## *Viewpoint*

# Continuous Renewal at Motorola

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Few of the challenges of leadership are as pressing as the task of addressing ourselves to the renewal of the dynamic high-technology industries. This paper contains a potpourri of thoughts on this subject.

## The Technology Road Map

Let me begin with a parable. Many years ago I spent a good deal of time roaming the halls of our laboratories. I am not an engineer; I needed to learn by osmosis. I think I understood how to appraise people's qualities in their professions. I discovered that the more roaming I did, the more I seemed to know about certain of our businesses – more, in fact, than the general managers of those businesses, who were not in such close contact with the roots of their laboratories.

Finally, one morning I became unusually impatient. There were things our really bright engineers felt were not being responded to properly by our otherwise excellent management. My impatience boiled over. By coincidence, the rest of our chief executive officers were in residence at the same remote place that day. I sat down with the general manager of the division in question and said, „This is a phenomenon that is no longer allowable. We are going to operate by means an organized process – a technology road map."

When I uttered that phrase, I didn't imagine it in capital letters, but „technology road map," turned out to be a good idiom. We sat down right there and sketched out where we were and where we wanted to go technologically.

Most companies today have something analogous to our technology road map, but 2 5 years ago there wasn't such a thing. Although we were a pretty successful company at the time – we were leaders in a number of businesses – there was just too much extemporaneousness in our approach to our future.

We desperately needed a formal technology road map. It had to have immense detail, and it also had to accommodate minority reports. Such a map is essential to a corporation like ours.

Another thing we needed was a better way of managing ourselves around the world. We're a global corporation, whatever that is. We are certainly located in a lot of places. We make, among other things, communications products, and these have different standards in different parts of the world.

Further, as a function of our general impatience with the way we were managing our technology projects, some of my associates came up with a plan to experiment with a world standard set of two-way radio products. To develop it, we put together a plan of action unlike any we had ever had.

Despite all our experience at managing technology projects, we always seemed to have incomplete definitions of our products. We kept extemporizing those definitions as we went through the evolution of the designs and as we put the products into manufacture. But in this case our people decided to do something fundamentally different, and it was very informative. We rediscovered that it is very important to take the time to sit down and define, for every element imaginable, the contract in terms of product definition.

We brought together people from Europe, Japan, and the United States, and we wrote a book. The book defined absolutely everything we would have to do with regard to this communication system – including adherence to the rules and regulations in England, France, Germany, and Japan.

After taking 10 weeks or so to write all this down – with considerable impatience, incidentally – we discovered that our extensive and detailed planning allowed us to conduct a much faster development program. The product that emerged was almost perfectly reproducible the first time out of the box – and we brought it to the worldwide marketplace far more effectively and rapidly than we ever had before.

Incidentally, our organization has a lot of very talented professionals. For a long while, we assumed that their contributions would directly reflect their levels of competence, which we thought were more or less fixed. But we discovered that all of us could learn a great deal more.

For example, we now know that most of our Ph.D.s can learn better how to define experiments. And all of us have learned that some absolutely new processes can be applied in the laboratory to yield an ultimately reproducible product. In the last six years, we have really taught ourselves new techniques whereby teams and cadres of engineers can very rapidly bring major jobs in manufacturing to maturity. They can do this with speed, with excellence, and in

ways that were not possible before.

## The Thrust for Renewal

All these discoveries occurred in response to the driving thrust in our corporation, which is renewal. Not a very dramatic word, renewal is nonetheless an absolutely compelling, energizing phenomenon in our institution. We use the word a lot and feel its meaning intensely. Because of our commitment to renewal, we assume that literally everything we do can be done differently or better. Only our principles – our ethical standards, for example, or our respect for each other – do not vary. In all other areas we will make major changes wherever necessary. We will actually obsolete our own products if necessary.

Our company has had the distinction of winning the Malcolm Baldrige National Quality Award. That has provided us a unique window to the world, because that honor also confers an obligation – actually a privilege – to present yourself to anyone who wants to know how you did it.

As a consequence, we have talked to a lot of people and we've learned an immense amount. One of the things that was essential to our winning the Baldrige Award – and that I'm afraid exists insufficiently in American society – is a certain level of expectation.

## Expectation Levels

Expectation levels in the United States are almost universally insufficient by an order of magnitude. People have yet to realize that they can run the three-minute mile rather than the four-minute mile in virtually everything they do. At Motorola, in contrast, we have come to the realization that if its imaginable, it's doable. Furthermore, unless we aspire to the accomplishment of the imaginable, we won't accomplish it.

In the area of quality, we recognized very early that there was only one standard to which we could aspire. At first we couldn't define it precisely, although we did find a simile for it: We call our quality program the „Six Sigma Program." If you have some training in statistics, you know that six sigma indicates a statistical result that represents six standard deviations from the norm on each side of the standard bell curve. If tolerances and designs are within the six sigma deviations, there are typically only 3.4 defects per million – a mathematical approximation of perfection.

As long as six years ago, I started saying publicly that our company's objective was perfection. One day, one of my peers – the very able leader of another large company in Chicago – said, „Bob, you ought to stop saying that. It's not credible. You're losing your audience when you espouse something that's beyond the realm of achievability." And I said, „Dick, that may be the case from your point of view, but I can't stop saying it because that's the only standard that our customers are now talking to us about." What our professional customers are now expecting of us is nothing less than perfection. And we're discovering that it can be achieved. We haven't achieved it everywhere in the company, but we're getting a lot closer.

To put what we're doing in perspective, many well-run businesses function at levels of 3.5 to 4 sigma. Our company is now operating most of its businesses at 5 to 5.2 sigma. Today, if plants operate below a certain level of quality, we close them down. We just won't let them operate until they can pull themselves back up to the highest levels. And we will achieve six sigma in the course of the next few years.

That's a high expectation. People said, „You shouldn't expect perfection." We expect it, and we're going to achieve it. We are achieving perfection, and we think we can do it in virtually everything we do.

We have not yet achieved operational perfection everywhere. But some of our operations have done things for more than a year without a single delinquency or mistake. We don't have repair departments there any more, and in many places we no longer have inspection departments.

I said to the head of a big automotive company, „You'll know you're really in the quality ball game when you order your people to close down your repair department and eliminate all the positions for inspectors. Then you'll really have a high-expectation-level quality and design program."

This man said, „But what do we do with the car that needs repair?" I said, „Scrap it." That's what we do. We scrap radios that theoretically need repair. We don't scrap very many radios, though. People just start to change the process so that defective radios don't get made in the first place.

## Leadership, Anticipation, and Commitment

I believe that 10 or 20 years from now the frontier is going to be quality of leadership. I don't mean leadership in the sense of achieving „followership" or motivating people, though these are important aspects of leadership. My focus

is on a greater-leverage aspect of leadership – anticipation and commitment.

I hope that five years from now, in our company, the principal way that we measure our key leaders will be the degree to which they have anticipated the consequences of surprises – whether they are creating those surprises or responding to them – and then have committed their operations to serving their customers as a function of what they have anticipated.

To illustrate what I mean, in 1936 my father, who had been broke many times before he started our then-fledgling company, had apparently salted away enough money to do something rewarding for my mother. So he took the family on a trip to Europe. In Germany, my father saw the Autobahn, the troops, and Hitler, and he realized there was going to be a war.

But beyond just anticipating it, he came back and did something with his insight. At that point he had a very little company – just nine or ten engineers with no military contracts, doing something less than $5 million total business, making a little profit. My father called in his chief engineer and said, „Don, we're going to go to *war*. That's going to make a difference in our business some day. Find out how the Army communicates in the field." So Don got in his car, drove up to Camp McCoy in Wisconsin, and literally knocked on the door. A major came out. Don said, „How do you communicate in the field?" And the guy said, „Well, we run a wire from the front trench to the back trench of a battlefield, and that's how we communicate."

I'm simplifying it, but that's the basic story. The chief engineer came back and told my father, who said, „That's pretty crude. We can't win a war that way. Don, do you think you could take the innards out of a car radio, marry it to something that could talk to the innards of another car radio, stick it in a box with a battery so a soldier could hold it in one hand, carry a pistol in the other, and still talk from one end of a battlefield to the other?" And Don said, „I don't know, maybe we could." My father said, „Go do it." That's commitment.

Before Hitler invaded Germany, Motorola – this little company you couldn't have found in the gross national product of the country – had designed, tooled, and readied for production what became the SCR 536 hand-held portable radio.

I don't know how many MBAs – if we'd had MBAs in the company at that point – would have said, „You can't afford it. I've done a discounted cash flow. It just won't work out." But my father went ahead and did it.

I have an aspiration that shortly Motorola should have an anticipations registry. Everything we anticipate should be registered on a ledger. And when things are anticipated, they will be automatically resourced. Some of my associates have responded, „How can we possibly afford that? Aren't we supposed to be specialists? Don't we have niches?" That's the common wisdom, but I'm influenced by Bernard Baruch, the great investment banker and adviser to presidents. His philosophy, very simply, was that if the crowd is going one way, you're probably better off going the other way.

So if the common wisdom says you'd better be in niches and you can only do so much, my inclination is to challenge it. We must provide the means to anticipate and commit to every surprise in our industry, because that's the only way you can achieve total customer satisfaction. Just delivering a perfect product on time is not achieving total customer satisfaction. If you don't deliver what they want, you won't be in business.

I started to work in 1940 and I have seen 16 major surprises – things like the transistor, the computer, fiber optic cable. And none of the major competing companies that my father looked up to 50 years ago are competitors of ours today.

What's the future? We like to talk in terms of 16 bits and 32 bits in electronics. There will be 32 surprises in the next 50 years. And almost none of the American companies that compete with us today will be in business, unless they learn to anticipate and commit resources fully. The Japanese companies will. They know how to operate with philosophies, practices, and programs that will keep them in business. But most existing American companies probably will not be here. Our company will. We're cultured to it.

We've put in place continuity of leadership that will know how to do it for at least the next 25 years. They understand that the key issue today is the articulation and management of expectation levels – and the encouragement of anticipation and commitment.