The Tactic of Six Sigma

The American current accounts imbalance continues to set records. People look to currency differences, world disruptions, and emerging economies for explanation. While all of these may contribute, the fundamental problem is not on foreign shores, it is right here at home and it is the ever-growing inability to provide goods and services that the world wants, at a price the world can afford.

This has been true for the past thirty or more years and for some reason that I cannot fathom, American businessmen seem to want to look at everything but they way they operate their enterprises. Oh sure, they'll pick the 'program of the year' and act as if it was answer, but like the program described herein, that is not a change, it is really just business as usual. Fundamental change is required. Six Sigma works against that change.

One can hardly walk into a bookstore these days without being deluged with Six Sigma volumes of one sort or the other. It seems to be an answer for every businessman's problem from controlling quality to designing new products to guaranteeing gleeful customers. As is usually the case, with these fads, the truth is somewhat less than the claims. Will adopting Six Sigma make a manufacturing company more effective? Is this a direction your organization should take?[1] What about "Lean Six Sigma"? Is that the wave of the future?

Even more importantly what can emerging economies, depending on trade for success, do to become more competitive? Is Six Sigma the answer (or part of it) or is there a better way? As it turns out there is a better way. It is demonstrably more successful than Six Sigma; it has been around for decades and is less jargon laden and less full of cant.

Motorola promoted their program as a quality/productivity solution and even developed a business center that emphasized Six Sigma consulting and training. However the company that has probably promoted it the most is General Electric. Jack Welch saw the overall promotion of General Electric as a part of his job and he tried to establish a GE 'way of doing business' in many aspects of running that enterprise. One of the things he promoted extensively was Six Sigma.

Six Sigma has spawned it's own vocabulary. For example, roles in so-called 'Six Sigma companies' are defined in combatant type terms (e.g. Green Belts and Black Belts). Ideas and words traditional to many different methods of quality improvement have been re-named and an inference made by many that they were developed as a part of the overall Six Sigma efforts. For example DMAIC an acronym associated with Six Sigma

[1] The words organization, company, and enterprise are used here somewhat interchangeably. While most discussion has centered on commercial ventures, non-commercial organizations are by no means excluded and most of what's written here and by Deming applies equally well in the non-commercial world.

stands for Design, Measure, Analyze, Improve, and Control. Theirs is nothing new about this improvement methodology. It has been around for decades.

But, the real question is not how Six Sigma has co-opted it's roots and its vocabulary from other sources, but what are its merits and what are its problems.

The most disheartening aspect of Six Sigma that I perceive is that it is essentially the same old soup in a different can. Another writer said he thought it was the same old car, but with a different salesman." Well-put…

The fact is that it is not much of change at all from traditional approaches to quality and productivity improvement. We already have ample evidence that the traditional approaches used in the U. S., simply doesn't get the job done. We also have a lot of evidence that there is a better way. Six Sigma is not it.

In fact it's not at all clear that Six Sigma has even had that profound an effect on either of its greatest advocates General Electric or Motorola Figures 1 and 2 in the Appendix show stock performance of GE and Motorola from the period pre-dating their adoption of Six Sigma to the present. If one inserts a vertical line in the late 80s timeframe, it can be seen the upward trends shown clearly started before program adoption and continued throughout at about the same rate. There is no dramatic change. Like Sherlock Holmes and the story of the dog in the night, it's what didn't happen that's noteworthy.[2]

One may reasonably ask 'Why hasn't Six Sigma been associated with dramatic improvements in competitive position?' It has been over 15 years since tit was introduced. My answer is that Six Sigma falls into a common business abyss. It is not a strategy. It is a program. A fix.

For example, virtually all definitions of Six Sigma call it a failure elimination program. This gives rise to the old disagreement among traditional quality practitioners. Simply stated, solving problems is not the same as improving quality. Of course, they overlap, but some of the biggest opportunities for quality and productivity improvement are not currently defined as problems. A problem-solving approach to quality improvement is too narrow. Strategic change is more broad-based and requires more fundamental change.

Consider 'just-in-time' inventory management. Now it's all one hears about, but that was certainly not the case twenty years ago. Inventory management specialists saw inventory as an optimization problem. The cost of having inventory on hand (in case it was needed) was balanced against the cost of not having this inventory when it was needed. Ollie Wight was the 'guru' and safety stock and order-points ruled the endeavor. Then came the Japanese with a totally different idea and suddenly what seemed a well understood phenomenon, inventory management, was completely redefined. The optimal level of inventory is now considered to be zero.

---

[2] From the Sherlock Holmes story, "Silver Blaze".

This concept was fundamental and before anyone in Detroit figured out what was going on, the difference in the cost of inventory between American cars and their Japanese counterparts was several hundred dollars

Thus traditional approaches that reduce costs or are targeted at problems representing more of the same thinking rather than a change of thinking. Certainly there is nothing wrong with reducing cost or solving problems. The point is that those are tactics, not strategies. The American airline industry is replete with examples of cost-cutting. Rather than ensure survival, these tactical moves have only changed the rate of blood flow as most of them bleed to death.

Current practices must be fundamentally changed. As is, they are not enough. Deming said they must be "…dynamited out".

Probably the most important competitive strategy that Deming taught the Japanese was what has become known as the 'Deming Chain Reaction'. Simply stated, it says that paying attention to quality in the right way will simultaneously improve quality and reduce cost.

Generally this can be thought of continual improvement (as opposed say, to meeting specs). If one is successful in pursuit of this strategy one finds oneself in the market with the best quality at the lowest cost. Gaining share is almost inevitable in that position. Moreover, the continual nature of this endeavor assures better and better quality at lower and lower cost. It is a difficult strategy to emulate and almost impossible to match in the short run. Market dominance leads to low rates of capitalization, more employment, better economies of scale and on it goes, this 'virtuous' cycle.

The primary strategy of American business has been to display profit now rather than to plan for long-term survivability and profit. In fact, short-term thinking and the obsession with 'quick fixes' is a serious problem for America, not only in the world of manufacturing and business, but also socially at home. This strategy has produced a 'vicious' cycle.

For a different perspective, consider Toyota. I would subjectively pick it as the most successful manufacturing company in the world today, perhaps of all time. Over the last 30 or 40 years, Toyota has been able to consistently turn out high-quality, low-cost products and have inexorably, riding on that strategy, captured the automobile manufacturing market, not only worldwide, but also in the United States itself. By the time you read this, Toyota will have passed the Ford Motor Company as America's number two automaker (that benchmark is imminent). Toyota is already the largest automobile manufacturer on a worldwide basis. In a few short years, given the agonies of General Motors, Toyota will replace GM as America's number one car seller. This was unthinkable even 30 years ago.

In the same time period two U. S. automakers have gone out of business (AMC, Chrysler twice). The automotive industry in America has laid off millions of workers. "Roger and Me", Michael Moore's movie about the then chairman of General Motors, Roger Smith, and showed dramatically how the city of Flint Michigan was ravaged by the inability of GM to compete. The same story could have been told of Warren, Ohio and countless other cities that derived their main sustenance from companies that were suppliers to U. S. automakers.

Now Toyota is beginning to plan to make airplanes. Honda already has a workable prototype that would compete with the Gulfstream. It is quieter, more fuel efficient, faster and more comfortable than the Gulfstream. The manufacture of airplanes is a part of Toyota's hundred-year plan. The BBC recently announced that a joint venture is being formed to combine Japanese and European interests in the joint development of a hypersonic replacement for Concorde.

A little over a year ago, the Aircraft Owners and Pilots Association (AOPA) printed an article predicting Japanese widespread entry into the small airplane market and N. Korea's recent adventurism has Japanese working of the development of jet powered fighter and other military aircraft.

That means that one of the last bastions of American manufacturing; the making of airplanes…already seriously attacked by Airbus…will be falling victim to the emerging Japanese airline industry shortly. So it has been with steel, Televisions, stereos, fax machines and on the list goes. How many U. S. inventions cannot be competitively manufactured here in the states? Dozens?

And it's not just America. Swiss watches, German lenses, small appliances, farm equipment, the motorcycle, the list continues. Whole industries have been overtaken by the superior competitive strategy of Japan. To whom do the Japanese attribute this economic miracle? Of course, it is their own hard work and inventiveness that explains much of their success, but the idea of the competitive strategy itself came from W. E. Deming after the Second World War. That same AOPA article cited an industry expert who said, "Deming's thumbprint is everywhere in every Japanese product."

What is Toyota's secret? Who would know better than it's chairman and founder?

"Everyday I think about what he meant to us. Deming is the core of our management. "

-Dr. Shoichiro Toyoda, Founder and Chairman, Toyota Motor Corporation[3]

The core of Deming's teachings to the Japanese is contained in a speech he gave in Japan at the Mt. Hakone Conference Center shortly after the war. Ishikawa, the noted Japanese quality control expert, estimated that the Presidents of corporations representing over

[3] From the www.managementwisdom.com web page. Also in Deming: The Prophet of Quality – CCM Productions.

70% of Japan's industrial base were present. They listened. They adopted the principles for the most part. Toyoda's quote indicates that the world's largest automaker today is still in touch with the basics of Deming's message. Moreover, on consideration, it is clear that these principles constitute a different method of attaining quality and, more significantly, an approach to competitiveness in the world marketplace significantly different to our own.

What are those basics? The core principles are:

- Adopt a process of continuous improvement of all aspects of the enterprise as a competitive strategy. Adopt the methods and thinking of continuous improvement. (start the 'chain reaction')

- Make the customer the focus of activity and stay ahead of the customer with regard to needs and satisfaction. Merely satisfying the customer is not enough.

- Stop depending on inspection and specifications to improve quality. Improve quality at its source. Reacting to outcomes does not improve things. It's too late, it's costly, it leads to inappropriate action and can make things worse.

- Incorporate the rigor of scientific investigation and prediction into the day-to-day operation of the enterprise. (See Walter Shewhart[4])

- Top management must take responsibility for the above. It must be the endeavor that occupies most of their attention. It cannot be delegated. It starts in the boardroom. It is the company's principal competitive strategy and receives the management attention that designation requires.

This last principle is, perhaps, the 'sine qua non' - the most important. The others are necessary but not sufficient. Quality improvement must become one of the few very top priorities of all of the senior management. Deming stressed this idea over and over again in his speeches to the Japanese and to American management as well.

Consider Six Sigma programs as practiced. If Top Management involvement is critically important, how do Six Sigma programs stack up? Usually they are delegated. Typically a staff Vice President is charged with the responsibility of 'getting this thing going' while the senior managers and operations people take care of the 'real' business of the enterprise. What I call the "checked off' mentality…"Ok, I've taken care of that, what's next?" As a primary strategic initiative, that mentality won't do it.

[4] Walter Shewhart was a physicist at the Bell Labs who invented the statistical control chart. His book (Edited by Deming) "Statistical Method from the Viewpoint of Quality" is groundbreaking on the use of the principles of science in management.

As I discussed, Six Sigma is not a continuous improvement approach, it is a problem solving approach. The difference is more fundamental than it might first appear. It actually gets back to how quality is defined. If quality is defined (as it traditionally is in America) as customer satisfaction, fitness for use or meeting customer expectations, then quality is an outcome…a destination. If quality is defined as continual improvement, then quality becomes a process…a journey. The activities required under these two definitions are fundamentally different.

Try this simple exercise. Divide a group of managers in two. Tell one group that their task is to detail a series of steps needed meet customer requirements. Ask them to make a list of activities they would engage in to accomplish this. Give the second group the same task (generate listing), but tell them their list must be to meet the goal of continuous improvement of the organization. You will see two very different lists of activities. You can do this exercise yourself.

Obsession with quality results not only in meeting or exceeding requirements but also, at the same time, reduces costs resulting in equally desirable (or more desirable) products or services at lower cost. This combination will gain market share. That is the strength of this strategy in a nutshell. As Deming said, "It's very simple really. Take over the market with better quality at lower cost." This strategy may not be all that simple to put into effect (in America it will require fundamental change), but there is no doubt that it works.

It is necessary when improving quality to improve it at its source. Inspection and examination of outcomes is an integral part of Six Sigma. Deming's Point #3 of his 14 points is to Cease Dependency on Inspection. The two approaches couldn't be more different in this regard. It may be counter-intuitive, but you cannot improve a process by reacting to its outcome. While the whole approach is larger than I can cover in this space, suffice it to say that inspection is too late. It's ineffective and it adds cost and no value. Harold Dodge[5] said it well, "You can't inspect the quality into a product." Quality must be improved at the source; where it's determined.

A recent article in the Australian Business Review Weekly pointed out how Six Sigma is not an approach that promotes innovation. If it is necessary to stay ahead of the customer and one's goal is to meet their expectations, then such efforts will constantly be falling short. The customer is usually limited to what he has seen. A competitive supplier will be so aware of how his product or service is used by the customer so as to help the customer innovate with the supplier's help. That's the way to get built into your customer's next generation of products, not waiting for the specifications to arrive at the

[5] Harold Dodge was also an employee of Bell Labs. Both he and Shewhart were tasked for figuring out ways of controlling the quality of the exploding telephone market. He focused on statistical inspection plans.

shipping room. It's too late at that point. Any competitor that doesn't wait will beat you to the punch.

Six Sigma does give the appearance of being rigorous, at least statistically, but a closer look shows that some of the statistical methods advocated are seriously flawed and reflect a fundamental misunderstanding of the statistical theory that underlies statistical process control, effective prediction, designed experiments and sampling. This is not a text on statistics and most of the critique would be beyond the elementary statistics readers have been exposed to. Suffice it to say that the concept of Six Sigma itself is a piece of miss-applied statistical theory.

Another of the difficulties is that the measure ignores completely the cost of the product in use. As Taguchi showed this is an integral factor in considering customer's total cost and cannot be ignored by a producer. One can produce a wonderfully designed car that costs a fortune to own. Likewise one can produce a car that seldom requires any but routine service. One of the main reasons people buy Toyotas is that they are known to be relatively trouble-free. Total cost of ownership is what matters.

Six Sigma attempts a measure of process capability. Indeed the estimation of six sigma itself is based on this concept. But, a process that is drifting into and out of control does not have a predictable capability associated with it. Six Sigma statistical calculations do not require a statistically stable process. There is no requirement to assure a stable process average or process variation and this results in estimates of six sigma that vary significantly depending on when the sample used to make the calculation was drawn.

Six sigma advocates indicate that detecting a 1.5 sigma shift is an adequate safeguard for this problem but as Donald Wheeler (the world's foremost expert on statistical process control) shows in his paper, "The Six Sigma Zone", no such assurance exists. In fact, this causes inappropriate action, searching for trends when there are none and ghost hunts.

Finally the calculation of six-sigma itself is accomplished by dividing a denominator based on a subjective assumption (The number of opportunities over which a defect can occur) into a measure of the number of defects where defects have been so ill-defined as to produce no meaningful measurement. That is, operational definitions are not used or advocated in any literature that I could find in my thorough search. Such specialized definitions are certainly not a common feature of the six-sigma programs I looked at. Yet, as Deming points out, they are vital.

Perhaps a requirement is in a restaurant that the customers' tables be wiped clean before they are seated. Therefore a 'dirty' table is a defect. But, what does this word 'dirty' mean. No casual food lying on it? No standing water? Clean enough to eat off of without a plate? Clean enough for surgery? What does it mean to say the table must be clean? It means nothing until you say what it means operationally – in this case, for this purpose. This operational definition is a must.

The statistical conversion from a defect rate (assuming a meaningful one can be found) to a probability density function that can yield percentage estimates of areas under a curve is too tortuous to discuss here. Suffice it to say that this too, has serious statistical faults.

Finally there is no mention in the Six Sigma literature of some important scientific principles. The elements of prediction are not discussed. Operational definitions (which are critical to training and measurement) are not discussed anywhere that was apparent. Logical thinking is not mentioned. The dangers of copying and other Post Hoc fallacies (e.g. confusing correlation with causation) are not discussed. Hypothesis testing is taught as a statistical method with no mention of the serious shortcomings associated with hypothesis testing and prediction. In short, there is not the emphasis on scientific and statistical thinking that will be an integral part of the new strategy.

All in all, Six Sigma does not represent the fundamental change that will be needed for America to become competitive in the world, at least against the Japanese. As Shewhart pointed out, the point is not to have a lot of statisticians in industry. What are needed are engineers, managers and executives who understand the principles of statistical and scientific thinking. Quality facilitators are helpful and attention to quality is important, but Six Sigma offers little that is new and has its emphasis in the wrong place. It is another of many competing programs in the enterprise.

That is the strategic failure. When quality and productivity are the main competitive strategy of the company, learning about quality, implementing effective control and innovation ARE the main business of the enterprise. The Chairman and Founder of Toyota seems to think so and who has been more successful?

It is likely that until and unless America begins the fundamental change required, the situation will get worse. As the world continues to shrink, more developing nations will be looking for ways to be competitive in manufacturing and service.

Here's what Deming[6] had to say on this subject in the early 80's:

Need Any Country be Poor?

"Japan had in fact in 1950 negative net worth. Japan was then, as now, devoid of natural resources - oil, coal, iron-ore, copper, manganese and even wood. Moreover, Japan had a well-earned reputation for shoddy consumer goods, cheap but worth the price. Japan (had to) export goods in return for food and equipment.

"If Japan be an example, then it is possible that any country with enough people and with good management, making products suitable to their talents and to the

[6] Generally Deming avoided political subjects. He saw himself as a scientist…a physicist and statistician. He did not consider himself an expert on economics although on reflection most of his writing is about economics.

market, need not be poor. Abundance of natural resources is not a requirement for prosperity. The wealth of a nation depends on its people, management and government… The problem is where to find good management."

Management can be taught. I have taught hundreds of seminars in these theories and methods. Any person of average intelligence can master the tools. Organizational change is the barrier. In a way, developing nations may have an advantage in that they are not wedded to 'traditional' way of doing things. China or India may be examples.

They seem uniquely well positioned to develop their own version of management. Imagine an economy with the size of China and the competitive skills of Japanese manufacturers.

About America Deming said:

"What is the world's most undeveloped nation? With the storehouse of skills and knowledge contained in its unemployed and the even more appalling under-use, misuse and abuse of skills and knowledge in the army of employed people in all ranks in all industries, the United States may be today the most underdeveloped nation in the world.[7]"

Is it time to wake up? Do we yet recognize the 'crisis' Deming addressed over 20 years ago? If not now, when? Economic dominance is not foregone nor is economic survival assured.

[7] From Out of the Crisis published by MIT Press in 1982.

Appendix

Figure 1.

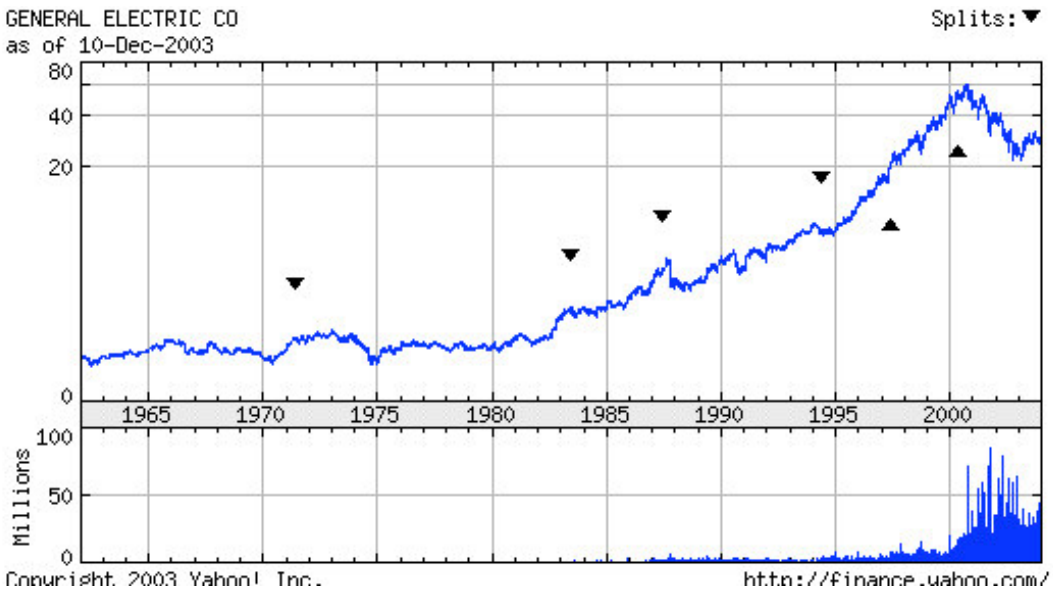
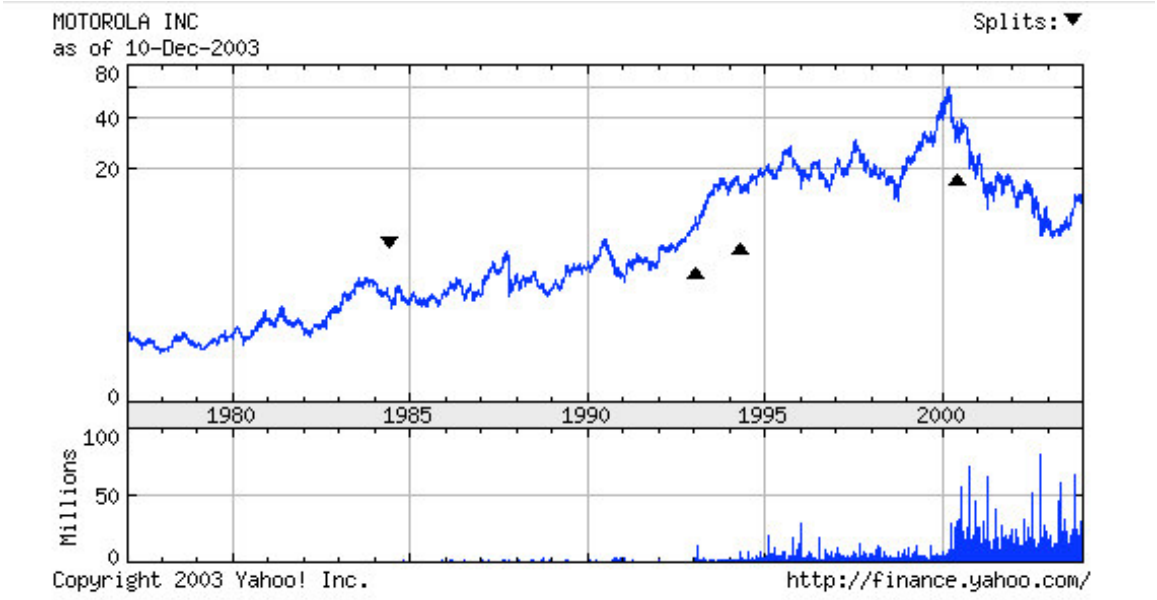


Figure 2.


MOTOROLA INC
as of 10-Dec-2003
Splits:
80
40
20
0
1980
1985
1990
1995
2000
100
50
0
Millions
Copyright 2003 Yahoo! Inc.
http://finance.yahoo.com/