I. INTRODUCTION

It was a genuine pleasure for me to accept Joe Denk's invitation to be with you today. Certainly, talking with computer people has been a part of my life. And, in recent years, and in particular in my role as chair of the ETPC, I have spent a lot of time talking to people in education. But as I thought about it today, I realized that the occasions when I've talked with groups who fell into both categories have been very few indeed. So I have anticipated this occasion with unusual pleasure and I thank you for the opportunity.

As we meet here today with slightly over eight years left in the 20th Century and being already a half century into the so-called Information Age, it is almost commonplace to say that computers have transformed human life: They have transformed scientific research and scientific knowledge, they have transformed the way products and services are designed and delivered, they have transformed the way we manage business. They have transformed the way we wage war. And much, much more. But in that catechism of transformation there is one glaring omission: they have not transformed the way we educate ourselves.

Said more pointedly, while computer and information technology have transformed life, they have not transformed how we prepare people to deal with life.

Changing that situation is an urgent matter, and it is a particular responsibility of those of us who are computer and information technology professionals.

It was toward such a change that the President & the State Governor's held an Education Summit two years ago and established six goals:

* By the Year 2000 all children in America will start school ready to learn.
* By the Year 2000, the high school graduate rate will increase to at least 90%.
* By the Year 2000, American students will leave grades 4, 8, 12 having demonstrated competency in challenging subject matter, including English, History, Math, Science and Geography. Every school will ensure that all students learn to use their minds well so that they may be prepared for responsibility citizenship, further learning, and productive employ in our modern economy.

* By the Year 2000, U.S. students will be 1st in science and math.

* Every adult American will be literate, possess knowledge and skills necessary to compete in a global economy and exercise rights and responsibilities of a citizen.

And, developing a plan for New Mexico to use education technology to help meet those goals was the charge by the CHE and the SBE to the ETPC.

II. N.M.'s CHALLENGE -- THE REPORT: ANSWER TO THE CHALLENGE

The committee's report, Challenge 2000, presents a strategy for dealing with change. It defines, first, a structure and process -- as opposed to being a simple plan for "procurement and deployment." The strategy also addresses immediate actions in areas of basic technological need. And finally it envisions aggressively increasing public awareness and support of education reform, and, in particular, the potential for education technology.

III. CHANGE

Let me start with a brief analysis of the nature of the change occurring which any education technology strategy must address if it is to be successful.

It is generally believed that the basic driving force for education change is failure -- increasing dropouts, illiteracy, poor test scores and so on. But those are symptoms. It's like saying someone can't work because of chronic headaches. The question is: What causes the headaches? And, in the case of education, the "headache" is caused by increasing societal complexity. This is not the time or place to elaborate on that. Suffice it to say that education in such an environment is complex and more complex tasks require new tools and processes -- technology.
We have plenty of new tools. Electronic technology is the most significant change in learning technology since the invention of the movable type printing press 500 years ago.

A lot of people in education sense not only the sheer necessity of using these new tools, but also the enormous satisfaction and excitement they can bring to learning. These people actively seek and promote change.

So, why is there a problem?

The answer is inertia...apathy.

There is a tremendous "disconnect" between the way students and parents perceive levels of achievement and the reality of the situation.

There is also widespread inertia among people in the education system itself. In the first place, any large system resists change and most people are "content." They have learned to live with "the system." It's sort of "the devil you know" syndrome. So, there is a gulf between the attitude of education leaders and most people in the system.

And, perhaps most important, there is inertia in the "recipients of the product" -- the universities who accept high school graduates...the businesses and government agencies who hire high school and college graduates. Oh, everybody complains a lot. But complaining and hand-wringing is not the same as demanding. The findings of a recent Harris poll reflect this.

What is the result of all these huge needs demanding change and the equally large forces of inertia and apathy?

Fractionation...splinter efforts...frustration. In the end, a lot of wasted effort. We see this in every day forms of schools without modems but a fiber optic cable out the front door...computers sitting unused in "labs" or in classrooms or, worse yet, in storerooms...strong (rich) schools getting stronger, weak (poor) schools getting poorer...teachers who have exciting, new learning ideas but no equipment and teachers with equipment and no idea of how to use it...legislators faced with a bewildering array of education legislation.
IV. THE DANGER AND THE OPPORTUNITY

There is clearly great danger in this state of affairs. The danger is this: those who see the opportunity and seize it will get stronger...those who don't will get weaker. States which adopt comprehensive and effective strategies will be winners -- not just educationally but economically. The same is true at the level of the university, the school district and the school.

The ultimate result will be even greater economic disparity between states, between local areas and, most tragically, between individuals.

V. THE COST

Education restructuring and reform is costly.

Once reform has taken place, the cost per student may well be less, or certainly no more than it was.

But any restructuring requires "one-time" costs.

A dramatic example of this is the enormous costs we are witnessing in the restructuring of the economic system in the Soviet Union and Eastern Europe.

VI. PRINCIPLES UNDERLYING THE STRATEGY

Successful reform -- successful technology utilization in particular -- involves several key principles.

The first of these principles is increasing public awareness.

Again, public apathy about the need for education reform is a major contributor to the inertia being experienced by reform efforts.

Most attempts to prod the public and government into action dwell on the negative and result in "bashing" this or that.

"The dropout rate is terrible and illiterate high school graduates are rampant" -- "the teachers are to blame."
"Our schools are not competitive and yet we're spending more money" -- "the public education system is unworkable."

In general, people can't cope with so much negative rhetoric. So they ignore it or reject it.

It is essential that a public awareness campaign show people the potential, the excitement, the reward and the fun, as well as the need for change in effective use of technology.

The second principle is collaboration.

This is an arena where business can be of great help.

Public-private partnerships can bring greater financial and human resources to bear on a situation. Business has much to offer in management and technical expertise as well as money. Today, New Mexico business spends a large amount of money on education in the state. Unfortunately, that spending is not focused or prioritized. These resources need to be focused and applied so as to achieve the greatest state-wide benefit. Increased collaboration between High Education, museums, libraries and K-12 education is likewise essential if there is to be progress.

The third principle is coordination of reform initiatives.

To be effective, the strategy for technology infusion must make use of and be a part of other reform and restructure initiatives: ReLearning, NSF's SSI program, America 2000, and MESA, to name a few.

The fourth principle is the use of what can be called "push-pull" methodologies.

The strategy entails the development of a reservoir of available products services and technical assistance -- push. And it provides training and incentives to practitioners to make use of that reservoir -- pull.

The fifth principle is: a structure and process for continuous improvement.
A total solution cannot be prescribed in one grand plan -- "cut from whole cloth," so to speak.

The process needs to be such as to allow the leaders and innovators in the education system to rise to the surface.

The process must recognize that technology change is dynamic and that appropriate utilization must be achieved step-by-step. That is, the infusion of technology will be on-going and needs specific oversight, management and assistance over a long period of time.

Priorities and needs and understanding of those needs changes from year to year.

Finally, it is essential that the process should be built on the precept of guidance, assistance, and standards of excellence from above with initiative, planning and action from below. Those closest to the work being done -- you at your institutions -- must plan for and pull technology into your work based on what is best suited to your needs. It cannot be dictated from above.

VII. THE STRATEGY

The strategy presented in the Challenge 2000 report consists of four key points:

1) Partnerships: (a) between the public-private sectors; (b) between various reform initiatives and, very importantly (c) between higher education and K-12 education;

2) Telecommunications -- complete the statewide telecommunications network;

3) Training -- of faculty, teachers and administrators in the effective use of technology in the learning process;

4) Technology in the schools -- establish a structure and process for planning and implementing educational technology.
This four-point strategy is based on, and embodies the five principles I mentioned.

Partnerships -- collaboration and coordination -- will be key to the successful implementation of each component of the strategy. In that regard, the announcement this month of the Governor’s Business Executives for Education group is important and welcome. That organization can play a key role in helping to put in place the public-private partnerships that are necessary.

The strategy, then, is:

* Partnerships...
* Telecommunications...
* Training...
* Technology in the schools.

The core of this strategy is the process envisioned in the last "T". I'll come back to that in a moment but first some comments on the other two "T's".

**VIII. TELECOMMUNICATIONS**

Telecommunications is the technology that is the foundation of education reform.

This is especially true for New Mexico with its largely rural character and a high degree of cultural diversity. Telecommunications is the only means by which the available rich resources for learning can be brought to every school and institution of learning.

Telecommunications provides a means for rural and urban students to undertake joint learning projects.

Telecommunications is the only feasible way for teachers to share ideas on new learning methodologies and experiments.
IX. TRAINING

Training in the use of technology in the learning process is essential. People can't use what they don't know how to use. People don't want to use what they don't understand.

The people in this room both understand and want to use technology. Your faculty colleagues are on average far more skilled at using computers than most of the people in education, and especially those in K-12 education.

But are they skilled in using computers and distance learning in their daily pedagogical processes? Sadly, the answer is no.

Are computers and electronic technology the focal point, the foundation stone upon which schools of education build a curriculum to train the teachers of tomorrow? NO.

Do history teachers use computers and multi-media devices to allow students to journey with Columbus on his voyage of discovery? To the Battle of Waterloo, to explore alternative outcomes?

Do literature professors use computer simulation to change “boundary conditions” to explore different outcomes based on different psychological motivations of Hamlet?

No, No, and again, NO. So how do people teach? They teach the same way they have been taught -- with lectures and books. Changing this involves much more than having a “state of the art” Department of Computer Science at a University.

X. IMPLEMENTATION

The first step in implementing the Challenge 2000 strategy is to establish the structure for the process for evaluation of local need and for technology planning.
Again the fundamental premise of the strategy is that evaluation and specific
direction must come from those engaged in the work. At the state level must
be a cooperative mechanism for establishing goals and standards of excellence,
for providing incentives and assistance, and for assessment of performance.

The principal components are the Educational Technology Coordinating
Council (ETCC) and its staff arm, the Educational Technology Office (ETO).

Members of the ETCC will be from faculty and administration of higher
education and public schools, from the national laboratories, business and
industry and from branches of government.

Through its Training, Telecommunications and Plan Review and Coordination
subcommittees, the ETCC will guide and coordinate the adoption and
integration of educational technologies throughout the state and raise public
awareness of the need for and benefits of educational technology.

The ETO will serve as the executive agent of the ETCC. The ETO staff will
have teaching and technical expertise to give it credibility in both areas. ETO
field officers will work throughout the state to advise and support local
educational institutions. It is in this arena that higher education can play a
vital role. And, through liaison with other states and the federal government,
the ETCC and ETO will help New Mexico get maximum use of resources
available outside its borders.

Implementation of the Challenge 2000 strategy also envisions immediate steps
in the telecommunications and training areas as well.

Overall, the implementation process will basically take place in three phases.
Obviously some schools or institutions will be ahead of others, but the goal is
that by the end of each phase everyone will be at least at the level indicated.
Phase One covers a two-year period. The goals are:

1) Bring all schools up to basic level communications -- direct access to minimum telephone service, telefax, photocopiers, audio and video recorders, television equipment, and computers with modems.

2) Focus on teacher and faculty training.

3) Increase public awareness.

Phase Two covers the next three years. Emphasis will be placed on achieving wide-area access, expanding the technology base and continuing public awareness programs.

Phase Three will be on-going. It will emphasize evaluation, continued technological improvement and maintaining a high level of public awareness.

In a nutshell, Phase One is the foundation that gets New Mexico's educational system on a solid footing and ready to expand into the age of educational technology. Phase Two expands the technological base and opens the classroom to the world. Phase Three will emphasize evaluation to be sure New Mexico's schools have chosen the right technology, are using it properly and are keeping pace with new advances.

XI. CHALLENGES AND CONCLUSIONS

Let me conclude with two particular challenges in this education technology reform process for computing professionals in higher education.

First, to assure that their organization is at the leading edge of computer technology.

Second, to exercise leadership in the transformation of the learning process at their own institution.

I could have spent this entire time talking about leading edge technology. There are others in this conference and elsewhere who are well qualified to do that.
We could also have spent more than the entire time talking about money. But you really don’t need your frustration exercised in that regard.

But I do want to mention one thing: perhaps the most important new technology in the use of computers today is object oriented data management. How many of your institutions have aggressive projects in the application of this technology? How many of you understand its implications, much less are engaged in object-oriented technology?

My challenge to you is to initiate research and application of this most important leading-edge technology.

With regard to the second matter, my challenge to you is straightforward: in this 1991-92 school year initiate in cooperation with one other department, the development of a course in which computer technology is integral to the teaching process -- not, mind you, as a calculating device which the student uses off-line and out of class, but as central pedagogical means of learning.

If each institution you represent does each of these two things you will be leading the nation in transformation of learning.

And I might add -- each of you will find excitement and enormous personal reward.