



What Is Quality? A Management Discipline and the Translation Industry Get Acquainted¹

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ABSTRACT

One way to answer the question “What is quality?” is to start with a framework put forward by Garvin (1984). That framework describes five approaches to determining quality: Transcendent, Product-Based, User-Based, Production-Based (“manufacturing” being Garvin’s term) and Value-Based. Garvin does not claim that any one of these approaches is sufficient unto itself. Rather, a well-rounded view of quality requires all five. The present article briefly describes these five approaches to quality and references the work of several of the most visible and respected people in the discipline of quality management. Following that presentation, the article discusses arguments for and against applying quality-management approaches to the translation industry. The authors of this article disagree about the relevance of quality management to the translation industry, but they do agree that stakeholders should take a position on the issue.

Keywords: Quality, Quality Management, Translation, Fitness for Use, Requirements, Specifications, Transcendent, Product-Based, User-Based, Production-Based, Value-Based.

RESUM (*Què és la qualitat? Quan la gestió i la indústria de la traducció entren en contacte*)

Una manera de contestar la pregunta "què és qualitat?" pot a començar amb el marc presentat per Garvin (1984). Aquest marc descriu cinc enfocaments que determinen qualitat: l'enfocament transcendent, el basat en el producte, el basat en l'usuari, el basat en la producció (Garvin utilitza el terme "manufatura") i el basat en el valor. Garvin no sosté que un d'aquests enfocaments sigui suficient per si mateix. Per contra, una visió multidimensional de la qualitat ha de comptar amb els cinc enfocaments. Aquest article descriu breument aquests cinc enfocaments sobre la qualitat i fa referència al treball d'alguns dels autors més reconeguts i amb major visibilitat en l'àmbit de la gestió de la qualitat. A continuació l'article debat els arguments a favor i en contra de l'aplicació dels diferents enfocaments sobre la gestió de la qualitat en la indústria de la traducció. Els autors d'aquest article estan en desacord entre ells sobre la rellevància de la gestió terminològica en la indústria de la traducció, però sí que coincideixen en què les parts interessades haurien d'adoptar alguna posició al respecte.

¹ This article is the first of trilogy of papers published in this issue: Melby *et al.*, Fields *et al.*, and Koby *et al.*



Paraules clau: qualitat, gestió de la qualitat, traducció, idoneïtat per a l'ús, requisits, especificacions, transcendent, basat en el producte, basat en l'usuari, basat en la producció, basat en el valor.

RESUMEN (*¿Qué es la calidad? Cuando la gestión y la industria de la traducción entran en contacto*)

Una manera de contestar la pregunta “¿qué es calidad?” puede en comenzar con el marco presentado por Garvin (1984). Dicho marco describe cinco enfoques que determinan calidad: el enfoque trascendente, el basado en el producto, el basado en el usuario, el basado en la producción (Garvin utiliza el término “manufactura”) y el basado en el valor. Garvin no sostiene que uno de estos enfoques sea suficiente por sí mismo. Por el contrario, una visión multidimensional de la calidad debe contar con los cinco enfoques. Este artículo describe brevemente estos cinco enfoques sobre la calidad y hace referencia al trabajo de algunos de los autores más reconocidos y con mayor visibilidad del ámbito de la gestión de la calidad. A continuación el artículo debate los argumentos a favor y en contra de la aplicación de los diferentes enfoques sobre la gestión de la calidad en la industria de la traducción. Los autores de este artículo están en desacuerdo entre ellos sobre la relevancia de la gestión terminológica en la industria de la traducción, pero sí que coinciden en que las partes interesadas deberían adoptar alguna posición al respecto.

Palabras clave: calidad, gestión de la calidad, traducción, idoneidad para el uso, requisitos, especificaciones, transcendent, basado en el producto, basado en el usuario, basado en la producción, basado en el valor.

1. Introduction

This article is the second in a three-part series on translation quality. The articles build on one another by addressing definitions of translation, quality, and finally translation quality. In the first article, we proposed that definitions of translation can be either “narrow” or “broad.” A narrow definition sees translation as strictly a text-centric activity, while a broad definition views translation as including many activities (e.g., localization) that go beyond texts. Stakeholders’ adoption of one view or the other will determine their expectations of translation quality.

In this article, we address the issue of quality and the relevance of quality-management principles to the translation industry. With respect to quality, producers of goods and services have been concerned about quality as long as people have engaged in exchange transactions. In an effort to improve quality, people began developing quality-management concepts in the eighteenth and nineteenth centuries. By the 1930s, quality management emerged as a formal management function, and it continued to evolve into the 1990s. This function spans both the public and private sectors, applying to large and small organizations and including every industry from manufacturing to professional services. As a result, quality management is a well-established discipline today.

Quality management seeks to ensure the consistency of products and services. Achieving such consistency requires that one determine exactly what one means by “quality.” Within the discipline of quality management, scholars have developed frameworks for determining quality. In this article, we present one such framework. After presenting that framework, we supplement it with the work of several other leaders in quality-management. Following that presentation, we outline arguments about the relevance of quality-management principles to the translation industry. In our last section, we discuss where beautiful and fluent translations may fall on a quality scale. We conclude with the hope that translation stakeholders will study issues of quality management to improve their services and increase profitability.



2. Garvin's Comprehensive Framework: Five Approaches to Quality

One of the more well-known frameworks for determining quality is that of David A. Garvin (1984). Garvin describes five complementary approaches to defining quality: (1) the transcendent approach, (2) the product-based approach, (3) the user-based approach, (4) the manufacturing-based approach (which we will call the "production-based approach" in this article), and (5) the value-based approach. According to Garvin, these five approaches arose independently in the fields of philosophy, economics, marketing, operations management, and finance. Each approach correctly describes an aspect of quality, but any of them standing alone provides only a limited view. To obtain a comprehensive view of quality, one must employ all five.

Garvin's five approaches to quality can be summarized as follows.

- **Transcendent Approach.** This approach sees the quality of a product or service as an innate characteristic that is both absolute and universally recognizable. Transcendent quality recalls Plato's concept of beauty as an "ideal form." Under this approach, a product or service possesses excellence based on its subjective relationship to some standard. The ability to determine that subjective relationship can only be developed through experience.
- **Product-Based Approach.** This approach sees a product's or service's quality as quantifiable based on certain ingredients or attributes. Garvin uses ice cream and rugs to illustrate this approach. Ice creams, for example, can be ranked according to butter-fat content, with higher butter fat indicating higher quality. Rugs can be ranked according to the number of knots per square inch, with a tighter weave indicating higher quality.
- **The product-based approach favors measurable attributes over an individual's personal preferences.** Nevertheless, Garvin identifies eight ways or "dimensions" that people actually use to evaluate product quality. These dimensions include performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Some of these dimensions are more objective, while others are more subjective.
- **User-Based Approach.** This approach is based on the premise that quality is "in the eye of the beholder," where the beholder is the user. According to this approach, quality is the degree to which a product or service satisfies the user's needs, wants, or preferences. For instance, if particular users believe that a Chevrolet meets their needs better than a Cadillac, then the Chevrolet would be the higher-quality vehicle for them.
- **Production-Based Approach.** This approach, which Garvin labelled the "manufacturing approach," views quality as "conformance to requirements." Under this approach, any deviation from the intended user's requirements reduces quality. Unlike the user-based approach, the production-based approach does not consider the eye of the beholder. Rather, this approach seeks to objectively measure the degree to which a product or service complies with pre-determined specifications.
- **Garvin identifies five types of production processes:** project, job, batch, assembly-line, and continuous flow. Professional services, including translation, are most often project processes. The assembly-line process does not apply to translation, and any attempt to think of quality in that context will not work. For that reason, we believe the term "manufacturing approach" could mislead readers of this article into thinking that this approach refers only to making thousands of identical widgets. Because this approach goes far beyond widgets, we have renamed it the "production-based approach."



- **Value-Based Approach.** This approach assesses quality in terms of costs and benefits: the more benefits outweigh costs, the more a product or service increases in value. Products or services with higher value enjoy higher quality. As a result, the product or service that performs best may not provide the highest value and so will not be the highest quality.

As noted above, Garvin argues that suppliers of products and services should employ all five of these approaches to quality. By doing so, suppliers can gain a comprehensive view of quality that will lead to significant benefits. These include cost savings, market-share gains, and profit growth.

Of course, Garvin's work is not the only attempt to provide a comprehensive framework for determining quality. Other scholars who have proposed comprehensive frameworks include Smith (1993); Reeves and Bednar (1994); and Seawright and Young (1996). In addition to these scholars, many other people have contributed to the quality-management discipline. Four of the most respected are Edwards Deming, Philip Crosby, Armand Feigenbaum, and Joseph Juran. Collectively their ideas have helped to operationalize the notion of quality.

- **W. Edwards Deming** is perhaps the figure most widely recognized as operationalizing quality concepts and principles. He asserted that people achieve quality through never-ending efforts at continuous improvement. Improvement occurs as people eliminate unwelcome variation in a product or service, and they do so by eliminating variation in the process that creates the product or service. Deming's ideas were influential in the development of the ISO 9000 series of quality standards. His ideas align most closely with Garvin's product-based approach.
- **Philip B. Crosby** advocated for "zero defects" as the foundation of quality. "Zero defects" does not mean that a product or service must attain "perfection"; rather, the product or service must conform perfectly to the requirements agreed upon by the customer and the supplier. In other words, the customer deserves to receive exactly what the supplier has promised to produce. This approach fits well with what we are calling Garvin's "production-based approach." Some people might assume that this approach applies exclusively to product manufacturing, but the concept of zero defects applies to both products and services.
- **Armand V. Feigenbaum** argued that quality is the total composite of characteristics through which a product or service will meet the expectations of the customer in use. Feigenbaum's name is virtually synonymous with the term "total quality management." He stressed that quality means what is best for certain customer conditions that encompass the actual use of the product (or service) and its cost to the user. His view can be seen as aligning with Garvin's value-based approach.
- **Joseph M. Juran** stated succinctly that "quality is fitness for use" and that "fitness is defined by the customer." According to this view, which is widely accepted across multiple industries, suppliers would be mistaken to decide what is or is not fit for the customer's use. Juran's position aligns most closely with Garvin's user-based approach.

The work of Deming, Crosby, Feigenbaum, and Juran created the bulk of the quality-management discipline. Because their work fits so well within Garvin's comprehensive framework, that framework provides a potentially useful approach for evaluating the quality of different services, including translation services.

3. Relevance of Quality Management to the Translation Industry

Until now, the translation industry and the discipline of quality management have had little contact. The industry does use several terms borrowed from quality management, such as



quality assurance and quality control. Nevertheless, the industry has not employed a comprehensive framework like that of Garvin. This situation suggests a question: how relevant are quality-management concepts to the translation industry? Throughout the rest of this article, we will suggest some possible answers to this question. In particular, we will outline points of agreement and substantial disagreement among ourselves. While we do not reach a consensus with respect to quality-management's relevance, we do agree that one's position on quality management is related to how one defines translation (see article one in this series) and translation quality (see article three).

We have encountered both the **transcendent and the product-based** approaches to quality in the translation industry. For example, during a presentation on translation quality at the 2014 World Congress of Translators (Berlin), an audience member made the following energetic comment: "Why would anyone want to measure translation quality?" The next equally energetic comment came from another audience member: "That was a stupid question!" The first comment typifies the transcendent approach: translation quality is not measurable. According to this view, translation quality is expressed in the innate beauty and artistic excellence of the expert translator's work. If the translator is an expert professional, then the target text will be excellent and its quality need not be measured, even if such measurement were possible. The second comment typifies the product-based approach: translation quality can be and is measured. That measurement concerns characteristics like accuracy (correspondence between source and target text) and fluency (target text readability and adherence to target-language norms, without regard to source content).

While the two Berlin audience members contradicted each other, the transcendent and product-based approaches share some common ground. Specifically, they both acknowledge that accuracy and fluency are relevant to translation quality. From a transcendent perspective, translators should always produce maximal accuracy and fluency even though those characteristics cannot be measured. From a product-based perspective, metrics should quantify as many aspects of accuracy and fluency as feasible and maximize both characteristics, subject to constraints imposed by other requirements. It would also be informative to bring in the perspective of Translation Studies on accuracy and fluency, but space limitations do not allow that in this article. A Functionalist perspective on relevant issues in Translation Studies, such as Skopos, loyalty, and ethics, is available in Hague et al (2011).

So long as the discussion is limited to professional translators, both the transcendent and product-based approaches support maximizing accuracy and fluency (unless project specifications indicate otherwise). However, when machine translation enters the picture, the discussion changes radically. Some machine-translation scenarios—particularly those involving time and financial constraints—do not require maximal accuracy and fluency. Sometimes inaccurate and less-than-fluent translation is useful. Sometimes it is not.

All of the authors agree that both the transcendent and product-based approaches to quality are relevant to the translation industry. We differ, however, over which approach should be emphasized, and we strongly disagree on the role and nature of translation specifications. This disagreement may be related to the definition of translation—broad or narrow (see the first article in this series)—that each of us accepts.

The **user-based approach**, which measures quality according to how well end-users believe a product or service meets their needs, is clearly relevant to the translation industry. We authors agree that a quality translation must meet end-users' needs. For example, a translated instruction manual for a machine or software package should allow people to use the product. If users do not believe the translated text can help them accomplish their task, the text is a bad translation.

We authors disagree about the degree to which this end-user's perspective is helpful to translation-quality assessment. Some of the authors argue that this perspective is useful because end-users require no knowledge of the source language to determine quality. If the



target text does not accomplish its purpose, it has failed. From a quality management perspective, it lacks quality.

Other authors do not consider this approach very useful. They note that end-users cannot evaluate certain aspects of translation quality. In particular, end-users suffer from a fundamental lack of source-text competence and cannot determine whether the target text actually represents the source-text meaning. Therefore, monolingual users' criteria for judging a translation's quality will generally be based only on fluency. A serious accuracy error can remain hidden to such users unless it contradicts real-world experience. This problem may be illustrated by an example: A well-written but erroneous translation prevents users from operating some machine. However, the text "reads well" in the target language and is not obviously a translation. In this scenario, users may well not recognize that the translation has created the problem. Instead, they may recognize only that a mismatch exists between the instructions and the machine, without understanding where the fault lies. In a related scenario, suppose an error existed in the original instructions and was translated accurately. The translation would replicate the source-text error, rendering the machine equally unusable. As in the prior example, end-users would recognize a problem but be unable to diagnose its source. This limitation renders the end-user perspective only minimally helpful.

People from the discipline of quality management would disagree with the conclusion that end-user perspectives are not very helpful to translation. After all, in both cases cited above, end-users can identify a quality problem. The fact that users cannot diagnose the problem's cause is irrelevant. Diagnosis is the task of someone evaluating the machine's documentation; that person knows that the instructions are a translation and understands how the machine functions. If the translated instructions are faulty, then the problem can be turned over to the translation project manager, who can contact a bilingual if needed. In this case, end-users have performed a vital function by identifying a quality problem to be diagnosed and repaired.

One of the authors' real-world experiences further illustrates the possible role of end-users in quality measurement. Some time ago, the author made a presentation in English for a Romanian audience, with the help of an interpreter. The author does not know Romanian. Nevertheless, based upon the audience's questions and comments, the author recognized that the interpreting service was not high quality. From an end-user perspective, the author performed a useful quality-evaluation function. Identification of quality problems drives diagnosis and prevention of future problems, which go beyond initial quality evaluation.

The **production-based approach** has already had a substantial impact on the translation industry. This approach, which reflects manufacturing approaches, emphasizes the need to implement good processes that increase the chances of obtaining a good product or service—one that conforms to specifications. This emphasis on effective processes makes a production-based approach attractive to the translation industry. Indeed, current translation service provider standards, such as the European standard (EN 15038) and the forthcoming international standard (ISO 17100), employ a production-based approach. We authors agree that this approach is relevant to translation companies and the translators who work for them, regardless of our individual opinions about the degree to which process-oriented approaches can aid translation-quality management.

Because the production-based approach shares common ground with manufacturing approaches, some people may misunderstand this approach's role in translation services. Specifically, they may believe that the production-based approach assumes that all good translations of a particular source text must be identical. Such is not the case. Neither is it the case that good professional services in other contexts must be identical. Two software engineers, for example, will never produce identical source code for a complex application, regardless of how detailed the specifications may be. The same applies to the translation industry: many different translations can fully meet the specifications of a particular project.



Using a production-based approach in tandem with other approaches does not mean that one should ignore subjective aspects of a translation, such as beauty. Consider, for instance, the case of two translators commissioned to translate Schiller into English. Both might do an excellent job, but requesters could still prefer the work they believe best captures the “music” of the original text. Alternatively, specifications may require that the Schiller translation be accessible to high-school literature students. In that case, requesters would favor a pedestrian but accessible translation over one they consider beautiful but inaccessible.

With respect to the authors’ opinions about production-based approaches to quality, we agree that translators should follow specifications and that a variety of good translations may “meet spec.” We strongly disagree, however, about whether specifications need always be stated explicitly and what kind of specifications are appropriate in translation projects. The last section of this paper, “The Elephant in the Room,” provides more details about this disagreement.

The **value-based approach** to quality is perhaps the one most discussed among professional translators. Under this approach, products or services increase in value as they offer greater benefits with respect to costs. The higher the value, the higher the perceived quality. In the context of translation, the value approach asserts that a translation’s economic benefit to the requester must exceed its cost. Otherwise, the translation is unattractive and undesirable; it lacks sufficient value.

The concept of value may appear simple enough, but one can determine value from two very different perspectives within the translation industry: that of requesters and that of providers. With respect to providers, many hold a transcendent view. Under that view, a translation’s quality depends on an individual translator’s production process. Quality is therefore inherent in a professional translation and unaffected by price. In contrast to this provider perspective, requesters perceive quality as the result of many factors. These factors include price, timeliness, and end-users’ reactions—in other words, value. From this requester perspective, quality does not simply “happen” or somehow inherently exist in a translation; rather, quality is created. For that reason, translation production processes must create quality results from multiple perspectives, including product, production, end-user, and value.

We authors disagree about the relevance of the value approach to translation quality. We agree, however, that many people tend to treat translation as a commodity and base purchasing decisions solely on price (American Translators Association, 2). Furthermore, we agree that translation should not be treated as a commodity and that specifications, when provided, are relevant. One way to apply the value-based approach to the translation industry is to stress that price should be a decision factor only when two or more proposals include the same explicit specifications and are guaranteed to meet those specifications exactly.

4. The Elephant in the Room

We have reviewed five approaches to quality and provided arguments about those approaches’ relevance to the translation industry. We have not, however, addressed the biggest mismatch between quality-management approaches and the translation industry. This so-called “elephant in the room” concerns those cases when specifications require less-than-maximal accuracy and fluency. Such cases raise the issue of whether less-than-maximal translations can ever be considered high-quality.

Typically, this elephant walks into the room only in cases of raw or lightly post-edited machine translation. However, human-produced translations may be subjected to lower expectations in some commodity-based approaches to translation. An example would be a project with high volume and an overnight deadline. Such a project may be divided among multiple translators to produce the text without sufficient time to coordinate style or terminology, resulting in less-than-maximal accuracy and fluency. Can such a translation be considered high-quality?



One answer is that people should not limit quality measurement to a translation's artistic beauty while ignoring the reason for its creation. According to this view, the purpose of a translated text (other than a literary or marketing text) is not to be hung on the wall, enjoyed as music or poetry, or appreciated for its beauty and the emotions it evokes. Rather, a translated text is produced to meet a requester's communication needs. The translated text cannot simply be exceedingly accurate and beautifully fluent; it must also fulfill a function.

The foregoing may seem counter-intuitive. After all, some people might assume that if a translated text is exceedingly accurate and beautifully fluent, it automatically fulfills its function. Multiple real-life examples, however, illustrate why functionality cannot simply be assumed. For instance, consider a health brochure translated from English into Spanish for limited Spanish proficiency audiences in the United States. The translation may be exceedingly accurate and beautifully fluent, but it might fail to accomplish its purpose if it does not match the audience's reading ability and expected register. A related example would be the translation of a company's annual report. If the translation is accurate and fluent but uses a competitor's terminology (say, Ford vs. General Motors), it will fail. As an additional example, a translator may produce an accurate and fluent translation that is not functional because it does not fit in the space allotted for it in a video or in a graphic-user interface. In a more serious example, a translation may accurately and fluently convey the message that terrorists plan to hijack airplanes on September 11, 2001. That translation would not be functional, however, if it is completed on September 12 or later. In contrast, a rough and sloppy machine translation that conveys the same gist about an imminent attack on September 10 would be much more functional and much more valuable, even if it only helped flag the content as immediately requiring accurate and fluent human translation. All of these examples illustrate how functionality may influence quality measurement.

While functionality has a role in quality measurement, most translators would not characterize a raw or lightly post-edited machine translation with less-than-maximal accuracy and fluency as a "high-quality" translation. Such would be the case even if professional human translation was not feasible and the translation met requester and end-user needs. The point of contention here is the term quality. Translators know that the same term can be used quite differently in a technical domain as opposed to general language. The question is whether the translation industry should reject quality management approaches because those approaches may understand the term quality differently than translators.

Some of the authors feel strongly that the translation industry should not reject quality management over terminology issues. In cases where translation specifications violate the transcendent assumption that accuracy and fluency must always be maximized, these authors suggest that industry use expressions such as "excellent solution given the requirements" rather than "high quality." These same authors believe that quality management offers significant benefits to the translation industry. For example, quality management provides an excellent way to address downward price pressure. Specifically, providers can include all aspects of the translation industry, including professional human translation and machine translation, in one coherent whole and apply quality-management approaches to those aspects. If providers do so, they can distinguish among various market segments, improve translation services, increase customer satisfaction, and raise profitability.

While some of the authors see the benefits of quality-management approaches, others are not convinced. Setting aside the elephant in the room, these authors note that there are "tigers" in the room as well. Those tigers are unscrupulous providers. If the translation industry adopts quality-management principles, it may open the door to an "anything goes" approach to quality. In such an environment, unscrupulous providers could claim that they provide "quality service." That claim would rely on the difference between the general public's vague understanding of "quality" and the definition of that term in quality management. Unscrupulous providers could use that difference to justify specifications that professional translators would consider ludicrous.



With respect to the possibility of unscrupulous providers, supporters of quality management respond that stakeholders should become familiar with the standard parameters described in our prior article on translation definitions. Standard translation parameters, which are based on the assumption that all translations must exhibit some degree of accuracy and fluency, form an importance safeguard against abuses. Those parameters heavily constrain the limits of acceptable specifications, and customers' knowledge about how specifications work can compensate for their lack of linguistic expertise. Properly informed, requesters and providers can cooperate in developing libraries of typical sets of specifications. By doing so, all stakeholders can better communicate before, during, and after production begins on a translation project.

5. Conclusion

In this article, we have reviewed different approaches to measuring quality and suggested how those approaches might apply to the translation industry. We have not come to a consensus, however, on the extent to which quality-management approaches are helpful to the industry. Some of us are convinced that quality management's advantages far outweigh its dangers. After all, quality management has worked in other industries, and it can benefit all translation stakeholders as well. Others among us, however, are not convinced. They argue that the translation industry's unique characteristics may require a nuanced approach to quality that recognizes the special features of translation services. Under this view, certain aspects of quality management may or may not apply to translation.

While we have not reached a consensus about the relevance of quality-management principles to the translation industry, we do agree that stakeholders need to be aware of these issues. Everyone will benefit if they understand just what quality means with respect to a particular project..

References

- American Translators Association. Translation: Buying a Non-Commodity. Web. 3 Dec. 2014.
- Garvin, David A. "What Does Product Quality Really Mean?" *Sloan Management Review* 26.1 (1984): 25-43.
- Crosby, Philip B. *Quality Is Free: The Art of Making Quality Certain*. New York: McGraw-Hill, 1979.
- Deming, W. Edwards. *Out of the Crisis*. Cambridge, MA: MIT Press, 1986.
- Feigenbaum, Armand V., *Total Quality Control*, McGraw-Hill, 1983.
- Hague, Daryl, Alan Melby, and Wang Zheng. "Surveying translation quality assessment: A specification approach." *The Interpreter and Translator Trainer* (2011) Vol. 5, no. 2: 243-267.
- Juran, Joseph M., and Joseph A. DeFeo. *Juran's Quality Handbook: The Complete Guide to Performance Excellence*. 6th ed. New York: McGraw-Hill, 2010.
- Reeves, Carol A. and Bednar, David A. "Defining Quality: Alternatives and Implications." *Academy of Management Review* 19:3, 1994, 419-445.
- Seawright, Kristie W. and Young, Scott T. "A Quality Definition Continuum." *Interfaces* 26.3 (1996): 107-113.
- Smith, Gerald F. "The Meaning of Quality." *Total Quality Management* 4.4 (1993) 235-244.