

Some Plain Talk About Six Sigma

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“Six Sigma helps us to establish our course and gauge our pace in the race for total customer satisfaction.”

Today, focusing on the customer is absolutely essential. Of course, we will recognize this. But do we really internalize the idea? Do we really believe that such a focus has the potential to drive business growth and impact to the level of prosperity which we should come to expect?

Closely linked to the idea of customer satisfaction is the concept of operational excellence—the kingpin of success. Without a focus on excellence, it becomes easy to accept the position of second or third best. Being the best means embracing change and reaching out for new and higher standards of performance. Only then can one break the chains of complacency and pave the way for breakthrough. The attainment of excellence is no longer a lofty goal or ideal, it is now a fundamental requirement—the ante for entering the game of business.

As most of us already know, the world has generally assumed this perspective and steadily acted upon it. The result of such a world focus has been

staggering, as evidenced by the creation and delivery of many superb products and services.

Hence, smart money says we must view the idea of operational excellence as a major focus in today’s marketplace. For those who might doubt such an assertion, just ask a customer what they think. After all, what the customer thinks provides us with a strong indicator of what will be purchased—and from whom.

Of course, it is widely recognized that the operational performance of an organization is largely determined by the capability of its processes. Another way of looking at this would be to say that our performance as a company is governed by the quality of our processes—high quality processes deliver high quality products, at the lowest possible cost, on time. Therefore, a focus on operational excellence in everything we do translates to a focus on process quality. Of course, we can not focus on what we do not measure and if we do not measure, we can not improve. Trying to improve something when we don’t have a standard to measure against

is like playing a sports game without knowing the score. Can you imagine setting out on a cross-country trip in an automobile without a fuel gauge? Just think of the personal grief, cost, and inconvenience which might result. Would you allow yourself to be placed in such a situation?

As we will discover, the measurement and improvement of our processes is absolutely essential if we are to achieve operational excellence and the ideals of total quality. To do, we must bear in mind the old axiom—let the product do the talking. In other words, the quality of our products can tell us how capable our processes really are. To measure product quality is to measure process quality because the two are correlated. It is very important to recognize that the inverse of this also holds true. Perhaps we should now set the stage for our ensuing discussion by examining what some have called the “Chain of Causation”

Chain of Causation

- 1** *Our survival is dependent upon growing the business.*
- 2** *Our business growth is largely determined by customer satisfaction.*
- 3** *Customer satisfaction is governed by quality, price, and delivery.*
- 4** *Quality, price, and delivery are controlled by process capability.*
- 5** *Our process capability is greatly limited by variation.*
- 6** *Process variation leads to an increase in defects, cost and cycle time.*
- 7** *To eliminate variation, we must apply the right knowledge.*
- 8** *In order to apply the right knowledge, we must first acquire it.*
- 9** *To acquire new knowledge means that we must have the will to survive.*

If you can't express something in the form of numbers you don't really know much about it. If you don't know much about it you can't control it. If you can't control it you're at the mercy of chance. If you're at the mercy of chance, why bother with it? Hence, we must learn the language of numbers. Such thinking represents a business philosophy—a way of guiding our company. From this perspective, we will focus our discussion on an all-embracing standard and methodology called “**Six Sigma**.” As we shall see, **Six Sigma** can be used to measure the quality of our work processes—in any field, from assembling a motor car, to inspiring a classroom full of students.

Over the years, this writer has been asked a great many questions about **Six Sigma**, most of which have been quite simple, practical and straight forward. For the sake of simplicity and reading ease, we shall complement such questions with simple, practical, and straightforward answers. Of course, we recognize that more sophisticated and detailed answers do exist, as many students of **Six Sigma** will testify. However, there is no point in hooking-up a fire hose when all we want is a glass of water.

Q What is **Six Sigma**?

A **Six Sigma** is several things. First it is a statistical measurement. It tells us how good our products, services, and processes really are. The **Six Sigma** method allows us to draw comparisons to other similar or dissimilar products, services, and processes. In this manner, we can see how far ahead or behind we are. Most importantly, we can see where we need to go and what we must do to get there. In other words, **Six Sigma** helps us to establish our course and gauge our pace in the race for total customer satisfaction.

For example, when we say a process is 6 sigma, we are saying it is best in class. Such a level of capability will only yield about 3 instances of nonconformance out of every million opportunities for nonconformance. On the other hand, when we say that some other process is 4 sigma, we are saying it is average. This translates to about 6,200 non-conformities per million opportunities for nonconformance. In this sense, the sigma scale of measure provides us with a “goodness micrometer”

for gauging the adequacy of our products, services, and processes.

Second, **Six Sigma** is a business strategy. It can greatly help us gain a competitive edge. The reason for this is very simple, as you improve the sigma rating of a process, the product quality improves and costs go down. Naturally, the customer becomes more satisfied as a result.

Third, **Six Sigma** is a philosophy. It is an outlook, a way that we perceive and work within the business world around us. Essentially, the philosophy is one of working smarter, not harder. This translates to making fewer and fewer mistakes in everything we do, from the way we manufacture products to the way we fill out a purchase order. As we discover and neutralize harmful sources of variation, our sigma rating goes up. Again this means that our process capability improves and the defects (mistakes) go away.

Q Can the **Six Sigma** approach be used as a benchmark to measure the capability of any work activity? If so, how does one apply the

same system of measurement to say, manufacturing a transformer or filling out a purchase order?

A Yes, the **Six Sigma** approach allows us to benchmark any work activity. For example, if we were to say that a transformer is 3 sigma, this would characterize the product as having below average quality, because we know (from extensive bench marking) that the average product, irrespective of complexity, is about four sigma, with best-in-class at around **Six Sigma**.

The same can be said for filling out a purchase order. In this case, the order form itself is a unit of product and the number of boxes to fill in constitutes the number of opportunities for error, where an error is an incorrect or unreadable entry. With this information, the sigma level can be determined.

As you can see, the sigma scale of measure can be universally applied because the common denominator is defects-per-unit. A unit can be, literally, any kind of task or physical entity—an hour of classroom instruction, a customer’s invoice, a

person at a barber shop, a part on a machine, etc. Also recognize that an “opportunity” is anything on, within, or connected to the “unit” which must be right. Thus, an “opportunity for error or defect” is anything which would be considered undesirable.

As should now be apparent the first step toward improving the sigma capability of a process is defining what the customers’ expectations are. Next you “map” the process by which you get the work done to meet those expectations. This means that you create a “box diagram” of the process flow, identifying the steps within the process. With this done, you can now affix success criteria to each of the steps.

Next you would want to record the number of times each of the given success criteria is not met and calculate the total defects-per-unit TDPU. Following this, the TDPU information is converted to defects-per-opportunity (DPO) which, in turn, is translated into a sigma value. Now, you are ready to make direct comparison—even apples and oranges if you want.

Once the comparison is completed, you should ask the following question: “Why is the best- in-class characteristic better than the rest?” If the answer is obvious, then go for it; otherwise, you must track down the sources of variation and then implement a logical scheme of variation reduction. Following this, you should verify the fix and get on to the next big issue. Of course, you would want to keep repeating this cycle until the customer smiles again. When the smile test reveals the warm glow of lips turned upward, keep doing it because it may not stay that way.

Q Could you give an example of how the sigma system could be applied to the activities of a teacher for instance?

A Let us first recognize that a teacher provides a unit of product to their students. Consequently, we could view this as a customer-supplier relationship. Naturally, the delivered product is knowledge. In this case, we would want to measure the quality of the knowledge transfer process because we know that an improvement in the process will translate into improved grades.

Based on the grades and the number of steps in the instructional process, we might discover that one of the two teachers is operating a 4-sigma instructional process. This would be to say the 4-sigma teacher would make 6,210 instructional mistakes per million opportunities for process error, on average. In contrast, we might know the other teacher is 3 sigma. This would translate to 68,807 instructional mistakes per million opportunities for process error. Notice the difference between the two teachers. From the facts, it is obvious, the process of the 4-sigma teacher is over 10 times more error free.

Q But a teacher can’t be only measured against exam results. How does one measure things like enthusiasm, transference of the desire to learn, and so on?

A A simple statement explains it all. If you can’t express something in the form of numbers, you don’t really know much about it. If you don’t know much about it, you can’t control it. If you can’t control it, you’re at the mercy of chance. If you’re at the mercy of chance, why bother with it?

More directly, a questionnaire can be created to surface subjective ratings. For example, one of the survey items could be worded as follows, “My work environment is stimulating”. Given this statement, the students would rate their feelings on a one to five scale—strongly agree to strongly disagree.

Yet another statement could be “Do you feel you have a ‘say’ in what goes on in class?” Here again, the students would rate the extent to which they agree or disagree with the statement, depending on the number they put after it.

By breaking things into elements and breaking each element into behavioral questions people can give a pretty accurate rating. If the scores of several people are grouped together, the results of analysis are even more precise, owing to the law of large numbers. Of course, once you have the numbers, computing the total defects per unit (TDPU) and defects per opportunity (DPO) is quite easy.

Q There are other systems for measuring work quality. What makes the **Six Sigma** approach so good?

A First, other systems for measuring quality have traditionally focused on the cost of quality, but with **Six Sigma**, the belief is that quality is free, in that the more you work towards zero-defect production, the more return on investment you’ll have.

Every time you track down a harmful source of variation and eradicate it you eliminate the related defects, decrease cost, and improve cycle time. Why? Because it takes time and resources to detect, analyze, and fix a defect. In fact, bench marking has shown that for the typical 4-sigma company, the cost due to internal and external repair exceeds 10% of revenues. In many cases, it is as high as 30%.

If you are operating on an 8% profit margin, and someone can undercut you by 10% or more, how long will you be in business? Simply stated, a focus on cost-of-quality will lead an organization to the conclusion that to go beyond 4 sigma is not cost effective. Of course, such a perspective is “penny-wise and pound-foolish.” Thus, stagnation and complacency sets in and the 4-sigma company will remain just that average.

Second, the **Six Sigma** method allows us to reduce things to a common denominator—defects-per-unit and sigma. In turn, this provides us with a common language and the ability to benchmark ourselves against like products, processes, and practices. Only then can we discover new ways of doing things that help the business. Of course, the alternative is to wait for people within the company to invent new things—we must take advantage of the superior practices that already exist. Following this, we can transfer those methods, practices, and technologies back into our business areas. In a nutshell, this is the way of **Six Sigma**.

Q What constitutes quality?

A Quality is when the customer is totally satisfied. That’s the overriding objective. Who is the customer? Someone who buys from us. What is satisfaction? Satisfaction is the extent of certainty, which the customer has that their quality, reliability, performance, delivery, and cost standards will be met. How much certainty is needed? Until exceptional quality becomes an everyday expectation in the eyes of the customer—until

near-perfection is a habit on our part. Here again, this translates to operational excellence.

Q It's interesting that the criterion for measuring quality is the customer, not the thing itself. Can more be said about this?

A We're talking quality control versus quality assurance. Quality control is posteriori—after the fact. It's like a boat. You can steer a boat by looking at the wake, that's control and it results after the fact, or you can steer by looking ahead, that's "assurance" and constitutes what will happen if we keep going in the same direction.

In the process of bench marking, we discovered a typical company is around 4-sigma. A world class company is at **Six Sigma**. Based on such information things become crystal clear; to compete in a world market, companies have to move towards a **Six Sigma** level of operational performance. But here again, you don't know what you don't know. If you are not measuring your performance on a level playing field, you don't know how you compare to those around you or the rest of the world. Let's

face it, if you don't know how you compare, it is easier and less costly to be complacent.

Q How big a difference in practical terms is there between 3- and 6-sigma?

A 3 sigma would be equivalent to one misspelled word per 15 pages of text. 6 sigma would be equivalent to one misspelled word per 300,000 pages—quite a difference indeed. Now, let's put this in real world terms. Some corporations are already running at **Six Sigma**. It is self evident they're going to perform better over the long haul. For example, several of the prestigious Japanese companies (which are doing so well in the world marketplace) are currently running at or near the 6-sigma level.

Q Many companies have benchmarks against the 6-sigma standard. Is there much difference between nations?

A Within the US and Europe, we most often observe a 4-sigma level of operational per-

formance, but in Japan the attainment of 6-sigma is not uncommon.

In some areas we already have a high level of quality. The airline fatality rate is about 6.5-sigma, but airline baggage handling is about 4-sigma. Both of these areas have processes attached to them. So why is there a difference between the way your baggage is handled versus the way your life is handled? The answer is self-evident. There is a certain amount of tolerance which management has in regard to quality. If peoples' lives are at stake, you can well bet the quality will be there, but if it's just a suitcase there is less focus. After all a suitcase is relatively cheap and can easily be replaced—so goes the reasoning.

When a company has its great awaking, when it realizes it is a 3- to 4-sigma organization, and has to move to **Six Sigma**, it will improve the processes by which it does its work. It all goes back to that spelling analogy. If you have to improve your quality from one misspelled word per page to one error in 300,000 pages, it won't help much to just polish up what your doing already. You need break-

through thinking, and new paradigms to achieve a significant improvement in process capability. In short, you must change the process. Of course, this assumes that we are first willing to change the way we think. Only then will the 'do' side of things change.

Q So, how does an organization put into practice the **Six Sigma** paradigm?

A When an organization asks people for a 10–12 percent improvement in process capability that's what they give. When the bar is raised to a ten-fold improvement, or even hundred-fold improvement, there are often a lot of bewildered people and comments of, "That's impossible!" But when two or three business units achieve the quantum improvement, other managers tend to visit those facilities, study them, and transfer the beneficial practices, methods, and technology back to their own workplace.

Organizations can achieve a hundred-fold improvement and it can be done so long as they focus on the process by which they work and maintain a

never-ending focus on total quality. This is the path to total customer satisfaction and business prosperity.

Q It clearly isn't enough just to urge employees to drastic levels of improvement. You have to examine the process by which you work, then involve the staff in finding out how the existing process is failing, and how it can be improved. Is this correct?

A That's right. Empowered people—with the necessary mind tools and leadership—have the control they need to improve the way they work. Interaction, participatory management practices, the notion of empowerment, an emphasis on cycle time, and significantly higher levels of expectation in terms of process performance. These are the keys to competitiveness in world manufacturability.

Q Can equally significant improvements be made in non-manufacturing areas?

A **Six Sigma** is applicable in everything we do. It can be used for such diverse tasks as cutting down the time it takes to process a patent or decrease the cycle time of designs. In addition, **Six Sigma** is employed to improve the cost of those designs and concurrently enhance manufacturability.

Q What does that mean?

A By configuring designs to be tolerant of manufacturing and material variations, we know they can be easily manufactured when it comes time to go into production. Of course, at the same time, the products will be less costly to produce because the designs will be able to utilize less expensive components and material.

Q That's very interesting. When we talk of the quality of a product, most people assume that means higher quality components,

more time spent on welding, or whatever. Does this mean an organization can make a component cheaper and please the customer more?

A Yes. Interestingly, the first reaction most companies have when trying to increase their sigma rating is to go out and beat up on suppliers, strive for better and better components, or inspect more. Sooner or later, these companies realize that 6-sigma won't result from a sole focus on suppliers or by better inspection or sorting. They can not get there by 'tightening up the tolerances'. As a consequence of such revelations, they slowly begin to focus on the capability of the related processes—of all types—of everything they do. When breakthrough happens, the success story spreads like a forest fire in high winds.

Credits

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