

The Juran Institute Research on Cost of Poor Quality

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By Mark De Feo

Abstract

A review of the literature regarding the cost of poor quality shows that there is a number of ways to discuss the topic. Some people report it as a percentage of sales, while others report it as a percentage of costs. Some state that it costs a company 10% of annual sales, while others state that it costs 40%. Do all of these reports contradict each other? Is there a common way to discuss the cost of poor quality?

Through an interview with Dr. Joseph M. Juran, the answers to these questions proved irrelevant. Juran suggested that the most important facet of the cost of poor quality is its value to any company. Regardless of how people report it, the cost of poor quality must be understood in terms of its significance to the business world. By breaking the concept down into its origins, development and impact, corporate executives cannot only avoid the burdensome nuances of its technical details, but they can also clearly understand why it's important and how it can help them earn greater profits.

Introduction

Upon receiving a copy of the first edition of his *Quality Control Handbook*, Dr. Joseph M. Juran quickly quipped, "I would like to know how many of these I have had to sign over the years. This must be an antique by now." Without the slightest display of irritation or arrogance after signing yet another book, Dr. Juran eagerly crafted a message and handed it back to me with a smile. This simple event caused me to stop and think. I was amazed that a man of 103



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years still had the ability to not only pick up a pen and sign a book, but to also quickly reply to my request with a witty remark. It was clear that Dr. Juran had not lost the charm and wit that brought him such a successful life, one that warranted the signing of an uncountable number of books.

I paused to reflect on the life of the man that sat across from me. Five times my age, Dr. Juran had lived through the Roaring Twenties, the Great Depression, both World Wars, the Vietnam War, the inventions of the radio, television, and computer, and the overall restructuring and transformation of a modern global society. Furthermore, Dr. Juran had not only witnessed a period of unprecedented economic growth, but had also actively participated in it. Meanwhile, I have survived through two decades and four presidents. Needless to say, I felt extremely honored to have the opportunity to sit down and interview such an accomplished man.

Before I could realize this honor, however, I spent a month's time devoted to researching the cost of poor quality as an internship project for Juran Institute. My mission was to discover what most experts in the field of quality management cited as the typical cost of poor quality as a percentage of sales for a company. The task was not as easy as it initially sounded. Many of the reports and articles I encountered presented conflicting portrayals of the statistic. Authors referred to the cost of poor quality as the cost of waste, the cost to assure quality, the poor quality cost, as well as the cost of nonconformance. The confusion continued when the articles reported the cost of poor quality in a myriad of ways: percentage of sales, percentage of operating expenses, percentage of value added, an absolute dollar value, a dollar value per employee and even as a number of deaths in the health care industry. There did not seem to be one common way to discuss the topic.



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Further complicating the issue, many reports, articles, internet sites and books cited the typical cost of poor quality without referencing any empirical data. They instead avoided this responsibility by giving a statistic upon which “experts” and “scientific studies” have agreed. This issue perplexed me. If “experts” and “studies” agree upon a number as if it were common, accepted knowledge, then shouldn’t most quality improvement resources cite the same number? Some articles try to solve this riddle by referencing another book, which references another paper, which references another article, and so on, until the estimated average cost of poor quality simply appears as a mysterious number snatched out of the air.

At this point, I realized that I needed to go back to the basics and take a less technical approach to the topic, which brings me to my interview with Dr. Juran. Instead of simply limiting my studies to the research of a number value, which eclipses the ultimate purpose of analyzing the cost of poor quality, I chose to research its origin, history, development and importance in the modern corporate economy. As one of the experts in the quality field, Dr. Juran provided an obvious resource for the answers to these issues and made it especially clear that the typical cost of poor quality reported in publications is not what matters most. Its utility and value to a company is what matters. The cost of poor quality reveals opportunities for improvement and cost reductions that many business executives often overlook because of a lack of understanding regarding the subject.

The Historical Background

In order to gain this understanding, Dr. Juran stressed the importance of the cost of poor quality's historical background, something many corporate executives and quality managers tend to ignore as they narrowly focus their studies on technical data. He began with the story of his father, a representative example of the pre-industrial economy. As a shoemaker, Dr. Juran's father presided over the entire production process, much like other artisans of his time. He had learned the trade, passed an examination, gained acceptance in a guild and now carried out each step necessary in making a shoe from beginning to end. He would gather the raw materials for the shoe, stitch its body, attach the sole and fasten a buckle. Because of the nature of the pre-industrial production process, Dr. Juran referred to his father as "a producer and his own customer," since after each step he would simply handoff the shoe to himself and continue the process.

This craft-oriented economy directly contrasts to today's modern industrial economy. Whereas Dr. Juran's father controlled the entire production process in the assembly of a simple product, different people, and often different departments, now control each step in the assembly of a more complicated product. With the advent of this division of labor, Dr. Juran emphasized the diffusion of responsibility and ignorance that perpetuated during the production process. For example, the person assigned to attaching the sole might miss a stitch. He or she, however, will still pass the shoe on to the next person in line. In this way, workers presiding over the later steps of the production process are oblivious to the errors made in the early steps. This problem never occurred during the era of Dr. Juran's father, since artisans controlled every step and understood every error that was made.



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Therefore, with the eruption of the Industrial Revolution and its tremendous technological advancements, the probability of creating a defective product greatly increased. Along with this increase in productive deficiencies came an increase in cost. Poorly constructed goods were often reworked, replaced or even thrown out, thus spawning what is now called the cost of poor quality. Dr. Juran explained that the first companies to recognize the impact of waste were Bell System Laboratories and Western Electric. In the 1920s, both businesses incorporated statistical and managerial analyses to identify potential errors that occurred in the production process. They employed quality specialists and reliability engineers to restructure businesses processes, ensuring the production of a quality product. Thus, a completely new field emerged, one that was dedicated to reducing the cost of poor quality.

The Cost of Poor Quality and its Impact on Today's Businesses

At this point in the interview, Dr. Juran had completed his story of the origins of quality management and its importance in the industrial economy during the middle of the twentieth century. Taking advantage of a break in our meeting, I paused to reflect on what this cost of poor quality meant for the business world and if it was even worth studying at all. Immediately, I remembered the analogy Dr. Juran made in the first edition of his *Quality Control Handbook*. He referred to the cost of poor quality as “the gold in the mine,”¹ highlighting the potential financial benefits quality improvement programs can achieve for a business. Is it true that the costs of poor quality represent untapped financial rewards? By uncovering where errors are made and deficiencies occur, can a company truly earn significant returns on investments by restructuring its processes?



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Two quotes help answer these questions. In 1987, Hewlett-Packard chief executive officer John A. Young exclaimed that, “In today’s competitive environment, ignoring the quality issue is tantamount to corporate suicide.”² Here, Young dramatizes the impact quality has on a company. Overlooking the costs that a business incurs due to faulty products can have a devastating effect. In 2002, Ford group vice president Jim Padilla further emphasized Young’s statement by explaining how, “The cost of poor quality is the single biggest waste we have. It costs us in warranty. It costs us in public image, which in turn affects our residual values.”³ These two quotes affirm that there is verbal support for Dr. Juran’s argument in today’s businesses.

An overview of the literature regarding the cost of poor quality shows that there is quantitative evidence, as well. The Xerox Corporation, winner of the Malcolm Baldrige Quality Award in 1989, demonstrates the financial rewards that can be achieved with the implementation of a cost of quality analysis and quality improvement projects. In 1992, Lawrence P. Carr discussed Xerox’s significant improvement, highlighting how the U.S. Customer Operations division reduced the cost of poor quality by \$53 million in only one year.⁴ By decreasing costs of this scale, Xerox greatly improved its bottom line and mined the gold described by Dr. Juran. Similarly, in 1991, Tenneco employed cost of poor quality studies, which helped cut failure costs by \$1.8 billion in a six-year period, thus increasing operating income by \$900 million.⁵

In addition to cutting costs, quality improvement can also boost revenue by increasing market share. For example, one study showed that businesses that improved quality increased their market share five or six times faster than those whose products declined in quality, and three times faster than those whose relative quality was similar to their competitors.⁶ Therefore,

companies can generate greater profits through cost reduction *and* sales improvement. Such financial success would not be possible without first conducting a cost of poor quality analysis, which reveals the deficient areas in a company's processes and signals potential room for improvement.

Do Company's Buy Into the Importance of Cost of Poor Quality?

In theory, a cost of poor quality analysis is extremely valuable. However, due to an inadequate understanding of the topic and lack of sufficient measurement systems, many companies do not correctly calculate the cost of poor quality. Other companies simply avoid the cost of poor quality altogether, overlooking its potential significance. A review of quality cost surveys by Kamlesh Kumar Shah and Peter FitzRoy⁷ underscores some particularly surprising results. Citing a variety of sources, Shah and FitzRoy found:

- Only 27% of a sample of textile firms reported quality cost as a percentage of sales turnover.⁸
- Only 13 out of 680 Japanese firms surveyed provided actual data on quality cost.⁹
- A survey of American companies revealed that only 38% of respondents claimed to have an organized quality cost system.¹⁰
- In Australia, a survey conducted showed that only 42% of respondents measured quality cost.¹¹

Given this information, it is clear that throughout the world most companies avoid quality cost analyses. Do they do so because they are not familiar with the topic or because they are uncertain of its potential rewards? Surprisingly, a report by Berry and Parasuraman indicates that, while many companies do understand the importance of quality, they still do not implement quality cost evaluations. By referring to a survey conducted by the American Management Association, Berry and Parasurman note that 78% of the North American, Western European and Japanese managers sampled believed that improving quality and service to customers is the key

to competitive success. However, the same study reveals that only 56% of the managers see service quality as a “clear and accepted priority throughout their organizations.”¹² While corporate leaders understand the potential impact of quality, they still fail to implement effective systems for ensuring it.

A more recent study published in the May 2004 issue of *Quality Progress* also supports this notion. For example, while 83.1% of the respondents were familiar with Total Quality Management, only 59.3% actually used this practice. Similarly, while 47.6% were familiar with Six Sigma, only 15.6% actually used the technique.¹³ Although these quality improvement practices may not directly include a cost of poor quality analysis, the data exhibited in this study express the disturbing fact that many business executives simply avoid the implementation of quality improvement projects, despite their financial rewards.

This fact can also be applied to the cost of poor quality case. Many companies, even with the potential return on investment, do not calculate their cost of poor quality. However, there still is a small remainder that actually does attempt to conduct this analysis. Unfortunately, they do so incorrectly. Jeremy Main highlights this point in his book *Quality Wars*, stating, “When corporations are asked what poor quality costs them, they guess around 5% or 7% of sales. But when they actually calculate their costs they find that it is more like 20% to 30%.”¹⁴ Frank Gryna expresses a similar notion, explaining that, “My experience indicates that only about 40% of the American companies have a system that goes beyond measuring scrap and rework dollars.”¹⁵ These reports identify a major problem in cost of poor quality analysis. Many companies do not have an accurate picture of their quality costs and often understate this number by limiting the measurement process to only tangible wastes like scrap and rework. In effect, they do not grasp the true cost of poor quality.

The Hidden Factory

The fact that many companies miscalculate the cost of poor quality represents one of its fundamental characteristics. It cannot be strictly defined, and, therefore, cannot be perfectly measured. Claude R. Superville addresses this issue, stating how, “Quality costs are dynamic and constantly changing over time. A firm’s total quality costs are determined by the quality measurement used, its current developmental level and technology level.”¹⁶ In one year, a company may focus on eliminating one contributor to its cost of poor quality. The next year, that same company might develop a way to measure another cost of poor quality, thus initiating a new quality improvement project. In this way, the cost of poor quality is constantly transforming as the company transforms.

Although this dynamism may make it difficult to analyze the cost of poor quality, it does not hinder its overall importance to a company. In fact, the exact opposite is true. Since the cost of poor quality is constantly changing, companies will always find new areas to improve. Jeremy Main uses Hewlett-Packard as an excellent example of this point. In 1979, the company determined that its cost of poor quality was 25% of sales. Throughout the next decade, Hewlett-Packard implemented a number of quality improvement strategies, earning the reputation as a leader in the field of quality. Despite such success, in 1992, Craig Walter (former corporate quality director) stated that the company’s cost of poor quality was probably still around 25% or 30% of sales. How could this be? Were all of Hewlett-Packard’s improvements unsuccessful? Walter explained the dilemma by emphasizing that the company’s efforts did not fail, but rather, its expectations had risen. He stated, “We’ve peeled another layer off the onion and we can see a lot of things now are obvious that were hidden before, a lot more opportunity.”¹⁷ While many



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companies often shy away from cost of poor quality because it is difficult to measure, hard to define, or constantly changing, Walter's statement affirms the fact that these reasons are incredulous. By examining the cost of poor quality and attempting to uncover new hidden areas of improvement, a company will continue to discover new investment opportunities and places to boost profits. The dynamic nature of the cost of poor quality, therefore, is a positive attribute, not a negative one.

Dr. Juran greatly emphasized this aspect, as well. During our interview, I asked him why a large number of articles reported such a wide range of estimates regarding the cost of poor quality. He responded by explaining that the cost of poor quality a company reports is based on its knowledge of the "hidden factory," his version of the peeled onion. In any company, Dr. Juran stated that there are two factories coexisting. The first makes a product that can be sold. The second works on things that cannot be sold. This second factory allocates all of its time and resources making, finding, and repairing defective products created by the first factory. Essentially, a company could eliminate this hidden factory, synonymous to the cost of poor quality, if the first factory produced everything perfectly. This concept helps explain the variability in the estimates regarding the cost of poor quality. Some companies understand the scope of the hidden factory better than others do, and therefore report higher values for their quality costs. Other companies, on the other hand, have only cracked its surface and therefore report a lower value.

Understanding the nature of this hidden factory is crucial to a company's success. Within it lies what Walter referred to as the onion. A company focused on quality will carefully examine the hidden factory, pulling off layers and uncovering more and more areas of



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improvement. Eventually, the hidden factory will shrink in size, greatly reducing the costs that a company incurs.

Cost of Poor Quality: The Basic Model

The question then remains, what does the hidden factory include? The basic model of the cost of poor quality, outlined in Juran's *Quality Control Handbook*,¹⁸ is divided into three categories: failure costs, appraisal costs and prevention costs.

Failure costs can be split into internal and external failure costs. Internal failure costs refer to the costs incurred within a factory prior to delivery. They represent the deficiencies that occur when a product fails to meet a certain specification or requirement, resulting in scrap or rework. External failure costs refer to the costs incurred when a product fails in the possession of the customer. Warranty charges, complaints, and returned material are all examples of external failure.

The second category refers to the appraisal costs, which represent the costs incurred to determine whether a product meets its specified requirements. Inspection and the testing of equipment fall under this category.

Finally, prevention costs are incurred to minimize the failure and appraisal costs. A company may utilize quality audits, process planning and the training of employees to prevent the production of deficient and nonconforming products. These prevention costs help save the company money in the long run. Richard W. Anderson, former general manager of the computers systems division of Hewlett-Packard, expresses this point in his widely cited quote explaining the damage caused by a two-cent resistor:

If you catch the resistor before it is used and throw it away, you lose two cents. If you don't catch it until it has to be soldered into a computer component, it may cost \$100 to

repair the part. If you don't catch the component until it is in a computer user's hands, the repair cost will amount to hundreds of dollars and may exceed the manufacturing costs.¹⁹

By eliminating a defective product in the early stages of production, a company can greatly reduce its cost of poor quality. Investing in prevention costs, therefore, is extremely important.

Taking a Deeper Look at the Cost of Poor Quality

Unfortunately, the issue of poor quality is not this simple. If quality costs could easily be identified, defined and categorized according to this basic model, then companies would have no problem calculating and eliminating their cost of poor quality. However, this model, while useful as a framework, represents only the most obvious and measurable costs, and therefore significantly limits the real cost of poor quality. In fact, Dr. Juran referred to the basic model as “primitive” not only because it is one of the oldest ways of understanding quality costs, but also because it is the simplest. To truly quantify the entire cost of poor quality, a company must thoroughly explore all of the processes related to the production of a good or service, from the factory floor to customer service. Only then will the company reveal the entire “hidden factory” and all of the unnecessary, unprofitable costs incurred throughout the production process.

To give a picture of these hidden costs, Dr. Juran highlighted three examples. First, he began by noting that many companies earn a profit by selling spare parts. If a product fails, the customer or merchant can simply buy a new part to replace the defective one. However, if the product never broke in the first place there would be no use for spare parts. In this way, the entire spare part industry is a cost of poor quality.

The same is true in the case of warranties. Many companies state that they will replace a defective product if it fails within a certain period from the date of purchase. For example, if the



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customer purchases a product and it breaks within a year, the company will incur the cost of replacing the deficient product. Many firms calculate warranties into their cost of poor quality, but Dr. Juran emphasized that they underestimate their impact. If a product fails beyond the window of the warranty, the customer must incur the cost of replacing that product, not the company. This cost is often excluded from the company's cost of poor quality analysis, but nonetheless still has an important effect. The failure of the product may discourage the customer from purchasing from that company in the future. In this case, the cost of poor quality is manifested in loss of sales.

Finally, Dr. Juran discussed customer service and its role in the cost of poor quality. This department deals with the complaints from customers who have received defective products. The time and labor devoted to such complaints represent a cost of poor quality, since these resources are being wasted on a failed good or service. Dr. Juran used the Xerox Corporation to exemplify this case. When Xerox possessed a monopoly on the copy machine due to patent restrictions, the corporation enjoyed the role of being the sole producer and distributor of the product. Although it made a superior machine that copied papers more efficiently than any other machine, the Xerox Corporation was still prone to deficiencies and failures. To deal with the frequent complaints from customers who received faulty copiers, the corporation constructed a customer service department to replace machines as fast as they failed. The Xerox Company soon found that the customer service business was profitable, since customers paid for the repair of the defective machines.

Dr. Juran used this case to support the argument that the entire customer service industry is a cost of poor quality. What if the copy machines simply did not fail? What if Xerox constructed them perfectly? If this were the case then customers would never have a need to



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complain, and therefore there would be no need for a department that served the complaining customers. By possessing a monopoly on the copier, Xerox did not have to worry about this problem. No matter how many times their machines failed, the corporation still sold its product because it was the only firm in the market.

Unfortunately, this did not last. Once the patent expired, Japanese companies began manufacturing machines that were equally superior, but did not fail. Customers discouraged by the Xerox failures began purchasing these new Japanese products. Now, Xerox faced a tremendous problem. The lack of quality in the production of its machines had translated into a significant loss in sales. Instead of hiring workers to spend their time and effort in the customer service department dealing with complaints, Xerox realized that it should use these same resources to manufacture a higher quality product that did not fail. If the corporation could do this, then it would not lose its market share to the Japanese.

By revealing three potential costs of poor quality that often remain hidden to corporate executives, Dr. Juran stressed the notion that companies must look beyond rework, scrap and other easily obtainable costs to uncover the most damaging ones. Other studies support Dr. Juran's argument as well. Through his analysis of consumer buying patterns, Armand Feigenbaum quantified the potentially devastating effects of customer dissatisfaction, one of the main problems for the Xerox Company in Dr. Juran's example. In his article, "No Pain, No Gain," Feigenbaum explains how completely satisfied customers tell six others about the product or service they have bought, while dissatisfied customers tell 22 others. Furthermore, satisfied industrial buyers are seven to eight times more likely to buy again from that supplier than from its competitors.²⁰ The results expose the dangers of producing a good or service that lacks quality. When a customer is dissatisfied by a company's product, that company potentially loses



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22 future customers. When a customer *is* satisfied by a product, then that company can potentially multiply its sales by seven or eight. Such consequences have a significant impact on the company, one that a customer service department cannot repair. While it may attack the symptoms of a problem, the customer service department evades the origin of the problem. By probing deeper into the cost of poor quality, a company can realize that it should allocate its resources to the prevention of a defective product, not to its repair or rework.

Empirical research supports this concept. In 1994, a study done by Shank and Govindrajana showed that when companies spend a majority of their quality expenses on failure costs, their total cost of poor quality is around 25% of sales. However, when companies spend a majority on prevention costs, their total cost of poor quality is only around 5% of sales. These results show that companies must attack the origin of their deficiencies. Simply waiting until the production of a defective product and then attempting to fix it can be extremely costly. By peeling the onion and revealing new hidden costs of poor quality, a company can prevent the production of a nonconforming product and its inevitably detrimental consequences.

Reporting the Cost of Poor Quality

Once a company thoroughly examines its cost of poor quality, it must report the results so that quality specialists can then devise improvement projects tailored to the costs. There is an almost endless number of ways to present this information. While most companies discuss the cost of poor quality as a percentage of sales, others express it as a percentage of operating expenses, an absolute dollar value, dollar value per employee, percentage of personnel and assets, and as a number of deaths per year. At first look, the lack of consistency that arises in the reporting of the cost of poor quality may promote the idea that there is no common practice or

way of discussing this statistic. However, upon deeper inspection, there is a variety of ways to describe the cost of poor quality because all of the ways are valuable. There is no best way. Each different method serves its own purpose to the company. Dr. Juran explained this concept by proposing the question, “What is the definition of reliability?” Before giving me the time to respond, he answered it himself, stressing the fact that there is no one definition. Different definitions serve different purposes. Reliability might have special significance for one department, but mean something very different for another. Therefore, the inconsistency present in the reporting of the cost of poor quality is acceptable.

In fact, it is more than just acceptable. The presence of a number of means to report the cost of poor quality can be highly advantageous for a company. This allows the firm to gain a complete understanding of its quality costs, since it is not limited to one narrow perspective. Jack Campanella expresses this important idea, stating that, “There is no limit to the number of indices or the level of detail that an effective quality cost system can have. More danger exists in oversimplification—such as using only one base for all purposes. There is no perfect base. Each base can be misleading if used alone.”²¹ By analyzing the cost of poor quality through a multitude of indices, company executives can gain a much more revealing, accurate picture of where they are wasting money.

Once one understands this advantage, the next step is to decide which measure to use. The most common ratio used to report the cost of poor quality is percentage of sales. In *Quality Planning and Analysis*, Dr. Juran and Frank Gryna describe that, “When quality costs are similarly related to sales, it becomes easier for upper management to grasp the significance of the numbers.”²² This form of describing the cost of poor quality can be extremely helpful to corporate executives because it not only directly relates quality costs to its effect on sales (and

ultimately profit), but it also provides a way to compare quality costs between companies. Since firms often vary in size and productive capacity, simply comparing the dollar value of the cost of poor quality can be misleading. For example, if one company has annual sales of \$1 billion and a cost of poor quality of \$250 million, its quality costs make up 25% of sales. Another company may have the same cost of poor quality (\$250 million), but only has annual sales of \$500 million. This company's quality costs, therefore, make up 50% of the sales, signaling a much larger problem.

While reporting the cost of poor quality as a percentage of sales can be useful, in certain conditions it can also be misleading. For example, in the short run, sales might significantly vary from the long-term average. Campanella discusses the circumstance of an aircraft manufacturer. If in one period the company fails to sell an aircraft, sales for that period would significantly drop. However, if expressed as a percentage of sales, the cost of poor quality would seemingly increase, when in reality it has remained constant. Likewise, if during the next period the aircraft manufacturer sold that aircraft, sales would significantly increase. In this case, if expressed as a percentage of sales, it would appear that the cost of poor quality declined, and that the company was improving. However, in reality quality costs have remained constant while the base of the ratio (sales) has fluctuated. Because of this problem, Campanella advises company executives to avoid expressing the cost of poor quality as a percentage of sales in the short run. Meanwhile, using it in the long run is useful, since the short run fluctuations tend to balance out.

Other forms of reporting can also be effective. Since many quality improvement projects are directed at specific areas of the production process, the ways of measuring the cost of poor quality should also be specific to those areas. Campanella suggests a number of different indices: internal failure costs as a percent of total production costs, procurement appraisal costs



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as a percent of total purchased material costs, total quality costs as a percent of production costs and rework costs as a percent of area labor costs.²³ In this way, when monitoring the cost of poor quality, the company must analyze different portions of the quality costs in relation to the specific production area where those costs are incurred. Campanella emphasizes this point, stating, “It’s important to the success of quality cost use that bases for individual progress measurements not appear to be unnatural to the parochial intent of the area. Instead, they should be complementary to that intent.”²⁴ Here, Campanella makes it clear that quality costs must be kept in perspective. The cost of poor quality does not represent one abstract number, meaningless to any individual department or employee. It represents the non-value adding activities and waste that occur in each piece of the production process, thus stressing the role that everyone plays in the cost of poor quality. Therefore, in order to carry out an effective quality improvement campaign, a company must attack quality costs where they occur in these localized areas of the production or service process. To monitor this improvement strategy, a company must also report the cost of poor quality using a number of different indices, each reflecting the origin or area where the costs were found. This will prevent any misleading data, thus providing a much more comprehensive and valuable analysis.

The Language of Money

Throughout my interview, Dr. Juran continually stressed this very point. He wanted to make it especially clear that many people in the business world tend to lose sight of the cost of poor quality’s ultimate purpose. It is used to open the eyes of corporate executives so that they can see where they are throwing away dollars. It represents the potential financial gains that a

company can earn through quality improvement. It does not matter how the cost of poor quality is reported, as long as it serves this purpose effectively.

When explaining this vital concept to me, Dr. Juran discussed the language of money, the fundamental driving force behind the successful implementation of a cost of poor quality system. Before any quality improvement initiative is employed, the upper management must buy into the system. The corporate executives must understand that investing in a cost of poor quality analysis and the subsequent improvement projects will have attractive financial rewards.

He explained this point using two examples. First, Dr. Juran went back to the Xerox case. Once the corporation began losing sales to the Japanese because of poor quality, the business executives called in Dr. Juran for a meeting. Here, he observed the ignorance of the corporate leaders. For years, these executives only looked at financial reports, which did not include any information on loss sales and other costs of poor quality. They were only concerned with the bottom line and therefore did not pay attention to the defective products that the company continually manufactured. However, once sales had declined rapidly when the company lost the monopoly on copiers, they immediately noticed that they needed to do something to prevent further loss.

To help fix the problem, Dr. Juran did not choose to show the executives the number of failed copiers, complaints, examples of rework, or the amount of waste the company threw away. Dr. Juran knew that the executives would not understand the significance of these costs because they were in the “language of things” and only concerned employees on the lower levels of production like operation managers and factory workers. Instead, Dr. Juran presented them with reports on how much *money* the company was wasting on the manufacturing of defects. Now, the upper management could grasp the problem and see that quality improvement was necessary.



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A similar situation occurred in the Rolls Royce Company, which, at the time, mainly produced airplane engines. Quality Manager Frank Nixon called Dr. Juran to discuss a problem regarding the steel veins allowed air to reach the engine. He told Dr. Juran that only 70% of the veins produced were actually usable. Nixon understood the significance of this waste, but he firmly believed that the top executives had absolutely no interest in improving quality.

After a meeting with the executives, Dr. Juran came to a different conclusion. Upper management did, in fact, care about quality, but only when it could be described in monetary terms. When the executives understood how much more profit they could earn by producing a greater percentage of usable engine veins, they showed a tremendous interest in quality.

To completely sell the idea to the upper management, Dr. Juran helped them examine their various investment options. Traditionally, most of Rolls Royce investment projects dealt with research and development. The company believed that in order to boost sales it needed to invent and manufacture a newly designed engine. Dr. Juran showed that this was not the only way to get a high return on investment. He suggested to the Rolls Royce executives that they cut their cost of poor quality. Dr. Juran explained that in five years the return on investment from attacking quality costs would be much higher than the return on investment for the designing and building of new engines. This concept shocked executives, further emphasizing the importance of using the language of money when dealing with upper management.

Manufacturing Versus Service Firms

In the cases of Rolls Royce and Xerox, it did not take much prying to get the corporate executives to focus on the cost of poor quality as a major factor in the financial success of their companies. However, Dr. Juran asserted that these two companies were not the only ones

affected by unnecessary quality costs. In fact, through his experience working with a number of firms, Dr. Juran discovered that the cost of poor quality for a company could be as high as 40% of sales, but usually fell within the range of 10-30%. A review of the literature regarding this topic yielded similar results (see Table 1 of Appendix A).

While all companies incur considerable costs due to poor quality, service companies generally suffer more, with quality costs totaling 30 to 50% of annual sales.²⁵ This finding, once again, reflects the dynamic nature of the cost of poor quality and how it can vary from company to company. Because they personally deal with the customer in the delivery of an intangible product, service firms encounter quality costs that are not as prevalent in manufacturing firms, thus resulting in a higher cost of poor quality.

Dr. Juran attributes this difference to time, an element that is not much of a factor in the manufacturing industry. For many service firms, time is an essential part of quality. Restaurants attempt to seat and serve their patrons as quickly as possible. Hospitals try to minimize the amount of time a patient has to wait to see a doctor. Banks have created drive-in windows to ease and speed up the transaction process. On the other hand, most manufacturing companies do not have to deal with these issues. They simply produce a specified amount of goods, which they can either distribute to merchants or store in inventory. Hongyi Sun elaborates on this fundamental difference, stating, “In manufacturing companies, when demand is higher than supply, orders can be taken in advance and supplied later...In service companies, service must be delivered on time and cannot be stored.”²⁶ Time, therefore, is extremely important to a service company, often at the heart of every transaction and business process.

With the addition of this crucial element, service companies tend to incur additional costs of poor quality that evade most manufacturing companies. Dr. Juran used the processing of an



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invoice as an example of this fact. When a service firm receives an invoice, a number of departments must agree that the order is correct and that the suppliers have delivered the right materials. It might take two weeks for the company to validate the document, as it slowly travels from department to department. The company, therefore, devotes a tremendous amount of time and resources to a relatively simple task. For the service company, this wasted time represents a cost of poor quality. Dr. Juran provided a remedy to eliminate this cost. He suggested training a clerk so that he or she could verify the invoice without having to consult each of the departments. Now, the company could validate the invoice in four hours, rather than two weeks.

Time is also a vital part of the actual delivery of a service, as well. Given that most service transactions deal with a one-to-one interaction between the provider and the customer, if a problem occurs, there is very little, if any, time to fix it. This dilemma increases the cost of poor quality for the service industry. A fast food restaurant cannot expect to deliver the wrong order to a customer, correct it, and still maintain that customer's complete satisfaction. The timeliness of the service's delivery is essential to its quality. Fast food goers do not dine at fast food restaurants to wait while their botched order is corrected. For fast food restaurants and service companies in general, there is very little room for error in the delivery process.

This personal interaction with the customer brings up another difference between service and manufacturing companies. In the manufacturing industry, the firm designs and produces the product according to predetermined customer specifications. In the service industry, customers do not officially propose standards. In fact, such specifications typically vary from customer to customer, making it more difficult to achieve customer satisfaction in the service industry. In response to this challenge, service companies tend to place a much greater emphasis on the monitoring of customer needs.²⁷ With a better understanding of exactly what the customer wants

and expects, the service company can avoid the costs that would arise from a poor interaction with the customer.

While manufacturing firms only focus on the quality of the good produced, service companies must also focus on the quality of the interaction between the provider and the customer. This additional element to the business process represents a much larger issue regarding the differences between the manufacturing and service industry, which Sun addresses in his article, “Comparing Quality Management Practices in the Manufacturing and Service Industries.” He explains how, “Products from manufacturing industries are tangible and visible, while services are intangible and invisible. As a result, service quality is difficult to measure and depends upon the perception of customers.”²⁸ For manufacturing companies, monitoring the quality of the product is simple. It either succeeds or fails in meeting certain predetermined specifications. For service companies, it is more difficult to measure and obtain quality, since quality is completely dependent on the interaction with the customer. Furthermore, since each individual customer possesses a different set of expectations and desires, understanding exactly what went wrong in the delivery of a service is a challenging task. In this way, different, often hidden variables enter the picture for the service industry. Dr. Juran noted that intangible factors like employee courtesy play a fundamental role in the success of a service company.

Such intangible factors may have skewed the results of a study conducted by Lars Sorqvist.²⁹ After sampling around thirty Swedish companies, Sorqvist noticed that service-oriented companies reported lower poor quality costs than production-oriented companies. He attributed this finding to the fact that the companies with the highest costs of poor quality tend to have the best methods for identifying and measuring these quality costs. For service companies,



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the task of identifying and measuring quality costs is difficult. When attempting to calculate the cost of poor quality, many of the hidden, intangible costs are easy to overlook.

Conclusion

This point brings the discussion back to the onion analogy. Many service companies avoid conducting cost of poor quality analyses because they find that the cost of conducting the evaluation and dealing with its intangible elements outweighs the benefits. However, if these companies took a more careful, penetrating look at their business processes they would continue to reveal new areas of improvement. By peeling off layers of the onion, the potential benefits of conducting the analysis will greatly increase.

This simple misunderstanding is common throughout the business world. Corporate executives fail to grasp the true nature of the cost of poor quality. By limiting their evaluations to obvious costs like scrap and rework, companies completely overlook the most damaging hidden costs. Other executives falter when they restrict the cost of poor quality to a rigid model, possibly one used by their competitors. This strategy would be effective only if every company were the same. However, the cost of poor quality not only varies from company to company, but the methods of measuring the cost of poor quality also vary.

Because of this dynamism, businesses must remember the point emphasized by Dr. Juran. The cost of poor quality can be reported in an endless number of ways. It can take a variety of different forms, some that many firms often ignore. It can represent 10% of a company's annual sales, or it can represent 40%, depending on how far they peel the onion. Despite these differences, one fact remains constant in all companies. The absolute cost of poor quality is detrimental to a company's bottom line. Thoroughly examining these quality costs can reveal a

number of improvement areas, ultimately resulting in attractive returns on investment and greater profits.

Even the highest levels of management cannot ignore this fact. Unfortunately, some never get the chance to realize the potential benefits of a cost of poor quality analysis because they simply do not understand its nature. However, once quality costs are presented in the language of money, these misunderstandings evaporate and executives immediately realize the true significance of the cost of poor quality.

Appendix A

Table 1

Source	COPQ Estimate (% of sales)
Baatz, E.D. "What is Return on Quality, and Why You Should Care," <i>Electronic Business</i> , Oct. 1992, p. 61.	<ul style="list-style-type: none"> • 20-30% for manufacturing firms • 30-50% for service firms
Band, William. "Marketers Need to Understand the High Cost of Poor Quality." <i>Sales and Marketing Management in Canada</i> . Nov. 1989: 56-59.	<ul style="list-style-type: none"> • 25% for U.S. companies • 5% for Japanese companies
Bell, D., et al. <i>Managing Quality</i> . Oxford: Butterworth-Heinemann, 1994.	<ul style="list-style-type: none"> • 5-25% for manufacturing firms • 30-40% for service firms
Campanella, Jack. <i>Principles of Quality Costs: Principles, Implementation and Use</i> . Milwaukee: ASQ Quality Press, 1999.	<ul style="list-style-type: none"> • 20% is common • 2-4% is possible
Carr, Lawrence P. "Applying Cost of Quality to a Service Business." <i>Sloan Management Review</i> . Summer 1992: 72-77.	<ul style="list-style-type: none"> • 25-30%
Crosby, Philip B. <i>The Eternally Successful Organization</i> . New York: McGraw-Hill, 1988. 35.	<ul style="list-style-type: none"> • 25% for manufacturing firms
Dale, B.G., and J.J. Plunkett. <i>Quality Costing</i> . 3 rd ed. Blackwell: Oxford, 1999.	<ul style="list-style-type: none"> • 5-25%
DeFeo, Joseph A. "The Tip of the Iceberg."	<ul style="list-style-type: none"> • 4-5% for visible/traditional costs

<i>Quality Progress</i> . May 2001: 29-37	<ul style="list-style-type: none"> • 15-25% for hidden costs
Galvin, Robert W. "Is Your Company Serious About Improving Quality?" <i>Financial Executive</i> . Jan/Feb 1991: 12.	<ul style="list-style-type: none"> • Up to 40%
Gurunatha, P. "Quality/Reliability Challenges for the 1980s." <i>Quality Costs: Ideas and Applications</i> . Milwaukee: American Society for Quality Control, Inc., 1984. 323-329.	<ul style="list-style-type: none"> • 15%
Hawley Atkinson and Company. <i>Cost of Poor Quality Assessment</i> . Hawley Atkinson and Company. 26 May 2004 < www.costofpoorquality.com/step1.htm >.	<ul style="list-style-type: none"> • 15-25%
Juran, Joseph M., and A. Blanton Godfrey. <i>Quality Control Handbook</i> . 5 th ed. New York: McGraw-Hill, 1999.	<ul style="list-style-type: none"> • 10-30%
Lenane, Dean-Michael. "Accounting for the Real Cost of Quality." <i>Quality Costs: Ideas and Applications Volume II</i> . Milwaukee: ASQC Quality Press: 374-383.	<ul style="list-style-type: none"> • 10-20% for U.S. companies • 2.5-4% for Japanese automotive industry
Main, Jeremy. <i>Quality Wars: The Triumphs and Defeats of American Business</i> . New York: Free Press, 1994. 7-8.	<ul style="list-style-type: none"> • 20-30%
Raab, Walter F., and Czapor, Edward P. "The Cost of Poor Quality." <i>Quality Costs: Ideas and Applications Volume II</i> . Milwaukee: ASQC Quality Press: 475-482.	<ul style="list-style-type: none"> • 20-25%
Sandholm, Lennart. <i>Total Quality Management</i> . Sweden: Studentlitteratur: 1997	<ul style="list-style-type: none"> • 20-30%
Schonberger, R.J. <i>World Class Manufacturing: the Lessons of Simplicity Applied</i> . New York: Free Press, 1986.	<ul style="list-style-type: none"> • 15-30%
Sorqvist, Lars. <i>Difficulties in Measuring the Cost of Poor Quality</i> . Sandholm Associates. 24 May 2004 < www.sandhom.se/artiklar/difficulties.html >.	<ul style="list-style-type: none"> • 10-30%
Superville, Claude R., and Sanjay Gupta. "Issues in Modeling, Monitoring and Managing Quality Costs." <i>Total Quality Management</i> . Nov. 2001: 419-424.	<ul style="list-style-type: none"> • 10-30%

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- ¹ Juran, Joseph M. *Juran's Quality Control Handbook*. 1st ed. New York: McGraw-Hill, 34.
- ² Shetty, Y.K. "Product Quality and Competitive Strategy." *Business Horizons*. May/June 1987: 46-52.
- ³ Connelly, Mary. "Automaker Forced to Trim Vehicle Costs After Launches." *Automotive News*. Oct. 2002.
- ⁴ Carr, Lawrence P. "Applying Cost of Quality to a Service Business." *Sloan Management Review*. Summer 1992: 72-77.
- ⁵ Feigenbaum, Armand V. "No Pain, No Gain." *Chief Executive*. March 1997: 36-39.
- ⁶ Shetty, Y.K. "Product Quality and Competitive Strategy." *Business Horizons*. May/June 1987: 46-52.
- ⁷ Shah, Kamlesh Kumar R., and Peter T. FitzRoy. "A Review of Quality Cost Surveys." *Total Quality Management*. 9,6, 1998: 479-486.
- ⁸ Allen, N. and J.S. Oakland. "Quality Assurance in the Textile Industry." *International Journal of Quality and Reliability Management*. No. 5. 1988: 25.
- ⁹ Kano, Noriaki. "Quality and Economy More Emphasize the Role of Quality on Sales Rather Than on Cost." *Quality Costs: Ideas and Applications Volume II*. Milwaukee: ASQC Quality Press: 331-345.
- ¹⁰ Chen, F. "Survey of Quality in Western Michigan Firms." *International Journal of Quality and Reliability Management*. No. 9. 1992: 46-52.
- ¹¹ Sohal, A.S., et al. "Quality Management Practices in Australian Industry." *Total Quality Management*. No. 3: 283-299.
- ¹² Berry, Leonard L. and A. Parasuraman. "Prescriptions for a Service Quality Revolution in America." *Organizational Dynamics*. Spring, 1992: 5-15.

- ¹³ Weiler, Greg. “What do CEOs Think About Quality?” *Quality Progress*. May 2004: 52-56
- ¹⁴ Main, Jeremy. *Quality Wars: The Triumphs and Defeats of American Business*. New York: Free Press, 1994. 7-8.
- ¹⁵ Gryna, Frank M. “Quality Costs—What Does Management Expect?” *Quality Costs: Ideas and Applications*. Milwaukee: American Society for Quality Control, Inc., 1984: 210-217.
- ¹⁶ Superville, Claude R., and Sanjay Gupta. “Issues in Modeling, Monitoring and Managing Quality Costs.” *Total Quality Management*. Nov. 2001: 419-424.
- ¹⁷ Main, Jeremy. *Quality Wars: The Triumphs and Defeats of American Business*. New York: Free Press, 1994. 7-8.
- ¹⁸ Juran, Joseph M., and A. Blanton Godfrey. *Juran’s Quality Handbook*. 5th ed. New York: McGraw-Hill.
- ¹⁹ Main, Jeremy. “The Battle for Quality Begins.” *Fortune*. Dec. 29 1980: 33.
- ²⁰ Feigenbaum, Armand V. “No Pain, No Gain.” *Chief Executive*. March 1997: 36-39.
- ²¹ Campanella, Jack. *Principles of Quality Costs: Principles, Implementation and Use*. Milwaukee: ASQ Quality Press, 1999.
- ²² Juran, J.M., and Frank M Gryna. *Quality Planning and Analysis*. New York: McGraw-Hil: 22-23.
- ²³ Ibid.
- ²⁴ Feigenbaum, Armand V. “No Pain, No Gain.” *Chief Executive*. March 1997: 36-39
- ²⁵ Baatz, E.D. “What is Return on Quality, and Why You Should Care,” *Electronic Business*, Oct. 1992, p. 61.
- ²⁶ Sun, Hongyi. “Comparing Quality Management Practices in the Manufacturing and Service Industries: Learning Opportunities.” *Quality Management Journal*. April 2001.
- ²⁷ Ibid.
- ²⁸ Ibid..
- ²⁹ Sorqvist, Lars. *Difficulties in Measuring the Cost of Poor Quality*. Sandholm Associates. 24 May 2004 <www.sandhom.se/artiklar/difficulties.html>.