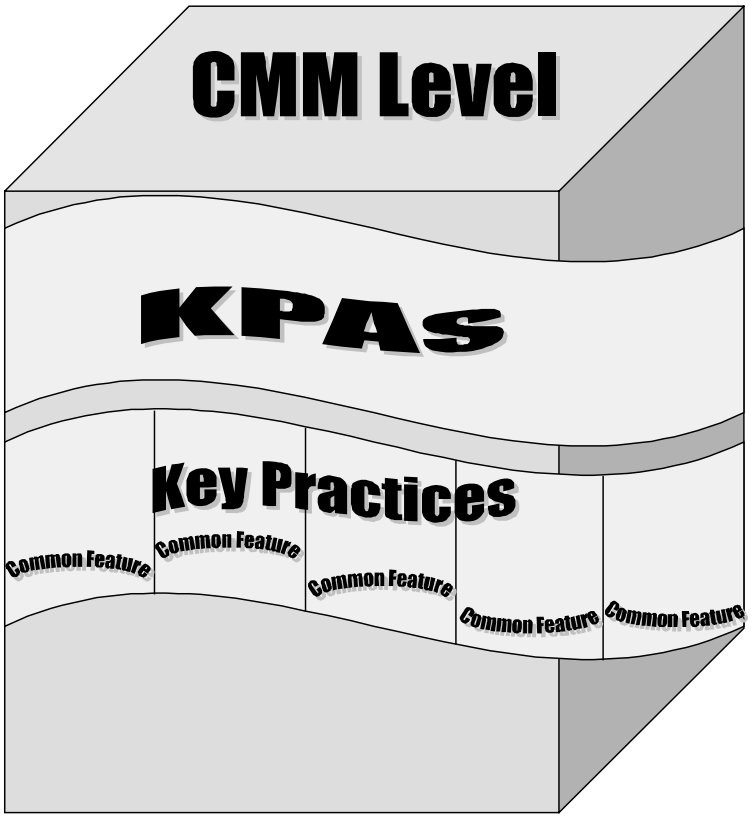
[8] Carnegie Mellon University SEI, *The Capability Maturity Model: Guidelines for Improving the Software Process*, (Addison-Wesley: Reading, Massachusetts) p. 41.
[9] Ibid. pp. 134-137.
[10] Ibid. p. 40.

"Measurements are made and used to determine the status of activities for the KPA."*



* Source: *The Capability Maturity Model: Guidelines for Improving the Software Process*, Carnegie Melon University, SEI, Copyright 1994, Addison Wesley Longman, Inc.

Figure 1: Elements of the CMM Model

Applying This Concept to Technical Communication

With this idea in mind, we can begin to connect a program of measurement and analysis to the technical communication process. With effective measurements and their analysis, we can determine the effectivity, repeatability, and sustainability of our technical communication process improvement efforts. Remember, M&A focuses on process improvement efforts. If an organization is not dedicated to process improvement, M&A will simply provide data. M&A does not bring about process improvement. It only indicates the effectiveness of your process improvement. Only people can improve the process.

What Gets Measured?

In terms of the technical communication process, what do we need to measure and how do we measure it? Before answering these questions, we must consider the different types of measurements. Just about anything can be measured, and the methods of measurement seem limitless. Before the monetary standard, people used to barter. A pound of butter may have been worth one chicken, two sacks of flour, or five candles. With our current monetary system, we have greatly streamlined the system of exchange, and we have brought a level of equity to the system. Measures can be formulated in terms of relations (x is bigger than y), ratios (1:2), and absolute numbers (101 feet), to name a few. Fenton and Pfleeger cite five measurement scales: nominal, ordinal, interval, ration, and absolute.[11] Try not to be overwhelmed with all of these measurement possibilities. Fortunately, we can again turn to the software process to focus in on some useful characterizations. These types of measurements have proven useful for measuring many industrial and corporate processes:

- Time in terms of efforts hours expended
- Time in terms of duration (calendar)
- Size
- Quality of product/process
- Customer satisfaction

Enough Theory. Where Do I Begin

So far we have outlined some of the fundamental theoretical aspects of measurement, but how does all of this apply to the technical communication process? What measures can we use and how can we use them to make improvements in our process? Consider the sample of measures from the previous sections. In technical communication, we may characterize these measurement types in a table similar to Table 3:

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[11] Fenton and Pfleeger, *Software Metrics: A Rigorous and Practical Approach*, (ITP: Albany, New York), pp. 46-48.

Table 3. Measurement Types and Characterizations	
Measurement Type	***Characterization***
Time in terms of Effort Hours	The number of hours expended to complete a unit, whether that unit is milestone like the end of phase 1 or a deliverable. Example*:* The number of hours to complete a draft of chapter 1.
Time in terms of Duration	The cumulative number of units (minutes, hours, day, weeks, months, etc.) taken from a perceived starting point to a perceived end point. Example: The start and end dates of a technical edit.
Size	The extent of an object in quantifiable terms. Example: The number of modules in a training program or the number of pages in a chapter.
Quality	The degree of excellence of an object or process. Example: The quantitative and qualitative results of a usability test.
Customer Satisfaction	The degree or magnitude of pleasure perceived by a customer of a given product or process. Example: The quantitative and qualitative results of a publication customer survey or the results of a training evaluation.

A good starting point is to review each phase of your technical communication process and determine one element in each phase of the process that you want to measure. Hackos cites five phases of what she calls the publications-development life cycle:[12]

1. Information Planning
2. Content Specification
3. Implementation
4. Production
5. Evaluation

Don't pull measurements out of thin air. You must measure something that gives you relevant feedback on your process. Giving due consideration to the measurement constitutes the analysis part of measurement and analysis. Once you have collected data, you must be able to understand what the data is telling you. A good method for determining what to measure is called the goal/question/metric approach (GQM).

[12] Hackos, *Managing Your Documentation Projects*, (John Wiley and Sons, Inc.: New York) p. 38.

The Goal/Question/Metric (GQM) Approach

The Goal/Question/Metric (GQM) approach, first developed by Victor Basili and his colleagues, is an extremely effective method for determining how to measure the success of processes. The method is based on the premise that process improvement occurs only when goals are clearly established and communicated. Fenton and Pfleeger state that, "…you cannot tell if you are going in the right direction until you know where you want to go."[13] GQM helps you determine measurements that best characterize successful completion of your goals. The method works like this:

- Express the overall goals you wish to attain.
- Develop questions that, when answered, will tell you if your goals have been met.
- Last, analyze the questions in terms of measurements. That is, review each question and then develop a set of measurements that will answer the question.

This method has been applied with great success in companies. The method has helped companies derive measurements that truly answer questions about company processes and that help companies determine if they are meeting their goals.[14]

Applying GQM to Technical Communication

This GQM method can be applied to technical communication. You can use it to develop relevant, meaningful measures that determine the state of your technical communication process. Let us work through a brief example of determining measurements.

State a Set of Goals

Recall the phases of the publications-development life cycle process. Begin by writing down an important goal for the specific process phase. Table 4 gives one possible goal for each phase:

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[13] Fenton and Pfleeger, *Software Metrics: A Rigorous and Practical Approach*, (ITP: Albany, New York), p. 83.

[14] Ibid. pp. 83-85.

Table 4. Phases and Goals	
Phase	***Goal***
Information Planning	Develop a project hours estimate that, when completed, is within 20% of actual project hours.
Content Specification	Create or update styles and standards that directly address 90% of customer complaints related to style or standards issues.
Implementation	Establish a peer review process that detects 90% of all technical inaccuracies.
Production	Reduce the time to develop an index by 10%.
Evaluation	Determine the current level of customer satisfaction.

For our example, we will focus on the goal of the Information Planning Phase: develop a project hours estimate that, when completed, is within 20% of the actual project hours.

Develop Questions

Next, write down a series of questions that will help you determine whether or not the goals have been met. Consider these examples:

- How much time has being spent in each phase?
- Are all phases required for this project?
- Over time, is this historical data consistent or not?
- Which phase takes the most time? Why?
- Which phase takes the least time? Why?

Formulate a Metric

Finally, write down measures that answer these questions. Recall the measurement types and characterizations from Table 3.

- Time in terms of Effort Hours
- Time in terms of Duration
- Size
- Quality
- Customer Satisfaction

The measures we use to answer the questions can be stated in terms of some of these characterizations. When reviewing our questions for the goal of phase 1, we want to measure the ***total cumulative effort hours*** expended in each phase. By logging the hours per task, we will develop a measurement of effort hours per task. This measure would answer four of our five GQM questions. Therefore, we would begin to measure total cumulative effort hours for each phase of the publications-development cycle. Here are some examples of other types of technical communication measures:

Time in terms of duration

- Gantt charts showing elapsed times of each phase for previous projects
- Specific Gantt charts for tasks such as research, writing, editing, illustrations, layout and production, and reviews

Size

- Number of pages by chapter and by publication
- Number of software function points to help you determine the scope of the software project
- Number of hardware procedures to help you determine the scope of the hardware project

Quality

- Number of errors in each technical review, broken out by categories such as technical accuracy, grammar/spelling/punctuation, and style/standards
- Quantitative data from usability testing

Customer satisfaction,

- Quantitative data from customer-satisfaction survey

These are just a few examples of the types of measurement for which historical data can be collected and maintained.

The Importance of Historical Data

Once you have developed a set of measures, you must determine effective ways to collect and apply the data. Historical data plays a key role in successful measurement and analysis, bringing a certain level of reliability to your measures. To be useful, historical data must be formally collected and maintained. Formal measures of data collection do not need to be difficult. You may want employees to log each hour they work on specific technical communication phases. Set up an Excel spreadsheet into which they can quickly and easily enter numbers. Then, make sure someone is responsible for transferring those numbers into a centralized database. Leaving data collection to chance reduces the reliability of the data; and the less reliable the data, the less reliable the estimates and analysis that are based on that data. Consider our measurement of effort hours. Over time, as we build up historical data, we will be able to estimate and track each phase of our process with a high degree of accuracy. Our measurement may reveal that we expend a lot of time in phase three. Perhaps on the next project, we will use fewer people in that phase and still make all of our milestones and release a product of equal quality. We have learned that we can meet our calendar (duration) commitments and still expend less effort hours, which means we save time and money.

Conclusion

Measurement and analysis are powerful elements of any process improvement program. The technical communication process resembles the software process and therefore can borrow heavily from the SEI Capability Maturity Model for software. Within this model, measurement and analysis, a common feature of that model, provide key information about strengths and weakness within a process. The Goal/Question/Metric approach can be used to develop useful measures with the various phases of the technical communication process. By using these quality tools, technical communicators can begin to develop and maintain historical data that can be used to improve important elements of the technical communication process.

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Author Information

Lori Marra has been a technical communicator since 1983. In her new position as Senior Training Developer, Lori develops technical training programs for two companies of Advanced Hi-Tech Corporation (AHT). In addition, Lori maintains her own consulting business, Communications Plus, a technical communications consulting firm which specializes in process improvement, documentation and training template design, and placements in both salaried and contract positions. Over the last decade, Lori has been very active in the Rochester Chapter of STC. She has been President, Vice President, and Program Chair. She has also been Chairperson for the chapter's local seminar, the longest running local seminar in STC. During her tenure as President, the Rochester Chapter won the prestigious STC International Chapter Achievement Award. Last year she planned the chapter's first one-day workshop on Web page creation and presented three sessions at the local seminar. Last year she also co-wrote an article on strategic planning for *Technical Communication*, the STC International publication. Lori remains very active in STC. This year she sits on the Rochester Chapter's strategic planning committee.

Lori earned a B.S. degree in management science from Nazareth College of Rochester. She is currently working on her thesis for a masters degree in philosophy from the University of Rochester. In her "spare" time, she founded and coordinates a book club, *All-Booked-Up*. When she is not working, studying, or reading, you'll find Lori taking in a play, tasting wine, cooking, working on a home improvement project, or watching reruns of Star Trek:TNG with at least one cat on her lap.

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