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at the

**BUSINESS LEADERS LUNCHEON**

April 12, 1988

Topeka, Kansas

Hosted by Washburn University

The Cornucopia Problem:

Managing in an Age of Plenty

First, I thank Washburn University and all of you here today for an opportunity to present some reflections on a few problems now facing managers and leaders of organizations. While it is true that the problems I have in mind may be most acutely felt by managers of "for profit" business, they are not the only ones. The impact of these issues must be considered by responsible persons in "not for profit" groups and programs as well.

The title for these remarks -- "The Cornucopia Problem: Managing in an Age of Plenty" -- is intended to refresh our perspective about the source of many of the operational challenges these managers and leaders deal with. That source is the cascade of goods, the cascade of data, which has intensified, and will continue to do so. Particularly noticeable since the end of World War II, its technological origins go further back. A discussion of those origins is not appropriate today. For the moment, it is enough to say that, with some exceptions and making allowance for persistent problems in distribution, the scarcity of the necessities of life is fading from our priorities. In its place is the concern for management of "plenty," securing access to it, and dealing with the reality that in fact there is already, in many situations, too much of it. One need consider only the flood and daily torrent of information. There is more than we know what to do with, as they say.

In his history, The Mediterranean and The Mediterranean World in the Age of Phillip II, widely regarded as one of the few great, if not the greatest, work of 20th Century historical scholarship, Fernand Braudel attributes all of the historical action he described to the interplay of "bread" and "peasants." (1241) To me, these rough words stand for the somewhat more complex relation between technology and demographics, with "bread" representing technology and "peasants" demographics. In times past, one might assess the separate and joint impact of technology and demographics in terms of specific localities, communities, and regions. One might be indifferent to the globe at large. World competition for world markets scarcely existed. Times have changed. The context for business decisions is global, and it is characterized by rapid turnover on a global scale in markets, products, services, capital, and people.

Speaking of technology first, we might say that all of us have become technological determinists. In this frame of mind, means make ends; "technology" says that more is better and ensures that we get it. The world bazaar, the cascade of goods, is the consequence. America is responsible for this view and the primacy of this view in defining the "western way" or "modernism" in the third world and LDCs. And it is this technological determinism that is the threat, the challenge to

traditional arrangements, relationships and economic institutions, work places, markets and shop floors.

The silicon chip is only a few decade old but already may be the greatest invented device in human history. Its ability to process and handle information is phenomenal and grows more so, but its "multiplier effects" in increasing the capabilities of numerous other devices gives it special significance. Little did Claude Shannon imagine, in his wartime work at Bell Labs, where his information theory would lead. Only Robert Noyces' invention in 1959 of the integrated circuit was needed to enable us to cross the threshold to the chip itself.

Now we are hard at work on a universal computer program and software that will permit each of us, or any of us, to design, program and then to build our own chips. This achievement is -- temporarily -- the ultimate advance in widespread technology application. It will guarantee innovation by the greatest number of individuals and the earliest implementation and use of those innovations. (Forbes, April 4, 1988, pp. 88 ff.) KCSI's development of its Fuelsaver, a patented microprocessor for locomotive fuel control, would have been greatly accelerated if such a program had been available.

Of course, mechanics and devices are only half the story. Organizational technology requires equal emphasis. That is to say, attention, even the biggest part of attention, must be given to systems by which information or data are collected, manipulated, stored and applied in millions of transactions, acts and business events. Our own experience with DST Systems, which developed the nation's primary mutual fund shareholder accounting and recordkeeping software, demonstrates the importance of these sophisticated, computer-driven, critical operating systems. Increasingly, all our businesses are dependent on such systems as we integrate our manufacturing, marketing, and financial operations in one common data base and data processing facility and operate the business from that array.

DST has learned from a powerful, growing mutual fund industry (that scarcely existed as we know it prior to 1960) how dependence on such a system can drive an entire business, provide its essential infrastructure, and determine its success or failure. The mutual fund industry is not unique in its dependence on such software for its explosive growth. The railroads were ahead of other U.S. industry in developing critical operating systems; it was from this railroad experience that DST's applications to financial services developed. At that time, the notion of a critical operating system as the essential infrastructure in business organizations, its identification, its management, its use to improve competitive position, its use to improve productivity, its use to develop new products and services -- all of this was unknown and only to be anticipated. We have come a long way since IBM "invented" the operating system or system software in 1964.

The growing importance of the so-called MIS function in our businesses illustrates these developments. But we as managers are just beginning to understand MIS or its implications. Moreover, this ignorance of big systems and their business impacts has been compounded by the "democratization of data processing" brought about through introduction of smaller and smaller computers with increasing computing power and memory<sup>7</sup> linked in complex, informal communications networks.

The combination of unprecedented computing power and communications networks to create the

new infrastructure for all business, for all organizations is the technological achievement of our century. Admittedly, it began in other, earlier times and there are interesting historical antecedents.

Many of you know that Samuel F.B. Morse invented the telegraph in 1837 and that the first message was transmitted in 1844 (though it's surprising how few of us remember these dates -- our Lechno logical memory fades fast). The telegraph's central importance, aside from point to point communication for the sake of the messages alone, lies in its use to move and control power over distance. Application of the telegraph to this fundamental task was the "invention" of someone you would be hardly expected to know. Charles Minot, General Superintendent on the Erie Railroad, for the first time used the telegraph to run trains on September 22, 1851, westbound out of New York to Port Jervis. The dramatic story of his innovative and inspired application of two different technological systems is interesting in itself, but it must await another occasion for the telling.

Again, KCSI's own experience with fiber optics may be pertinent. While we began to build a fiberoptic network in our service territory using our railroad right-of-way, we learned that its success would require a larger and more extended, national network. We subsequently merged our LDX System with the fiber-optic network of Williams Brothers Pipelines. Together as Williams Telecommunications Group, we will have a coast-to-coast fiber system by the end of this year. Our network does not provide switched service in competition with carriers such as AT&T, MCI and US Sprint. However, widely available new communications technology has made possible the growth of .the informal, private networks that use our fiber instead of traditional facilities offered by these switch service carriers. The primary business purpose of the Williams Telecommunications network is to serve, to develop, to enhance and support the large number of private-line networks now in place and rapidly being built around the Nation.

The remarkable thing about fiber is its almost limitless potential for expansion1 once the fiber is in the ground. Through the use of "step-ups" in the electronics which drive light signals through the fiber, great improvements in capacity can be achieved at increasingly reduced expense. We installed our fiber in 1985-1986 using so-called 405 Mb technology, equivalent to 6300 voice frequencies per fiber pair. Our cable held 12 fiber pairs and was less than an inch in diameter disregarding the sheathing. So we could carry 37,800 simultaneous telephone conversations. Currently, however, we are installing and using 1.12 Gb technology, equivalent to 17,500 voice frequencies per fiber pair. Without laying new cable, our system now becomes capable of carrying 105,000 simultaneous conversations.

We expect within the next few years to step up to 2.8 Gb technology with obvious enhancements of capacity. Please bear in mind that at 405 Mbs, a single fiber pair is roughly equal to 3-inch diameter copper bundles; the copper cable would have to be roughly 18 inches. in diameter to equal 12 fiber pair at 405 Mbs.

The real importance of fiber optics is not its inexpensive, more reliable, more secure characteristics. In themselves these would be enough to justify abandonment of old technology. The real importance is in the incredible capacity of fiber optics for signal transmission. Only with fiber optics can computers be linked together for on-line total integration from one end of

the country, indeed the world, to the other. Until fiber's capacity was available, it was prohibitively expensive to run computers together, separated by great geographic distance. Computer Integrated Manufacturing on a national or world scale is made possible only by fiber optics.

Turbulence in technology affects business decisions profoundly, and presents enormous opportunity for growth and for calamity. The growing awareness of the ways in which technology affects organizational prospects now controls investment decisions and expectations as to realization of value. Of course, technology evaluation is traditional in arriving at internal rates of return, but now such evaluation is applied to analyze an "external" rate of return for the business unit as a whole. On the down side, changing standards and data as to safety have potentially ruinous impacts on many industries. Consider for the moment asbestos, tobacco, and most recently DuPont's experience with chlorofluorocarbons and the ozone layer. On the other hand, opportunities brought about by new technology may be foregone -- consider the dilemma of those who wish to make U486 the "morning after" pill.

From this hasty and preliminary survey of technology issues, one may conclude that technological determinism leads to a kind of technological fatalism. Such a mind-set contributes to apprehension about "exits" from investments, about waiting for or deferring realization of asset values. Lack of commitment to the long term, because many have no confidence in their ability to assess the long term, leads to a "bust-up" mentality and the allure of the dollar here and now.

And so a word or two about the second of Braudel's twin forces: demographics. By now, you are weary of contemplating the effects of population shifts, baby booms, and busts, the aging work and leisure force, and the varied impacts of new national and ethnic labor groups here and offshore. Your knowledge and concern about these matters, especially how they now and will affect your employees and your markets, will be presumed. However, we should pause to consider a less statistical, less quantifiable aspect of these changes.

If one considers the primacy of human physical capital in economic activity until fairly recently; if one acknowledges that slavery was the major characteristic of labor in the ancient world and even in some pre-modern societies well into the 19th century, and survives even today in some places; if one tracks enfranchisement for voting with emancipation from economic and political bondage; one must conclude that what was once an experiment (and a foolish one at that too many of our founders' contemporaries) in individual liberty and self-realization has now become the world standard. All men and women are or must be free to choose their own personal and economic aims and select appropriate means to achieve those aims. These nearly universal personal expectations will create new world markets of every kind.

Such expectations also give rise to frustrations in managing the traditional work place. Peter Drucker tells us the work place, the work force of the future, must be like an orchestra in which all participate as colleagues, with an almost nonexistent role for the manager, displaced from his usual hierarchical prominence. This pattern, if he is correct, will lead to fragmentation of big economic units -- as he says, one can "manage" eleven to 20 research scientists, but not 300, without sacrificing innovation and productivity. Remembering the added computer power, the

communications networks, and most of all the mass of data, to which we have access as individuals, Drucker's forecast is very convincing. Are we ready for it? How do we get ready?

Another aspect of this new work environment requires emphasis: constant training and "adult learning" to anticipate and use new technology; to equip our colleagues to adapt to change and make their individualized contributions to the dynamics and the shared prospects of the enterprise. Such a commitment to constant training in a formal and disciplined scheme must involve careful decisions on design of effective programs, sensitive to the needs of the organization, sensitive to costs, and some as yet uncertain criteria for return on investment. This recommendation, considered with other demographic constraints, suggests that a fixation with early retirements may be a mistake. We must find a way to keep talented people, with perspective and experience about the organization and its activities, involved beyond an obsolete and anachronistic idea about "retirement" age.

There is more to say on all these subjects, more examples of the interplay between information and people or "bread" and "peasants." While business and organizational learning on these subjects have proliferated since World War II, one would hardly have predicted the number of business schools, business students, business studies now in this country and spreading around the world. This phenomenon is symptomatic of our need to know, of the attempt to find out, and not of the success or our satisfaction with this particular approach. Business education is not a panacea.

We may have more confidence in the superiority of the "shop floor," where the resilience and ingenuity of the organization is expressed, where small increments of improvement and change are introduced daily, and, with the right "work force," lead to growth and success for its participants.

We may also have more confidence in our shared mastery of the language of technology. English is that language, the versatility and power of which are unequaled in human culture today. Literacy in English for use in computer and technical applications and for use in ordinary human communication thus becomes a priority in the ongoing training of our organizations.

I end these remarks with some lines of Wordsworth, that great Romantic poet and thinker, who is often apparently opposed to progress and its consequences. You remember perhaps his reaction to the Industrial Revolution ... that England had become a "fen of stagnant waters" run by "selfish men," that the world was "too much with us ... getting and spending we lay waste our powers." His view of technology and its important contribution and potential for the well-being of mankind was different, however. In *Steamboats, Viaducts, and Railways* (1832) he praised the best examples from his contemporary experience:

*Motions and Means, on land and sea at war  
With old poetic feeling, not for this,  
Shall ye, by Poets even, be judged amiss!  
Nor shall your presence, howsoe'er it mar  
The loveliness of Nature, prove a bar  
To the Mind's gaining that prophetic sense*

*Of future change, that point of vision, whence  
May be discovered what in soul ye are.*

*In spite of all that beauty may disown  
In your harsh features, Nature doth embrace  
Her lawful offspring in Man's art; and Time,  
Pleased with your triumphs o'er his brother Space,  
Accepts from your bold hands the proffered crown  
Of hope, and smiles on you with cheer sublime.*

"Cheer sublime" may be a trifle extreme, but we can embrace the vision and present reality of "motions and means" ... "in Man's art," which transform our work and lives together.

Thank you.