



# THE UNFREEZING

Using small samples of companies with a strong quality focus  
and companies with a strong performance focus,  
the author arrives at some startling findings  
about productivity, profits, and employment.

# OF AMERICA

TOR DAHL

**R**evolutions are difficult to predict. No one announced the Renaissance, or the Industrial Revolution, or the Quality Revolution. Revolutions often come when the church becomes more important than the faith, when the old ways of doing things no longer work, or when a new paradigm changes our understanding of the world.

Productivity improvement is the only way to create new wealth. When productivity increases, so does new wealth creation. By studying improvements in tools and materials, anthropologists have estimated that productivity increased by about one percent per year over more than a thousand years. In the Middle Ages, a person's income doubled every 72 years. The Industrial Revolution doubled the growth rate to 2 percent per year (now income doubled every 36 years). After World War II, U.S. productivity increased even further, to about 3 percent per year, until it suddenly and inexplicably dropped below 1 percent per year, starting in 1982.

1982 started what we shall refer to as The Freezing of America. From 1982 to 1994, productivity only increased by 0.6 percent per year, and showed negative numbers for 1989 (-0.1 percent) and 1991 (-3.6 percent).

Productivity only increased by an average of 1.1 percent in the United States over the 27-year period from 1967 to 1994.<sup>1</sup> Compared with the years that followed (1995 to the present), the long period of negligible growth carried a terrible opportunity cost. Indeed, had we been able to raise our productivity improvement rate from 1.1 percent to 5.0 percent over the period 1967 to 1994, U.S. GDP would have been 332 percent larger in 1994 than it actually was at that time.

If the U.S. had achieved a 5 percent productivity improvement rate per year starting in 1982, GDP in 2002 would have been 210 percent higher, or about *twice* today's figure.

We may thus have forfeited more than \$10 trillion in GDP by *not* focusing on productivity during the last few decades. A productivity focus would very likely have done away with government deficits; solved the funding problems of Social Security, Medicare, and Medicaid; and brought unparalleled prosperity to the U.S. and to the world.

## Is a productivity revolution feasible?

Is a 5 percent productivity improvement rate an unreasonably large figure? Perhaps. It

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*Tor Dahl wishes to acknowledge the invaluable assistance of Amy Thering in the preparation and research for this paper.*

is, however, a number that has been attained and sustained by a number of countries. China has exceeded this rate over the last decade, and so has Botswana. So have thousands of U.S. corporations. A 5 percent productivity improvement rate would double income about every 14 years. That would be a revolution rivaling anything we have seen in the past.

**SIX SIGMA IS A SYSTEM FOR QUALITY IMPROVEMENT THAT AIMS TO REDUCE ERRORS, OR VARIATION, TO A LEVEL THAT IS 3.4 ERRORS PER MILLION OR LESS.**

Is it doable? Certainly. To understand why this is so, we must look into what happened over the last 30 years, compare it with the recent numbers on productivity, and decide whether that which we might call the Productivity Revolution (a 5 percent productivity improvement per year) is feasible. In fact, the Productivity Revolution has already arrived. Because of the prodigious changes that will follow in its wake, it will not be possible to ignore it.

To understand productivity, we must understand quality.

- Quality happens when we *remove* all variation in a product or a service; productivity happens when we *introduce* variation in a product or service.
- Quality *freezes* a process; productivity *unfreezes* a process.
- If we *freeze* first, productivity improvement will drop to zero if no change occurs; if we *unfreeze* first, productivity will increase, and quality will help lock in the gains.
- To improve productivity *and* quality, we must unfreeze first, and then freeze to lock in the gains—and then unfreeze again to avoid stagnation.

The most spectacular improvement in productivity over the last 30 years has been in the computer and software industries. Silicon Valley companies unfreeze and freeze in a cycle that is only about 18 months long, following Moore's Law.<sup>2</sup> A fieldlike education changes much more slowly, and the health sector actually shows *negative* productivity for every year over the last 30 years.

The principles for unfreezing are known, just as the principles for freezing were

known and practiced for the last part of the twentieth century. In fact, it is the success of the Quality Revolution that has made these quality principles so universally applied throughout our country and throughout the world.

### What happens if the focus is on freezing?

The work of W. Edwards Deming, Joseph Juran, and others in Japan following World War II introduced Total Quality Management to Japan. This caused Japan to become the world's second largest economy. One of the consequences of freezing is that waste is eliminated. That causes a significant gain in productivity. However, when all waste is removed, and no other change occurs, productivity improvement falls to zero. And that is why, in our opinion, Japan's productivity growth has been negligible for the last 14 years.

Toyota's quality improvement practices brought the Quality Revolution to Detroit in the early 1970s. An NBC White Paper, "If Japan Can, Why Can't We?" brought the Quality Revolution to the rest of the U.S. in 1980. The "freezing" of the U.S. coincides with the Quality Revolution, and it is not a coincidence. The rate of productivity improvement in the U.S. dropped dramatically with the start of the Quality Revolution and did not recover until 1995.

To examine what happens to a corporation that chooses to focus on quality, we studied companies that had implemented comprehensive Six Sigma programs. Six Sigma is a system for quality improvement that aims to reduce errors, or variation, to a level that is 3.4 errors per million or less. Boeing aircraft are doing even better, achieving Eight Sigma in fatal failure rates. The health sector in the U.S. is doing much worse, with some 25,000 fatal errors per million.

Through the kind cooperation of the Juran Center for Leadership in Quality at the University of Minnesota, we obtained a list of companies whose philosophy and commitment to Six Sigma quality are considered exemplary. Twelve of these were listed on U.S. stock exchanges, so we had access to all available data reported to the

**EXHIBIT 1** Six Sigma Company Summary

Summary for 12 Six Sigma Companies	Revenue in 2002 constant dollars (mil)	Costs in 2002 constant dollars (mil)	Net Income in 2002 constant dollars (mil)	Multifactor Productivity	Net Profit Rate	Number of Employees	Labor Productivity
<b>2003</b> (GDP deflator .9826)	\$520,342	\$480,012	\$40,330	1.07	7.75%	1,392,621	\$373,642
<b>2002</b>	\$522,322	\$491,417	\$30,905	1.06	5.92%	1,456,815	\$358,537
<b>2001</b> (GDP deflator 1.02)	\$519,675	\$494,845	\$24,830	1.07	4.78%	1,505,007	\$345,297
<b>2000</b> (GDP deflator 1.04)	\$557,213	\$510,638	\$46,575	1.13	8.36%	1,568,144	\$355,333
<b>1999</b> (GDP deflator 1.06)	\$515,058	\$466,702	\$48,356	1.17	9.39%	1,592,234	\$323,481
<b>1998</b> (GDP deflator 1.08)	\$486,725	\$430,543	\$56,182	1.22	11.54%	1,483,603	\$328,069
<b>Totals/Weighted Averages</b>	\$3,121,335	\$2,874,157	\$247,178	1.12	7.92%	8,998,424	\$346,876
<b>Change from 1998 to 2003 (%)</b>	6.91%	11.49%	-28.22%	-12.76%	-32.85%	-6.13%	13.89%
<b>Average annual change (%)</b>	1.34%	2.20%	-6.42%	-2.70%	-7.65%	-1.26%	2.64%

SEC. The following are referred to as the Six Sigma companies:

- General Electric (GE)
- Coca-Cola (KO)
- 3M (MMM)
- Caterpillar (CAT)
- American Express (AXP)
- Dow Chemical (DOW)
- Honeywell (HON)
- Xerox (XRX)
- Ford Motor Company (F)
- Motorola (MOT)
- Dana Corporation (DCN)
- Bank of America (BAC)

The Six Sigma companies represent some of the finest and most admired companies in our country. They set, by their actions, a standard for doing business that is widely

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copied throughout the U.S. and the world. We studied the performance of these companies over the period of 1998 to 2003. There was one recessionary year (2001, lasting eight months); otherwise, the period chosen was one of relatively high average annual productivity improvements for the U.S. economy.

For each company, we obtained total revenue, total cost (total revenue less net income to stockholders), and the total number of employees. We calculated the average labor productivity (total revenues divided by the number of employees) and the average multifactor productivity (total revenue divided by total cost, output/input). All dollar figures in Exhibit 1 are expressed in 2002 dollars.

Over the period, costs increased at a higher rate than revenue (2.20 percent vs. 1.34 percent, respectively), resulting in an annual reduction in net income of 6.42 percent. This happened in spite of a reduction in the number of employees of about 1.26 percent per year. However, the reduction in employees kept labor productivity positive, at 2.64 percent per year.

However, the multifactor productivity improvement rate *dropped* by an average of 2.70 percent per year. The net profit rate dropped by 7.65 percent per year, from

11.54 percent in 1998 to 7.75 percent in 2003. Thus, a focus on quality in Six Sigma companies seems to be associated with:

1. A reduction in the multifactor productivity improvement rate
2. A reduction in overall employment
3. A reduction in net income

According to our “freezing” hypothesis, this is what we would expect where there is a strong focus on quality. It is also consistent with the jobless recovery we have observed in the American economy over the same period.

### **What happens if the focus is on unfreezing?**

Would a greater performance focus show a greater difference than the one discussed earlier? In the U.S. economy, there are literally thousands of companies that perform far beyond the average of the U.S. business sector. If we apply the Six Sigma concept to performance, we arrive at a Six Sigma for unfreezing, where a performance that ranks six standard deviations above average qualifies for inclusion.

To calculate this statistic, we must know the distribution of all relevant performance measures, something that is beyond the scope of this article. Here, we have selected 11 companies that were exceptional performers. We looked for stability over time and consistency of results. These are the companies that were selected, and we refer to them as the Exceptional Performers:

- Microsoft (MSFT)
- Washington Mutual (WM)
- Wells Fargo (WFC)
- USBancorp (USB)
- Eli Lilly (LLY)
- Oracle (ORCL)
- Anworth Mortgage (ANH)
- GulfMark Offshore (GMRK)
- Capital Automotive (CARS)
- Urstadt Biddle Properties (UBP)
- EPIQ Systems (EPIQ)

In the selection of these companies, we only looked for companies that performed with a multifactor productivity improvement rate averaging more than 1.33 over the period (the Six Sigma companies’ average is 1.12 over the same period). Thus, our focus was performance, just as the focus

**EXHIBIT 2 "Exceptional Performers" Company Summary**

Summary for "Exceptional Performers"	Revenue in 2002 dollars (mil)	Total Costs in 2002 dollars (mil)	Net Income in 2002 constant dollars (mil)	Multifactor Productivity	Net Profit Rate	Number of Employees	Labor Productivity
2003 (GDP deflator .9826)	\$77,862	\$55,682	\$22,180	1.3983	28.49%	378,356	\$205,791
2002	\$103,593	\$77,978	\$25,615	1.3285	24.73%	371,959	\$278,505
2001 (GDP deflator 1.02)	\$78,206	\$61,591	\$16,615	1.2698	21.25%	344,221	\$227,197
2000 (GDP deflator 1.04)	\$76,261	\$55,205	\$21,056	1.3814	27.61%	284,872	\$267,702
1999 (GDP deflator 1.06)	\$69,071	\$50,791	\$18,280	1.3599	26.47%	268,737	\$257,022
1998 (GDP deflator 1.08)	\$61,753	\$49,671	\$12,082	1.2432	19.56%	260,801	\$236,782
<b>Totals/Weighted Averages</b>	\$466,746	\$350,919	\$115,827	1.3301	24.82%	1,908,946	\$244,504
<b>Change from 1998 to 2003 (%)</b>	26.09%	12.10%	83.58%	12.47%	45.60%	45.07%	-13.09%
<b>Average annual change (%)</b>	4.75%	2.31%	12.92%	2.38%	7.81%	7.73%	-2.77%

### EXHIBIT 3 Quality/Performance Focus Contrasts

	Revenue	Total Costs	Net Income	MFP	Net Profit Rate	FTEs	Labor Productivity
<b>Six Sigma Companies</b>	1.34%	2.20%	-6.42%	-2.70%	-7.65%	-1.26%	2.64%
<b>Exceptional Performers</b>	4.75%	2.31%	12.92%	2.38%	7.81%	7.73%	-2.77%

for selecting the Six Sigma companies was on quality.

Looking at Exhibit 2, the 11 Exceptional Performers differed from the Six Sigma companies in dramatic fashion. Multifactor productivity and net profit rate were extraordinarily higher, as expected, but the increase in employment from 1998 to 2003 of 45.07 percent was a surprise. That is equivalent to an annual percentage change of 7.73 percent in increased hiring.

Studying the contrast in Exhibit 3, the most interesting finding is the relationship between hiring and productivity. The large increase in employment undoubtedly affected labor productivity, as demonstrated by the negative annual percentage of -2.77 percent in labor productivity for the exceptional performers. Eventually, training and experience are likely to correct this phenomenon. The increase in multifactor productivity is the key variable here, indicating the likely capital-intensive nature of these highly productive companies.

One of the most persistent myths about productivity is the assumption that productivity improvement takes away jobs. The opposite is the case. It is *lack* of productivity improvement that threatens jobs. Productivity improvement also increases profits and wages, and this is a combination that is attractive to both investors and wage earners. The extraordinary productivity of the computer industry has created an expectation of falling prices as well, even though what we buy from that industry has improved in speed, memory, and convenience.

A strategy that increases wages, increases profits, *and* reduces prices, all at the same time, is as close to a materialistic heaven as we can dream about on this earth. However, there is an even more interesting impli-

cation from looking at these data. Many of the companies that are focused on productivity are also associated with high quality. Since any quality failure is associated with a performance failure, could it also be that improving performance would improve quality as well? Could we have had the Productivity Revolution *without* any quality problems?

### Conclusion

Productivity and quality are both vitally important in a successful business. Deming's diagnosis of Japan's poor quality goals in 1949 was correct, and the focus on quality vaulted Japan to second place among the great economies of the world. Then it stalled. Japan now shows world-class productivity improvement only in its export industries, where it has to be competitive with state-of-the-art manufacturing the world over. The rest of the Japanese economy is stagnant, and its productivity improvement rate overall is barely positive.

A far worse situation exists in the U.S. healthcare sector. Over the last decade, the number of admissions to U.S. hospitals has declined at the same time the number of full-time employees has increased. If the U.S. healthcare sector had kept pace with the U.S. non-farm business sector in productivity, we would have seen little or no price increases, better outcomes, and no funding crises for either Medicare or Medicaid.

It seems paradoxical that a strong focus on quality should be at the expense of productivity. The opposite appears *not* to be the case. It is in this context that we suggest that the U.S. has actually forfeited GDP that would otherwise have been within reach. We are certain that a productivity

improvement of 5 percent per year is both feasible and attainable.

The simplest way to achieve this is to unfreeze *before* any freezing takes place.

There are only five unfreezing principles, one redeployment of resources principle, and one tested change strategy that will bring about both unfreezing and lasting change in an organization.<sup>3</sup> The result of the unfreezing and change process is what should be preserved by Six Sigma applications to retain any gains achieved. Companies that are engaged in manufacturing life-saving equipment must be very careful about guaranteeing the dependable functioning of its instrumentation. It would *not* be a smart strategy to freeze the creative and somewhat unruly process that brought that life-saving equipment into being in the first place.

In our many productivity improvement engagements with clients, productivity improvement was a *minimum* of 10 percent. The reason is simple: productivity improvement is rooted in knowledge, and a group of 20 people or more may represent several centuries of insight into an organization and its functioning. Collection of these insights, anonymously and exactly, will reveal that only about 8 percent of the work that is currently being done is being done perfectly—the participants themselves will say they can improve the other 92 percent. Implementing this potential for improvement creates prodigious changes in performance, and these very changes will eventually lay the basis for another turn of an upward-oriented productivity spiral in the future.

Data from completed projects show that productivity improvement leads to increases in job satisfaction, and reduction in negative stress. The reason for this is also simple: two-thirds of all stress and dissatisfaction is linked to unproductive work. To teach people to live with their stress and dissatisfaction in the workplace is literally asking them to live with unproductive work.

Why not take out the unproductive functioning and replace it with new, satisfying, and far more productive work?

The Quality Revolution has been won and the Productivity Revolution is just beginning. Since we shall not be seeing the incremental changes of the last decades under this new Revolution, it will not be possible to sit on the sidelines if a competitor starts improving its productivity every year in dramatic fashion. Thus, this revolution will engage everyone, and we shall all be better off for it. ■

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#### NOTES

<sup>1</sup> Donald Fisk and Darlene Forte, "The Federal Productivity Measurement Program," *Monthly Labor Review* (May 1997).

<sup>2</sup> Observation made in 1965 by Gordon Moore (the co-founder of Intel) that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented. Moore predicted that this trend would continue for the foreseeable future. Data density has doubled approximately every 18 months, and this is the current definition of Moore's Law, which Moore himself has blessed. Most experts, including Moore himself, expect Moore's Law to hold for at least another two decades.

<sup>3</sup> Tor Dahl, *Creating Lasting Change—A Presidential Address*, delivered at the World Productivity Congress (Kuala Lumpur, Malaysia, 1990); Tor Dahl, *Peak Performance—The Role of Satisfaction, Stress and Control*, proceedings from the World Productivity Congress (Stockholm, Sweden, 1993). More detailed discussions of the unfreezing principles may be found in articles, publications, and newsletters at [www.tordahl.com](http://www.tordahl.com).