Technology: Follower or Leader? Bane or Blessing?

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It's wonderful for this close observer of the rapidly-changing world of technology to be with this group of distinguished investment technology professionals tonight. I want to discuss with you, first, a bit of Vanguard's history, as we grew from a technology *follower* in the financial services arena to the technology *leader*. But I also want to discuss the impact of technology on the mutual fund industry, and specifically whether it is a bane or a blessing. Clearly, information technology has brought our world into a new era, as the availability of information and the speed and ease of communications soars to levels beyond what any of us—or at least myself—would have even found imaginable as recently as 15 years ago.

In my case, I can make that statement with considerable authority. For in September 1985, a reporter for *Forbes* magazine asked me how I viewed the priority that tiny Vanguard—then with $10 billion of assets, just 1/53rd of our present $530 billion asset size—would place on technology. *"We are not going to be a technology leader,"* I said, and was duly quoted in the article that appeared later that month. *"We cannot afford to be."*

Considering the circumstances at that time, it was not quite as stupid a comment as it might seem today. For, then as now, we were extremely cost-conscious, driving as hard as we could to become the lowest-cost provider of financial services in the world. We sought that goal, not because it would be an advantage in marketing (although it would prove to be just that), but because, as the only truly *mutual* mutual fund organization—uniquely, Vanguard shareholders own both the funds *and* the company that operates them—we knew that every dollar of costs we saved would provide an extra dollar in the returns we delivered to our fund investors. (By 1999, the 100 basis point (1%) difference between Vanguard's unit costs and the fund industry norm would put an extra *$5 billion* in our shareholders' pockets.)

The First Leap Forward

Despite that philosophy and despite my callow words to *Forbes*, within a year we took our first aggressive steps to expand our technology commitment. Bob DiStefano—then and now Vanguard's technology boss, and for my money, one of the most capable technology executives in the financial services field—reminds me that in mid-1986 I urged him to step a bit more lightly on our cost-control brake and more heavily on the accelerator that drove our then-modest technology program. While the numbers seem puny by today's standards, we quickly upped the number of programmers' two-and-a-half fold—from 22 to 56—and our total tech staff to 75. We have been building our technology focus and commitment ever since.

In those days, our world was fairly simple: each shareholder in each fund got a regular quarterly statement from each fund independently, just as if he or she owned, say, one Vanguard fund, one Fidelity fund, and one T. Rowe Price fund. With some 700,000 shareholders on our books—most of who owned but a single fund—that was "industry standard" at the time. But the standard was about to change, and our commitment to expand our technology effort came not a moment too soon.

Our business not only grew by leaps and bounds, but at ever-increasing levels of activity and complexity. Today, with some eight *million* shareholders on our books, Vanguard has become the second largest mutual fund organization on the face of the globe. Most own at least two Vanguard funds, and many own five, six, seven or more. Through the miracle of technology, they now receive a *single* combined statement for all of them, in the mail or, for the many whom have elected to skip the paper, electronically. Two million of those shareholders own Vanguard funds in their 401(k) corporate retirement plans, along with hundreds of thousands who own our funds through our variable annuities, or our brokerage affiliate, or our defined benefit administration, or our asset management and trust division, so we actually must maintain *six* separate record-keeping systems. Nonetheless, today our shareholders can view a combined electronic statement that combines *all* of their accounts through our "Access Vanguard" website, which receives about 100,000 visits each day. This is a remarkable and valuable service and a big cost saver as well.

The Next Leap Forward

Getting to the *here* of 2000 from the *there* of 1985 was not easy. I think (and Bob DiStefano agrees with me) that the major turning point came in 1992, with the delivery of my "Sacred Cow" speech at our executive meeting in mid-year. In it, I announced that my somewhat heavy-handed, Luddite-type approach to our business could, in a rapidly changing New World, retard our progress. I presented the staff with a list of seven Vanguard business principles—I called them "Sacred Cows"—that the officers felt, probably reading me correctly, we would never violate. I told them that those principles that involved our basic investment philosophy and our fundamental human values indeed *were* sacred, but that other policies would have to be killed if we were to remain competitive. By the time my speech was over, four of the sacred cows were dead, including number two: "We shall not be a technology leader." To visualize its demise, I created an imaginary article from a bogus June 1992 issue of the aforementioned *Forbes* magazine, in which I was quoted as reversing the cautious and provincial position I had expressed seven years earlier. The new quote read: "*We are going to be the technology leader. We cannot afford not to be*."

We began by bringing in Arthur D. Little to develop a major analysis of our technology operations, the beginning of a year-by-year series of quantum leaps that took our technology from 1990s followership to year 2000 leadership. Today, it is impossible to overstate the importance of technology in our operations. Our technology expenditures represent some 40% of our total operating costs—more than $400 million in 1999. By way of contrast, we spend less than $15 million on the investment supervision of the $370 billion of mutual fund assets we manage directly—$150 billion in fixed-income securities and $220 billion in equities that track various stock market measures such as the Standard & Poor's 500 Stock Index—barely 3% of the technology budget.

Technology—Finances and Focus

While our expenditures on technology can be characterized as *real money*—or even real, *grown-up* money—our operating expenses have actually declined in relationship to our burgeoning fund assets. When I gave that stodgy quote to *Forbes* in 1985, our direct expenses of some $45 million represented 0.41% (41 basis points) of our $10 billion-plus asset base—essentially the figure that represents how much of a shareholder's investment return is consumed by our direct costs. By 1999, however, that direct expense rate had been slashed to just 22 basis

points of our $500 billion base—a near-50% decline. We can't accept all of the kudos for that reduction, however. For our total direct expenses leaped from $45 million in 1995 to well over $1 billion last year. However, soaring stock prices and huge cash inflows from investors carried our assets upward at an even faster rate. Economies of scale in fund management were also a big help. But modern communications and computer technology played a powerful supporting role, and our now 2000-person technology crew managed both the growth in our shareholder base and the increasing complexity of our businesses processes with extraordinary efficiency, economy, focus, and vision.

I might add here a word about management's role in all of this. Despite what I view as the mind-boggling complexity of computers and investment technology, of programs and processes, of bits and bytes, and of Bluetooth and XML, Bob DiStefano reminds me that *how* we do technology is far less challenging than deciding *what* we do—our objectives, our strategies, the allocation of our resources. Be that as it may, the record is clear that we've been pretty good in both areas. But we realize that we must never ignore the importance of setting intelligent priorities for our technology resources, and the need to have clear business objectives for each project we undertake.

I'll spare you my own pride in what Vanguard's Information Technology team has accomplished. However, I won't spare you the results of the study conducted by *Information Week* a few months ago, in which we were ranked #40 among the 500 leading IT innovators. Indeed, in the Banking and Financial Services Category, we were ranked #7 among the 43 top firms, only two of our mutual fund peers even *made* that list, ranking #13 and #25. What is more, we earned gold medals in *each* of four designated categories: Application Development, E-business, Customer Management, and Business Processes/ERP. So, eight years after that imaginary *Forbes* quote that I used in 1992 to illustrate the abrupt change required in our technology priorities—from complacent also-ran to clear leader—we can fairly be said to have reached our ambitious goal. This seems only poetic justice, for the ship's motto of HMS Vanguard—a name that has persisted in the British navy for more than two centuries—is "leading the way."

The Miracles of Technology

Let me now turn from the miracles of what Vanguard's IT group has accomplished to the miracles that technology has brought to the mutual fund industry. These four stand out:

- The emergence of a financial system that has enabled the professional money managers of funds to offer a whole new variety of investment products, to provide remarkable liquidity for transactions, and to transact business around the globe at the speed of light.
- The provision of an up-to-date information network that provides data about mutual fund portfolios and performance so vast as to be beyond the ability of the human mind to absorb.
- The development of websites that not only provide fund shareholders with real-time account valuations, but also financial planning advice, including recommendations on saving for retirement and on the allocation of investment assets.
- The availability of a communications network so efficient that investors can purchase and redeem fund shares instantaneously (albeit so far with the transactions executed no more frequently than hourly), without ever moving from their desktop computers.

But, with all of this extraordinary technology available to investors, I ask you tonight: To what avail?

Yes, computer technology has played a major role in the growth of the mutual fund industry, adding a whole new order of magnitude to the growth fostered by the 18-year bull market in stocks. Today, we have a new mutual fund industry, one that is distinctly different from its staid, largely conservative ancestor—in variety, in concept, in investor participation, in service quality, and in pricing. But the question is: Do we better serve investors?

A New Industry Emerges

Surely there are more fund choices. The number of mutual funds has exploded, providing investors with an enormous variety of fund objectives, strategies, and managers. Just 20 years ago, the old industry was composed of fewer than 300 equity funds—the embattled survivors of the great 1973-1974 bear market, licking their wounds. The new industry comprises a bewildering total of some 7,300 funds—not only 4,000 equity funds, but 2,200 bond funds and 1,100 money market funds as well.

However, to a surprisingly large extent, equity funds have become *virtual stocks*—evaluated as individual common stocks, purchased as stocks, traded as stocks, and discussed as

stocks in the corridors of commerce and at cocktail parties alike. For millions of investors, funds *are* stocks, and when particular funds are hot, that's where the investors' capital flows . . . and, of course, vice versa.

What is more, yesterday's *investment* industry has become today's *marketing* industry. Once we sold what we made; today we make what will sell. Hot performance. Mutual funds using sophisticated investment techniques are aggressive beyond anything we might have imagined 15 years ago. Internet funds; micro-cap funds; and quantitatively managed funds. Funds based on theories of price momentum, earnings expectations, technical readings of the market, and multiple regressions that, dare I say, boggle the mind. Even funds for stocks in Vietnam and Indonesia and the Czech Republic—none hitherto known as bastions of capitalism.

Further, even old-line funds follow strategies that only yesterday would have been deemed outrageous. On average, mutual fund managers turned over their portfolios at a 15 percent rate in the 1950s and 1960s. Even in the "Go-Go Years" of 1965-68, the rate rose to "only" 40 percent. But last year, the turnover rate was 90 percent, suggesting that the average holding period for a given stock is now just 406 days. Such speculation not only flies in the face of intelligent investment policy, it carries heavy transaction costs and unnecessary tax costs that frustrate the objective of fund shareholders to earn returns that even approach the returns of earned in the stock market. What ever happened to long-term investing by professional managers? By anyone?

In short, mutual fund managers—once considered as long-term investors—have become, to an important degree, short-term speculators. Many of the former shepherds of the flock have become the sheep of the pasture: a roaming, inconsistent, wild lot, given to impulsive—if sometimes precisely quantified—decisions that frustrate the very purpose of investing on the basis of traditional standards of corporate valuation. We have investment technology to thank for its role in helping us to engage in all of this feverish activity. But technology has given us the tools without giving us the wisdom to handle them constructively.

A Flood of Information

The computer and the Internet have also given us nonstop access to data that allow us to analyze and evaluate mutual funds beyond our wildest dreams, and to make fund selections with unimaginably vast information literally at our fingertips. Never again will mutual fund investors lack the ability to make fully informed investment decisions. From that standpoint, mutual fund investors are among the greatest beneficiaries of the computer revolution.

But they are also among its greatest victims. With each passing day, mutual fund investors are proving—as we must have known all along—that in investing, information is all too often mistaken for knowledge; and knowledge is all too seldom translated into wisdom. But, wisdom—far more than mountains of detailed data—and common sense—far more than opportunism—are ever destined to be the prime ingredients of long-term investment success.

Communications technology has given us immediate access to abundant information when we are considering our fund decisions—to buy, to hold, to add or subtract, to withdraw entirely. How much information? Consider Morningstar's Principia database, in which it provides for each of the 3000 stock funds in its database:

- For the stock portfolio: price-earnings ratios, growth rates, market capitalization, industry diversification, rate of turnover.
- Risk Characteristics: R-squares, Betas, Alphas, standard deviations, Sharpe Ratios.
- Past Performance: annual and cumulative returns, monthly and rolling three months, rankings versus a market index, and versus peer groups; tax-adjusted returns.
- Investment styles: a matrix of nine boxes sorting fund both by growth or value characteristics and by size of market capitalization, i.e., large cap growth funds. (And funds must maintain their "style purity," no matter what.) Portfolio manager experience, education, and tenure.
- Costs: sales charges, 12b-1 fees, expense ratios. (By the way, please never ignore costs!)
- And the *summum bonum*: The "Star" rating, based on risk-adjusted returns relative to other equity funds.

It is no exaggeration to say that the superb Morningstar service provides all the information an investor could possibly need to evaluate a fund's characteristics, to understand a fund's character, and to make informed decisions. I fear, however, that they rarely use this information

to enhance their knowledge. Rather, they rely on a fund's past performance and star rating. Our trust is placed "in our stars, not in ourselves," precisely the opposite of what Cassius told Brutus. But the "stars" do *not* give investors the power to select future winners. While Morningstar's information is *priceless* in understanding a fund's investment style, past returns, and present portfolio, the evidence strongly suggests that it is virtually *worthless* in enabling investors to enhance their returns. Technology has made information accessible without providing knowledge and without engendering wisdom. Perhaps a rereading of the Book of Proverbs would remind us of what is really important: "Get wisdom, get insight."

The Quality of Advice

With all the information and commentary that is available on Internet websites, I find myself particularly troubled by the offering of investment and financial planning advice. This advice is voluminous and comprehensive, giving investors the ability to plan their financial futures with decimal point precision, and to manipulate the data to their hearts' content, raising and lowering their expected retirement plan contributions, their allocations to stocks and bonds, and their assumptions about future returns in the financial markets, about tax rates and inflation rates, and about retirement age. But, at bottom, the data that is provided tacitly ignores the most fundamental characteristic of investing: *Uncertainty*.

I go quickly to the first principle: T*he stock market is not an actuarial table*. Yet the projections provided in the numerous websites that investors can access seem to me to cast an aura of predictability—if not certainty, surely high relative assurance—in the numbers that appear. But the output, as ever, is highly sensitive to the input. A few examples from three different websites make the point.

- Consider a retirement plan for a 30-year old investor, investing 6% of his $50,000 salary in a 401(k) plan (with a 3% company match), his income growing at 5% per year until planned retirement at age 65. If he believes the stock market's annual return will be 12%, in 2060 (when he will reach his actuarial life expectancy of 90 years) the accumulated capital would be $22,848,149. (Note the precision!) If, on the other hand, the market return turns out to be 9%, he runs out of money at age 81—a zero balance, and nine years too soon at that. But believe me, no one in the world knows which of

those two outcomes—$22 million vs. pauperhood—is more likely, or can even imagine what the future return on stocks will be.

- Consider an asset allocation plan that calls for an "ideal mix" for a risk-averse investor of 27% in bonds, 13% in foreign stocks, and 60% in large cap growth stocks—assuming future returns of 8.6%, 9.5% and 13.6%, respectively. (Again, note the precision.) Now bump the foreign return up to just 10.6% and reduce the other two returns by a single percentage point and—abracadabra!—the required foreign stock allocation rises from 13% to 45% of the portfolio; bonds drop to 10%, and growth stocks drop to 45%. Who, really, is fooling whom here?
- Consider another financial planning website—and an extremely successful one at that—which does a fine job of presenting options that show the probabilities of reaching your planning goal by the use of various assumptions grounded in the dispersion of past returns in the financial markets. This approach makes sense, but the system errs by making what appear to be highly arbitrary projections of future performance for individual funds. It assumes, for example, that three particular funds will produce a range of nominal returns as follows: growth fund: 16.56% to 1.50%; value fund: 14.38% to 2.02%; and the total U.S. stock market: 15.35% to 2.34%. (Precision again.) Reasonable as these ranges seem to me—though they are in no way assured—I just can't imagine deciding to go with that particular growth fund simply by reason of its putative superior future return under these tenuous assumptions.

In all, I believe much of our industry's information technology is presenting investors with hypothetical information clothed in the mantle of precision. Long-term investors, I think, would be far better served to simply stop trying to outguess the unguessable, and opt for using a simple asset allocation plan, not a complex one: owning the entire stock market, not trying to select winning stock funds based on their past returns. Sometimes it is better to be roughly right than precisely wrong.

Transaction Technology—Switch When the Iron is Hot

Finally, transaction technology has given us the ability to trade both stocks and mutual funds beyond our wildest imagination, as unambiguously unhelpful as it is to fund investors and

to the portfolio managers of the funds whose shares they trade. Yes, technology has driven transaction costs down. But it has also helped drive stock trading to its highest level since 1929, a turnover of 100%, meaning that the average stock is now held for just one year, compared to six years in the mid 1970s. The net result as described in a compelling law review article:[1]

> . . . even as computer and network technology dramatically reduces the cost of and increases our access to information, our biological limits ensure that individual and institutional investors alike consider only a limited subset of all the data available . . . Purely speculative trading that springs from the natural dispersion of investors' subjective opinions under conditions of uncertainty, however, drains investor wealth. And the new information technology may encourage speculation. In other words, securities markets may be subject to the law of unintended consequences just as the rest of life is . . . Unfortunately, if the demand for stock speculation is relatively elastic, reducing the marginal costs associated with speculative trading can have the perverse effect of increasing total costs (and with it, deadweight losses).

At least a few others share my concerns about the role technology has played in creating this new world of hyperactive investing, and about the accelerating pace of investors' turnover of fund shares. A recent *New Yorker* article described it in harsh terms: ". . . giddy money managers [including, I would add, investors who actively manage their own fund portfolios] are enthralled by the new gadgetry—technology now sits at the center of a speculative frenzy of religious intensity, a financial mania, a bubble."

In the mutual fund arena, turnover of equity fund shares by investors has also soared. In the 1960s and 1970s, liquidations of equity fund shares averaged 9 percent of assets per year; in the late 1990s, the rate has been running at about 36 percent. Put another way, the holding period of the average fund shareholder has tumbled from eleven years in the earlier era to slightly more than three years currently. *Just three years.* Mutual fund shareholders are using the best medium ever designed for long-term investing for the purpose of short-term speculation. And they will be the losers.

[1] "Technology, Transactions Costs, and Investor Welfare," Professor Lynn A. Stout, *Washington University Law Review*, 1997.

Nonetheless, I freely concede that technology has served fund shareholders extremely well in one sense: The unit costs of fund share transactions and fund portfolio transactions have sharply declined. Indeed, their decline has already helped to reduce the costs of operating mutual funds. Computer costs have plummeted by almost 99 percent, from $150,000 per million instructions per second (MIPS) in 1985 to perhaps $1,000 per MIPS today. The cost of a personal telephone response was $10 in 1985; today, it is only $2 for an automated telephone response (a bit discomforting for many investors). When a printed fund prospectus is delivered, the cost is $8; when the same prospectus is delivered over the Internet, the cost is essentially zero. Fund transactions can be electronically implemented and processed by pushing just a few keys on a personal computer—a further huge savings.

It was recently estimated that some 30 million of 50 million fund investors have home computers, with 10 million using them in investing. (Another estimate suggests that 30 percent of fund shareholders in the largest mutual fund casino—my word for the mutual fund supermarkets where trading fund shares is at least tacitly encouraged—already handle their transactions in its website.) Today's 10 million users will soon become 15 million and then 20 million, and they will all have the ability to redeem their shares at a moment's notice. It takes only a moment's contemplation to imagine what might happen in the financial markets if, say, half of that number responded to a major earthshaking (literally or figuratively) news event. The industry's old gatekeeper—a busy signal on the telephone—is retiring, for better or worse. Perhaps busy Internet service provider numbers, or even an Internet crash, will "protect" us if the dark day comes, but perhaps not. Honestly, it's sort of scary.

The Report Card

Let's grade each aspect of the technologies currently used in mutual fund investing:

- **Investment technology**: Innovative financial instruments, A+; liquidity, A+; cornucopia of funds, A+; soundness of new funds, C; investment behavior of mangers, D.
- **Information technology**: Availability of data to investors, A+; completeness and scope, A+; availability of meaningful knowledge, A; effective use of that knowledge,

D; intelligent selection of funds for future performance, D; investment behavior of shareholders, F.

- **Transaction technology**: Ease and facility, A+, implicit encouragement to trade funds, A+; efficiency and expense savings, A+; flow-through of lowered costs to fund shareholders, F; facilitation of enhanced shareholder returns, F.

My report card would rate the contribution of technology to information as A+; to knowledge, C; and to wisdom, D or perhaps even F. In all, good grades go to the technology, bad grades to the users.

What does the technology revolution portend for tomorrow? More Websites, more bulletin boards. More information, more transactions, still more facilitation and speed, and more cost savings (though probably not flowed through to the benefit of fund shareholders). And, I must add, more risk. Most of the new financial instruments made possible by the computer power of technology have never been tested in the crucible of a bear market. Nor have most fund shareholders, who are now able to trade without restraint. And, given the Internet, they can do so without even the intercession that used to be represented—for better or worse—by the inability of funds to staff enough telephone lines. Anyone who is not cognizant of these risks is, in my view, making a serious mistake.

But I am not an aging Luddite who is renouncing the future and calling for a return to the past. We can't go home again. But I do hope we will soon return to the fundamental principle that mutual funds are best used as long-term investment. I'm enough of an idealist to be confident that the kind of casino capitalism that is in the air today will not be a permanent fixture in the mutual fund industry. For trading in fund shares not only places roadblocks in the way of the implementation of sound strategy, but also engenders additional costs to all of the shareholders in the fund. What is more, it is also a loser's game for fund shareholders who elect to follow active trading strategies. Technology, for all its gee-whiz wonder, is both a bane and a blessing.

In the fund industry, the idea of something for nothing is rife, and plain fantasy about future returns abounds. My asking earlier, "To what avail?" regarding the remarkable advances in the application of technology, was not intended to demean them. I only urge that this industry give far more thoughtful consideration to curbing the powerful monster we have

created and to figure out how to make it bow to *our* will, *not us* to its will. We must begin by obliterating the notion that funds should be treated as individual stocks—actively traded, sometimes in exotic forms, by managers who can create miracles. Abandoning the massive advertising of funds as though they were beer or toothpaste or perfume would be a step in the right direction. And we ought to give serious consideration to appropriate limitations on frequency of exchanges, and fee penalties for investors who redeem shares after short holding periods. All of these steps would be met with horror, not only by short-term investors who are using funds as stocks, but by the fund managers who seek additional assets without concern for their durability. But each of these steps would serve the interest of the long-term investors whom we are sworn to serve.

I concluded my draft of these remarks before President Clinton used some familiar words from Benjamin Franklin to close his recent State of the Union Address. But, perhaps shamelessly, I'm going to present them to you anyway, for I want to end my remarks on an upbeat note. At the close of the Constitutional Convention in 1787, speaking of the new republic that had just been created, Franklin pointed to General Washington's chair, on which a sun was painted in gold leaf, and observed: "I have in the course of the Session, and the vicissitude of my hopes and fears, looked at that sun without being able to tell whether it was rising or setting. But now I have the happiness to know that it is a rising and not a setting sun."

Similarly, I would express my own hopes and fears about the impact of computer technology on the new mutual fund industry we have created. Whether it is a rising sun or a setting sun is, finally, up to mutual fund investors. But it is up to fund executives and our information technology leaders to keep in mind not only information, speed, cost, and efficiency, but common sense, foresight, and wisdom.