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# NATIONAL SUMMIT ON HIGH TECHNOLOGY: DAY ONE—HIGHLIGHT

## HEARING

before the

## JOINT ECONOMIC COMMITTEE
## CONGRESS OF THE UNITED STATES

ONE HUNDRED SIXTH CONGRESS

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# NATIONAL SUMMIT ON HIGH TECHNOLOGY: DAY ONE—HIGHLIGHT

Monday, June 14, 1999

Congress of the United States,
Joint Economic Committee,
*Washington, D.C.*

The Committee met at 9:35 a.m., in Room SH-216 of the Hart Senate Office Building, the Honorable Connie Mack, Chairman of the Committee, presiding.

**Present:** Senators Mack, Lott, Frist, Bennett, Domenici, Bond, Kennedy, Sessions, and McConnell. Representatives Eshoo, Moran, Dooley, and Sherwood.

**Staff present:** Shelley S. Hymes, Chris Edwards, Joseph Pasetti, Kevin Doyle, Stephen Schultz, Kurt Schuler, Kerry Fennelly, Victor Wolski, Lawrence Whitman, Daphne Clones, Howard Rosen, James D. Gwartney, Chuck Skipton and Colleen J. Healy.

## OPENING STATEMENT OF SENATOR CONNIE MACK, CHAIRMAN

**Senator Mack.** I'd like to call the first of three days of hearings on high tech to order. I think you can tell that for a Monday morning, there is a great deal of interest in these issues. We have a lot of people to hear from—not only today, but over the next several days.

So, it is going to require of me that I try to keep us on time.

What that will mean is that there will be a limited amount of time for opening statements. We've allocated as much as a half hour this morning. This will be the only time in which there will be opening statements by Members.

If we run out of time in opening statements, what I will do is to recognize those Members first who have not had an opportunity to speak in the questions that will be asked in subsequent panels.

With that, again, I would like to thank each and every one of you for coming. I will turn to the Majority Leader first for his opening statement.

And thank you for your attendance this morning.

[The prepared statement of Senator Mack appears in the Submissions for the Record.]

## OPENING STATEMENT OF SENATOR TRENT LOTT, MAJORITY LEADER

**Senator Lott.** Thank you, Mr. Chairman. And I note that you cautioned about being brief right before you introduced me, not afterward. So I'll try to comply with that.

(Laughter.)

But I want to thank you, Mr. Chairman, for having this hearing. In our meeting right before we came into this room, I said this is one of the more exciting things that I have seen happen this year because the significance of the high-tech industry, what it means to the economy of our country and the creation of jobs.

So I commend you and all the Members of this Joint Committee on both sides of the aisle, on both sides of the Capitol, for having this hearing.

I'm really pleased to see Chairman Greenspan here. I note some of his comments of the past. And when you look at the continuing growing economy, a lot of the credit can be given, this segment of the economy, because of the increased production that's been made possible by the innovative work in the high-tech area. And I know it will be very interesting to hear his further expansion on those comments.

We welcome our special guests here and I look forward to hearing their testimony as the day goes forward.

I have continuing concern, as I know many Members of this Committee have, about the intrusiveness of government. We want to do everything we can to have a free market, unencumbered by government regulation. We want this sector of our economy to be free to grow and expand and to develop in every way possible.

So we will remain vigilant in our effort to assure a climate of freedom existing in this area to foster and encourage development of new technology.

As proof of that, of course, last year, we did have securities litigation reform that went through the Congress and went to the President. When his veto was overridden, I thought that that was a significant development.

Last year, we did have the creation of the Internet Commission, which had some bumps along the road. But thanks to the cooperation of many of you in this room, we got it worked out and complied with the law and we'll look forward to the recommendations of that commission.

Of course, tomorrow, we expect, after several unnecessary delays and efforts to block the legislation, we expect to pass the Y2K litigation bill.

And, of course, we hope later on this year to take up some tax relief that will provide some incentives for growth in this area.

So we have a lot of exciting things happening in the economy because of high-tech, and I believe we're doing some very helpful things in the Congress to encourage that openness and development and freedom.

So, Mr. Chairman, thank you, and I look forward to hearing the testimony and watching as you go through these three days of hearings.

**Senator Mack.** Thank you, Senator Lott. And thank you as well for being short and to the point.

I will take approximately three minutes or so for an opening statement and then I will turn to Senator Kennedy.

This three-day summit will highlight, explore, and advance issues important to this critical and fast-growing sector of the economy.

The U.S. has the largest and most successful high technology companies in the world. Our software, semi-conductor and biotechnology companies, to name a few, dominate world markets.

In fact, this country has the highest share of high-tech manufacturing relative to total manufacturing of any country.

Look at biotechnology.

American biotechnology companies have revenues five times greater than all the biotech firms in Europe combined.

Or the Internet.

The U.S. dominates the Internet with twice as many users as Europe and is home to 64 percent of the world's Internet host computers.

And why does the United States lead the rest of the world in so many of these new knowledge industries? The vitality of high-tech in this country reflects our economic freedom. It is also a tribute to the creative and entrepreneurial genius of thousands of individual business people, scientists, and engineers who took great risks with uncertain rewards.

We have entered the era of the Innovation Economy—a system in which we see as never before the value of an idea—whether that idea takes the form of a superior technology, superior service, or superior process for bringing products to market.

Today, more than ever before in our history, brain power is being valued as the engine of economic growth.

I see this new economy as a kind of continuum—a logical progression rooted in the freedom that sets our country apart:

Freedom leads to knowledge.

Knowledge leads to innovation.

Innovation leads to capital formation.

Capital formation leads to new products.

And new products leads to new jobs.

That's the way our free-market system works. It's the mainspring that sets our economy in motion.

Michael Rothschild, one of the most path-breaking thinkers of our new economy—asks us to think of the economy as an eco-system—an organic entity that must be allowed to function and flourish without outside interference.

We are now faced with the challenge of "De-Inventing Government"—to get it out of the way before it stifles the Innovation Economy that has made America the world's pre-eminent economic leader.

What does all this have to do with Washington?

It's a reminder that we need to maintain policies that give the strongest possible support to innovation.

We ought to quit playing games, for instance, with the Federal R&D tax credit — extending it a year at a time, allowing it to expire, and then bringing it back to life again.

That's wrong, because it's counter-productive. No company can plan and invest for the long-term against a policy that changes every 12 months.

Our job is to get the big things right. It's up to government to provide an environment that allows the private sector, that allows each and every person to innovate as only he or she can, to exercise the entrepreneurial spirit that turns innovation into jobs and into GDP.

That's the genius of free enterprise.

That's the genius of America.

For more than two centuries, it's what helped make America the envy of the world.

Now, as we approach the new Millennium, it's what will make the next century a new American century as well.

And I will now turn to Senator Kennedy. I welcome you this morning. We're delighted that you're here.

## OPENING STATEMENT OF SENATOR EDWARD M. KENNEDY

**Senator Kennedy.** Thank you very much. I want to join all of those on the Committee in thanking you, Senator Mack, for holding these hearings and for the focus that you've given and for the range of witnesses that you're bringing together to help us in the Congress to better understand both the opportunities and the challenges which are presented by this extraordinary explosion in the information age of technology.

And I think the fact that we have our Majority Leader here is a clear indication again of the significance of this hearing and the importance of this issue.

So we are all looking forward to these next several days and we thank Chairman Greenspan for being here. He has spoken about this issue in the past and has important insights about this role of high technology in our economy. We look forward to welcoming him and the other witnesses that are here.

I think the Majority Leader has really stated well what is going to be the relationship between the Congress, the Federal Government, and this industry.

I take special pride, along with other colleagues here in the Senate, in the fact that our states have been so involved in this industry.

Massachusetts and the nation have seen an absolute explosion in terms of new, basically small companies that have developed, with the recovery from the last recession, and it has been dramatic. The whole area of information technology has been a backbone in terms of that comeback. And we want to make sure that that is going to continue.

We look forward to seeing the expansion of that industry and its opportunities to extend it throughout the world.

I believe if you look at where we are, we want to try and see the very important role of continued research and development.

We talk about our role in terms of the Federal Government. We need to investigate the areas of basic research, applied research, and study how this kind of technology will impact our economy.

We have seen cuts in such research in recent times. We are under budget caps at the present time where we're going to have to make some judgments whether we want tax cuts or whether we want basic research.

That's an important area. That's an important choice. And that's going to be before us in the Congress. And I think it's very fundamental, as we understand and as many of us support what Chairman Mack has pointed out about getting R&D credits and putting them in place where we have a degree of predictability. That's certainly something that we want to see and we want to support, perhaps research and development assistance for the training and upgrading of various skilled workers. But we want to make sure that we're going to have some important and basic research.

The Federal Government has an important role on the issues of encryption and the export of technology.

Where are we going with this issue? What is going to be the attitude of the government on export controls as we have an extraordinary expansion of democracy in places around the world?

This may be one of the most important things, besides the First Amendment, I like to believe, that we might be involved in.

And so, what is going to be our policy on this issue as well? Are we going to be interested in trying to find ways to understand that in the area of information technology, how is that going to be balanced out in terms of security?

But that's clearly going to be an important aspect.

We understand the importance of the e-rate. People can say, what is the role of the Federal Government?

We made an agreement about how we were going to work out different legislation in the past. And with the e-rate, it opens up important opportunities for this kind of support for schools and museums.

Massachusetts is the number-one state in all of New England to take advantage of the e-rate. It has been an important help and assistance to many different areas of our country and to communities and schools.

Finally, Mr. Chairman, I'm very proud of information technology, and software industries.

In my own State of Massachusetts, we were 48th out of 50 states in schools wired to the Internet just four years ago. We said that we were going to do something about it.

And as a result, of a voluntary involvement our technology companies contributed more $38 million to schools all over my state.

The labor unions contributed 350 miles of laying cables. They were coming together and understanding the importance of making sure that all public schools, were going to have accessibility and availability in terms of essential technology.

So we're not going to see a further disparity in the areas of technology.

That is enormously impressive. And now we're one of the states with the highest kinds of availability and accessibility to the Internet, and it is really due to the industry.

We have some responsibility, I think, in the area of teaching, to take sure that teachers are going to be able to use the new technologies and translate curriculum into the students and the classrooms where I think there's really an impact and interface with families across this country.

So, Mr. Chairman, I want to thank you so much for having these hearings. I look forward to participating and hearing from our witnesses about where they think we can go and what suggestions they have in order that we can see a growth and expansion of the industry.

I thank the Chair.

[The prepared statement of Senator Kennedy appears in the Submissions for the Record.]

**Senator Mack.** Thank you, Senator Kennedy.

Senator Domenici? And I want to thank the Members on this side for accommodating Senator Domenici since he has a limited amount of time that he can stay.

## OPENING STATEMENT OF SENATOR PETE V. DOMENICI

**Senator Domenici.** Thank you very much, Mr. Chairman.

Few people know, but Bill Gates's first choice for a home for Microsoft was New Mexico.

We didn't know what software was all about, so we turned him down when he asked for a $15,000 grant from the state economic development department.

Software—that sounded kind of silly way back then. Fortunately, New Mexico's decision only slowed him down and it didn't take him too long to get to the State of Washington, where he created a whole new flourishing industry.

Saying no to Bill Gates is probably one of the greatest economic development mistakes our state ever made. But it's on par, Mr. Chairman, with a turn-of-the-century patent commissioner who wanted to close down the patent office because he didn't think there was anything else left to invent.

Now, one of the purposes of this hearing is to make sure that Congress is informed so that it will make better policy decisions than the two examples that I just gave.

In fact, the United States is really a great incubator for technology. And obviously, information technology as a sector has reciprocated by serving our economy very, very well.

It has accounted for about a third of the growth in the United States economy since 1992.

As a sector, it has been growing at about 12 percent a year since 1993.

Phenomenal.

Only more phenomenal is the growth in e-commerce. It tripled in 1998 to nine billion dollars.

Congress needs to recognize that knowledge-based industries are extremely sensitive to tax policy and tax costs.

The R&D credit expired again at the end of May, on May 31st. The credit has been renewed seven times since its creation.

We have to make it permanent, Mr. Chairman. Companies have five- to ten-year planning time horizons for R&D and the planning that accompanies it. This doesn't jibe with six months one year, or 18 month extensions that Congress has been applying to this very formidable instrument for research and development.

Forty-six senators have cosponsored one or more of the various bills making this credit permanent.

I have attended various meetings where the extension of this and making it permanent is thought to be the most significant instrument for additional research and development by America's companies.

It is even more important that we get it in place than that we increase Federal Government support. They're both necessary. But if you look out there, you must do the permanentizing.

And I submit to those who will be looking that the old law is not as good as it ought to be.

So I think that you ought to consider—we ought to consider, Mr. Chairman, and Senator Kennedy, as we move this bill through, making it better than the one that we've got.

The old one does not help small business. It makes it very difficult for some companies to figure out the tax credit. And so I've listed here in the record about ten things that ought to be changed, and it shouldn't surprise you that they are changed in a bill that I introduced with Senator Bingaman, Senator Kennedy, and about 6 other senators.

I think that we should look at that and look at it very carefully.

I would disagree with my friend, Senator Kennedy, just for a moment. He says that we don't need tax cuts because we need to invest money in R&D.

Actually, we need a tax cut. We need this tax cut, the one I just referred to. It costs $40 billion, and because we can accommodate a large tax cut, there is no excuse this time for not making it permanent and improving it.

Thank you very much.

**Senator Mack.** Thank you. And I'll turn to Representative Eshoo.

## OPENING STATEMENT OF REPRESENTATIVE ANNA G. ESHOO

**Representative Eshoo.** Thank you, Mr. Chairman. I very much appreciate being included in these important hearings. So I want to salute you and all the members of the Committee, and a very warm welcome to those that are going to testify today.

I don't think that there's another member of Congress that will have as many constituents that comes before us both today and the following days, before the Joint Economic Committee.

I have the distinct privilege of representing, I think, one of the most distinguished Congressional Districts in the country, the 14th, which includes most of Silicon Valley.

So this is an ongoing conversation for me with those that are going to be appearing here.

The Internet is really changing business and the way we do business. The companies are busy expanding the Internet and e-commerce at really an explosive pace.

Last week, a University of Texas study reported the Internet economy generated over $300 billion in U.S. revenue. In just five years since the commercial introduction of the World Wide Web, the Internet sector rivals the automobile and telecommunications industries, which have been in existence for nearly a century.

So America is very, very much on the move and enjoying the benefits of this industry. And the Congress, of course, must step up and be a very able partner so that we do all that we can so that it can indeed continue to progress.

I think as legislators we have to amend outdated laws that impede the new age of growth, while protecting very important principles of fairness.

More importantly, as public policy-makers, I think we have to be open to new ways of thinking in order to create the conditions in which innovation can flourish.

In the Silicon Valley, unlike Washington, one of the operating principles is that we are not risk-averse. And we are here.

So I think that we're going to have to try and turn that iceberg around. We have to be willing to think outside the box.

And if there is a failure, that that should not impede us, that we get back up and keep going.

Several have already mentioned public policies that will enhance the atmosphere in which we are working. Certainly making permanent the R&D tax credit.

We should continue to march on with the e-rate. It's very important. It's having a salutary effort in many places in our country. But we really cannot afford to have a digital divide in this country.

That, in and of itself, is un-American. We believe in bringing everyone along. Our educational policies really have to move into a new age.

And I think if there's any industry, Mr. Chairman, that has recognized what needs to be done, especially K through 12, understanding that we have the finest university and college system in the world, everyone comes to our colleges and universities, not only to attend them, but to see what's happening with them.

There are very few from around the world that come to see what we're doing in K through 12.

So we have to think outside the box and be able to shape a system that is really worthy of this new economy so that our young people, as they grow, that they will grow into it, that there will be a place for them.

So I look forward to the recommendations that are going to come to us from the very distinguished individuals that are coming before us.

But I hope that it doesn't end up in a dusty report that's set on a very distinguished Senate or House shelf, but that we will embrace what is recommended to us and that we move on because, after all, this is the work of the Congress to be good for the nation, and that in the next century, we will continue leading and that a century from now, it will be called an American century as well.

Thank you very much.

[The prepared statement of Representative Eshoo appears in the Submissions for the Record.]

**Senator Mack.** Thank you very much.

Senator Frist?

## OPENING STATEMENT OF SENATOR BILL FRIST

**Senator Frist.** Thank you, Mr. Chairman. I will be brief.

And let me just thank you for your outstanding leadership in the organization of the National Summit on High Technology.

Technological growth, the growth in our economy, lots of different reasons. We'll explore that over the course of the morning.

But I should point out that a dozen economic studies, including those of Nobel Prize winner Robert Solow, have demonstrated that technological process has historically been the single most important factor in economic growth, having more than twice the impact of labor and capital.

I want to reinforce what has been said earlier, that current economic expansion and growth, however, cannot continue and be maintained if we do not provide the necessary incentives and credits and funds to perform the critical R&D, research and development, throughout the scientific disciplines.

I should add that the federal expenditures on both civilian and defense R&D as a percentage of GDP has fallen and fallen quite dramatically, from 2.2 percent in 1965 to only 0.8 percent in 1999, nearly one third of its value.

That's as a percentage of GDP.

We've introduced the Federal Research Investment Act, introduced in January, which does increase this funding for fundamental research, for scientific research, in pre-competitive engineering research, over an 11 year period.

Secondly, we do, as has been pointed out, have an obligation, I believe, to further this technological growth, this economic growth, to make the R&D tax credits permanent over time.

According to Price Waterhouse Coopers, it is estimated that between 1998 and 2010, U.S. companies would have spent an additional $41 billion on R&D if tax credits were made permanent.

This simply provides the foundation and the necessary catalyst reaction to maintain our competitive edge.

The third area is that of the talent pool. And I would also like to reinforce the importance of K through 12, kindergarten through 12, where it has been clearly shown in terms of international comparisons that we are falling behind increasingly, in math, in science, the two disciplines which provide that base for education, as we look to that talent pool for the future.

I'm sure we'll be hearing more about that over the course of the morning.

I'm anxious to hear from Chairman Greenspan and others and I'm confident that we all will agree that our future economic prosperity depends on maintaining an innovative environment with appropriate investment in research and development and maintenance and creation of a talent pool which can provide that foundation for that economic growth.

**Senator Mack.** Thank you.

Representative Moran?

## OPENING STATEMENT OF REPRESENTATIVE JAMES P. MORAN

**Representative Moran.** Well, thank you very much, Mr. Chairman.

Here at the end of the 20th Century, we're standing on the pinnacle of economic progress. And I guess the two pillars we're standing on are technology and trade.

But I think that this Joint Economic Summit is a reflection of the fact that the Congress understands that and understands the importance of these factors.

But as Will Rogers said, it's not enough to be moving in the right direction. If you're not moving fast enough, you're going to get run over.

And I guess the point is that we in the Congress, while we may be on the right track, if we're not keeping up with the pace of progress in the private sector, we will not be able to run interference.

We're going to be simply getting in the way.

And so, the people that are going to be testifying before us today, Mr. Chairman, I think have the answers as to how we can play the most constructive role. I trust we have the questions.

I appreciate the opportunity to ask them today. Thank you, Mr. Chairman.

**Senator Mack.** Thank you very much.

I'm going to now turn to Senator Bennett. When we conclude, I will ask Chairman Greenspan for his opening statement. And those Members who have not been able to make an opening statement, I'll recognize you after the first series of questions.

Senator Bennett?

## OPENING STATEMENT OF SENATOR ROBERT F. BENNETT

**Senator Bennett.** Thank you, Mr. Chairman.

I want to take mild issue with some of the comments that have been made, perhaps not in substance, but in vocabulary. And yet, vocabulary sometimes leads us into directions of substance.

We are not here today to talk about an industry. We are not talking about the high-tech industry, like the auto industry or the steel industry or agriculture as an industry.

We are talking about a revolution.

High tech permeates the auto industry. It permeates the steel industry.

I've discovered as chairman of the Senate Committee on Y2K that we have Y2K problems in agriculture because every modern farmer has computers all throughout his equipment.

This is as fundamental a change in American society as the Industrial Revolution starting in the 1830s and the 1840s was a fundamental change, perhaps first in British society and then spread throughout the rest of the world.

We couldn't as a people make the adjustment from the agricultural age to the industrial age easily.

We fought a war where the industrialized north crushed the agricultural south, even though historians say the south had the better generals and the more motivated armies.

I hope we don't have to fight a war to make the transition from the Industrial Revolution to the Information Revolution.

The other thing that I have learned as Chairman of the Y2K committee, not only that computers are everywhere and that they're almost all connected with each other. I have learned that we cannot go back.

There is no turning back.

We can only go forward now. Y2K has demonstrated that to me. And this revolution has profound implications for the economy, society, and everything we do in the future.

So it is most important, Mr. Chairman, that these hearings go forward and that they be the first of a series of educational hearings aimed at educating the Congress, firmly rooted in the 19th century in some of our traditions and attitudes, into the realities of the 21st century.

I look forward to hearing the leaders of this revolution. And I recognize that our first witness, Chairman Greenspan, understands profoundly that this is a revolution and not just an industry that we're talking about.

And I'm very grateful for his willingness to come share his insights with us.

Thank you.

**Senator Mack.** Thank you, Senator Bennett.

Just two short announcements. One is we will during the question time be accepting some questions via e-mail. So it's appropriate that I would tell everyone what the e-mail address is.

It is techsummit — that's t-e-c-h-s-u-m-m-i-t @ j-e-c dot senate dot gov.

And also over the next three days, we will be live-streaming over the Internet. We can be accessed from our website at j-e-c dot senate dot gov slash technet -- t-e-c-h-n-e-t.

And with that, Chairman Greenspan, welcome and we look forward to your comments.

## PANEL I

## STATEMENT OF THE HONORABLE ALAN GREENSPAN, CHAIRMAN, BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

**Mr. Greenspan.** Thank you very much, Mr. Chairman, and distinguished Members of the Committee.

I thought Fedspeak was complex. But I feel as though we are lost in antiquity with respect to language at this particular stage.

(Laughter.)

Something special has happened to the American economy in recent years.

An economy that 20 years ago seemed to have seen its better days, is displaying a remarkable run of economic growth that appears to have its roots in ongoing advances in technology.

I have hypothesized on a number of occasions that the synergies that have developed, especially among the micro-processor, the laser, fiber-optics, and satellite technologies, have dramatically raised the potential rates of return on all types of equipment that embody or utilize these newer technologies.

But beyond that, innovations in information technology—so-called IT—have begun to alter the manner in which we do business and create value, often in ways that were not readily foreseeable even five years ago.

As this century comes to an end, the defining characteristic of the current wave of technology is the role of information. Prior to this IT revolution most of twentieth century business decisionmaking had been hampered by limited information. Owing to the paucity of timely knowledge of customers' needs and of the location of inventories and materials flows throughout complex production systems, businesses required substantial programmed redundancies to function effectively.

Doubling up on materials and people was essential as backup to the inevitable misjudgments of the real-time state of play in a company. Decisions were made from information that was hours, days, or even weeks old. Accordingly, production planning required costly inventory safety stocks and backup teams of people to maintain quality control and to respond to the unanticipated and the misjudged.

Large remnants of information void, of course, still persist, and forecasts of future events on which all business decisions ultimately depend are still unavoidably uncertain. But the recent years' remarkable surge in the availability of real-time information has enabled business management to remove large swaths of inventory safety stocks and worker redundancies, and has armed firms with detailed data to fine-tune product specifications to most individual customer needs.

Moreover, information access in real-time—resulting, for example, from such processes as checkout counter bar code scanning and satellite location of trucks—has fostered marked reductions in delivery lead-times on all sorts of goods, from books to capital equipment. This, in turn, has reduced the relative size of the overall capital structure required to turn out our goods and services.

Intermediate production and distribution processes, so essential when information and quality control were poor, are being bypassed and eventually eliminated. The increasing ubiquitousness of Internet web sites is promising to significantly alter the way large parts of our distribution system are managed.

The process of innovation goes beyond the factory floor or distribution channels. Design times have fallen dramatically as computer modeling has eliminated the need, for example, of the large staff of architectural specification drafters previously required for building projects. Medical diagnoses are more thorough, accurate, and far faster, with access to heretofore unavailable information. Treatment is accordingly hastened, and hours of procedures eliminated. In addition, the dramatic advances in biotechnology are significantly increasing a broad range of productivity-expanding efforts in areas from agriculture to medicine.

Economists endeavor to describe the influence of technological change on activity by matching economic output against measurable economic inputs: quality adjusted labor, and all forms of capital. They attribute the fact that economic growth has persistently outpaced the contributions to growth from labor and capital inputs to such things as technological innovation and increased efficiencies of organizations that are made possible through newer technologies. For example, since 1995 output per labor workhour in the nonfarm business sector—our standard measure of productivity—has grown at an annual rate of about two percent. Approximately one-third of that expansion appears to be attributable to output growth in excess of the combined growth of inputs.

Of course, it takes time before a specific innovation manifests itself as an increase in measured productivity. Although some new technologies can be implemented quickly and have an immediate payoff, others may take years or even decades before achieving their full influence on productivity as new capital is put in place that can take advantage of these creations and their spillovers. Hence, the productivity seen in recent years likely represents the benefits of the ongoing diffusion and implementation of a succession of technological advances; likewise, the innovative breakthroughs of today will continue to bear fruit in the future.

The evident acceleration of the process of so-called "creative destruction," which has accompanied these expanding innovations and which has been reflected in the shifting of capital from failing technologies into those technologies at the cutting edge, has been truly remarkable. Owing to advancing information capabilities and the resulting emergence of more accurate price signals and less costly price discovery, market participants have been able to detect and to respond to finely calibrated nuances in consumer demand.

The process of capital reallocation has been assisted through a significant unbundling of risks made possible by the development of innovative financial products, not previously available. Every new innovation has suggested further possibilities to profitably meet increasingly sophisticated consumer demands. Many ventures, of course, fail. But the few that prosper enhance consumer choice.

The newer technologies, as I indicated earlier, have facilitated a dramatic foreshortening of the lead-times on the delivery of capital equipment over the past decade. When lead-times for capital equipment are long, firms must undertake capital spending that is adequate to deal with the plausible range of business needs likely to occur after these goods are delivered and installed. In essence, those capital investments must be sufficient to provide insurance against uncertain future demands.

As lead-times have declined, a consequence of newer technologies, firms' forecasts of future requirements have become somewhat less clouded and the desired amount of lead-time insurance in the form of a reserve stock of capital has been reduced.

In addition to shortening lead-times, technology has increased the flexibility of capital goods and production processes to meet changes in the demand for product characteristics and the composition of output. This flexibility allows firms to deal more effectively with evolving market conditions with less physical capital than had been necessary in the past.

Taken together, reductions in the amount of spare capital and increases in capital flexibility result in a saving of resources that, in the aggregate, is reflected in higher levels of productivity.

The newer technologies and foreshortened lead-times have, thus, apparently made capital investment distinctly more profitable, enabling firms to substitute capital for labor and other inputs far more productively than they could have a decade or two ago. Capital, as economists like to say, has deepened significantly since 1995.

The surge in investment not only has restrained costs, it has also increased industrial capacity faster than the rise in factory output. The resulting slack in product markets has put greater competitive pressure on businesses to hold down prices.

Technology is also damping upward price pressures through its effect on international trade, where technological developments and a move to a less constrained world trading order have progressively broken down barriers to cross-border trade. All else equal, the enhanced competition in tradeable goods enables excess capacity previously bottled up in one country to augment worldwide supply and exert restraint on prices in all countries, markets.

Because neither business firms nor their competitors can currently count any longer on a general inflationary tendency to validate decisions to raise their own prices, each company feels compelled to concentrate on efforts to hold down costs. The availability of new technology to each company and its rivals affords both the opportunity and the competitive necessity of taking steps to boost productivity. This contrasts with our experiences through the 1970s and 1980s when firms apparently found easier and more profitable to seek relief from rising nominal labor cost through price increases than through cost-reducing capital investment.

The rate of growth of productivity cannot increase indefinitely. While there appears to be considerable expectation in the business community, and possibly Wall Street, that the productivity acceleration has not yet peaked, experience does advise caution.

As I have noted in previous testimony, history is strewn with projections of technology that have fallen wide of the mark. While the innumerable potential permutations and combinations of various synergies, forecasting technology has been a daunting exercise.

There is little reason to believe that we are going to be any better at this in the future than in the past. Hence, despite the remarkable progress witnessed to date, we have to be quite modest about our ability to project the future of technology and its implications for productivity growth and for the broader economy.

A key question that we need to answer in order to appropriately evaluate the connection between technological innovations and productivity growth is why have not the same available technologies allowed productivity in Europe and Japan to catch up to U.S. levels. While productivity in some foreign industrial countries appears to have accelerated in recent years, a significant gap between U.S. productivity and that abroad persists.

One hypothesis is that a necessary condition for information technology to increase output per hour is a willingness to discharge or retrain workers that the newer technologies have rendered redundant. Countries with less flexible labor markets than the United States enjoys may have been inhibited in this regard.

Another hypothesis is that regulations, systems of corporate governance, trade restrictions, and government subsidies have prevented competition from being sufficiently keen to induce firms in Europe and Japan to take full advantage of the efficiencies offered by the latest advances in information technology and other innovations.

Further investigation will be necessary to evaluate the importance of these possible influences. But at this stage, one lesson seems reasonably clear. As we contemplate the appropriate public policies for an economy experiencing rapid technological advancement, we should strive to maintain the flexibility of our labor and capital markets that has spurred the continuous replacement of capital facilities embodying older technologies with facilities reflecting the newest innovations.

Further reducing regulatory impediments to competition will, of course, add to this process. The newer technologies have widened the potential for economic well-being. Governments should seek to foster that potential.

Thank you very much, Mr. Chairman.

[The prepared statement of Chairman Greenspan appears in the Submissions for the Record.]

**Senator Mack.** Thank you very much, Mr. Chairman.

I turn now to Representative Sherwood.

## OPENING STATEMENT OF REPRESENTATIVE DON SHERWOOD

**Representative Sherwood.** Thank you, Senator Mack, for the opportunity to participate.

With my long career in business, and now being involved in the national discourse, I just came to listen. But I have to comment a little bit.

Chairman Greenspan, you synthesize so many ideas that we've all been thinking about and putting them in one paper—it's brilliant.

But it seems to me that education and flexibility of capital and markets are what we're going to have to concentrate on in this body if we can keep pace or else get out of the way.

But I've been worrying for some time about a shortage of labor in this country in the future. And I think you have said that we maybe shouldn't worry so much about that as long as we can keep our technology moving and our people able to stay with it.

How do you feel the labor market is going to be here in the future?

**Mr. Greenspan.** Congressman, you raise a very important question and I appreciate your comments on this paper which is incomplete, and it's incomplete for precisely the reasons you suggest.

Technology is essentially a human process which starts with an intellectual insight into the way the world works and the physical manner and how one can alter it in a way that will enhance the capability of producing goods and services which meet consumer needs.

But it's people who have to do that. And while it is certainly the case that we have an exemplary educational system beyond the elementary and high school levels, we fall far short from K to 12.

I'm hard pressed to see how we can maintain what is increasingly an intellectually-based output system if there is a significant proportion of our working groups who are unable to have insight into that process.

And I therefore think that it is crucial that as we view the notion of enhancing incentives to advancing technology, we also need comparable and consistent policies which enhance the capacity of people to deal with that capital stock which is becoming increasingly sophisticated.

**Senator Mack.** Representative Dooley?

## OPENING STATEMENT OF REPRESENTATIVE CALVIN M. DOOLEY

**Representative Dooley.** Thank you, Mr. Chairman.

Mr. Greenspan, when we look at the impacts or, I guess, the implications of the information technology in the movement of capital globally, are we seeing this result in basically the need to facilitate increased transparency in some of the countries which have been facing

some financial crisis and, in fact, that has led to a flow of capital away from those markets, and there have been surprises?

And do some of our present institutions, whether it be IMF or otherwise, are we moving in that direction rapidly enough to provide, I guess, greater certainty in the flow of this capital that is being facilitated by this information technology?

**Mr. Greenspan.** It's fairly clear that the market value of increasing information has become so evident that transparency becomes a market value, and while I do believe that governments in one form or another should be moving in this direction, it's fairly evident that the private sector is doing so at a far more rapid pace than governments tend to move.

But you're certainly correct that the issue of transparency indeed is implicit in the value-added process of any intellectually-based economic system.

**Senator Mack.** Senator Bond?

## OPENING STATEMENT OF SENATOR CHRISTOPHER S. BOND

**Senator Bond.** Thank you very much, Mr. Chairman.

Chairman Greenspan, we're delighted that we're able to hear from this distinguished panel today.

I am reminded of the story of the snail who was run over by a turtle. When interviewed by one of our ever-present media mavens, he was asked what happened. The snail said, it happened so fast, I couldn't figure it out.

(Laughter.)

I'm hoping that this hearing will help us get out of the position of that snail.

We are here to learn today. I appreciate, Chairman Mack and Chairman Greenspan, your reference to plant biotechnology, which I think is the third technological revolution which is coming down the pike.

But on the subject of information technology, which is what we are primarily discussing today, I want to take this opportunity as Chairman of the Committee on Small Business, to advise those who are listening that we will be having an open forum tomorrow afternoon in the Senate Small Business Committee at Russell 428 from 3:00 to 4:30, on e-commerce, the opportunities for small business, and what impediments there might be to small business.

Let me address a question to Chairman Greenspan.

We know that many of the very successful information technology companies are small businesses. We also know that large companies are eagerly grabbing up small business services and their products.

Do you see an economy of haves and have-nots as those companies not basically in information technology, the smaller companies, may be losing out to potentially larger competitors who have the resources and the staff to become sophisticated and proficient in information technology.

**Mr. Greenspan.** I recognize that a lot of these small firms are selling out to the larger companies at fees which are unbelievable. So it doesn't strike me as involuntary servitude.

(Laughter.)

**Senator Bond.** No. I'm talking about the ones who aren't in information technology, the folks who are trying to produce something that is not directly IT-related in their product.

**Mr. Greenspan.** Senator, you are raising a much broader point which I think does require emphasis, and that is that a very significant part of new ideas are engendered by a very small number of people in a small company. And indeed, if you look at market capitalization of the larger companies versus the smaller companies, it's an awesome spread. Some of the have-nots are now the larger companies. What this means, however, is that a lot of the companies in information technologies who are small are going to fail. It's inevitable as there are winners and losers. The ones who win will win big, but there will be an awful lot of losers.

The great advantage of being a loser in this country is that, having lost, you just go back to square one and you start again. And that's happened innumerable times.

I would suspect that if we did not have the type of freedoms which this country offers—which Senator Mack outlined in the very beginning —I don't think this process of a small business becoming larger business and becoming an increasingly successful businesses, is possible.

There are five or six major corporations in this country now which did not exist just a few years ago. And that suggests that small business can really do it.

It does say that if you're in information technology, you have to recognize that it's a high-risk business and that the payoff is big. And if you lose, you've got to start again, and that's perfectly sound and sensible. And that's what small business is in fact doing.

**Senator Bond.** Mr. Chairman, if I could have one question?

You hypothesized that the success of IT depends on the willingness and ability to discharge or retrain workers.

You mentioned the regulations and trade barriers in Europe and Japan, what we refer to as Eurosclerosis, which may be inhibiting their development and the benefits they receive from IT.

Do you see similar impediments in our governmental regulatory system?

Are we inhibiting the flexibility that is necessary to take advantage of IT?

**Mr. Greenspan.** I'm sure that there are innumerable such inflexibilities and other witnesses will detail them in great specificity, I won't get into that.

**Senator Bond.** Thank you, Mr. Chairman.

**Senator Mack.** Senator Sessions?

## OPENING STATEMENT OF SENATOR JEFF SESSIONS

**Senator Sessions.** Thank you, Mr. Chairman. And thank you for this hearing. It's very exciting.

And your comments, Connie, were powerful and really inspiring and I think reflect the highest ideals of what we are as the American people. And it helps explain where we are today.

I remember a number of years ago, people were terrified that computers would put people out of work, that we would have unemployment, that wages would go down, and that some even today say that the only thing that's increasing are low-paid wage jobs.

Mr. Greenspan, it is true, though is it not, that average wage is increasing and increasing faster than the rate of inflation?

Unemployment is at record low levels.

Do you attribute that to the technological advancement?

**Mr. Greenspan.** There's no question that the dramatic changes in information technology which have altered the way in which companies do business and can achieve profitability have been a major factor in this really quite stellar economic expansion of the last five to eight years.

**Senator Sessions.** I remember since I've been on this Committee, two and one half years, I've heard you testify a number of times.

Each time you've wrestled with this question of lower and lower unemployment, the danger of inflation, and the question of productivity.

Do you consider—and I think you've indicated in your remarks today. But to reiterate that, you are saying, fundamentally, at its most basic level, technological increases have made this possible and have allowed us to achieve this record?

**Mr. Greenspan.** As I've said in other testimony and in recent speeches, it is possible to reconcile the extraordinary growth in economic activity in a period in which the rate of inflation is falling by recognizing that productivity growth is continuously increasing; that is, it's not as though productivity is increasing, it's the rate of productivity growth that has been increasing. What that has done is contain costs and increased

output and has been a crucial factor in the remarkable economic performance of this business expansion.

If we did not have the dramatic changes in productivity that we have seen, it is extremely doubtful that the economy would be behaving anywhere near as well as it has in recent years.

**Senator Sessions.** It's just been, I know, a scary time for American workers when they see jobs being eliminated. But in the process, we're creating jobs and apparently, paying higher wages than before.

And we're reaching a record unemployment.

So something is working.

**Mr. Greenspan.** Senator, it's very hard to realize this, but there are more than 300,000 people a week who lose their jobs. But a larger number than that get jobs. The amount of churning that goes on in this economy and this labor market is probably unprecedented with respect to any other major industrial country.

**Senator Sessions.** Thank you, Mr. Chairman.

**Senator Mack.** Senator McConnell?

## OPENING STATEMENT OF SENATOR MITCH MCCONNELL

**Senator McConnell.** Thank you, Mr. Chairman.

Alan, thank you so much for coming and kicking off this summit.

I was struck as I listened to your testimony that we're talking in the next three days about an island of immense prosperity, relatively unspoiled by taxation, regulation, unionization and litigation.

It seems to me it's parallel in some ways to the Hong Kong experience. And 1997 may well have been a watershed year for Hong Kong, as the People's Republic of China came in. And I think the jury is largely still out on whether Hong Kong will continue as it has been, or whether it will change.

In the same way, it seems to me that the year 2000 could be a watershed year for this industry.

There's no question that Washington has taken notice of this economic island of prosperity. The real question will be whether Washington will allow the high-tech sector to remain free or even increase its freedom.

Or, to the contrary, will it, somewhat akin to the People's Republic of China, begin to step in and do something, we know not what, to this extraordinarily successful industry, which has in many ways been the engine of our prosperity in recent years.

So I just wanted to thank you for your observations and for kicking this summit off in a very, very effective fashion.

Thank you, Mr. Chairman, for having the hearing.

**Senator Mack.** Thank you.

Senator Kennedy?

**Senator Kennedy.** Thank you. Thank you very much. We want to move on.

But I appreciate, Mr. Chairman, just on a brief little comment from my good friend, Senator Domenici, a little earlier.

I'm a supporter of the R&D tax credit. But what we have to understand in our budget, as you understand, Mr. Chairman, we're talking about a $778 billion tax cut over the next ten years. That's in the budget.

With those kinds of projections, we're looking at Federal support for R&D is projected to fall from $79 billion in 1999 to $76 billion in 2004, a decline of 13 percent after adjusting for expected inflation.

And nondefense R&D is projected to fall, if the budget resolutions are followed, from $38 billion in '99 to $36 billion in 2004, a 12 percent decline for inflation.

So, as we're looking at the noninterference, which I think we have to look at obviously issue by issue—where are we going with encryption? Where are we going in terms of export? How are we going to work through those?

And those are legitimate kinds of issues that involve national security. But also, the availability of information overseas.

Basic research in R&D and applied research. And research in terms of our economy I think go hand in hand.

And I think as we're all making these statements about where we're going down the line, how we want to be friends to the industry, I think, at least in terms of industry people that I've talked to in Massachusetts, they say, look, you can keep out of our way, but the kinds of basic research that is being done is something that is enormously important.

And on this area, I take my hat off to our Chairman of our Committee, who has been the leader in the Senate with others in terms of the NIH research.

Let me ask you both in terms of the importance of research down the line for the future. But secondly, all workers haven't participated, with all respect to others on the Committee.

Minimum-wage workers have fallen further behind. Those in the lower quarter of our economy have worked harder, worked longer, and fallen further behind.

With this increasing productivity, what's your own sense about the responsibility, whether it ought to be done in the private sector between various groups, about sharing this whole prosperity which is a part of this whole kind of economic expansion?

We see the increasing productivity. Generally, when we've had increasing productivity, workers, small business, others in the whole market system, have also participated and have benefitted.

Do you see that as something that we ought to expect as well?

**Mr. Greenspan.** Senator, one of the most important aspects of this dramatic economic expansion, which is fundamentally driven by technology, is what it has done to enable us to absorb a number of people who have heretofore been on the periphery of the labor force.

They have been moved into work, have achieved on-the-job skills, have developed the types of understandings of the market place which, without this extraordinary expansion, I suspect they would not have been able to achieve.

The impact of increasing real wages in the lowest 20 percent of our income groups in the last couple of years has been the first strong sign that I've seen that we're moving in the right direction.

The most effective public policy of which I'm aware is to make sure that this process, this whole structure of economic expansion, which is technologically fed, moves forward.

I'm certain there are many other initiatives which could be helpful. But in the context of today's hearing, we ought to use the occasion to emphasize that the very fact of this extraordinary productivity advance is doing many of the things which we all think are important for the structure of our economy overall and for all the American people.

**Senator Kennedy.** Research and Development—my time is up—could you comment on the importance of R&D, research and development?

**Mr. Greenspan.** R&D is crucial, obviously, to the development of technologies. Indeed, it is so by definition. Whatever one thinks about the questions of either tax credits or government-sponsored R&D, because there are disputes among economists of how effective they are, the one thing I think is reasonably certain with respect to the tax credit is that if you're going to have a tax credit, it should not be a stop-go measure because you cannot operate in an efficient manner with government policies incapable of being understood or projected.

**Senator Mack.** Mr. Chairman, we thank you for your participation this morning and look forward to further discussions with you about this important matter.

**Mr. Greenspan.** Thank you very much.

**Senator Mack.** And now, it is my pleasure to welcome to the Joint Economic Committee, Mr. Lou Gerstner, who is the Chairman of the Board and CEO of the IBM Corporation.

Again, I welcome you. And I'm pleased we had the opportunity earlier this morning to chat about some of our common interests in cancer and research.

So, again, we are delighted that you are here this morning. And if you would, proceed with your statement.

## PANEL II

## STATEMENT OF LOUIS V. GERSTNER, JR., CHAIRMAN OF THE BOARD AND CEO, IBM CORPORATION

**Mr. Gerstner.** Good morning. Mr. Chairman, I would like to thank you and the Committee for providing this forum and for the opportunity to participate in this important discussion.

I am here—we are all here—to talk about a revolution. It emanates from the relentless advance of information technology and it draws sustenance from a new development—the long-awaited merger of computing and communications to create what is often called a networked economy, or a networked society.

But my message today is not about technology.

It is not about a new model of computing.

We are witnessing nothing less than the rise of a new economy, a digital economy, and a new global medium that will be the single most important driver of business, economic, and social change in the coming century.

It will alter the way we teach our sons and daughters.

It will alter the way we care for the aged, reach out to the disabled and home-bound, and enlighten the isolated and the disenfranchised.

It can create new opportunities to help close the divide that exists today between the rich and the poor. And it will exert new pressures on existing geo-political structures and all their underlying economic assumptions.

A world connected by global networks, by definition, has more fluid borders.

So it will challenge the very nature of the nation-state. It will shift the way democracies behave.

It will fundamentally alter the challenges of national security.

It will create the first global venue for debate and decisions on issues that affect all the world's people.

You may think of it as elevating the concept of a town meeting to a world stage.

Five years ago, using the Net to buy a car or trade a stock or earn college credits, was revolutionary. So why not envision a day when we vote with much greater convenience from our home or work place? Or a day beyond that when it is possible to hold a legitimate worldwide

referendum in which all people vote as a global statement of individual preference without regard for conventions like political parties or national borders.

I am completely convinced that this is possible. Not inevitable, but certainly possible and attainable provided we make smart decisions and, importantly, we benefit from thoughtful, insightful leadership in the public and private sectors.

Because this is one of those technological transformations that comes along every hundred years or so and changes all existing models in profound and permanent ways.

We've seen it before.

The printing press—the proliferation of knowledge and the acceleration of the Renaissance.

The automobile, a redefinition of the concept of distance, the restructuring of metropolitan communities, and the relationship between the workplace and the home.

As with all world-altering technologies, this will take a while. We're probably about five years into a 30-year cycle of transformation.

But there is simply no doubt that 25 years from now, when people reflect on the seminal changes of the early days of the century we are about to begin, the impact of network computing will stand in relief.

I think I can safely assume that most members of this Committee have a view of this network world that begins with its impact on the individual consumer or the home user, with applications for news, entertainment, or online chat.

That's understandable because that's where the bulk of the interest and attention has been concentrated.

Let me try to frame the economic, social and governmental implications of what's happening.

We're headed for a day when we'll have hundreds of millions of people, perhaps a billion, connected to one another and to all the world's leading institutions and enterprises.

Next, and in the not-too-distant future, we'll add to this mosaic of connections, computing and communications, perhaps a trillion intelligent devices connected to the network -- all kinds of things, from intelligent cell phones and smartcards, to cars, household appliances, medical devices or vending machines.

The technology will literally become pervasive, disappearing into the infrastructure of the home, the work place and the world.

Today, most estimates say there are around 150 million people using the Net worldwide, and the growth rates are astounding.

One projection says an average of 62,000 new users will come online every day for the next five years in the U.S. alone.

Even at this rate, most of the growth is occurring outside the United States.

To date, we've been the beneficiaries of most of the economic growth generated by e-business. But the rest of the world is moving fast to close the gap.

At the end of last year, 11 nations other than the U.S. had at least 10 percent of their populations using the Web.

China, a country that is just now joining the world economy, already has one and one half million people on the Net.

And sometime this year, and it may already have happened, we'll hit the cross-over point. The majority of Internet users will be outside North America.

What are all these people doing?

At first, they were doing what the conventional wisdom said they were doing—chatting, browsing, and playing games.

Most recently, they've been buying things, lots of things. Most estimates say global e-commerce totaled around $50 billion in 1998, and that this marketplace will crack the one trillion dollar mark in the next few years.

That's roughly 10 percent of all business transactions in the U.S. and about 5 percent worldwide.

But, again, the impact and implications are far more encompassing than just Net-based buying and selling.

IBM created the term "e-business" to talk about the broader, more powerful aspects of this change—the way it allows institutions of all sizes and all industries, public- and private-sector, to redefine what they do and reinvent who they are.

The applications redefine the rules of market access, that unify trading partners in a supply chain, or transform models of distribution, applications to transform internal operations from product development to the way work gets done and employees share ideas.

We believe that transformation of all these core processes is, and will continue to be, a powerful source of real productivity gains for countries and for companies.

As Exhibit A, I'll submit IBM and cite just two applications that would apply in either the private or public sector.

About one-third of our internal training will be done this year via distributed learning, with savings and productivity gains of $100 million.

And we'll procure $12 billion in goods and services over the Web this year, saving $240 million in the process.

And as I said, the benefits transcend the commercial world. Governments are finding that the Net is a tangible way to demonstrate efficient use of taxpayers' dollars.

Arizona enables citizens to renew their vehicle registrations over the Net. The convenience alone probably justifies the investment. But the state has learned that processing an online renewal costs 75 percent less than an over-the-counter transaction.

Singapore is deploying networked applications in its bid for primacy among Asian shipping ports. They've slashed the time for governmental approval of cargo manifests from days to as little as 30 minutes.

We're working with many governmental entities to help kick-start this transformation. But for the most part, government has not embraced the network world.

We estimate that 90 percent of all government services are still delivered over the counter in face-to-face transactions.

Think about the opportunities to invest in new areas or re-deploy capital or tax dollars if you could reduce the cost of some of those physical operations by 75 percent the way Arizona has done.

Let me turn to the implications for the U.S. economy and my perspective on key issues facing policymakers and regulators.

There's obviously not time today to detail every issue. But let me offer a few observations because we are in the ultimate high-stakes game.

In the economy of the 21st Century, this technology will underpin our nation's, and every nation's, ability to drive production, productivity, profitable growth, and ensure the prosperity of its citizens.

There is an absolute correlation between U.S. industry's investments in information technology and the ever-lengthening cycle of American economic growth.

Perhaps the most profound impact of these investments will be with smaller businesses, which we all know are the greatest source of job creation and economic expansion in America today.

Networked technology is a great leveler. It allows these small- and medium-sized enterprises to redefine their market presence and go global virtually overnight.

One of our small business customers is a family-owned nursery called Hawaiian Greenhouse. They sell tropical flowers. When they started to feel the squeeze of big international growers—the Goliaths of their industry—they found their edge on the Net. Ten percent of all their new orders come to them via the Web.

And they now refer to themselves, appropriately, as David dot com.

(Laughter.)

The U.S. can be proud of the economic and technological leadership it enjoys today.

But leadership is not a birth right. Information technology spending as a percentage of GDP will remain higher in the U.S. than Europe and Asia this year, but the gap is expected to close.

Governments around the world are building strategies to compete for investments and jobs, not based on traditional incentives like tax structures, but on their electronic readiness and capability.

Earlier I said that while networked computing can drive economic expansion and societal change, those things are not inevitable.

One critical dependency is the development of a workable public policy framework for electronic commerce. I am predisposed to believe that government, working with industry, can create an environment that nurtures e-business for economic, competitive, and societal advantage.

Building this kind of market-based environment implies that we allow our respect for free-market economics to work wherever possible.

We have to remember that this transformation is fundamentally about the urgent search for new models. It is a grave error to think the Internet and e-business will develop under the same kind of regulations that we applied, say, to the phone system back in the days when coal and steel were determinants of a nation's greatness and economic models based on information were simply unimaginable.

This means we have to be patient and thoughtful before rushing to enact new legislation.

That's often hard to do, when all of our experience, training and instincts tell us that there's a change afoot, so it's time to act.

However, in many instances today, we simply haven't collected enough data points to have the basis of informed decisions.

Policies hastily put in place today could be obsolete tomorrow—or worse, ruin this nascent economic engine.

Protecting online privacy is one area where we're already seeing the positive effects of a market-driven approach—one that builds on many U.S. privacy laws.

A recent Georgetown University survey shows that a clear majority of commercial web sites now have their privacy statements visible to the consumer.

The situation is not perfect, but it shows that the marketplace is responding to the desires of customers and consumers. IBM, as an example, refuses to advertise on sites that don't inform visitors of their privacy policies.

Now I am not suggesting, as some in my industry have, that government is merely a bystander here.

There are areas where government must lead. Tax policy is a good example. Congress took an important step last year with the passage of the Internet Tax Freedom Act. The commission formed by that act will begin meeting later this month and we look forward to a considered debate on the issues.

The issue of information security is a case study in the importance of government/industry cooperation. We have to push for a sensible encryption policy in this country, one that recognizes the commercial demand for secure information systems and transactions, and also recognizes the legitimate needs of law enforcement and national security.

And finally, we need policies that will promote the continued build-out of broad-band systems, and we need government to continue its traditional role in support of R&D and as a source of fundamental new ideas and knowledge, often developed in cooperation with the academy and industry.

I'll close with this because it is the source of my profound concern as I think about the opportunities of a networked world.

If there is one factor that can dead-end for the U.S. this new world of economic opportunity and prosperity, it's the deplorable condition of our system of public education.

Just as surely as a high-quality education, or the lack of one, can separate people it will also separate winners and losers in the global, networked economy that's coming to life around us.

American public schools are in a race with the rest of the developed world. Sadly, it's a race we have been losing consistently and relentlessly for decades.

I have been passionate about this subject for 20 years. Looking ahead, that passion is turning to fear.

Unless we arrest the wasting decline of our public schools, and unless we do it now, America is destined to be an also-ran in the emerging digital economy.

The issue here isn't computers. The issue here is leadership, from parents, elected officials, administrators, educators, and business men and women.

No American can opt out of this one. It's one more reminder that in every era, the most important challenges and the resources to meet them are intensely human.

I hope we all recognize that we are facing the leadership opportunity of a lifetime—the chance to build the greatest, most dynamic

marketplace of goods, services and ideas the world has ever known, and drive economic prosperity for our citizens in the next century.

Our ability to make this real rests squarely on the quality of leadership we get across the board, in industry and government.

The leadership enterprises in every industry segment are starting to emerge right now -- in every case, behind the vision of individuals who have the will to go first and make fundamental changes in the way things are currently done.

If we're going to nurture and exploit these technologies to really change things, to make the world a better place, more tolerant, more secure, more prosperous, we'll need the same kind of leadership in government.

Leaders with the will to step forward and embrace the networked world, with the foresight to apply this technology for economic and social change, and the wisdom to trust the marketplace and the partners in industry.

This forum is a very positive sign that we recognize the opportunity. We acknowledge that our work must be grounded in cooperation, communication, and a lot of thought. And most importantly, we believe that, together, we can deliver on the promise and potential of this networked world.

Thank you very much.

[The prepared statement of Mr. Gerstner appears in the Submissions for the Record.]

**Senator Mack.** Mr. Gerstner, let me thank you for a very thoughtful presentation this morning. You touched on a number of different topics and subjects in your statement. Just one thought before I turn to Senator Bennett and then to further Members.

Senator Bennett kind of referred to the potential impact of this new age, new revolution, whatever one wants to call it—Alvin Toffler wrote for years that when you change the economic underpinnings of a society, you eventually change its social and political structure as well.

And I think that came through fairly clearly in your statement.

The last point that I would make is you referred to it's a great leveler between the small and the big with respect to competition and companies. But it is exactly the same thing among nations.

**Mr. Gerstner.** Yes.

**Senator Mack.** If we are not prepared to address the issues that you've raised here, there are many nations around the world today that in fact can challenge America in the future.

So I think, again, it's been an excellent statement and I appreciate it.

Senator Bennett, I will turn to you.

**Senator Bennett.** Thank you, Mr. Chairman.

The one frustration that I'm having is that these hearings are too short and I want to go on and have a dialogue on all of these issues.

I agree with the Chairman that your statement is very thoughtful.

Let me respond to your final statement, if I may, with a personal experience and tell you that I've tried to spread the gospel a little with respect to education.

I was CEO of a very prosperous company and enjoying finally the sense of financial stability that was coming from that after going through the experiences that Chairman Greenspan spoke of—that is, running small businesses that kept failing and starting over.

And finally, I found one that didn't fail and I was enjoying it, as I say. And I got a phone call asking me to serve as chairman of the strategic planning commission for the Utah state board of education.

And I began to get my education into the state of America's public education. And that was probably the experience that got me interested in public life and eventually into the United States Senate.

I agree with you absolutely that there is no more critical long-term survival issue for the United States than the state of our public schools.

And I've tried to open a dialogue with an entity that usually does not talk to Republicans; which is the National Education Association. Had representatives of that group in my office saying, what can we do to bridge the gap between our association and the business community to get some cooperation and understanding as to what has to be done to fix our schools?

These were very earnest, very motivated, good people.

I handed them a copy of your book. And I said, if you will read this and understand what is being said here about entrepreneurial approaches to education, the willingness to take risks, the willingness, if you will, to have failures in an attempt to get to the kinds of successes that are available for those who will take the challenge, then we can talk.

Unfortunately, I haven't had a response. I gave them your book and have not had another conversation.

I applaud you and your organization immensely for your focus on education and am willing to open a dialogue at some future point with you and IBM to see what we can do here because the critical shortage that we face in this revolution that we're going through is a people shortage.

We do not have the trained people that we need in the United States and the challenge, one of the challenges that has come through the Y2K experience that I've had is the vulnerability we have in this country

of people from overseas coming in and getting into our code, to fix the code for Y2K problems and at the same time, leave behind little souvenirs that might allow some foreign nation to them attack us in ways that our current military is not aware of.

So I just share that with you and respond with a personal cry to say, you're right on on education and we want to do everything we can to help you.

**Mr. Gerstner.** Thank you, Senator. I might say that there are 350,000 open, unfilled jobs in the information technology industry in the United States today.

350,000 high-paying, information-age jobs open. We can't find qualified people to fill those jobs.

And secondly, I might say the experience that the NEA people had with my book is similar with everybody else. They usually nod off in the middle of it.

(Laughter.)

But that's true of all books on education.

(Laughter.)

**Senator Bennett.** I didn't nod off in the middle of it. I guess that says something strange about me.

(Laughter.)

I enjoyed it and I appreciate your testimony here.

**Senator Mack.** Ms. Eshoo?

**Representative Eshoo.** Thank you, Mr. Chairman.

What a pleasure to listen to you today. I don't see how anyone can nod off either listening to you or reading what you've written.

I think you're a quality, real high-quality human being, and it shows with your policies and what you've done. And of course, your intellect and your leadership.

Thank you for what you've done with ACHIEVE. That is an outstanding effort. And I think it's helped change the landscape.

So I think you have a lot to be proud of.

I want to shift gears for a moment and ask you about an area that I'm concerned with and what kind of an effect it could have on the broader things that we're talking about today.

And that relates to the Financial Accounting Standards Board, FASB.

They've proposed eliminating the use of the pooling of interest method of accounting in corporate mergers and acquisitions. And also requiring companies to record repricing options as an expense.

These changes are supposedly being proposed or made to bring U.S. accounting methods more in line with various international methods.

So I have two questions for you.

First, do you think that these proposed changes, which I think will have an effect on the ability of companies to grow through mergers and grant employee benefits, do you think that they're necessary?

And secondly, do you think it's wise public policy to impose arcane European accounting standards on U.S. companies, which is critical to the growth, of course, to the high technology industry and, in turn, the overall U.S. economy?

Do you want to get into this?

(Laughter.)

**Mr. Gerstner.** Not really.

(Laughter.)

But I will tell you that IBM has expressed in writing to FASB its unhappiness with some of the changes that are being proposed.

I would tell you that our feelings are stronger on some rather than others. And there's no question that it will slow down the merger and acquisition activity in our industry and in all industries.

I'd rather not comment beyond that. Thank you.

**Representative Eshoo.** Since the green light is on, Mr. Chairman, can I sneak in just one more question?

**Senator Mack.** Absolutely.

**Representative Eshoo.** If you were to advise us with any kind of specificity, what would that advice be since the Congress has had very little involvement in K through 12.

Most of the federal policies that have been on the boards over the years have been in higher education.

If there were a role for the Congress—first of all, do you think that there is a role that the Congress should play in K through 12? And if so, what would your advice to us be, given your passion for this issue and how you described it in your testimony?

**Mr. Gerstner.** Thank you. That question I'd love to tee off on. But I'll be brief, Mr. Chairman.

As you know, 92 percent of the money we spend on K through 12 education is spent by local governments, state and local government.

So the U.S. Federal Government provides about 8 percent of the spending. So this really is a local issue. And if we're going to turn around our public schools in this country, it's going to fall to the governors to do this.

And I'm encouraged that the governors are really beginning to step up, a lot of it around this organization that we created called ACHIEVE.

It doesn't mean, though, that the Federal Government—if it is decided that we're going to spend a certain amount of money at the federal level for public schools, then I would like to see it spent in the area of promoting high standards, measurement, and accountability.

We are the only developed country in the world that does not describe what our children should learn.

How can you run an enterprise of any kind, public or private, where you don't set out in the beginning and say, here's what I need to accomplish?

And so, we have got to create world-class standards for our children. And then we've got to measure whether we're getting to those standards, and if we're not, we have to hold ourselves accountable to fix it.

And that's what ACHIEVE is all about. The governors have come together to really promote high standards.

We should not say, as some people do in this country, that underprivileged children should not be held to high standards. That's the worst thing you can say to those children.

All children should be expected to meet high standards because that's what those children need to get out of poverty.

So standards, accountability, measurement and accountability.

Now what can the Congress do?

Well, you have lots of titles—Title I, Title II—where you provide money for schools. And you provide them for disabled, immigrants, for lots of programs.

Why can't you tie a lot of that money to school districts that really promote high standards, that really look at performance, that measure outputs instead of inputs in the school system?

I think there's a lot that you can do in your existing regime to build that kind of focus into the monies that you provide to local school districts.

**Representative Eshoo.** Thank you very much.

**Senator Mack.** Thank you.

Mr. Sherwood?

**Representative Sherwood.** Thank you. Lou, I'm very happy to hear your testimony.

In the 36 years since we left Hanover, I spent 20 of them as a public school director. So I've been in the trenches on that and it takes a lot of hard work and good management to run a public school system.

**Mr. Gerstner.** It does.

**Representative Sherwood.** But we have to raise the bar. We have to expect more, and we all need to be more involved in our local school system.

We had the very good opportunity of having a Procter & Gamble plant nearby and we partnered a lot of things. Those folks showed us that they needed skills that we didn't produce. And so, we worked very hard with it.

But I couldn't agree with you more that that's all of our future. And the money that we spend in Washington, we have to make sure that we get it down to the classroom. And I think the role of the Federal Government is to have some meaningful comparison among schools so that parents know which schools are getting the jobs done and which ones aren't.

But it's not an easy issue. It has lots of passion.

But I thought one of the very important things you told us today, that we're about five years into a 30-year cycle. And I think that's important for us to understand.

We're ahead of the rest of the world, but it sounds to me like if we're not careful, we won't be, on the information age.

And I think that's a challenge for us. Thank you very much. I very much enjoyed it.

**Mr. Gerstner.** Well, I might comment—may I, Mr. Chairman?

**Senator Mack.** Sure.

**Mr. Gerstner.** That a group of us from the information technology industry were here last week. We met with some of the people in this room, some of your colleagues.

It's very, very important that we create the right policies on exports in this country, or we will create a very large competitive industry outside of this country that will feed off the countries that we block from U.S. based companies.

And so, I suspect that we'll see some movement here. But the issue of export controls on hardware, on encryption, are critical today, this week, next week kind of issues if we're going to maintain our lead in this industry.

**Senator Mack.** Thank you very much.

Mr. Moran?

**Representative Moran.** Thanks very much, Mr. Chairman.

You know, we talked about the role of education and you speak very eloquently, Chairman Gerstner. And you've cited the fact that we've got 350,000 jobs unfilled.

Here in Northern Virginia alone, we lose about a billion dollars a year because we've got 19,000 IT jobs. We just can't find the people to fill them.

But it's not just education. It's training. It's skills training. And it doesn't require a four-year college degree. We probably could do most of it with community colleges and an acceptance of the need for lifelong learning.

But the Federal Government particularly, and probably all governments, do a miserable job of training people for the private sector.

We've had a proliferation of federal training programs. We finally, and I think the lead was taken by the Senate, consolidated some of those training programs.

But we had over 40 of them. They weren't coordinating. They were wasting money. And the results were dismal.

One of the problems was that the people who were doing the training were basically training to whatever skills they had when they went into training, and didn't update those skills.

They were training to jobs that didn't exist or had well been outdated. They were training on computers that had already been outmoded, that the private sector didn't want and that's how they got them, because the private sector dumped them into the training program. And so, they teach the new trainees.

But in the private sector, we've had problems, too. And you probably epitomize the greatest problem, and that is that too often, no good deed goes unpunished.

IBM was doing virtually all of the computer training at one, both in terms of hardware installation and the like, and software.

And yet, what happened was that more and more start-up firms would simply pirate your people.

You say now that you're doing much of your training through distributive training and I can see it's saving money. But it would seem that there's a need for more collaboration among the private sector, that the training needs to be driven by the private sector, what your immediate needs are in terms of personnel.

It seems that the firms in a region should contribute in a collaborative way so that the expenses that are put into training don't put one firm at a disadvantage versus another that doesn't invest in training.

And it would seem that the public's role should be to provide some of the financial support for that industry-driven and trainer-supplied program.

We have a bill to do that—the Regional Training Alliances. It's been introduced in the House and Senate. But it doesn't seem to get the kind of attention that I think it needs.

When we've got 350,000 unfilled vacancies, we've got to do something better than what we're doing today. And it does seem to need a collaboration between the public and the private sectors.

Can you address the need for training and what we could do to help firms like you and those of your colleagues?

**Mr. Gerstner.** Well, I certainly agree with your view that the educational requirements in our society don't end at public school levels.

In fact, in an information age, we all need to be retrained all the time, although we spend a billion dollars a year in IBM on training of all of our people—a billion dollars every year upgrading the skills of our people. It's important for us because our industry changes so rapidly.

So there's a huge need to train existing workers and executives in our country.

Now, what we don't want to do in American business is train them to read and write. So I want to go back to the fact that we spend $25 billion, according to one estimate, in U.S. business doing remedial education for people who come out of the public school system.

That's $25 billion we could spend on true worker education, career skill education, as opposed to teaching them basic skills that we would prefer the public schools teach, which we have no real expertise to do.

So that would really be helpful to us.

I think that we are going to have to find ways to go back and capture two generations—not two generations—but 10 years, about 15 years of children that have graduated from our schools with very little skill.

We have to go back and help those people. So that requires job training after school.

I will not, and cannot, at this point comment on your specific bill, Congressman, but I'll read it when I go back and talk to my colleagues.

**Representative Moran.** Thanks. Thank you, Mr. Chairman.

**Senator Mack.** Thank you. Mr. Gerstner, thank you so much for your presence before the Committee.

Again, a very thoughtful presentation. We appreciate your being here.

For the information of members, we're going to take a few minutes here to hear from Roberta Katz. But I think we will just hear from Roberta Katz, don't raise any questions, so that we can get to the next panel, which is five individuals, and then we will be able to get into the questions.

And I will again recognize the group that was unable to ask questions in this round.

Dr. Katz, welcome.

PRESENTATION

## STATEMENT OF DR. ROBERTA KATZ, PRESIDENT AND CEO, THE TECHNOLOGY NETWORK

**Dr. Katz.** Thank you very much.

Mr. Chairman, Mr. Vice Chairman, members of the Committee, I am Roberta Katz. I am President and CEO of the Technology Network. And I am very pleased to be here today to discuss the new economy.

I want to thank you very much for convening this summit. I think it's a very important step.

With the Internet and with the electronic commerce, we now have distance learning. We have online banking, online books, online toy stores, music, cars, airline tickets, and even groceries on line.

One third of the total growth in U.S. economic production in the last seven years has come from high technology industries. This is the new economy in operation.

The new economy is a new way of getting work done. It is a new way of thinking and a new way of communicating. It celebrates ingenuity and innovation and it is productive.

Perhaps most important, the new economy is about using technology to improve the quality of our lives, from life-saving drugs to the communications revolution that we've been talking about.

As we participate in such pervasive change, social issues, by which I mean issues of policy and politics, will predictably and inevitably arise. And that's why the technology network, which is also known as TechNet, was created two years ago.

TechNet is a network, literally, of 140 chief executive officers and senior partners of the nation's leading companies in the fields of information technology, biotechnology, venture capital, investment banking, and law.

TechNet's mission is to engage these business leaders personally in the political process, so that they can build working relationships with the state and national political leaders who are striving to understand the social issues related to the new economy.

I'm very pleased to tell you that 11 of our members will be testifying during the three days of this summit.

The traditional view is that the high-tech community does not care about policy and politics. But that view is incorrect.

The high-tech community increasingly understands that politics and policy are important to the growth of the new economy. Many of the

break-through developments that have occurred in the recent past are in fact the result of federal programs, sound regulatory and tax policy, and even accounting rules that enable and empower America's technology industries to create new products and new markets.

TechNet champions fundamental policy issues that drive the growth of the new economy, policies that encourage innovation, improve education, foster employee ownership, and stimulate entrepreneurship.

This year, TechNet's top policy priorities include increasing the federal and corporate commitment to research and development, preserving accounting rules that recognize the importance of intangible assets and employee ownership in growing the new economy, and improving K through 12 education so that youth will be ready for the challenging jobs being created by the new economy.

With respect to the importance of research and development, we often lose sight of the fact that innovation begins with research. The single greatest impetus for technology innovation is investment in research and development.

A recent NSF study shows that three quarters of all patent applications in the United States cited publicly-funded research for at least one of the sources of their new discoveries or inventions.

TechNet members have unanimously called for a joint commitment by government and industry to, one, enact substantial, consistent increases in federal funding for basic science, energy and technology research over the next decade; and

Two, enact a permanent research and development tax credit to spur increased corporate investment in long-term R&D.

The federal and private sector roles are complementary with the government providing the initial critical spark for innovation and the private sector then building on the federal investment to achieve important breakthroughs that advance the science, engineering, and broad range of national goals.

Numerous breakthroughs in information technology, including the Internet, the first graphical web browser, high-speed networks, artificial intelligence, super-computers, databases, and graphical user interfaces, have resulted from government-sponsored research.

These innovations, sponsored by the government initially, have grown into industries that now employ 7.4 million American workers with average salaries that are more than 60 percent higher than the average private-sector wage.

The Internet alone has created billions of dollars in new wealth, vastly exceeding the government's initial investment in networking research.

Significant pressures on federal research spending are expected in future years due to congressional budget caps that limit overall discretionary spending, however, and the future of federal support for basic research is unclear.

We cannot afford to take for granted the fact that the federal research budget will grow. We must have a concerted national agenda for fostering critical investment in basic scientific research.

On the private side, since 1981, the R&T tax credit has provided a powerful incentive for increased research by American industry.

Although the credit has been effective, its history of repeated, limited extensions has prevented it from achieving its full incentive effect.

An R&D credit that requires constant renewals, that suffers from gaps in coverage and retroactive enactment, impedes the progress of innovation.

The uncertainty of a credit which must be renewed annually and which has the potential to expire makes it impossible for firms to factor the credit into their valuation of long-term research investments.

Numerous studies support the credit's effectiveness in encouraging corporate research expenditures above and beyond previous levels.

The result has been new and innovative technologies, medicines, products and services that benefit all Americans.

With respect to accounting issues, today's new economy differs significantly from the traditional manufacturing and service-based economy. A defining feature of the new economy and a key to its tremendous growth is the increased importance of knowledge and intangible assets, including R&D, employee talent, brands and knowledge.

Accounting standards should recognize the role that intangibles and knowledge-based assets play in the new economy.

As was mentioned before, FASB's review of accounting rules for business combinations and stock compensation threatens to undermine the factors driving the new economy, which are employee ownership, innovation, research and development, capital formation and efficiency-enhancing mergers among other issues.

Before the adoption of new rules by FASB that may have a significant and negative effect on economic growth in the technology industry and economy, we should be certain that the impacts of these rules are fully understood and that there are perceived problems with existing accounting standards that justify such changes.

As a result, TechNet is not in favor of many of the FASB-proposed rules.

Finally, with respect to education, since its inception, TechNet has made the improvement of K through 12 education a top priority.

Our members believe strongly in the need to ensure that America's students are prepared for the new economy and can compete in a fast-changing global environment.

We are fighting hard to create a world-class education system by eliminating bureaucracy, removing barriers to student and teacher excellent, and expanding the resources available to our schools.

Last year, TechNet spearheaded a successful legislative effort in California to greatly expand the number of public charter schools in the state.

Every child in America needs a strong education to enjoy a high standard of living in the future. Our failure to provide that education is unfair to our children and ultimately to our society as a whole.

Our strategy for improving K through 12 education is to insist on the establishment of high educational standards and the deregulation of public education.

Performance against the standards should be rigorously measured. Schools should be forced to compete and parents should be able to choose the best public school for their children so that all can share in the benefits of the new economy.

In conclusion, TechNet's members believe that through active and ongoing dialogue such as is going on in this summit, government and industry can together build the bridges that are essential to keep the new economy thriving.

And we look forward to working with you to that effect.

Thank you very much.

**Senator Mack.** Dr. Katz, again, thank you for your presentation this morning and the specific issues that you've raised. It's helped us to become more focused on the issues of specific concern. So thank you very much.

**Dr. Katz.** Thank you. It's been gratifying to hear the questions already. They seem to be addressing these very issues.

Thank you.

[The prepared statement of Dr. Katz appears in the Submissions for the Record.]

**Senator Mack.** Very good. Thank you. We're going to move on now to the next panel:

Sara Horowitz, Executive Director of Working Today;

Jim Barksdale, President of Barksdale Group;

Judy Carter, president and CEO of SOFTWORKS, Incorporated;

Edward Nicoll, President and COO of Datek Online Holdings Corporation; and

Mr. Craig Barrett, President and CEO of Intel Corporation.

Please be seated. Mr. Barrett joins us via satellite. We can see you and we welcome you this morning.

I will turn to you first for your statement. Please proceed.

## PANEL III

## STATEMENT OF CRAIG BARRETT, PRESIDENT AND CEO, INTEL CORPORATION

**Mr. Barrett.** Thank you, Mr. Chairman, members of the Committee.

It's actually a pleasure to address you using, not so much satellite technology, but personal computer technology, this morning.

I wanted to just take one moment and describe Intel to you because I think it is an excellent example of what we're talking about today, of how a few bright engineers with a clever idea can create a strong economic machine.

You may be aware that Intel started 30 years ago by Bob Noyce and Gordon Moore with about $2 million of venture capital money, a one-page business plan, with the idea of exploiting the concept of integrated circuit technology.

Over a 30-year period, this company has grown to approximately a $30 billion company with a $200 billion valuation and has spawned, I think, several new industries, such things as dynamic RAMs, other integrated circuit memories, and the micro-processor, which has helped spawn the entire personal computer industry.

Today, we employ over 65,000 people, roughly two-thirds of them in the United States. We export approximately 60 percent of our product. And we are perhaps one of the largest taxpayers in the United States.

We're also the largest integrated circuit manufacturer in the world, being some two and one half times larger than our nearest competitor.

I think perhaps the most interesting statistic of our company and of our industry in general is that each year, approximately 80 to 90 percent of our revenue comes from products which were not in production 12 months ago.

So every 12 months we have almost a total turn-over of our revenue coming from new products.

Our industry is dependent on engineers, research and capital.

I would point out one simple law or physical observation that drives our industry, and that's called Moore's Law, after Gordon Moore, our founder.

It basically states that the number of transistors that you can put into a semi-conductor device or the processing power you can create in a micro-processor doubles every 18 months or so.

Gordon first postulated that law in the mid-19€Js, where, 35 years later, today, that law is still valid. And by all projections, it will be valid for at least another 15 years or so.

So every 12 to 18 months for the next 15 years, we should see a doubling of the processing power for micro-processor or a computer that you can put on your desktop.

We also have a simple vision of the future. You've heard some testimony earlier today in terms of the importance of electronic commerce and the Internet.

Our simple vision of the future is that within the next five to six years, there will be approximately one billion connected computers around the world connected to the Internet. Over those one billion computers, people will be able to communicate instantaneously and conduct commercial transactions instantaneously.

To give you an idea of how rapidly e-commerce is spreading, Intel, approximately a $30 billion company, will do one half of our business over the Internet this year.

This is a business-to-business transaction. And at approximately a billion dollars a month and we should do about $15 billion this year in electronic commerce.

We took our first electronic commerce order last July. So in less than a year, we're already running at a billion dollars a month.

We believe that we're the type of company that the United States wants more of. We continue to experience strong competition from Japan, Korea, Taiwan and Europe.

We have numerous public policy challenges. I will briefly mention these and then conclude.

First is the issue of U.S. export controls.

As I've mentioned, Moore's law allows us to double the processing power in the personal computer every 18 months. Today, the export requirements are set right at the top end of our product line.

Within the next 18 months, we will obviously double that processing power and we will exceed the current U.S. export controls.

I think the interesting observation here is, today, there are more personal computers sold around the world than television sets. And the concept of trying to have export controls on something as ubiquitous as a television set or a personal computer is very difficult to imagine.

We are basically at the point of requiring export controls for a computer that someone with readily-purchased components and an eighth grade education can build.

The other issue was mentioned by Mr. Gerstner earlier, the issue of encryption technology.

It's possible to download free strong encryption technology over the Internet anywhere in the world at any time. Yet, the U.S. has strong export restrictions.

The second public policy issue is the Year 2000 issue, on which there is, I think, strong debate in the Congress today and pending legislation to be voted on this week.

We are in support of issues in the McCain-Dodd bill, such as proportional liability, and a cooling-off period of 90 days for companies to be able to effect fixes in Year 2K noncompliant hardware or software.

The third issue, also mentioned earlier this morning is in basic research.

I think we would all agree that education is of paramount importance to our industry and having a highly educated and trained workforce is necessary for success. The fact that the number of people graduating from our universities with technical degrees has shown a decline over the last decade, while in fact, high tech has been the main driving force for the economy has two trends going in divergent directions.

We really need more support of basic research, both by industry and government, in our universities.

We need more technically trained graduates.

We need a better K through 12 education system, as discussed also by Mr. Gerstner.

If I had a simple suggestion to make here, the fact that approximately 50 percent of all of the high-tech graduate students in the United States are foreign nationals, we might consider stapling a green card to every Ph.D. degree in the high-tech field that our public universities grant.

The fourth issue is the Internet, which I think will be discussed by just about all the panelists this morning.

E-commerce, as demonstrated by the Intel example I mentioned earlier, is very important. There are various estimates suggesting that by the year 2002, 2003, some ten percent of the U.S. GDP or one trillion dollars will be conducted over the Internet.

We think that it's to everyone's advantage to in fact support this concept and to provide the infrastructure so that the United States leads in this field and does not follow.

And one of the most important aspects of that is the concept of broad-band capability. That is, high band-width capability to small business and home users in the United States for the Internet.

We need to have more competition between the various broad-band suppliers, both cable and the telephone companies.

I find it disappointing that countries like Singapore, with a population of only approximately three million people, have more ADSL connections, or high-band width telephony connections, than the entire United States.

In short, everywhere I travel in the world, people recognize that information technology and high-tech and knowledge-based industries will be the driving force for future economies.

I'm glad to be able to be here to help support that testimony this morning.

Thank you.

**Senator Mack.** Thank you, Mr. Barrett.

We will now move to Mr. Nicoll.

## STATEMENT OF EDWARD J. NICOLL, PRESIDENT AND COO, DATEK ONLINE HOLDINGS CORPORATION

**Mr. Nicoll.** Well, thank you, Mr. Chairman, for the invitation to speak before the National Summit on High Technology.

It's an honor to be on this panel with such a distinguished group of entrepreneurs and business leaders.

My name is Ed Nicoll and I'm the President of Datek Online, the fourth largest online brokerage company in the United States.

I recognize that the topic of these hearings, technology, is a rather broad one, so I'll restrict my remarks to that aspect of technology that I know best—online investing.

Growing up in a working-class family in New Jersey, as I did, it never occurred to me that I might some day find a career in the investment world.

Online investing, which was still a generation away, was beyond my imagination. I remember every evening watching the "Huntley-Brinkley Report" with my family. At a certain point in the broadcast, there would be a brief mention of the performance that day of something called the Dow Jones Industrial Average.

It was a regular part of the news each night, but I can assure you that no one in my family knew what this strange Dow Jones Average was. We had a hunch it had something to do with rich people and with their money. But it seemed entirely irrelevant to our lives.

I suspect that I was not alone in my ignorance.

Until very recently, the stock market was the playground of the small elite. But the Internet has changed all of that.

It has made it possible for anyone with a computer and a modem to interact with our equity markets.

Technology has empowered the consumer and leveled the playing field between individual investors and the professionals of the financial world.

It has given us real-time quotes, online research reports, and enormous historical databases.

A decade ago, even if you could afford to obtain it, generating and communicating such data could take several hours, even several days.

As most online investors will tell you, one of the great benefits of the online investing industry has been the tremendous reduction in commissions. In the past, the high cost of commissions effectively served as a barrier to many ordinary investors.

Today, the average cost of an online trade is under $20, a fraction of what traditional investment houses charge their clients.

As a result, the demand for online brokerage services has been nothing short of staggering.

In 1995, there was only one online broker. Today, there are more than one hundred. According to the New York Times, the number of households with online trading accounts has risen from 2.2 million at the beginning of 1998 to 6.3 million in April of this year.

During the first quarter of this year, nearly 16 percent of all equity trades occurred online. That's almost one in six transactions.

This is a remarkable record for an industry that didn't exist three years ago and I provide even more detail about the growth of the industry in my written testimony.

Despite our rapid growth, I believe we are just scratching the surface of what online investing has to offer. Individual investors, for example, are just beginning to benefit from the increased efficiencies and open-access of the alternative trading systems which now compete with traditional trading forums.

Eighteen months ago, my firm started a new company—the Island Electronic Communications Network, or ECN, as it is known. Island electronically matches orders without the intervention of a market maker or a floor broker.

Today, Island matches over 100 million shares a day. It is the single largest ECN in the world and the second largest alternative trading system, and it is now in the process of registering with the SEC as the nation's first new stock exchange in over a generation.

I fully expect that this aspect of online trading will continue to develop. The enhanced technology that we see today has forced us to rethink the way our markets operate. And I believe that consumers will be the ultimate beneficiaries.

Mr. Chairman, I've spoken enthusiastically about the benefits of online investing, but I also want to emphasize that online investing is not necessarily for everyone.

Many investors enjoy the freedom that comes with online investing. Others will continue to demand a higher level of personal attention that can only come from a traditional broker.

While investors who make their own investment decisions can and should invest online, those investors who need advice and have been served well by an investment advisor should stick with that advisor.

But I also recognize that good investment advice is extraordinarily hard to find and expensive. It is perhaps the rarest commodity to be found on Wall Street.

For many investors, there is a disconnect between the amount of information that is available to them on the Internet and their ability to effectively make use of that information.

I am convinced that there is a healthy market out there for companies that want to help more Americans become confident and self-directed investors.

For our part, Datek Online is undertaking a number of steps to improve consumer education about online investing and to promote more knowledge about stock markets in general.

For example, in conjunction with Smart Money magazine, we are helping to launch Smart Money University, a highly interactive website that will promote financial literacy and a broader understanding of online investing.

We have also helped to found learntoinvest.org, a not-for-profit program to establish investment clubs in high schools around the nation, especially in underserved inner-city schools.

Finally, let me acknowledge that Congress has a critical role to play, both in protecting consumers and in creating an environment where legitimate businesses can innovate and grow.

I say that is a critical role, Mr. Chairman, but it is also a difficult one.

No one would be foolish enough to predict exactly where this industry is going. But if Congress and the Administration continue to allow this industry to evolve unhindered by heavy regulation, if you continue to allow the entrepreneurs to create new ways of serving consumers, if you continue to allow technology to make our equity

markets more accessible to everyone, then I am confident in predicting three things.

First, more Americans than ever before will own equities and share in the prosperity of our country.

Second, investors will become more educated about the advantages and the risks of investing, allowing them to make better financial decisions.

Third our industry will continue to innovate, providing more choices for consumers at more competitive prices.

Please remember that although the financial services industry as a whole is highly regulated, the online brokerage segment has flourished without much additional government regulation.

I would urge you and your colleagues to see our success as only the first stage.

As an active participant in the industry, I share your concern for maintaining an industry that is free from fraud and protects consumers. But I am heartened by the way the market has worked to address these concerns without the need for legislation or government intervention.

It would be a grave error to consider heavily regulating an industry that is still evolving and continually providing benefits to ordinary consumers.

In closing, I'd like to thank you again, Mr. Chairman, and all the members of the Committee for your leadership and foresight in sponsoring this first annual national summit on high technology.

I look forward to working with you in the years to come and to answering any questions you have today. Thank you.

**Senator Mack.** Thank you, Mr. Nicoll.

[The prepared statement of Mr. Nicoll appears in the Submissions for the Record.]

Ms. Carter?

## STATEMENT OF JUDY G. CARTER, PRESIDENT AND CEO, SOFTWORKS, INC.

**Ms. Carter.** Good morning. It's an honor to be here today.

Thanks for the opportunity to participate in this very important discussion.

I'm the CEO and President of SOFTWORKS. We've been in the information technology business for 22 years. And during this time, we have both contributed to and benefitted from the evolution of information in computing technology.

Today, we're a global company. We sell our software solutions in all of the major markets around the world. We have over 2000 customers,

including 87 of the Fortune 100 and over half of the Fortune 500 companies.

These companies, like Citicorp, Bank of America, UPS, Yellow Freight, and Humana Hospital, all rely on our products to help them insure that their critical business information is available to them and that their systems are up and running and achieving peak performance.

We achieve these results by developing software solutions that actually enhance the capabilities of other vendor hardware and software and shore up the weaknesses of that same hardware and software.

Essentially, our software drives other vendor software and hardware solutions to help companies around the world insure that they're getting the absolute highest return that they can achieve on their information technology investments.

We do this because we believe that the companies and countries that can effectively exploit technology are going to be the winners.

In 1977, when we entered into business, we only had one company whose technology we needed to be compatible with and to extend.

That was IBM's.

Today, our software interfaces with seven different operating systems and over 25 varieties of other vendor software and hardware solutions.

You can imagine what a challenge it is for a small company like SOFTWORKS just to maintain the status quo and continue to make our existing products both profitable and acceptable to a very rapidly changing market place.

The combined need to meet the status quo and to bring new products to market, along with meeting the requirements and demands of our Wall Street investors, require us to really balance the need for continuing research and development with those bottom-line requirements.

The R&D tax credit helps SOFTWORKS fund the necessary research and development that we need to perform in order to secure the future of our company and to continue our growth activities, as well as meet those bottom-line needs.

In 1998 alone, the research and development tax credit allowed us to add a penny per share to our earnings.

You know, product development is an evolutionary process. Being in the industry for 22 years, I can tell you that it's very rare that a new technology, whether it's software or some other type of technology, gets developed within the span of a year.

Typically, these development processes evolve over several years.

We're a small software company, under $50 million. And as I mentioned earlier, we're the beneficiary of technology as well.

When we were just a $12 million company, SOFTWORKS embarked on a project to become a global company. And the result of technologies like telecommunications and computing technology that companies like Cisco and IBM and Microsoft have brought to the forefront allowed a small software company like SOFTWORKS to reach out into the global markets of the world and effectively compete with other vendors, not only from the United States, but from foreign countries.

Because of this, we've been able to accomplish an average annual revenue growth of 56 percent.

Today, we employ over 270 employees. 215 of those employees are U.S. citizens. We have telecommuters across the United States, as well as 13 offices around our country, that not only service the United States population, but also support our customers in global markets.

Those telecommuters in some cases are home-bound people who wouldn't ordinarily, without the aid of technology, be able to find the same kind of challenging work.

In closing, I'd like to say that the United States is the technology leader today. And it's very important that we secure that position, not just for today, but for the future.

In order to do that, we need to make long-term investments in research and development, such as those that we've made in the past.

The research and development tax credit is an effective means to promote these investments and we should make it permanent so that we can continue to be leaders in technology and secure that place for ourselves in the future.

Thank you very much for the opportunity today.

**Senator Mack.** Ms. Carter, thank you as well.

Mr. Barksdale, welcome

[The prepared statement of Ms. Carter appears in the Submissions for the Record.]

## STATEMENT OF JAMES L. BARKSDALE, PRESIDENT, THE BARKSDALE GROUP

**Mr. Barksdale.** Thank you, Mr. Chairman.

I have submitted my written testimony, and in order to keep the time brief, I will just summarize it, if that's okay.

Basically, I have addressed a portion of the new economy that we have labeled the Net economy or the Internet economy, which is this echo system which was discussed earlier in previous testimonies.

And I just wanted to explain a little bit, at least my understanding of why it's so powerful and what it's doing and what public policy issues that might raise for the Congress and for state and local governments, who are equally involved in these efforts.

The simplest definition of the Net economy is when all transactions and interactions are on line, what will the world be like and what will it do for us?

There are many effects of this, many great effects and some troubling effects, obviously.

Some of the more profound positive effects are in business and commerce, obviously, if you can reach customers through advertising and promotion, they can decide to buy your wares and then they can enter their orders online and pay for the product online.

You have a whole new way, a whole new medium of conducting business. And as was indicated earlier by Mr. Nicoll and others, this is an exciting new prospect for many new industries because it takes out the friction of business.

It makes it much quicker to go from seller to buyer.

Education. Marvelous new things being done in education. Many more things can be done, obviously.

Convening parent-teacher conferences, communicating between a teacher and a parent and a student about a student's progress, all through online new Web sites that are being built by various state governments, state educational groups and so forth, seem to have a great deal of promise and perhaps the highest and best use of the Internet and the Net economy is in the field of education and remote learning.

In medicine, we have whole new teams of people who collaborate online. Physicians and people with rare diseases for whole new treatment processes that have been very exciting to all of us.

Entertainment. Now the biggest drop in television viewing is blamed on the fact that the Internet use has gone up in households.

I don't know if this is good or bad, but it is a profound change and the first time in the history of that industry.

These new mediums and new technologies excite all of us and are making great changes, as Chairman Greenspan and others have testified earlier today.

A point here to make is that it came out of government research. We all know and have discussed the importance of basic research funding. It goes back to defense research funding in the '60s, with the creation of what we now call the Internet. And through ARPA.

And in the '80s, through the National Science Foundation funding of places like the University of Illinois National Center for Super-

Computing, which developed the first graphical user interface, or browser, that really made the Internet usable by mere mortals and no longer just academicians and researchers, which is why it became a great consumer phenomenon.

And then in the early '90s, in '92, the Congress allowed for it to go commercial and we dot-commed everything when we allowed the Internet to become a commercial entity.

So you have yourselves to either thank or blame for that.

(Laughter.)

Now we find many more things that are happening that are impacting all of us. The growth of this is enormous.

This University of Texas study mentioned earlier, a $300 billion. But it's doubling every nine months. That's twice as fast as Moore's Law because of the enormous impact of people-to-people and interactive communications.

The policies that we're most interested in have already been mentioned. I would also reiterate the encryption and the improved workforce issues and Y2K, thanks to Senator Bennett and others seems to be moving along nicely.

The one last point I would make is the whole Internet is a child of openness. It is because of open standards and connectivity that people finally got off their principles and connected everything together through an open network that was truly universal and global.

This open principle is certainly one that we all believe in and I trust that the Congress will allow the people in various parts of law enforcement and other area who are protecting this, allow them to ensure the benefits of openness to mankind.

And by that I mean to watch out for where the chokeholds are because when everything is connected, there is even more danger that someone or group or others may create chokeholds that inhibit and stifle innovation.

It's a great pleasure to be with you this morning and thank you for your wonderful work in this area.

Thank you, sir.

**Senator Mack.** Thank you, Mr. Barksdale.

Ms. Horowitz?

[The prepared statement of Mr. Barksdale appears in the Submissions for the Record.]

## STATEMENT OF SARA HOROWITZ, EXECUTIVE DIRECTOR, WORKING TODAY

**Ms. Horowitz.** Thank you for the invitation this morning.

I wanted to talk about high technology and the implications for this new work force that's being created.

I wanted to echo a few comments that were made earlier, that in fact, this is really the third biggest transformation in the way that people have been working in this country.

The first was the Industrial Revolution, where we really generated what we called craft-type work.

Then around World War I, we shifted to mass production, where we had jobs that were much more centralized, much more long-term.

And in each transformation, we really changed the ways that people were working.

And now, the third transformation is most notably with high-technology. And you can see that we're creating in fact a new way of work that tends to be much more short-term. It's much more decentralized.

People are just not connected to employers long-term the way they were before.

With the big manufacturing work place, most notably in the 1930s, we created a whole New Deal safety net that was attached to that manufacturing type of work.

Now, we have this new work force that's in fact 30 percent of the work force. It's just not fitting in to the 1930s way that we were talking about then.

So what I want to talk to you about today is a way we could support this work force that would also support the industry, so that we could encourage participation in the benefits that we're seeing Alan Greenspan talk about.

How could we have a new support system that would accept mobility and flexibility, but would also bring a wide range of workers with us?

First I want to say, what is this new work force that we're talking about?

We hear these numbers, and the numbers are really kind of sketchy because one of the things that we've heard over and over again is the changes that are happening are just happening so quickly.

But the best numbers that are around right now say that 19 percent of the work force is part time, 10 percent are independent contractors, and 2 percent are temps.

So you have about 30 percent of the work force that's short-term and not connected to an employer.

And why is that an issue?

Because one of the things that we're seeing is that we're looking at a rise of the working uninsured. We're looking at people who are not going to be covered by pensions.

We haven't developed a new delivery system for benefits to enable people to move around and go from job to job and project to project.

And if we were looking at what that new kind of support structure would be like, I think what we'd call it portability—portability of benefits and portability of protections.

So that as people can go from job to job, they can get pro-rated benefits. And that we have examples of this.

We have TIAA-CREF and the university system's portable pensions. We have the film industry.

The film industry is a perfect example for high-tech to look at as a model for just this sort of thing.

We saw that with our film industry, which has always been a very successful industry for us, we had the studio system, which was much more like the manufacturing workplace of the '30s. People made four or five movies in one year if they were lucky. They got their benefits and that sort of thing from the studio.

But around the 1970s, the film industry really changed and it became project to project.

And so, the Screen Actors Guild allowed the industry to become more flexible, but at the same time pro-rated these benefits.

So what Working Today has done is we've realized that this new workforce is not only creating a set of entrepreneurs in business, but also a set of entrepreneurs in nonprofit, union, community-based, and church-based sectors, of groups creating all sorts of associations and organizations.

We started linking these groups into a network. There are 25 organizations in our network. And those organizations have a combined membership of 93,000 people.

It's a very vast, new constituency of people talking about what they are going to need in this new economy.

And what we found when we spoke with the people in our network, the number-one issue was health insurance. Because the 43 million people who are uninsured, when you exclude those covered by Medicare and Medicaid, are really the working uninsured.

And what we're seeing is that, even in high-tech industries where people are really doing better than in many other industries in this

country, there are still so many who are either buying their safety net—that is, buying their health care, their pension, their child care, their unemployment insurance—and those who are just going without.

And so, what we did is we're starting a pilot project that is to create a portable benefit fund for high-tech people in New York City.

We're linking professional associations like the World Wide Web Artists Consortium of computer programmers, community-based groups, and employers with fewer than 20 employees who also are having a crisis of insuring the people who work for them.

We're creating a portable benefit system where people can take their benefits from job to job and project to project and get those benefits pro-rated if there's a contribution.

What we've discovered is that it's important that people can move around and take their benefits and legal protections with them. But the real issue is that we have to start thinking about creating a new delivery system for the things that we know have been important throughout this century.

And how are we going to enable business to be flexible, but at the same time to bring the workforce with them.

Thank you very much.

[The prepared statement of Ms. Horowitz appears in the Submissions for the Record.]

**Senator Mack.** Thank you very much for your presentation as well.

I'm going to turn to Senator Sessions. I think Mr. Barrett has a limited amount of time. So if you've got a question or so you want to toss his way, you might do that.

**Senator Sessions.** Well, I do. Mr. Barrett, thank you for being with us via our new medium.

I would like to discuss for a moment the question of the Y2K litigation. I'm concerned about that. I know you are.

I had an experience on the Judiciary Committee to deal with the asbestos company litigation. There were 200,000 asbestos cases that have been concluded, 200,000 pending, and some say another 200,000 may be filed.

Seventy percent of the asbestos companies are now in bankruptcy and only 40 percent of the money paid out by the asbestos companies actually got to the people who got sick.

So I am of a belief from a purely public policy point of view that we cannot allow our computer industry to be savaged by hundreds of thousands of lawsuits in every single county of America, clogging our courts, taking years to conclude, costing billions in legal fees.

I'm glad to see you mentioned it. Have you had a chance to review the legislation that's moving along? I'm hopeful we'll have a favorable result this week.

But do you have any comments on that?

**Mr. Barrett.** Well, first of all, I think that everyone in our industry recognizes the potential of real issues with the Year 2000 computer problems.

I think it behooves anyone who really has noncompliant hardware or software to attempt a fix.

Our main issue is, as you suggest, that we not clog up the courts and that we not tie down industry with frivolous litigation, that people have to show that there is real harm, and give companies the opportunity to fix noncompliant software.

And that if there is an issue of harm, that judgments be made on the basis of proportional contribution to that harm, not a joint and several liability.

We think the current legislation moving through the Senate, specifically the McCain-Dodd bill, is beneficial to the country as a whole and we would wholeheartedly support that.

**Senator Sessions.** Well, I think you're correct. I believe what we need to focus on is having our attention and effort and money go to fixing the problem rather than massive litigation.

I'm cautiously optimistic we'll have a good result on that this week.

Thank you, Mr. Chairman.

**Senator Mack.** Very good.

Mr. Dooley?

**Representative Dooley.** Thank you. Mr. Barrett, the recent attention that surrounded the release of the Cox Report and some of the breaches of security at our national labs has focused some attention on whether or not, which direction we ought to move in terms of technology transfer, in fact, export controls.

I'd be interested in hearing from you just in terms of China alone. How important of a market is that to Intel in terms of what you see happening in the growth that's going to occur there, both as it relates to export controls, as well as what policy this country should have in terms of moving forward with economic engagement with China with the WTO accession agreement.

**Mr. Barrett.** That's a fairly broad question. First of all, we would support engaging China as a member of the WTO with all of the issues that that carries with it. That is, respect for intellectual property, opening their own market, and distribution for goods and services.

Your specific question about how important is China as a specific market, my best estimation is, probably by the end of this year, China will be the second largest computer market in the world.

I think right now, they probably are number three behind the U.S. and Japan, but should pass Japan by the end of this year.

So they are going to be an increasingly important market, not just for companies like Intel, but computer companies and software companies as we move forward.

My comments in my earlier testimony were, on export control issues, targeted the fact that, today, a standard desk-top computer, of which tens of millions are sold each year, are right at the export limit controls.

So what we're attempting to do is to control the export of something which is as ubiquitous as a television set.

I think that that is extremely difficult.

The industry has no problem whatsoever with controlling high-performance computers. That is, the so-called super-computer class. The real issue is trying to control things like personal computers or television sets.

I think that that is an impossible task, to try to control something with that many units being shipped all around the world each year.

**Senator Mack.** Senator Frist?

**Senator Frist.** Thank you, Mr. Chairman. I want to just turn the conversation to the privacy issues.

A number of you have mentioned it and I would like to focus on it a bit because, as we look at what Mr. Barksdale said in terms of the University of Texas saying that the net economy will potentially double every nine months, which is twice as fast as chips and all were doubling back three or four years ago.

It does drive to a focus that I think we all have to be very sensitive to. And it does impact what we do in the United States Congress. And that is, addressing the issues of privacy, rights to privacy.

The conversation goes on into encryption, which we've mentioned as well. But I want to stop just short of that.

In medical records, we have legislation right now whereby, in August, we have to address issues of privacy, that doctor-patient relationship, who owns those medical records.

Once they do reach the level of the Internet where people can pull them down, what are the patient identifiers.

Mr. Nicoll, in your field, I'm sure the whole third-party verification possibility will bring in additional costs which might affect commerce.

Mr. Barksdale, in your written testimony, you talk also about privacy. In fact, you open in terms of important policy considerations, your number-one issue is privacy itself.

All of us in terms of e-commerce, the immediacy of it, of being able to look and compare and buy, all within about 30 seconds, is something that we've never seen before.

But before we give that credit card number out, I have a great hesitancy today in terms of where that is going to be used, how it is going to be used.

Will it be used against me in some shape or form?

Today, we've relied a great deal on, and the field has been accelerated, I think, over the last year, how the private sector is responding to those privacy concerns.

On a lot of the initial Web sites, the first thing you see is a privacy understanding which you can sign or which you can read. And they seem to be improved almost on a daily basis because you'll pull it up a week later, and you can see that there are different paragraphs and it looks the same.

So a lot of being done.

But let me just ask anybody on the panel to comment on how the privacy issues, where the juncture comes between what's going on in the private sector, the commercial sector, with what we do as legislators, how you see that evolving.

Is it something that we should be focusing more or less attention on?

Mr. Nicoll, I guess we can start with you.

**Mr. Nicoll.** Well, for my industry, it's interesting to see in the papers, for instance, that Bank of America recently has made a decision not to disclose financial information to third parties who it previously sold that information to.

The brokerage industry historically has not shared personal financial information with third parties. It has viewed that information as strategic.

I think that that will continue. It's important to a customer coming to Datek Online to know that the information in his or her account is private and confidential.

We make a pledge of that to all of our customers. But we do it for good business reasons. And I think that banks, for instance, will increasingly, as we move into a friction-free environment, that we will come to understand that this information is strategically extremely important and valuable and that institutions like Bank of America will see

that it's in their business interest to keep that information private and confidential.

We certainly do. The brokerage industry as a whole historically has had a practice of doing that.

**Senator Frist.** Mr. Barksdale, the European Union has looked at third-party verification that requires a fairly heavy bureaucratic oversight.

Is that something that we should be looking at?

**Mr. Barksdale.** No, sir—well, you should be looking at it, probably. I don't know that you need to act on it right now.

I think what's happening, as was indicated, the industry realizes the severity of this problem and knows that it will not continue to grow at the rates that it has if it can't protect the privacy of data and information supplied by people.

And just in the last year, I think Mr. Gerstner pointed out, as others, the number of those trustee sites, is what you're referring to, that we have gotten people to adopt and put on their sites that clearly defines their policy, has exploded.

A year ago, there probably weren't more than a few dozen. Today, it's the vast majority of the sites that have this because the industry realizes the importance of this.

I would also offer, though, encryption is another form of increasing privacy and better U.S. encryption products can go in that direction.

And new programs, not just in privacy, but decency and parental control. You've seen a lot of industry coalescence around that. There's a new one-click program that Microsoft and AOL and IBM and just a host of companies recently adopted to be brought up by July so that parents can go and see all the things to protect them and their children from things that they do not want them seeing.

This was a result, in large part, from the Littleton tragedy.

We're all learning as we go. I don't know that it's necessary for legislation at this moment on it, but certainly, it's one of the subjects that this conference should become more aware of, and the Congress and others should take the time necessary to understand it and not just react quickly.

It was just announced today, a whole new payment mechanism for wallets. You're concerned about your credit cards. Well, I think we've got that covered now, Doctor. We've got some new ways of doing that because we realize that if we can't do those things, people won't give us their credit cards.

And so, the open market, I think, will address most of these issues. And then you folks can take up the slack.

(Laughter.)

**Senator Frist.** Thank you.

Thank you, Mr. Chairman.

**Senator Mack.** Representative Eshoo?

**Representative Eshoo.** Thank you, Mr. Chairman. I want to particularly thank you for extending an invitation to those of us from the other side of the aisle, and Members of the House on top of it.

So we really appreciate it.

I think with all the issues that the participants here this morning giving their outstanding testimony, that these are issues that go beyond political parties.

Just as the Internet knows no boundaries, these issues know no political boundaries. And so, I want to salute you for extending your hand across the aisle to us.

To Mr. Barrett and some of the comments that you made earlier about export controls.

Can you tell us what M-TOP level you believe is an accurate level to control? Can you be specific about that?

**Mr. Barrett.** If you look at what I would call high-volume desktop computers, if you were to raise the M-TOP level to, say, 2000 M-TOPs, that would cover most of the standard desktop computers for the next six or nine months.

That's still quite different from the range of M-TOPs, millions of theoretical operations per second, which you find in a super-computer, which are up in the basically millions of M-TOP ranges.

As we've been talking about whether you talk about Internet commerce or Moore's law and you double something every year or so, the current level of 1200 M-TOPs is pushing right at the limit of where we have desktop computers today.

Two thousand M-TOPs would take that for another nine months or so. But I think that there's a huge range between that limit and what we would call a super-computer, something that you would use to do nuclear simulations, which are up in the hundreds of thousands or millions of M-TOP range.

**Representative Eshoo.** Well, I very much appreciate your answer because I think there's a blurring between the two issues in the Congress.

One of the strongest emotions for human beings is fear. I know while our law enforcement agencies, with great legitimacy, have tried to point out what we should fear, I think that there's been an overlay cast over both of these issues and that there is a difference between what you just pointed out and then the whole area of super-computing.

So I appreciate your answer and I hope it will be helpful to us as we move on to try to resolve this as a national policy.

Thank you.

**Senator Mack.** Thank you.

Senator Bennett?

**Senator Bennett.** Thank you, Mr. Chairman.

I again would love to exchange conversation with all of our witnesses on a bunch of issues.

Ms. Horowitz, I very much would like to talk to you about how we amend the tax laws in order to increase affordability of benefits.

And one of the things I keep trying to convince my friends on the Finance Committee of is that these are not, quote, benefits, unquote, bestowed by an employer. This is compensation earned by the employee. And the employee ought to be able to control how it is spent.

So the employee ought to be able to say, that's my money you're putting into a health insurance policy and I should decide where it goes. And furthermore, take it with me when I move along.

That's not your money that you're in a beneficent way bestowing upon me as some kind of gift.

I earned it. I ought to be able to control it.

And once we can get over that mentality, we can go a long way in the direction.

But I will resist getting into that one and move more—we can talk about that later—move more to an issue perhaps more directly with high tech, and that's the cable access issue.

Mr. Barksdale, I appreciate your willingness to indulge my fantasies and interests in high-tech areas before. You've come to Utah and been very responsive.

I'd like you to take this one and tell us what we need to know about the cable access issue.

**Mr. Barksdale.** Well, the issue is that, in most cases, a locally-granted monopoly, a physical monopoly of cable carriers to have access to your homes. It wasn't deemed appropriate to have multiple cable companies digging up your backyard, so they just allowed one trench.

And now that we find that it's a marvelous medium for carrying high-speed access to the Internet, with a lot of great work by many companies in the country, including at home at others, it's become obvious, though, that it could be one of these choke points that I mentioned because if I can get multiple Internet service providers over my telephone line, why shouldn't I have the same freedom over my television or cable line.

And that's the essence of the issue and I think there are many of us who think that you should have the same sort of open access to cable that you have for your telephone line and that content, which certainly can be provided by the cable carriers if they choose, but that there should be

other people allowed to compete for that content that goes into your home.

**Senator Bennett.** Are we looking at a time when the technology makes it possible for voice to be free?

**Mr. Barksdale.** I certainly believe we are.

**Senator Bennett.** Doesn't that give AT&T very sleepless nights?

**Mr. Barksdale.** Oh, I worry about a lot of people; AT&T isn't one of them.

(Laughter.)

They seem to be doing all right. I don't know what you mean by that.

Of course, I've been in a business where my product was made free by one of my competitors and we went into other things.

I think that, obviously, if it can be reduced in cost, that is the benefit of technology, not a threat. And that the consumer gets more for less, which was, after all, what we were trying to accomplish.

It also could help resolve the lack of competition in the local or regional operating company geographies in the company that were envisioned by the '96 Telecommunications Act.

**Senator Bennett.** Ultimately, doesn't the home want one source of access, just as it currently has one source of power?

**Mr. Barksdale.** One source or one—

**Senator Bennett.** One outlet. One black box. One thing on the roof, whatever it is to a layman, through which all of it goes.

Right now, if I have a computer upstairs and my son has a computer downstairs, we need two telephone outlets or two cable connections or something. We can't put it all on one.

**Mr. Barksdale.** Well, I'll show you a way to do that with a home hub, sir.

**Senator Bennett.** Okay.

(Laughter.)

**Mr. Barksdale.** In my house, we just have one telephone connection. But I do get your point.

I think there would be some households that would like that, yes, and others that wouldn't.

Why not let them decide? Give them the opportunity. And that to me implies more choice, not less.

But I do agree that there's a need in home systems that they be made simpler so that more people would use them.

**Senator Bennett.** I see. And my time is done.

Thank you.

**Mr. Barksdale.** Yes, sir.

**Senator Mack.** I've decided to take my time to ask a question that has come over the Internet. And what is interesting is that the folks who have been engaged in this discussion via the Internet have learned, as members of the Congress have, to try to get as many questions into one burst of transmission.

(Laughter.)

So I'm going to toss this out and anybody can respond to it that would like.

It says—as our country/world economy prepares for the next century—how will the advancements in high technology affect the definition of the work place and family life as we know it today?

Additionally, what policies can be enacted to ensure uniformity and compatibility of new technologies?

How will electronic commerce be a formative competitor to traditional face-to-face purchasing?

And how will it affect local and state governments who rely on the sales taxes to fund many of their programs and services to their constituents?

As I said, we covered a lot of territory there. And again, I direct that to anybody who wants to respond to it.

**Ms. Horowitz.** I've love to start with just the beginning rather than try and find a theme in that question.

**Senator Mack.** That would be fine.

**Ms. Horowitz.** I think what's interesting is that if you look historically, we spoke earlier about the change from the agrarian economy to the Industrial Revolution, and that was tumultuous. It really changed the fabric of society. And we created organizations that made sense at that time to start getting people the things that they needed.

We had a progressive movement. We had craft type of unions. And we had the same kind of changes, again, with the manufacturing, mass-based production. And we created again—the New Deal came about 20 years later.

And I think that the best way to answer that question is to see that, as business is changing, it's really like 20 years that it takes us to start figuring out what exactly are the institutions that we need to have in place to ensure that we have widespread sharing of that.

And I think that that's where we start seeing this crisis for a certain part of this work force that's seeing that they are working too hard. A third of this work force is ineligible for unemployment insurance. That child care is just becoming a huge expense and making it very difficult for families.

So I think that we have to start looking at the organizations that our democracy should be creating to deal with a lot of the change that we're seeing.

**Senator Mack.** Anyone else want to respond?

**Mr. Nicoll.** Yes. There are a couple of things in there that I could respond to.

Number one, I think it's important to understand that what's really happening, and it's especially illustrated in my segment of the online industry, is that we're really creating a friction-free environment, allowing people and empowering exchange.

And as we all learned in sort of Economics 101, one of the powers of capitalism is that when people exchange goods and services between themselves, everybody benefits because I give to you what you value more than me. In return, you give to me what I value more than you.

And we eventually get to a state called parieto optimalady where each of us owns goods and services which we create the most value from.

It's important to see the new economy as one that empowers exchange and really gets the most out of this fundamental aspect of the capitalist society.

The online brokerage industry has reduced transaction costs dramatically over the past two years. In the matter of two years. It's an industry that didn't exist two years ago.

I used to run one of the largest discount brokerages in the United States. When I left that firm in 1995, we were charging an average of $50 a transaction, which we thought was pretty good since Merrill was charging $200.

Well, Datek Online charges $10. So that's an 80-percent reduction in a two-year period of time. That's a very powerful impact.

And this whole notion of exchange and reducing transaction costs and putting goods and services in the hands of—in its most productive hands, is a powerful element of the new economy, I think.

**Senator Mack.** Mr. Barksdale?

**Mr. Barksdale.** On the issue of state and local taxes that was part of that question, the person who asked the question should be advised that we were just now getting started with the advisory commission on electronic commerce. It's part of the Tax Freedom Act, the Internet Tax Freedom Act that gave sort of a three-year moratorium to study this.

But, obviously, funds that are expended at the state and local levels that are collected from sales taxes need to be replaced.

I think that what makes sense, though, is if we're going to do this, let's do it in a way where you can have a uniform collection process for taxes, just like we have a uniform commercial code, so that every small

electronic business doesn't have to come up and be compliant with 50 states and however many counties and cities and local tax authorities there are in this country.

Why don't we just come up with one uniform way to do it? But that's my personal opinion. I'm sure they're going to get more into it.

I recently got off of that commission in order that one of the local government people could get on it so that they could express their need for these tax dollars.

**Senator Mack.** Very good I have one additional question to toss out.

Recently, an FTC commissioner suggested—in fact, it was last week—that we may need to regulate the Internet.

Again, what kind of reaction do you have?

And I realize that that's an incredibly broad question -- what does it mean? What did that person mean to regulate the Internet?

But does anyone want to respond to that?

**Mr. Nicoll.** I'd be happy to. I think it would be a mistake. I think that nobody knew the power—

**Senator Mack.** Let me hop in for a second.

That person could have just been saying, well, we need to do something about privacy, but maybe you're suggesting that the privacy ought to be done by those of you who are engaged in the Internet.

**Mr. Nicoll.** I wouldn't be against—I would agree with Jim that the market will take care of itself with respect to privacy. And to the extent that it doesn't, then there might be room for government to act.

But I would be cautious about stepping in now before we've sorted that out.

I would especially be cautious about trying to regulate an industry that none of us really has an idea where it came from and where it's going over the next three years.

This is a powerfully dynamic development, the kind of command and control outlook that is part and parcel of regulation.

I think it would be an enormous mistake to undertake.

**Senator Mack.** Let me suggest one more thing before we close. Again, I want to thank you all, plus those who participated earlier. Thank you very much for your participation.

I would just say that you still have five members here. It's not every day that you get a chance to kind of give that last little point that you might want to get across as to how the Congress ought to be responding to your concerns.

And so I would say, if there's an additional comment that you would like to make, have at it. I would try to keep it short.

**Senator Bennett.** Let me comment before they do start, how unusual it is to have five members here at the end of a three-hour session.

It's a demonstration of how important the issue is that, aside from the Chairman, you have balance, both bicameral and bipartisan.

**Senator Mack.** Mr. Barksdale?

**Mr. Barksdale.** I would just offer two comments.

One is I want to reiterate all of the earlier comments about the need for improved K through 12 educational efforts. That is the number-one priority, I think, of anybody you talk to in our industry. And it's got a lot of very good and wholesome support and now is the time, whatever we can do.

And I recognize that an awful lot of that is at the state and local levels. We have some ideas on that in TechNet and other places.

And the other is to reiterate the point that I made about the importance of understanding and supporting the concept of openness.

It's open connectivity that created the Internet. It's users who create uses which create users.

You can't size a bridge by counting the swimmers. So let it go.

Now there are going to be occasions where choke holds and choke points happen, and that is maybe a place for regulations or at least effective enforcement of the anti-trust provisions, or whatever becomes necessary.

But I don't think right now we need to act on any more regulations than we have. And I agree with the point made earlier on that regard.

But I do think that there is certainly a need to appreciate the value of open standards and open communications and what that means and how powerful it is.

**Senator Mack.** Very good.

Anyone else?

(No response.)

If not, thank you all for your participation.

**Mr. Barksdale.** Thank you.

(Whereupon, at 12:30 p.m., the Committee recessed, to reconvene at 9:30 a.m., on Tuesday, June 15, 1999.)

PREPARED STATEMENT OF SENATOR CONNIE MACK, CHAIRMAN

Good morning and welcome to the Joint Economic Committee's "National Summit on High Technology." This three-day summit will highlight, explore, and advance issues important to this critical and fast-growing sector of the economy.

We have heard a lot of good news about the U.S. economy recently—unemployment is at a 29-year low, GDP has been growing at over 4%, and the stock market is at record highs. But the most exciting news on the economic front has been the incredible advances that are being made in America's high-technology industries. New medicines, faster computers, and new applications for the Internet seem to be announced every week.

As Chairman of the Joint Economic Committee, my role is to focus attention on the right policies to keep the economy energized. Our distinguished panels over the next few days will help us understand what Washington can do—and what it should avoid doing—to make sure that high-technology continues to thrive.

The U.S. has the largest and most successful high technology companies in the world. Our software, semiconductor and biotechnology companies - to name a few - dominate world markets. In fact, this country has the highest share of high-tech manufacturing, relative to total manufacturing, of any country. Look at biotechnology - American biotech companies have revenues five times greater than all the biotech firms in Europe combined. Or the Internet - the U.S. dominates the Internet with twice as many users as Europe, and is home to 64% of the world's Internet "host" computers.

Why does the United States lead the rest of the world in so many of these new Knowledge Industries? The vitality of high-tech in this country reflects our economy freedom. It is also a tribute to the creative and entrepreneurial genius of thousands of individual businesspeople, scientists, and engineers who took great risks with uncertain rewards.

We have entered the era of the Innovation Economy — a system in which we see as never before the value of the idea ... whether that idea takes the form of a superior technology, superior service or superior process for bringing products to market. Today, more than ever before in our history, brain power is being valued as the engine of economic growth.

I see this new economy as a kind of continuum - a logical progression rooted in the freedom that sets our country apart:

Freedom leads to Knowledge ...
Knowledge leads to Innovation ...
Innovation leads to Capital Formation ...
Capital Formation leads to New Products ...
New Products lead to New Jobs.

It's a virtuous cycle which has produced immeasurable blessings for men and women all across the globe. It has lifted millions out of poverty. It has stretched the limits of human achievement. And it will generate benefits tomorrow that we cannot begin to comprehend today.

That's the way our free market system works — it's the mainspring that sets our economy in motion. Michael Rothschild -- one of the most path-breaking thinkers on the new economy — asks us to think of the economy as an ecosystem: An organic entity that must be allowed to function and flourish without outside interference. Think of how far removed that concept is from the traditional command-and-control paradigm that's shaped so much of our Government's economic policy in the past.

We are now faced with the challenge of "De-Inventing Government" — to get it out of the way before it stifles the Innovation Economy that has made America the world's preeminent economic leader.

Because here's the thing about an Innovation Economy: It doesn't just generate wealth — it generates progress.

What does all that have to do with Washington? It's a reminder that we need to maintain policies that give the strongest possible support to innovation. We ought to quit playing games, for instance, with the federal R&D tax credit — extending it a year at a time, allowing it to expire and then bringing it back to life again. That's wrong — because it's counterproductive: No company can plan and invest for the long-term against a policy that changes every 12 months.

That inefficiency impedes innovation — and that hurts all of us.

Why is it so crucial that the United States remain dominant — to be the center of influence in the 21st century? The first reason is rather obvious: if we're the center of influence, then it's fairly easy to draw the conclusion that we will be able to enhance the standard of living for our children and grandchildren.

But I think the issue goes deeper than that. A great nation has to set itself on a course to achieve something greater than itself. We are a nation of people who have thrived because of our beliefs in freedom, justice, human rights and capitalism. And we are committed to exporting

these ideas and principles around the world. So what we are involved in is vital to the kind of future and legacy we will leave behind.

We've already begun to live in a new economy.

An economy in which one billion computers move $1 trillion dollars, all with the click of a mouse ...

An economy in which one company generates as much wealth as an entire country ...

An economy in which a key communications system of the future is designed by three kids on a PC in someone's spare bedroom ...

If that sounds intimidating — it really shouldn't. After all, listen to the way we speak about the new economy. The accent is on innovation. And as a result of our freedom to innovate and create, we are able to out-perform, out-produce, out-compete and out-create anybody anywhere on the planet.

Our job is to get the big things right: It's up to government to create an environment that allows the private sector — that allows each and every person — to innovate as only he or she can, to exercise the entrepreneurial spirit that urns innovation into jobs and GDP.

That's the genius of free enterprise.

That's the genius of America.

For more than two centuries, it's what helped make America the envy of the world. Now, as we approach the new Millennium — it's what will make the next century a new American Century as well.

## PREPARED STATEMENT OF SENATOR EDWARD M. KENNEDY

I commend Chairman Mack, Ranking Member Stark, and other members of the Joint Economic Committee for organizing this National Summit on High Technology. It's an honor to be part of this effort to discuss the critical role of technology for the future of our economy, our country, and our planet.

Turning ideas into new products and moving those products to market has always been the lifeblood of economic growth and social progress. The transformations that the information age are bringing to us are obvious for all to see. The rapid growth of high tech has made it the nation's third largest employer, with 4.8 million workers.

These trends are mirrored in my home state. Massachusetts' high-tech companies employ over 300,000 residents. Most of the firms leading our state's economy are new and relatively small. Nearly 40 percent have been launched since 1990. Annual sales currently total about $47.5 billion — approximately 13 percent of sales in the state economy.

High technology has excelled in Massachusetts for several reasons. Most important is our highly skilled workforce, which is attracting business from around the country. But standing pat means falling behind. High tech is not only supplying the jobs, but is revolutionizing education and training.

Technology skills are no longer a luxury — they're a necessity. Without knowledge of computers and the Internet, today's students will have great difficulty competing in tomorrow's economy. Used effectively in the classroom, modern technology can level the playing field and open extraordinary new horizons and opportunities for students.

That is why a partnership of business and labor have been working in Massachusetts to connect our schools to the Internet. With contributions of over $35 million including equipment from our high technology firms — many of them small companies — and the hard work of 20,000 volunteers, in three "Net Days" we have connected over two-thirds of Massachusetts' school districts to the Internet. Together we are working to complete the job of connecting 100 percent of our districts as we move into the next century.

We must also train our teachers in the use of this technology. Boston is a model for the nation with 80 percent of teachers trained in using computers as tools in the classroom. We must make the same commitment for the students of our nation.

We must work hard to combat a "digital divide" in which segments of our population lack access to high technology and the opportunities it provides. I urge my colleagues to support full funding of the E-Rate

program, to reduce the cost of access to telecommunications and technology by our schools and libraries. Massachusetts is currently the #1 recipient of E-Rate funds in New England, with $29 million in awards so far. The E-Rate program is critical to ensure that all of our students have access to these vitally important tools.

We are now reaping the benefits of investments made twenty years ago in basic research. Those investments, which led to development of the Internet, communications technology, and advances in computers, have led to the longest peacetime expansion in U.S. history.

While I am pleased that we are convening this high tech summit, we must do much more. I am concerned that we are celebrating the growth of high tech yet my colleagues across the aisle are proposing draconian cuts into our nation's research and development budget. I would hope that this Congress will be more forthcoming in its support of investment into research and development.

A good beginning is the Information Technology for the 21st Century Initiative being proposed by President Clinton and Vice President Gore as part of their FY 2000 budget. That proposal calls for a $1.7 billion investment by the federal government next year in information technology research — a 28 percent increase from last year.

Three kinds of research would be covered — basic research seeking new breakthroughs in computing and communications; applied research seeking to use new technology in innovative ways, such as the design of cleaner, more efficient engines; and research into the social and economic implications of technology.

These federal investments are essential. Much of America's technological leadership today has been stimulated by previous federal R&D expenditures, and we need to continue and strengthen these investments as a top national priority.

We must also support those smaller companies that are contributing so much to our economy. In Massachusetts, the transforming power of technology has been seen in the number of smaller companies making a big difference. They are doing a great job, but we must encourage them to continue to invest. We must support them by making the Research and Experimentation tax credit permanent. The credit has proven successful in encouraging investment by private industry. But the on-again-off-again quality of the current credit denies these small companies the certainty needed to make these continuing investments.

I'm sure that the three days of sessions scheduled this week for the Summit will give all of us many more ideas of the proper role of government in maximizing the benefits of the high tech revolution.

It's an honor to join in welcoming all of our witnesses here today, and I look forward to listening to their testimony. Thank you very much.

**PREPARED STATEMENT OF REPRESENTATIVE ANNA G. ESHOO**

Thank you Senator Mack and Congressman Stark for inviting me to participate in this hearing, and let me welcome the participants and thank them for appearing before us.

I don't believe there is another member of Congress who has as many constituents appearing before this committee. Most of the companies represented here have an address in my district in California which includes Silicon Valley. When I travel home, I often visit the management and employees of these companies. So rather than this hearing aspiring to an "unprecedented" status, I hope it can instead be the continuation of a dialogue many of us have been having for some time.

Mr. Chairman, the Internet is changing business — and the way we do business. These companies are busy expanding the Internet and E-commerce at an explosive pace. Last week, a University of Texas study reported the Internet economy generated over $300 billion in U.S. revenue. In just five years since the commercial introduction of the World Wide Web, the Internet sector rivals the automobile and telecommunications industries in existence for nearly a century.

As legislators we must amend outdated laws the impede this new age of growth, while protecting important principals of fairness. More importantly, as public policy makers we must be open to new ways of thinking in order to create the conditions in which innovation can flourish.

Everything — from the accounting standards that determine the financial health of these companies, to how we educate our children to participate in this new era of opportunity is subject to review.

Silicon Valley owes its success to the principal that failure is not bad. These industries have thrived because they know failure can in the end signify progress. One cannot think "outside of the box" without encountering failure. Now, can you think of a concept any more foreign than that here in risk-averse Washington.

Mr. Chairman, that however is the challenge before us. As public policy makers we must think outside of the box. Partisanship and politics guarantees failure — and not the type of failure that brings forth progress, but the kind of failure that guarantees a slow descent to second-rate economic status for our nation.

Once again, my thanks both to Rep. Stark and Sen. Mack for convening this hearing, and I look forward to hearing the speakers.

PREPARED STATEMENT OF THE HONORABLE ALAN GREENSPAN

Something special has happened to the American economy in recent years.

An economy that twenty years ago seemed to have seen its better days, is displaying a remarkable run of economic growth that appears to have its roots in ongoing advances in technology.

I have hypothesized on a number of occasions that the synergies that have developed, especially among the microprocessor, the laser, fiber-optics, and satellite technologies, have dramatically raised the potential rates of return on all types of equipment that embody or utilize these newer technologies. But beyond that, innovations in information technology — so-called IT — have begun to alter the manner in which we do business and create value, often in ways that were not readily foreseeable even five years ago.

As this century comes to an end, the defining characteristic of the current wave of technology is the role of information. Prior to this IT revolution most of twentieth century business decisionmaking had been hampered by limited information. Owing to the paucity of timely knowledge of customers' needs and of the location of inventories and materials flows throughout complex production systems, businesses required substantial programmed redundancies to function effectively.

Doubling up on materials and people was essential as backup to the inevitable misjudgments of the real-time state of play in a company. Decisions were made from information that was hours, days, or even weeks old. Accordingly, production planning required costly inventory safety stocks and backup teams of people to maintain quality control and to respond to the unanticipated and the misjudged.

Large remnants of information void, of course, still persist, and forecasts of future events on which all business decisions ultimately depend are still unavoidably uncertain. But the recent years' remarkable surge in the availability of real-time information has enabled business management to remove large swaths of inventory safety stocks and worker redundancies, and has armed firms with detailed data to fine-tune product specifications to most individual customer needs.

Moreover, information access in real-time — resulting, for example, from such processes as checkout counter bar code scanning and satellite location of trucks — has fostered marked reductions in delivery lead-times on all sorts of goods, from books to capital equipment. This, in turn, has reduced the relative size of the overall capital structure required to turn out our goods and services.

Intermediate production and distribution processes, so essential when information and quality control were poor, are being bypassed and

eventually eliminated. The increasing ubiquitousness of Internet web sites is promising to significantly alter the way large parts of our distribution system are managed.

The process of innovation goes beyond the factory floor or distribution channels. Design times have fallen dramatically as computer modeling has eliminated the need, for example, of the large staff of architectural specification drafters previously required for building projects. Medical diagnoses are more thorough, accurate, and far faster, with access to heretofore unavailable information. Treatment is accordingly hastened, and hours of procedures eliminated. In addition, the dramatic advances in biotechnology are significantly increasing a broad range of productivity-expanding efforts in areas from agriculture to medicine.

Economists endeavor to describe the influence of technological change on activity by matching economic output against measurable economic inputs: quality adjusted labor and all forms of capital. They attribute the fact that economic growth has persistently outpaced the contributions to growth from labor and capital inputs to such things as technological innovation and increased efficiencies of organizations that are made possible through newer technologies. For example, since 1995 output per labor workhour in the nonfarm business sector — our standard measure of productivity — has grown at an annual rate of about 2 percent. Approximately one-third of that expansion appears to be attributable to output growth in excess of the combined growth of inputs.

Of course, it often takes time before a specific innovation manifests itself as an increase in measured productivity. Although some new technologies can be implemented quickly and have an immediate payoff, others may take years or even decades before achieving their full influence on productivity as new capital is put in place that can take advantage of these creations and their spillovers. Hence, the productivity growth seen in recent years likely represents the benefits of the ongoing diffusion and implementation of a succession of technological advances; likewise, the innovative breakthroughs of today will continue to bear fruit in the future.

The evident acceleration of the process of "creative destruction," which has accompanied these expanding innovations and which has been reflected in the shifting of capital from failing technologies into those technologies at the cutting edge, has been remarkable. Owing to advancing information capabilities and the resulting emergence of more accurate price signals and less costly price discovery, market participants have been able to detect and to respond to finely calibrated nuances in consumer demand. The process of capital reallocation has been assisted

through a significant unbundling of risks made possible by the development of innovative financial products, not previously available. Every new innovation has suggested further possibilities to profitably meet increasingly sophisticated consumer demands. Many ventures fail. But that few that prosper enhance consumer choice.

The newer technologies, as I indicated earlier, have facilitated a dramatic foreshortening of the lead-times on the delivery of capital equipment over the past decade. When lead times for capital equipment are long, firms must undertake capital spending that is adequate to deal with the plausible range of business needs likely to occur after these goods are delivered and installed. In essence, those capital investments must be sufficient to provide insurance against uncertain future demands. As lead times have declined, a consequence of newer technologies, firms' forecasts of future requirements have become somewhat less clouded, and the desired amount of lead-time insurance in the form of a reserve stock of capital has been reduced.

In addition to shortening lead-times, technology has increased the flexibility of capital goods and production processes to meet changes in the demand for product characteristics and the composition of output. This flexibility allows firms to deal more effectively with evolving market conditions with less physical capital than had been necessary in the past.

Taken together, reductions in the amount of spare capital and increases in capital flexibility result in a saving of resources that, in the aggregate, is reflected in higher levels of productivity.

The newer technologies and foreshortened lead-times have, thus, apparently made capital investment distinctly more profitable, enabling firms to substitute capital for labor and other inputs far more productively than they could have a decade or two ago. Capital, as economists like to say, has deepened significantly since 1995.

The surge in investment not only has restrained costs, it has also increased industrial capacity faster than the rise in factory output. The resulting slack in product markets has put greater competitive pressure on businesses to hold down prices.

Technology is also damping upward price pressures through its effect on international trade, where technological developments and a move to a less constrained world trading order have progressively broken down barriers to cross-border trade. All else equal, the enhanced competition in tradeable goods enables excess capacity previously bottled up in one country to augment worldwide supply and exert restraint on prices in all countries' markets.

Because neither business firms nor their competitors can currently count any longer on a general inflationary tendency to validate decisions to raise their own prices, each company feels compelled to concentrate on efforts to hold down costs. The availability of new technology to each company and its rivals affords both the opportunity and the competitive necessity of taking steps to boost productivity. This contrasts with our experiences through the 1970s and 1980s, when firms apparently found it easier and more profitable to seek relief from rising nominal labor costs through price increases than through cost-reducing capital investments.

The rate of growth of productivity cannot increase indefinitely. While there appears to be considerable expectation in the business community, and possibly Wall Street, that the productivity acceleration has not yet peaked, experience advises caution.

As I have noted in previous testimony, history is strewn with projections of technology that have fallen wide of the mark. With the innumerable potential permutations and combinations of various synergies, forecasting technology has been a daunting exercise.

There is little reason to believe that we are going to be any better at this in the future than in the past. Hence, despite the remarkable progress witnessed to date, we have to be quite modest about our ability to project the future of technology and its implications for productivity growth and for the broader economy.

A key question that we need to answer in order to appropriately evaluate the connection between technological innovations and productivity growth is why have not the same available technologies allowed productivity in Europe and Japan to catch up to U.S. levels. While productivity in some foreign industrial countries appears to have accelerated in recent years, a significant gap between U.S. productivity and that abroad persists.

One hypothesis is that a necessary condition for information technology to increase output per hour is a willingness to discharge or retrain workers that the newer technologies have rendered redundant. Countries with less flexible labor markets than the United States enjoys may have been inhibited in this regard.

Another hypothesis is that regulations, systems of corporate governance, trade restrictions, and government subsidies have prevented competition from being sufficiently keen to induce firms in Europe and Japan to take full advantage of the efficiencies offered by the latest advances in information technology and other innovations.

Further investigations will be necessary to evaluate the importance of these possible influences. But at this stage, one lesson seems reasonably clear. As we contemplate the appropriate public policies for

an economy experiencing rapid technology advancement, we should strive to maintain the flexibility of our labor and capital markets that has spurred the continuous replacement of capital facilities embodying older technologies with facilities reflecting the newest innovations. Further reducing regulatory impediments to competition, will, of course, add to this process. The newer technologies have widened the potential for economic well-being. Governments should seek to foster that potential.

PREPARED STATEMENT OF LOUIS V. GERSTNER, JR.

Mr. Chairman, I would like to thank you, Senate Majority Leader Lott and Senator Bennett for providing this forum and for the opportunity to participate in this important discussion. I am here, we are all here, to talk about a revolution. It emanates from the relentless advance of information technology. And it draws sustenance from a new development -- the long-awaited merger of computing and communications to create what we hear called a networked economy, or networked society.

But my message today is that the real revolution is not about technology. It is not about a new model of computing based on the Internet. We are witnessing nothing less than the rise of a digital economy and a new global medium that will be the single most important driver of business, economic and social change in the coming century. It will alter the way we teach our sons and daughters, care for our aged, reach out to the disabled and homebound, and enlighten the isolated and disenfranchised. It is our best hope to close the "digital divide" that exists today between the rich and the poor. And it will exert new pressures on existing geopolitical structures... and all their underlying economic assumptions.

A world connected by global networks has more fluid borders. It will challenge the very notion of the nation-state, shift the ways democracies behave, fundamentally alter the challenges of national security, and create the first global venue for debate and decisions on issues that affect all the world's people. You might think of it as elevating the concept of the town meeting to a world stage.

Five years ago, using the Net to buy a car, or trade a stock, or earn college credits was revolutionary. So why not envision a day when we vote with much greater convenience -- from our home or workplace. Or a day when issues are presented to all the people of the world and we vote as a global statement of individual preference without regard for conventions like political parties, or national borders?

I am completely convinced that all this is possible. It is not inevitable, but it is certainly possible and attainable, provided we make smart decisions, and importantly, benefit from thoughtful, insightful leadership in the public and private sectors. Because this is one of those transformations that comes along once every hundred years or more and changes all existing models in profound, and permanent ways.

We've seen this before. The printing press: the proliferation of knowledge and the subsequent end of the Middle Ages. The automobile, a

redefinition of the concept of distance, the restructuring of metropolitan communities, and the relationship between the workplace and the home.

As with all world-altering technologies, this will take a while. We're probably about 5 years into a 30-year cycle of transformation. But there is simply no doubt that 25 years from now, when people reflect on the seminal changes of the early days of the century we are about to begin, the impact of networked computing will stand in relief.

I think I can safely assume that most members of this committee have a view of this networked world that begins with its impact on the consumer. On the home user. With applications for news, entertainment, or chat. That's understandable. Because that's where the bulk of the interest and attention has been concentrated.

Let me try to frame the economic, social and governmental implications of what's happening. We're headed for a day when we'll have hundreds of millions of people -- perhaps a billion -- connected to one another and to all of the world's leading institutions and enterprises. Next, and in the not too distant future, we'll add to this mosaic of connections, computing and communications perhaps a trillion intelligent devices -- from intelligent cell phones and smart cards, to cars, household appliances, medical devices, or vending machines. The technology will literally become pervasive -- disappearing into the infrastructure of the home, the workplace, the world.

Today, most estimates say there are around 150 million people using the Net worldwide, and the growth rates <u>are</u> astounding. One projection says 62,000 new users will come online every day over the next few in the U.S. alone. Even at that rate, most of the growth is occurring outside the U.S.

To date, the U.S. has been the beneficiary of most of the economic growth generated by e-business. But the rest of the world is moving fast to close the gap. At the end of last year, 11 nations other than the U.S. had at least 10 percent of their populations using the Web. China, a country that's just now joining the world economy, already has one-and-a-half million people on the Net. And sometime this year -- it may have already happened -- we'll hit the crossover point. The majority of Internet users will be <u>outside</u> North America.

What are all these people doing? At first, they were doing what the conventional wisdom said they were doing: chatting, reading and playing games. More recently, they've been buying things. Lots of things. Most estimates say global e-commerce totaled around $50 billion in 1998 and that this marketplace will crack the $1 trillion mark in the next few years. That's roughly 10 percent of all business transactions in the U.S. -- and about 5 percent worldwide.

But again, the impact and implications are far more encompassing than just Net-based buying and selling. IBM uses the term "e-business" to talk about the broader, more powerful aspects of this change: The way it allows institutions of all sizes, in all industries, public and private sector, to redefine what they do, and reinvent who they are. These applications redefine the rules of market access, unify trading partners in a supply chain, and transform models of distribution. They transform internal operations, from product development to the way work gets done and employees share ideas. We believe the transformation of all these core processes is—and will continue to be— a powerful source of real productivity gains for companies and for countries.

And as Exhibit A, I'll submit IBM, and I'll cite just two applications that would apply in either the private or public sector. About one-third of all our internal training will be done this year via distributed learning, with savings and productivity gains of $100 million. And we'll procure $12 billion in goods and services over the Web this year.

As I said, the benefits transcend the commercial world. Governments are finding that the Net is a tangible way to demonstrate efficient use of taxpayer dollars. Arizona enables citizens to renew their driver's licenses over the Net. The convenience alone probably justifies the investment. But the state has also learned that processing an online renewal costs 75 percent less than an over-the-counter transaction. Singapore is deploying networked applications in its bid for primacy among Asian shipping ports. They've slashed the time for governmental approval of cargo manifests from days, to as little as 30 minutes.

We're working with many governmental entities to help kick start this transformation. But for the most part, government has not embraced the networked world. We estimate that 90 percent of all government services are still delivered "over the counter" in face-to-face

transactions. Think about the opportunities to invest in new areas or re-deploy capital or tax dollars if you could reduce the cost of some of those physical operations by 75 percent the way Arizona has done.

I'll turn now to implications for the U.S. economy, and then offer my perspective on key issues facing policy makers and regulators. There's obviously not time today to detail every issue. But I'll offer a few observations, because we're in the ultimate high stakes game.

In the economy of the 21st Century, this technology will underpin our nation's—and every nation's—ability to drive production, productivity, profitable growth, and ensure the prosperity of its citizens. There is an absolute correlation between U.S. industry's investments in information technology and the ever-lengthening cycle of American economic growth.

Perhaps the most profound impact of these investments will be with smaller businesses, which we all know are the greatest source of job creation and economic expansion in America today. Networked technology is a great leveler. It allows these small and medium-sized enterprises to redefine their market presence and go global, virtually overnight. One of our small business customers is a family-owned nursery called Hawaiian Greenhouse. They sell tropical flowers. When they started to feel the squeeze of big international growers—the Goliaths of their industry—they found their edge on the Net. 10 percent of all their new orders come to them via the Web, and they now refer to themselves as David-dot-com.

The U.S. can be proud of the economic leadership it enjoys today. But leadership is not a birthright. Information technology spending as a percent of GDP will remain higher in the U.S. than Europe or Asia this year, but the gap is expected to narrow. Governments around the world are building strategies to compete for investment or jobs—not based on traditional incentives like tax structures—but on their electronic readiness and capability.

Earlier I said that while networked computing can drive economic expansion and societal change, those things are not inevitable. One critical dependency is development of a workable public policy framework for electronic commerce. I am predisposed to believe that

government, working with industry, can create an environment that nurtures e-business for economic, competitive and societal advantage. Building this kind of market-based environment implies that we will allow our respect for free market economics to work wherever possible.

We have to remember that this transformation is fundamentally about the urgent search for new models. It's a grave error to think the Internet and e-business will develop under the kind of regulation we could apply, say, to the phone system back in the days when coal and steel were determinants of a nation's greatness, and economic models based on information were simply un-imaginable.

That means we have to be patient, and thoughtful before rushing to enact new legislation. That's often hard to do when all of our experience, training and instincts tell us that there is change afoot, so it's time to act. However, in many instances today we simply haven't collected enough data points to have the basis of an informed decision. Policies hastily put in place today could be obsolete tomorrow; or worse, ruin this nascent economic engine.

Protecting online privacy is one area where we're already seeing the positive effects of a market-driven approach -- one that builds on many U.S. privacy laws. A recent Georgetown University survey shows that a clear majority of commercial Web sites now have their privacy statements visible to the consumer. The situation is not perfect, but it shows that the marketplace is responding to the desires of customers and consumers. IBM, as an example, refuses to advertise on sites that don't inform visitors of their privacy policy.

I am not suggesting—as some in my industry have—that government is merely a bystander. There are areas where governments must lead. Tax policy is a good example. Congress took an important step last year with the passage of the Internet Tax Freedom Act. The commission formed by that act will begin meeting later this month, and we look forward to a considered debate on the issues.

The issue of information security is a case study in the importance of government/industry cooperation. We have to push for a sensible encryption policy in this country—one that recognizes the commercial demand for secure information systems and transactions, and also recognizes the legitimate needs of law enforcement and national security.

Finally, we need policies that will promote the continued build-out of broadband systems, and we need government to continue its traditional role in support of R&D and as a source of fundamental new ideas and knowledge, often developed in cooperation with industry.

I'll close with this, because it is the source of my fondest hopes—and also my most profound concern—as a I think about the opportunities and the threats of a networked world. If there is one factor that can dead-end this new world of economic opportunity and prosperity, it's the deplorable condition of our system of public education. Just as surely as a high quality education—or the lack of one—can separate people, it will also separate winners and losers in the global, networked economy that's coming to life around us. And right now, American public schools are in a race with the rest of the developed world. Sadly, it's a race we have been losing—consistently and relentlessly—for decades.

I have been passionate about this subject for 20 years. Looking ahead, that passion is turning to fear. Unless we arrest the wasting decline of our public schools—and do it now—America is destined to be an also-ran in the emerging digital economy. The issue here is leadership—from elected officials, administrators, educators, and parents. No American can opt-out on this one. It's one more reminder that in every era, the most important challenges, and the resources to meet them, are intensely human.

I hope we all recognize that we are facing the leadership challenge of a lifetime. Our ability to exploit this magnificent opportunity and make it real for the benefit of all people rests squarely on the quality of leadership we'll get across the board—in industry and in government. The leadership enterprises in every industry are starting to emerge—in every case behind the vision of individuals who have the will to go first, and make fundamental changes to the way things are currently done.

If we are going to nurture and exploit these technologies to really change things in the world and make it a richer, more understanding, and more secure place, we'll need the same kind of leadership in government. Leaders with the will to step forward and aggressively embrace e-business as a tool for economic and social change, and the confidence to trust the dynamics of the marketplace.

This forum is a very positive sign that we agree this work must be grounded in communications, cooperation and a lot of thought.

Testimony of

ROBERTA KATZ
PRESIDENT AND CEO
THE TECHNOLOGY NETWORK

Before the

JOINT ECONOMIC COMMITTEE
NATIONAL SUMMIT ON HIGH TECHNOLOGY
June 14, 1999

*The Technology Network and the New Economy*

Mr. Chairman, Mr. Vice Chairman and Members of the Committee, Thank you for the opportunity to testify at this first-ever National Summit on High Technology. I am Roberta Katz, President and CEO of the Technology Network and I am very pleased to be here today to discuss the New Economy.

The world is changing in fundamental ways. Thanks to the Internet and e-commerce, we have distance learning, online banking, online books and toy stores, music, cars, airline tickets and even groceries online. A third of the total growth in U.S. economic production in the last seven years has come from high-technology industries. This is the New Economy in operation.

The New Economy is a new way of getting work done. It is a new way of thinking and a new way of communicating. It celebrates ingenuity and innovation, and it is productive. Today, technological progress is increasingly responsible for the growth of the U.S. economy and is a principal driving force in long-term prosperity and increased standards of living for Americans.

Perhaps most important, the New Economy is about using technology to improve the quality of our lives, from life-saving drugs to a communications revolution.

As we participate in such pervasive change, social issues – meaning issues of policy and politics -- will predictably and inevitably arise. And these issues must have the attention of the thinkers who are behind the New Economy, including the technologists who gave birth to this phenomenon.

That's why The Technology Network, also known as TechNet, was created two years ago. TechNet is a network, literally, of 140 chief executive officers and senior partners of the nation's leading companies in the fields of information technology, biotechnology, venture capital, investment banking and law. TechNet's mission is to engage these business leaders personally in the political process so that they can build working relationships with the state and national political leaders who are striving to understand the social issues related to the New Economy.

Building bridges between the technology industry and our nation's political and policy leaders is a very new idea. Although our industry's capable associations have worked hard to build relationships and to create a policy dialogue with Washington, individual technology industry leaders have been reluctant to do so. The traditional view is that the high-tech community could not care less. After all, who needs politics, which are messy, ugly and concerned with social issues, in a world defined by the clean elegance of bits and bytes?

The answer is that the high tech community needs both politics and policy, both of which are increasingly important to the growth of the New Economy. We as a nation often lose sight of the reality that the dazzling gadgets and revolutionary improvements in healthcare have their roots in partnerships between government and industry. Many of the breakthrough products transforming our society and the new drugs and techniques improving our lives are in part the result of federal programs, sound regulatory and tax policy, or even accounting rules that enable and empower America's technology industries to create new technologies, products and markets.

In short, the New Economy is not an accident. It is the result of sound investments and pro-growth policies of the past decade. TechNet's mission is to ensure that policy-makers understand the role of

the technology industries in the New Economy so that we can work together to preserve, protect and even enhance the factors driving the New Economy's extraordinary growth.

TechNet champions fundamental policy issues that drive the growth of the New Economy - policies that encourage innovation, improve education, foster employee ownership, and stimulate entrepreneurship.

I would like to highlight briefly the policy issues that we see as critical to the continued growth of the New Economy. This year TechNet's top policy priorities include increasing the federal and corporate commitment to research and development, preserving accounting rules that recognize the importance of intangible assets and employee ownership in growing the New Economy, and improving K- 1 2 education so that American youth will be ready for the challenging jobs being created by the New Economy.

***Strengthening America's R&D Agenda: A Sound Investment in the New Economy***

The end point of innovation is economic growth and a better quality of life. We often lose sight of the fact that its beginning is in research. The single greatest impetus for technological innovation and increased American productivity is investment in research and development.

TechNet members have unanimously called for a joint commitment by government and industry to: (1) enact substantial, consistent increases in federal funding for basic science, engineering and technology research over the next decade; and (2) enact a permanent research and development tax credit to spur increased corporate investment in long-term R&D.

The federal and private sector roles are complementary, with the government providing the initial, critical "spark" for innovation, and the private sector building on the federal investment to achieve important breakthroughs that advance science, engineering and a broad range of national goals. Many of the discoveries that are transforming our economy began not from inventors chasing profits but in universities and laboratories where scientists have sought new knowledge through fundamental research.

Numerous breakthroughs in information technology – including the Internet, the first graphical Web browser, high-speed networks, artificial intelligence, supercomputers, databases and graphical user interface -- have resulted from government-sponsored research. These innovations have grown into industries that now employ 7.4 million American workers with average salaries that are more than 60 percent higher than the average private sector wage. The Internet alone has created hundreds of billions dollars in new wealth -- vastly exceeding the government's investment in networking research.

The federal investment in basic research is also among the most effective ways of providing hands-on scientific and technology training to American students in colleges and graduate schools and is crediting with developing new generations of technology industry leaders.

Significant pressures on federal research spending are expected in future years due to congressional budget caps that limit overall discretionary spending, however, and the future of federal support for basic research is unclear. In short, we cannot afford to take for granted the fact that the federal research budget will grow; we must have a concerted national agenda for fostering critical investments in basic, scientific research.

A strengthened federal commitment to basic research must be met by a renewed commitment to R&D by corporate America. Since 1981, the R&D tax credit has provided a powerful incentive for increased research by American industry. Although the credit has been effective, its history of repeated, limited extensions has prevented it from achieving its full incentive effect.

An R&D credit that requires constant renewals, that suffers from gaps in coverage and retroactive enactment serves not as a bridge to the 21st Century, but as a drawbridge that impedes the progress of innovation. The uncertainty of a credit which must be renewed annually and which has the potential to expire makes it impossible for firms to factor the credit into their valuation of long-term research investments.

Numerous studies support the credit's effectiveness in encouraging corporate research expenditures above and beyond previous levels. The result has been new and innovative technologies, medicines, products and services that benefit all Americans.

***Preserving Sound Accounting for Intangible Assets and Employee Ownership***

Today's New Economy differs significantly from the traditional manufacturing and service-based economy. A defining feature of the New Economy – and a key to its tremendous growth – is the increased importance of knowledge and intangible assets, including R&D, employee talent, brands and knowledge. Accounting standards should recognize the role that intangibles and knowledge-based assets play in the new economy.

The Financial Accounting Standards Board's review of accounting rules for business combinations and stock compensation threatens to undermine the factors driving the New Economy: employee ownership, innovation, research and development, capital formation and efficiency enhancing mergers, among other issues. TechNet supports financial accounting standards that accurately describe the values of corporate assets and liabilities without impeding the unprecedented economic growth and global competitiveness of the knowledge-based New Economy.

The ability of high-tech companies to growth and acquire new technologies through mergers and acquisitions and to compensate their employees through stock options are important factors driving the U.S. economic expansion – economic growth that is the envy of the world. Before the adoption of new rules that may have a significant effect on economic growth in the technology industry and economy, we should be certain that the impacts of these rules are fully understood and that there are perceived problems with existing accounting standards that justify such changes.

***Improving America's Education System***

Since its inception, TechNet has made the improvement of K-12 education a top priority. Our members believe strongly in the need to ensure that America's students are prepared for the New Economy and can compete in the fast-changing, global environment. We are fighting hard to

create a world-class education system by eliminating bureaucracy, removing barriers to student and teacher excellence, and expanding the resources available to our schools.

After more than a decade of attempts to reform California's public charter school system, last year TechNet spearheaded a successful legislative effort to greatly expand the number of public charter schools in the state. The law signaled a new commitment to innovation in California's public schools.

Every child in America needs a strong education to enjoy a high standard of living in the future. Our failure to provide that education is unfair to our children and to our society. Our strategy for improving K-12 education is to insist on the establishment of high educational standards and the deregulation of public education. Performance against the standards should be rigorously measured. Schools should be forced to compete, and parents should be able to choose the best public school for their children. We should invest in education so that future generations in California and America continue to prosper and to share in the benefits of the New Economy.

***Conclusion***

TechNet is working to build the bridges that must be built between the old economy and the New Economy. Building those bridges imposes a responsibility on those who have helped bring the New Economy into being. TechNet's members believe that we must be personally involved in communicating what the New Economy is about if we expect policy makers to understand the world of high tech. Through this dialogue and an ongoing, two-way education process, government and industry can together ensure that the partnerships that so effectively fostered technological progress and economic growth in the past will continue into the future.

## PREPARED STATEMENT OF EDWARD J. NICOLL

Mr. Chairman,

Thank you for your gracious invitation to speak before the National Summit on High Technology. The Joint Economic Committee deserves considerable praise for its willingness to take on such a broad topic that is of immense importance to American citizens and to the economy as whole.

At first glance, it might seem as if there was nothing more to be said about the role of technology at the end of twentieth century. The modern era has been defined by technology. It has shaped the way we live, the way we work, the way we communicate and the way we view the world and ourselves. No industry has been immune from its benefits. From health care to homebuilding, from transportation to television, every industry we know of has seen its basic business model undergo a radical transformation in the last few decades as a result of the immense leaps we have taken in technology.

I am not a scientist nor would I describe myself as a technologist. But I have been fortunate enough to be "present at the creation" of an industry that owes its existence to technology: online investing. Today I am the President of Datek Online, the nation's fourth largest online brokerage company. Eleven years ago, I helped to launch Waterhouse Securities, one of the earliest innovators in automating transactions for buyers and sellers of securities.

In the decade since then, technology has not only changed the brokerage industry, it has created an entirely new relationship between citizens and the securities market. As I will explain today, this watershed change has had an unprecedented and positive impact on the ability of individual consumers to manage their own finances and invest in our economy. The growth of the online brokerage industry has also propelled the financial services industry into the next century, breaking down the barriers and rigid trading rituals that had existed since the earliest days of the first stock market in this country. I am convinced that both consumers and the brokerage industry are far better off.

Having said that, I believe what I am discussing today is still an industry in its infancy. It should be apparent to anyone familiar with online investing that three years ago, I could not have testified on this subject. Until 1995, there were no online brokerages of any significance.

Today, of course, online investing has emerged as one of the most dynamic and creative sectors of the economy. While I am very confident about its future, I must confess that I cannot predict with any certainty what its future shape will be. This is an industry that has thrived precisely because of the tremendous advances in technology, and I fully

expect those advances to continue—perhaps at an even more breathtaking pace.

In my testimony before this committee, I would like to describe the dramatic changes we have already seen in the way securities are traded due to Internet-related technology; the rapid growth of the online brokerage industry; the impact this industry has had on consumers, on the economics of buying and selling securities, and on the economy as a whole. I will also briefly describe some of the technological advances that have already taken place in this new financial services arena. I will then touch on a subject that I know is of keen interest to this committee: consumer education and the question of whether online investing is for everyone. Finally, I will share with you my thoughts about the proper role of Congress in helping this industry continue to thrive while protecting the interests of consumers.

The Evolution of Trading

When I think about the many, many changes that have occurred in the world of securities transactions over the last 25 years, one date in particular stands out. May 1, 1975. Though barely discussed today, this was truly a watershed date in the securities industry. On that date, the Securities and Exchange Commission forced the securities industry to end the practice of fixed prices on commission rates for all securities that were bought and sold. Its impact was not immediate, but it set in motion a series of gradual changes that made the world of online investing possible.

The real effect of the end of fixed commissions is that the charges for services provided by traditional brokerage firms could now be unbundled. The fee for advice could be separated from the fee for transactions. Brokers could offer lower prices for fewer services or higher prices for more comprehensive services. Indeed, lower prices were only a secondary consideration of the SEC. It understood that because there could be a range of prices reflecting a range of services, the notion that the full-service broker was the only option for consumers really ended on that day. It took a while, however, for both the industry and the public to appreciate the impact of this development. At first, just a small handful of firms took advantage of this new environment: Charles Schwab, Quick and Reilly, and Source Securities were really the industry leaders when it came to the rise of the discount broker. But again, the full effect of the SEC decision was more than lower commission rates. By unbundling all the services a traditional brokerage house provided to its clients, the industry was forced to consider the real cost of each of the

services offered. That set the stage for a whole new relationship between broker and client once technology advanced.

That technology arrived in the form of the Internet. So much has been said and written about the rapid spread of the Internet that I will only mention a few statistics that capture the scope of the changes it triggered. In 1994, according to a research report by Morgan Stanley, three million people, most of them in the U.S., used the Internet. Last year, 100 million people used it. Some experts, such as Nicholas Negroponte, the founder and director of the Media Lab at the Massachusetts Institute of Technology, predict that some 1 billion people will be connected to the Internet by 2005.

The very fact that the Internet has rapidly become a popular medium, not just a tool used by engineers or computer experts, is the source for the truly revolutionary character of online investing. The Internet has made it possible for anyone with a computer and a modem to interact with our equity markets in a way that was inconceivable 10 years ago. It has made it possible for the average citizen to take control of his or her investments and it has leveled the playing field between individual investors and professional investors.

It is worth remembering how different things were a decade or two ago. Buying or selling stock was not something that was easily done by a person without any links to the financial markets. To begin with, one had to establish a relationship with a brokerage house or investment bank. For better or worse, this relationship was often established by a commissioned broker "cold calling" a prospective investor. Orders were place in person or over the phone with a licensed broker. That broker in turn would write the order up and pass it to a specially trained order clerk who translated the buy or sell order into a code that could then, through the use of a teletype, transfer it to the floor of the Exchange. On the Exchange floor, the newly received order would be walked around until the trade was executed. The confirmation would then require walking back through all those steps.

Automation helped increase the speed of buying and selling stock, but it was the Internet and the technology it has spawned that fundamentally changed the role of the consumer. Today many trades are made online without a commissioned broker's involvement. They are routed automatically to the appropriate exchange or other execution venue. A buyer's ability to make the purchase is verified automatically by computer. The trade is then executed and the buyer receives an immediate confirmation while he or she is still online. All of this happens in under 10 seconds and—here is the critical point—it often occurs with no human intervention. Technology and the Internet have

allowed every stage of the transaction to be automated so that for most transactions a human is needed only in unusual circumstances.

## The Empowered Consumer

For the typical consumer, the ability to buy and sell stocks instantaneously over the Internet without the intermediaries is obviously a quantum leap in efficiency. But the more striking aspect of this technological change is the way in which it has placed the consumer at the very center, rather than the periphery, of the world of investing. The Internet has not only brought a mechanism to execute trades within the reach of ordinary consumers, it has brought a new sense of democracy and liberation to securities transactions. Once knowledge about stocks was limited to an elite circle of experts concentrated on Wall Street. Without maintaining an account at one of these firms, it was extraordinarily difficult for the average consumer to learn about investment opportunities, or even to keep track of investments they would like to make. For the more experienced investors, the pre-Internet system wasn't any friendlier. To gain knowledge about the state of the market or the current performance of one's account, one had to rely on a call to a brokerage house during market hours. The financial section of the morning newspaper was one of few sources of information about how a particular stock performed on a given day.

Today, the accessibility to financial information has empowered the consumer. Technology now puts in the hand of anyone interested in investing much of the same information that was once only available to large financial institutions. Technology has given us real time quotes, online research reports, and enormous historical databases. With a simple computer and access to the Internet, someone with no training in finance or securities can, in a matter of seconds, look at a three-month performance record of a stock, compare it is to its three-year performance, compare it again to the performance of competing companies, and then create a graph comparing all those companies to the Dow-Jones Industrial average over the same period. It is not exaggeration to say that no long ago these were pieces of information available only to preferred clients of large brokerage houses—and even then, generating and communicating such data could take several hours to several days.

From a financial perspective, the spread of online trading has caused a revolution in traditional commission costs. In the past, the high cost of transaction fees effectively served as a barrier to most ordinary investors. It was simply too expensive to buy and sell stocks. Today, the

average cost of a trade is below twenty dollars—a fraction of what the large investment houses have traditionally charged their clients.

Lower commission fees mean that individuals have greater financial freedom to invest as they see fit. It has also allowed a very small subsection of investors with more experience to trade as frequently as professional traders. These are active investors who no longer need the cumbersome and costly relationship with a Wall Street financial house to pursue the investment style of their choice. They serve the same function that previously was exclusively reserved for privileged members of the Wall Street community: providing needed liquidity to securities markets. That liquidity improves securities markets by promoting efficient price discovery and reduces trading costs by narrowing spreads between bids and offers.

The Growth of the Online Brokerage Industry

Lower costs, greater access, the democratization of financial knowledge, and the efficiency of Internet trading have helped spawn an industry that has soared in just a few years. The first online broker appeared in 1995. Today, Datek is one of more than 100 online brokers competing in a dynamic market. I have every reason to believe that competition will intensify. Just this month we have had an announcement from Merrill Lynch, which has the country's largest physical retail brokerage network, that it, too, is launching an online trading service for its clients at competitive prices.

A brief glance at the most recent statistics for the online brokerage industry amply illustrates the sheer demand for its services. According to Credit Suisse, First Boston, online trading grew at a remarkable 47 percent during the first quarter of 1999. This expansion follows an equally impressive 34 percent growth rate during the final quarter of 1998. This growth has not been concentrated in just one or two industry giants. Every major online trading firm experienced growth rates of between 23 and 63 percent in the first quarter of this year.

To understand the practical meaning of these growth rates, it is worth considering that during the first quarter of 1997, there were fewer than 100,000 online trades executed in the United States. Today there are nearly 500,000 trades executed each business day. More remarkable is that this growth has occurred while the overall market values were more modest. Credit Suisse First Boston reports that during the first quarter of this year, market values on the New York Stock Exchange grew 4.4 percent. This suggests that the large number of consumers making online

trades are not being driven by a short-term market frenzy. Rather, they are attracted by both the ease and low-cost that online investing offers.

It is also safe to assume that much of the growth in online trading comes from a migration of traders from traditional, full-service brokerages. During the first quarter of this year, nearly 16 percent of all equity trades occurred online—almost one in six trades. That, too, is an increase over the fourth quarter of 1998 when 13.8 percent of trades were conducted online. Some have predicted that by next year, one in every four trades will be conducted over the Internet.

It is worth stressing that individuals, not institutions, largely fuel this growth. This has been a consumer revolution. According to the U.S. Department of Commerce, online trading is the fastest growing consumer use of the Internet after email. Americans are investing from their home computers or their offices. Most online investment firms deliberately tailor their services to meet the demands of individuals, not businesses. The growth in the number of households with online trading accounts attests to the success of this strategy. According to the New York Times (April 17, 1999), the number of households with online trading accounts has risen from 2.2 million in December 1997 to 6.3 million in April 1999. Forrester Research, a high-tech research firm, estimates that the number of online accounts will grow to 20.3 million by 2003.

## The Importance of Technology

This astonishing level of growth is a product of the finest technology available. Online trading owes its existence to technological developments and has itself become a driver of technological innovation.

If we have learned anything in the past three years, it is that this is not a static industry. My company, Datek, has gained 10 percent of the market of online trading after just two years in operation. With the kind of growth we have experienced, we simply could not afford to rest on the technology that we started with. Over the last year we have implemented system-wide upgrades that have increased processing speed and capacity by more than 500 percent. I know that our competitors are faced with the need to make similar technological improvements. The nature of the business, and the demand from our clients, leaves us no other option.

The push for better, faster, more secure data transfer systems to be used for online trading has also brought considerable benefits to customers. In an effort to provide our clients with more real-time information, we developed what is known as a streaming quote applet, which we have named "Streamer." Streamer allows dynamically

updating real-time quotes that work through almost all firewalls. Customers on our system not only see the most recent price of a stock, they see the dynamic fluctuations of the stock play out before them in real time. This type of information was once reserved for only the most experienced traders working inside a large brokerage firm or on the floor of the stock exchange.

I believe this is just scratching the surface of what online trading has to offer. As sophisticated as we now seem, the industry has not even begun to explore the capacity of an interactive website and more advanced automation of every aspect of a transaction.

Individual investors are also just beginning to benefit from the increased efficiencies and open access of Alternative Trading Systems (ATS), which now compete with some of the traditional trading venues. For Nasdaq stocks we helped to create a separate company, The Island ECN, which electronically matches orders without the intervention of a market maker. Today, Island is the single largest ECN in the world, and the second largest ATS. I fully expect this aspect of online trading to continue to develop. The enhanced technology that we see today has forced us to rethink the way our markets operate. And I believe that consumers are the ultimate beneficiaries of this process.

The Impact on the Securities Industry

Technology, in short, has revolutionized an industry that for decades had been conducted by a small number of specialized firms concentrated in one part of the country. I can confidently predict that online investing will have a permanent impact on virtually every aspect of the securities industry: from the pricing of services, to the structure of companies, to the type of employee who is attracted to the industry.

In truth, online investing gave the securities industry a much-needed push into the modern era. It has forced a rethinking of the basic business model. It has introduced new players in an industry long dominated by established financial giants. Above all, it has fostered remarkable gains in productivity.

When I left Waterhouse Securities in 1995, the firm was executing approximately 10,000 transactions a day for its customers, charging on average $50 per transaction. To run this business, we needed about 1,200 employees. When I arrived at Datek last year, the firm was executing nearly 50,000 trades a day at $10 a trade. Note that this produces the same $500,000 a day in revenue at Datek as Waterhouse generated when I left. But at Datek, we employed less than 400 employees at the time: an increase in productivity per employee of 300

percent. And note that the investing public was the real beneficiary of this increased productivity, since their average commission charge decrease by a whopping 80 percent from 1995 to the present!

The greatest savings for the industry have obviously come from the high cost of maintaining an army of brokers who charge clients high commission fees. This has been not only a high cost for the traditional brokerage firms but it also was once a considerable barrier to entry for new competitors. The Internet changed that by eliminating the need for brokers for those investors confident of making their own decisions and seeking their own investment advice and research.

I think the decline of the traditional, commission-based broker has actually been an improvement for consumers. The old model that operated at most brokerage houses was filled with mixed incentives. A good broker established relationships with clients and worked honestly to give them the best advice. But his or her commissions were driven by the amount of buying and selling a client did, especially in products that carried the highest commission payout to the broker. Sometimes the best advice a client could get was to neither buy nor sell, but to simply do nothing. Unfortunately, the broker was paid nothing to proffer such advice. Therefore good brokers needed to resist the temptation to make recommendations based on their own interests rather than those of their customer. Often, full-service brokers found it difficult to resist that temptation.

By removing the commission-based broker from the equation, a new relationship has been established between an online brokerage house and its customers. At Datek, our goal is not to offer advice on investments or to encourage or discourage individual trading. Our service is designed for the self-directed investor who wants to make his or her own decision. Twenty years ago, there were relatively few of those types of consumers simply because there was little investment information available and no mechanism to service the consumer. Online investing has effectively created a market of informed, confident investors.

Online Investing is Not For Everyone

Mr. Chairman, I've spoken enthusiastically about the benefits of online investing because I believe those benefits are significant, both for consumers and for the economy. But I also want to emphasize that online investing is not for everyone.

While many investors enjoy the freedom that comes with online investing, others will continue to demand a higher level of personal

attention that can only come from a traditional broker. While investors who make their own investment decisions can and should execute trades swiftly and efficiently using online brokerage, those investors who need advice and have been served well by an investment advisor should stick with that advisor.

On the other side of the coin, Mr. Chairman, there is a myth developing that online accounts are only for day-traders, latched onto their computer keyboards, monitoring every financial channel, ready to take immediate advantage of any shift in a stock's price. The truth is, all self-directed investors can benefit from online trading—whether they trade once a day, or once a year.

But that begs the question for many investors entering the market: how does one become such a self-directed investor? I believe there is now a gap that needs to be filled between the amount of information that is available to the public and some of the public's ability to make use of that information. I am convinced that more and more Americans would like to be confident, self-directed investors. But to get there—to have a sufficient amount of knowledge to do research on line and make trades with confidence—requires both self-discipline and education.

I believe there is a healthy market out there for companies that want to help investors win that confidence. For our part, Datek Online is undertaking a number of steps to improve consumer education about online investing and to promote more knowledge about stock markets in general. For example, in conjunction with Smart Money magazine, we are helping to launch SmartMoney University, a highly interactive website that will promote financial literacy and a broader understanding of online investing. We will also act as a sponsor of LearnToInvest.org, a not-for-profit program for high school investment clubs, especially in underserved inner city schools. We will provide participating schools with the tools they need to invest (at no charge) and work with other sponsors to mentor students about the business of buying and selling stocks.

A Role for Congress?

I know that the Joint Economic Committee is watching this industry with great interest. Congress has a critical role to play, both in protecting consumers and in creating an environment where legitimate businesses can innovate and grow.

I said that is a critical role, Mr. Chairman, but also a difficult one. Congress has the power to act as a partner with an evolving industry that

will face exciting opportunities, but also unknown challenges in the years ahead.

No one would be foolish enough to predict exactly where this industry is going. But if Congress and the Administration continue to allow this industry to evolve, unhindered by heavy regulation ... if you continue to allow the entrepreneurs to create new ways of serving consumers ... if you continue to allow technology to make our equity markets more accessible—then I am confident in predicting three things:

First, more Americans than ever before will own equities, allowing millions of additional Americans to share in the prosperity of our country.

Second, investors will become more educated about the advantages and dangers of investing, allowing them to make better decisions about how to invest their assets.

Third, our industry will continue to innovate, providing more choices for consumers at more competitive prices.

Please remember that online trading is an industry that has flourished within a highly regulated financial services industry, but without much specific additional government regulation. We have provided our customers with security arrangements and privacy that they can count on. We have lowered their costs. We have provided tools and information to them never previously available.

I would urge you and your colleagues to see these successes as only the first stage. As an active participant in the industry, I share your concern for maintaining an industry that is free from fraud and protects our customers. But I am heartened by the way the market has worked to address these concerns without the need for legislation or government intervention. It would be a grave error to consider heavily regulating an industry that is still evolving and continually providing benefits to ordinary consumers.

In closing, I would like to thank you again, Mr. Chairman and all the members of the Committee for your leadership and foresight in sponsoring this first annual National Summit on High Technology. I look forward to working with you in the years to come and to answering any additional questions.

## PREPARED STATEMENT OF JUDY G. CARTER

Mr. Chairman and members of the committee, my name is Judy Carter, and I am the Chief Executive Officer and President of Softworks of Alexandria, Virginia. I applaud your leadership in convening this event, and thank you for the opportunity to submit this statement as part of the National Summit on High Technology. Like you, I believe that our nation's economic growth and our citizens' employment are inextricably tied to national advances in high technology.

Softworks has been in the information technology business for 21 years—during this time we have both contributed to and benefitted from the evolution of information and computing technology. We are a global company with software solutions that are sold in every major market around the world. We have offices in the UK, France, Italy, Spain, Germany, Japan, Australia and Brazil, as well as thirteen offices throughout the U.S. and Canada. We have over 2000 customers worldwide including 87 of the Fortune 100 companies and about 58% of the Fortune 500. Importantly, we currently employ over two hundred workers in the United States.

As the Committee members consider technology issues in the 106th Congress, I encourage them to endorse fiscal policies and initiatives that will fuel the U.S. economy, keeping American companies and their workers prosperous and competitive in the changing global marketplace as we enter the 21st century. Without a growing economy, Americans' standard of living, and our ability to support the needs of our aging population, will be in jeopardy. Faced with a static or decreasing workforce as U.S. demographics shift, U.S. lawmakers must focus on encouraging technology development to increase productivity, enabling a smaller workforce to support a growing population of retirees.

Increased technology development will help to ensure sustained economic growth and the prosperous environment needed to continue to improve our standard of living for current and future generations of Americans, will permit additional individual tax reductions, and will ensure a growing economy with resources necessary to adequately support the health and retirement needs of an aging U.S. population. While much of this activity, clearly, must be accomplished by the private sector, there are a number of things that the federal government can do to allow and encourage companies like mine to continuously innovate. Better protection under patent law, relief from the compliance burden imposed by federal regulations, and decreased tax rates on investment income all would allow Softworks and other US high-tech firms to allocate more resources to research and experimentation.

The R&D tax credit, which will be the principal focus of my testimony today, is believed by many government and private sector experts to be one of the most effective, proven means of generating increased research and development activity, which in turn will provide the technology improvements to benefit the economy. Last year the accounting firm of Coopers & Lybrand (now PricewaterhouseCoopers) completed a new study, Economic Benefits of the R&D Tax Credit, (January, 1998) that dramatically illustrates the significant economic benefits provided by the credit, and further reinforces the need to make the credit permanent. According to the study, making the R&D credit permanent would stimulate substantial amounts of additional R&D, increase national productivity and economic growth almost immediately, and provide U.S. workers with higher wages and after-tax income

## I. R&D CREDIT LEGISLATIVE HISTORY

The R&D credit was enacted in 1981 to provide an incentive for companies to increase their U.S. R&D activities. As originally passed, the R&D credit was to expire at the end of 1985. Recognizing the importance and effectiveness of the provisions, Congress decided to extend it. In fact, since 1981 the credit has been extended nine times. In addition, the credit's focus has been sharpened by limiting both qualifying activities and eligible expenditures. With each extension, the Congress indicated its strong bipartisan support for the R&D credit.

In 1986, the credit lapsed, but was retroactively extended and the rate cut from 25 percent to 20 percent. In 1988, the credit was extended for one year. However, the credit's effectiveness was further reduced by decreasing the deduction for R&D expenditures by 50% of the credit. In 1989, Congress extended the credit for another year and made changes that were intended to increase the incentive effect for established as well as start-up companies. In the 1990 Budget Reconciliation Act, the credit was extended again for 15 months through the end of 1991. The credit was again extended through June 30, 1992, by the Tax Extension Act of 1991. In OBRA 1993, the credit was retroactively extended through June 30, 1995.

In 1996, as part of the Small Business Job Protection Act of 1996, the credit was extended for eleven months, through May 31, 1997, but was not extended to provide continuity over the period July 1, 1995 to June 30, 1996. This one-year period, July 1, 1995 to June 30, 1996, was the first gap in the credit's availability since its enactment in 1981.

In 1996, the elective Alternative Incremental Research Credit ("AIRC") was added to the credit, increasing its flexibility and making the credit available to R&D intensive industries which could not qualify for the credit under the regular criteria. The AIRC adds flexibility to the credit to address changes in business models and R&D spending patterns, which are a normal part of a company's life cycle. The sponsors of S. 680 and H.R. 835 recognize the importance of the AIRC. Their legislation, in addition to making the credit permanent, provides for a modest increase in the AIRC rates that will bring the AIRC's incentive effect more into line with the incentive provided by the regular credit to other research-intensive companies.

The Congress next approved a thirteen-month extension of the R&D credit that was enacted into law as part of the Taxpayer Relief Act of 1997. The credit was made available for expenditures incurred from June 1, 1997 through June 30, 1998, with no gap between this and the previous extension. Most recently, the Congress approved a one-year extension of the credit, until June 30, 1999.

According to the Tax Reform Act of 1986, the R&D credit was originally limited to a five-year term in order "to enable the Congress to evaluate the operation of the credit." While it is understandable that the Congress in 1981 would want to adopt this new credit on a trial basis, the credit has long since proven over the sixteen years of its existence to be an excellent highly leveraged investment of government resources to provide an effective incentive for companies to increase their U.S.-based R&D.

The historical pattern of temporarily extending the credit, combined with the first gap in the credit's availability, reduces the incentive effect of the credit. The U.S. research community needs a stable, consistent R&D credit in order to maximize its incentive value and its contribution to the nation's economic growth and sustain the basis for ongoing technology competitiveness in the global arena.

## II. WHY DO WE NEED A R&D CREDIT?

### A. The credit offsets the tendency for under investment in R&D

The single biggest factor driving productivity growth is innovation. As stated by the Office of Technology Assessment in 1995: "Much of the growth in national productivity ultimately derives from research and development conducted in private industry." Sixty-six to eighty percent of productivity growth since the Great Depression

is attributable to innovation. In an industrialized society R&D is the primary means by which technological innovation is generated.

Companies cannot capture fully the rewards of their innovations because they cannot control the indirect benefits of their technology on the economy. As a result, the rate of return to society from innovation is twice that which accrues to the individual company. This situation is aggravated by the high risk associated with R&D expenditures. As many as eighty percent of such projects are believed to be economic failures.

Therefore, economists and technicians who have studied the issue are nearly unanimous that the government should intervene to increase R&D investment. The most recent study, conducted by the Tax Policy Economics Group of Coopers & Lybrand, concluded that "...absent the R&D credit, the marketplace, which normally dictates the correct allocation of resources among different economic activities, would fail to capture the extensive spillover benefits of R&D spending that raise productivity, lower prices, and improve international trade for all sectors of the economy". Stimulating private sector R&D is particularly critical in light of the decline in government funded R&D over the years. Direct government R&D funding has declined from 57% to 36% of total R&D spending in the U.S. from 1970 to 1994. Over this same period, the private sector has become the dominant source of R&D funding, increasing from 40% to 60%.

**B. The credit helps U.S. business remain competitive in a world marketplace**

The R&D credit has played a significant role in placing American businesses ahead of their international competition in developing and marketing new products. It has assisted in the development of new and innovative products; providing technological advancement, more and better U.S. jobs, and increased domestic productivity and economic growth. This is increasingly true in our knowledge and information-driven world marketplace.

Research and development must meet the pace of competition. In many instances, the life cycle of new products is continually shrinking. As a result, the pressure of getting new products to market is intense. Without robust R&D incentives encouraging these efforts, the ability to compete in world markets is diminished.

Continued private sector R&D is critical to the technological innovation and productivity advances that will maintain U.S. leadership in the world marketplace. Since 1981, when the credit was

first adopted, there have been dramatic gains in R&D spending. Unfortunately, our nation's private sector investment in R&D (as a percentage of GDP) lags far below many of our major foreign competitors. For example, U.S. firms spend (as a percentage of GDP) only one-third as much as their German counterparts on R&D, and only about two-thirds as much as Japanese firms. This trend must not be allowed to continue if our nation is to remain competitive in the world marketplace.

Moreover, we can no longer assume that American companies will automatically choose to site their R&D functions in the United States. Foreign governments are competing aggressively for U.S. research investments by offering substantial tax and other financial incentives. Even without these tax incentives, the cost of performing R&D in many foreign jurisdictions is lower than the cost to perform equivalent R&D in the U.S.

An OECD survey of sixteen member countries found that thirteen offer R&D tax incentives. Of the sixteen OECD nations surveyed, twelve provide a R&D tax credit or allow a deduction for more than 100% of R&D expenses. Six OECD nations provide accelerated depreciation for R&D capital. According to the OECD survey, the U.S. R&D tax credit as a percentage of industry-funded R&D was third lowest among nine countries analyzed.

Making the U.S. R&D tax credit permanent, however, would markedly improve U.S. competitiveness in world markets. The 1998 Coopers & Lybrand study found that, with a permanent credit, annual exports of goods manufactured here would increase by more than $6 billion, and imports of good manufactured elsewhere would decrease by nearly $3 billion. Congress and the Administration must make a strong and permanent commitment to attracting and retaining R&D investment in the United States. The best way to do that is to permanently extend the R&D credit.

### C. The credit provides a targeted incentive for additional R&D investment, increasing the amount of capital available for innovative and risky ventures

The R&D credit reduces the cost of capital for businesses that increase their R&D spending, thus increasing capital available for risky research ventures.

Products resulting from R&D must be evaluated for their financial viability. Market factors are providing increasing incentives for controlling the costs of business, including R&D. Based on the

cost of R&D, the threshold for acceptable risk either rises or falls. When the cost of R&D is reduced, the private sector is likely to perform more of it. In most situations, the greater the scope of R&D activities, or risk, the greater the potential for return to investors, employees and society at large.

The R&D credit is a vital tool to keep U.S. industry competitive because it frees-up capital to invest in leading edge technology and innovation. It makes available additional financial resources to companies seeking to accelerate research efforts. It lowers the economic risk to companies seeking to initiate new research, which will potentially lead to enhanced productivity and overall economic growth.

**D. Private industrial R&D spending is very responsive to the R&D credit, making the credit a cost effective tool to encourage economic growth**

Economic studies of the credit, including the Coopers & Lybrand 1998 study, the KPMG Peat Marwick 1994 study, and the article by B. Hall entitled: "R&D Tax Policy in the 1980s: Success or Failure?" Tax Policy and the Economy (1993), have found that a one-dollar reduction in the after-tax price of R&D stimulates approximately one dollar of additional private R&D spending in the short-run, and about two dollars of additional R&D in the long run. The Coopers & Lybrand study predicts that a permanent R&D credit would lead U.S. companies to spend $41 billion more (1998 dollars) on R&D for the period 1998-2010 than they would in the absence of the credit. This increase in private U.S. R&D spending, the 1998 study found, would produce substantial and tangible benefits to the U.S. economy.

Coopers & Lybrand estimated that this permanent extension would create nearly $58 billion of economic growth over the same 1998-2010 period, including $33 billion of additional domestic consumption and $12 billion of additional business investment. These benefits, the 1998 study found, stemmed from substantial productivity increases that could add more than $13 billion per year of increased productive capacity to the U.S. economy. Enacting a permanent R&D credit would lead U.S. companies to perform significantly more R&D, substantially increase U.S. workers' productivity, and dramatically grow the domestic economy.

## E. Research and Development is About Jobs and People

Investment in R&D is ultimately an investment in people, their education, their jobs, their economic security, and their standard of living. Dollars spent on R&D are primarily spent on salaries for engineers, researchers and technicians.

When taken to market as new products, incentives that support R&D translate to salaries of employees in manufacturing, administration and sales. Of exceptional importance to Softworks and the other members of the R&D Credit Coalition, R&D success also means salaries to the people in our distribution channels who bring our products to our customers as well as service providers and developers of complementary products. And, our customers ultimately drive the entire process by the value they put on the benefit to them of advances in technology (benefits that often translate into improving their ability to compete). By making other industries more competitive, research within one industry contributes to preserving and creating jobs across the entire economy.

My experience has been that more than 75 percent of expenses qualifying for the R&D credit go to salaries for researchers and technicians, providing high-skilled, high-wage jobs to U.S. workers. Investment in R&D, in people working to develop new ideas, is one of the most effective strategies for U.S. economic growth and competitive vitality. Indeed, the 1998 Coopers & Lybrand study shows improved worker productivity throughout the economy and the resulting wage gains going to hi-tech and low-tech workers alike. U.S. workers' personal income over the 1998-2010 period, the 1998 study predicts, would increase by more than $61 billion if the credit were permanently extended.

## F. The R&D credit is a market driven incentive

The R&D credit is a meaningful, market-driven tool to encourage private sector investment in research and development expenditures. Any taxpayer that increases their R&D spending and meets the technical requirements provided in the law can qualify for the credit. Instead of relying on government-directed and controlled R&D spending, businesses of all sizes, and in all industries, can best determine what types of products and technology to invest in so that they can ensure their competitiveness in the world marketplace.

## III. THE R&D CREDIT SHOULD BE MADE PERMANENT TO HAVE MAXIMUM INCENTIVE EFFECT

As the Joint Committee on Taxation points out in the Description of Revenue Provisions in the President's Fiscal Year 2000 Budget Proposal (JCS-1-99), "If a taxpayer considers an incremental research project, the lack of certainty regarding the availability of future credits increases the financial risk of the expenditure." Research projects cannot be turned off and on like a light switch; if corporate managers are going to take the benefits of the R&D credit into account in planning future research projects, they need to know that the credit will be available to their companies for the years in which the research is to be performed. Research projects have long horizons and extended gestation periods. Furthermore, firms generally face longer lags in adjusting their R&D investments compared, for example, to adjusting their investments in physical capital.

In order to increase their R&D efforts, businesses must search for, hire, and train scientists, engineers and support staff. They must often invest in new physical plants and equipment. There is little doubt that a portion of the incentive effect of the credit has been lost over the past seventeen years as a result of the constant uncertainty over the continued availability of the credit.

If the credit is to provide its maximum potential for increased R&D activity, the practice of periodically extending the credit for short periods, and then allowing it to lapse, must be eliminated, and the credit must be made permanent. Only then will the full potential of its incentive effect be felt across all the sectors of our economy.

## IV. CONCLUSION

Making the existing R&D credit permanent best serves the country's long term economic interests as it will eliminate the uncertainty over the credit's future and allow R&D performing businesses to make important long-term business decisions regarding research spending and investment. Private sector R&D stimulates investment in innovative products and processes that greatly contribute to overall economic growth, increased productivity, new and better U.S. jobs, and higher standards of living in the United States. Moreover, by creating an environment favorable to private sector R&D investment, jobs will remain in the United States. Investment in R&D is an investment in people. A permanent R&D credit is essential for the United States economy in order for its industries to compete

globally, as international competitors have chosen to offer direct financial subsidies and reduced capital cost incentives to "key" industries. I strongly support the permanent extension of the R&D credit, and increasing the AIRC rates by 1%, and urge Congress to enact the provisions of S. 680 - H.R. 835 before the credit expires on June 30, 1999.

**Testimony of**

**Mr. James L. Barksdale**

**The Barksdale Group**

**before the Joint Economic Committee**

**National High-Technology Summit**
**June 14, 1999**

## I. INTRODUCTION

Mr. Chairman and members of the Committee: it is an honor to appear before you to talk about the role of high technology in the economy – indeed how high technology is transforming the economy and creating an entirely new one – as well as the public policy implications of this transformation. I have focused my remarks on the portion of high technology that I will refer to as the Internet economy or the Net Economy.

## II. THE NET ECONOMY. WHAT IS IT? HOW WILL IT IMPROVE OUR LIVES?

Mr. Chairman, let me first define the Net economy: what it is, and how it will improve commerce, communications and our lives in general. The Internet's power as a tool for commerce and communications is unprecedented. Over the past five years the Internet has become a commercial entity and we've witnessed its explosion onto the global scene. Right now, articles about the Internet now account for one-quarter of all news. Every advertisement today includes a web address. And once you understand and have used the Internet, you cannot do without it. A recent AOL-Roper cyberstudy of Internet users showed that if people were stranded on a desert island and had to choose between the Internet, a telephone, and a television, the majority of them – 67% – said they would want to be connected to the Internet. Only 23% would prefer a telephone, and only 9% a television.

Technology, particularly networking technology, has increasingly affected the way our lives are lived and business is done. The telephone, fax machine, and cell phone, for example, have become indispensable, helping us to meet business challenges more quickly and efficiently. Today, it is Internet technology that is making a difference, causing profound changes in the way we conduct business and communicate. A study just released by the University of Texas sized the Net Economy at $301 billion in 1998 and potentially doubling each nine months. This is profound.

Currently, we're seeing enterprises and institutions use open-standards Internet technology to link their entire supply chains together and create vertical trading communities online. These new real-time, online vertical trading communities help to tightly connect enterprise to enterprise in a world where all commerce is electronic - the Net Economy.

### A. Virtual space vs. bricks and mortar.

It used to be that to build a business, you needed to think about bricks and mortar - in other words, physical retail space. In the new world of the Net Economy, however, your showroom can exist solely in virtual space. Amazon.com, a relative newcomer to the

book business (and a business whose "store" is solely online), now has a higher market capitalization than Barnes & Noble. Yet Barnes & Noble has been in the business much longer and has about $1 billion in hard assets in retail stores.

B. New Marketing.

The ability to understand how this new Net Economy is going to change the business model and everything we do every day is a critical part of making a company successful in the future.

The Internet has created a mass-market opportunity many businesses are very excited about. It's a new way of meeting and interacting with customers - not like running a TV ad, which is the old way of marketing to millions of people. In the new way of marketing to millions, via the Internet, customers can respond immediately. In fact, the Internet is the only medium in which a customer can see, evaluate and buy – virtually at once. Television is great for step 1, direct mail and other media work for step 2, but getting the customer to the store to make the purchase is the hardest part. Online, customers flow smoothly through all three steps. So it is not just hyperbole to say the Internet is a new medium. It genuinely creates new kinds of interaction and transaction opportunities. Everything changes.

## III. THE ROLE OF GOVERNMENT

As it looks at the future, the high-technology community should be united on at least one point: the government has a role to play in insuring that these opportunities can continue to exist. We should do all that we can to see that government does not over-regulate and stifle these industries. But that doesn't mean government should have no role at all. It has, and it will.

A. The Internet itself.

As you all know, the current Internet traces its lineage to federally funded research. If it were not for the work done by the Defense Advanced Research Project – especially in the area of packet switched and other networking technologies – we might not have the Internet as we know it. Continued federal funding throughout the 1980s through the National Science Foundation and other programs fueled the engine that became the Internet. On behalf of many, I say thank you to the Congress and to both Republican and Democratic Administrations for the foresight demonstrated in those prudent funding decisions.

B. Eliminating commercial restrictions.

So the Internet has been in existence since the 1960's, but we didn't hear much about it until the 90's. Until Congress changed the law in 1992, the Internet was almost solely the province of researchers and academicians. Then government, having served as mid-wife,

wisely decided to get out of the way and to open up the Internet to so many of the commercial possibilities. There are important lessons in that.

C. The Internet browser.

Marc Andreesen, the co-founder of Netscape Communications, was a participant in National Science Foundation programs in the early 90s at the University of Illinois, where he and his team in 1993 wrote the code that became the first easy to use browser. Even though the Internet and its ancestors had been around since the 1960's, the graphical browser – which allowed non-computer scientists to navigate the Internet - was the technological innovation we had been waiting for. This led to the creation of Netscape in 1994. And from that point on, there was no looking back. A lift-off explosion of innovation was triggered and the Internet achieved orbit -- and now the opportunity to improve the quality of life for all of mankind is right here before us. I am very, very proud of the role Netscape had in changing the world for the better.

There are two other laws that deserve mentioning, but not laws considered by Congress.

D. Two other laws – Moore's and Metcalfe's

For more than 30 years, we've all been excited about Moore's Law, which states that every 18 months or so the speed of microprocessors doubles and the cost decreases proportionally. Today, however, companies are no longer constrained by processor speed. Moore's Law is not going to do a whole lot more for these companies.

The important law to pay attention to now is Metcalfe's Law. This is named after Bob Metcalfe, inventor of Ethernet and founder of 3Com. Metcalfe's Law states that the value of a network grows exponentially. Every endpoint that's added can then be connected to all the other endpoints. In other words, the number of endpoints squared is an indicator of the value of a network. The network that doesn't reach everywhere is of little value. Think about what a tough job the first telephone salesman had. Who was the first customer going to talk to?

Companies today are driven more by the networking truths of Metcalfe's Law than by the hardware truths of Moore's Law. That's one of the features of the Net Economy. Networks - whether they are physical distribution networks such as the one Federal Express built or electronic networks such as the Internet and cellular phone networks - have the same underlying principles and values. I've had the privilege and opportunity to play a major role in all 3 of the network revolutions that have occurred over the past 25 years. So I have seen firsthand, from several vantage points, how an open point-to-point network grows in value exponentially as the number of endpoints grow. This is because new users create new uses which create new users. You can't size a bridge by counting the swimmers - a bridge creates traffic just as a network creates traffic. A network grows in value exponentially because every endpoint that's added can then be connected to all the other endpoints. That's what makes networks great economic engines – the Net Economy.

## IV. IMPORTANT POLICY CONSIDERATIONS

Mr. Chairman, let me mention a few policy issues that must be addressed carefully, some by Congress and some by business. First, privacy. Any firm doing business online must be sure to manage personal data about its customers ethically. Customers fear that their personal information may be collected by Web sites and shared with people or businesses they don't know. Customers demand to be informed about data collection practices; many laws in Europe, Canada, Australia, and elsewhere require companies to manage data in certain ways. It is in every business's best legal and financial interests to have a privacy policy prominently placed on its Web site, to participate in industry self-regulatory efforts, to become aware of applicable laws, and, most important, to listen to customers and their demands for privacy protection. Industry self-regulation has made great progress in the past year, but there will be an ongoing need for this to be monitored by government.

As part of our right to privacy, let me mention encryption, a critical and ubiquitous technology which allows our communications to remain private and our electronic commerce transactions to remain safe. A world without encryption for the Internet would be like a world without envelopes for letters. Every communication would be like a postcard. I recognize that more dialogue between industry and government is needed before we finally resolve this, which has been a particularly difficult issue for Congress. But the fact that the Internet is truly a global medium has meant that this and many other issues can no longer be looked at through just the prism of the U.S. government.

Much has been accomplished during the last two years on protecting our children from indecent material on the Internet. The issue of decency requires self-regulation by the industry through the increasing availability of effective and easy to use parental control software products. Recent events also indicate a need for greater awareness on the part of parents of how their children are using the Internet. Free speech has both positive and negative consequences.

This industry is a child of government research. It is now more important than ever that federal funding be increased for information technology basic research, as recommended by the Presidential Information and Technology Advisory Committee. The R&D tax credit should also be extended from annual to permanent if you want it to cost less and do more. The capital gains taxes collected from just one Internet startup pays for many years of federal funding of both programs.

A well educated work force is vital, and our education policies and assumptions must continually be challenged and updated to address real world needs. Also, the Congress and Administration are making strides in updating our immigration policies for high tech essential workers, but this will be a recurring issue for Congress and industry.

Similarly, there are a myriad of complicated telecommunications pricing and subsidy issues that will need to be addressed if we are to ensure we do not have a great societal divide between the information haves and the information have nots. We -- industry and government -- have only started to scratch at the surface of this problem.

A special word of thanks to the Congress, and perhaps especially to Senator Bennett for his leadership, on the Y2K legislation, which I understand is now ripe for consideration.

And there very important set of issues such as accounting, pooling, stock options, R&D tax treatment and others which have played an enormous role in establishing the appropriate incentives which have driven Net Economy companies. Congress must play the appropriate oversight role to insure that these uniquely important economic incentives are preserved or, if anything, increased.

The need for informed tax policies on Internet commerce are obvious, and I am confident the recently formed Advisory Commission on Electronic Commerce will produce a set of recommendations that lead to a simplified uniform system of taxation in the Net Economy.

## V. LOOKING AHEAD

Looking ahead, there are many exciting developments yet to come in the development of the Net Economy: enormous improvements in bandwidth and spectrum availability – both wired and wireless - at ever-decreasing prices; the convergence of voice, data, and video technologies and the new Internet services that will be born of that convergence; new appliances that connect to the Internet with or without wires, continually decreasing prices for PCs, which will provide greater opportunities for developing countries and certain population groups to gain more Internet access; opportunities for the improvement of medical research, the distribution of drugs and medicines, and the formation of communities focused on a particular disease or medical topic; the spread of distance learning, which is increasing the number of people who study, learn, and get degrees via a virtual classroom; new management practices for the virtual company; the combination of DVD, Internet-enhanced television, and web content for almost unlimited visual and auditory entertainment on demand.

The Internet is a powerful, interactive network that can span radio and television programming, information exchange, and telephony. Obviously, there are miles to go before we sleep, but it is very exciting to be a part of this.

## VI. HOW WILL IT IMPROVE MANKIND?

Imagine the opportunity as we connect billions of information devices, such as PCs, Web-ready television sets, telemetry devices, cellular phones, and telephones, in a global network where every point touches every other point – the Net Economy. The enormity

of this proposition is almost beyond human belief. It actually holds out a promise for solving many of the seemingly insurmountable problems that our children and grandchildren will face -- problems ranging from global warming to poverty and world hunger to the need for economies to continue to grow if we're going to continue to raise the standard of living throughout the world. With both physical distribution networks and telecommunications networks working together I believe we can provide solutions such as better education and training, better understanding of others' needs and wants through improved communication, and new payment systems that will allow the economies of the world to work together more smoothly.

Networks will enable nonindustrialized parts of the world to receive, at affordable prices, the same kinds of goods and services as the industrialized parts of the world. As we build these big networks, the incremental costs become less. Businesses can pinpoint markets through these marvelous new point-to-point networks and provision people with communications devices. As more people find it affordable to be part of the network, a whole new networked economy will be created.

## VII. ALL WORLD COMMERCE IS MAKING THE LEAP TO A VIRTUAL WORLD. IT IS ALL ONE FUTURE.

When I see press stories about the Net Economy, there is sometimes the notion that one is either in the Net Economy or the Old. If you go shopping at Wal-Mart in a small midwestern town, you might feel isolated from the Net Economy and assume it is for a new breed of people from California or other high-tech centers around the country.

But all world commerce is making the leap to a virtual world. All the real-world companies we know and have grown up with – such as Wal-Mart or Ford Motor Company or Bank of America or NBC – all of them will have new versions in the new virtual world.

The tremendous amount of capital flowing into the Net Economy, coupled with the relatively low barriers to entry, mean there are almost unlimited opportunities for entrepreneurs. A truly open Net Economy can create the next wave of opportunity so that today's dreamers and entrepreneurs can become the Sam Waltons or the Henry Fords of the Internet? There are so many bright people working in this new medium, and they're coming up with even more explosive ideas than anything we've imagined to date.

But the Net Economy - and all of us lucky enough to live in it - will only benefit from their genius if our most important policy objective is met: To ensure that true competition is restored to the industry. The engine of innovation has always been competition, and it is more important than ever that our economy is driven by this fundamental principle.

In the Old Economy, the lines between steel and agriculture and banking and telephones were clear and bright and the industries removed from one another. But in the Net Economy, much of this economic activity will consist of electronic transmissions through

the ether. This creates a greater opportunity for one or more entities to gain control over the chokeholds in the Net Economy. As more and more economic activity is conducted over the Internet, the harm to the economy from undue concentration of power could be far greater than in the Old Economy.

Simply put, the Internet is too important to be disrupted by undue concentrations of power, either in the public or private sector. There are several possible chokeholds in the Net Economy. It should be an important public policy goal that neither the government or a single firm or alliance should be allowed to acquire and use monopoly power with respect to these pathways to the Internet. No new laws are needed for such policy objectives to be achieved. Bipartisan support for public servants entrusted with the responsibility of enforcing current laws is surely not too much to ask. Indeed, if we do not have effective enforcement of antitrust laws, then it is only a matter of time before Congress or some agency has to step in and regulate, and that is surely not the way to go.

In closing, Mr. Chairman and members of the committee, let me express my profound appreciation to you for hosting the first High-Tech Summit. I have recently retired from active business management. As I near the next phase of my career as an observer, user and investor in the Net Economy, I am excited about this age of opportunity. I plan to continue to work with policymakers in the months and years ahead to expand the hope and promise of the open Net Economy.

Working Today

*A national voice for America's independent workforce*

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## Background on Working Today

Working Today is a national non-profit membership organization that promotes the interests of people who are working on their own. The organization was founded in New York City in 1995 to support a constituency that now makes up nearly 36% of the American workforce, according to Department of Labor statistics. We complement the efforts of professional associations and other worker groups by linking them together to create a network with the buying power and advocacy strength to create a new safety net for this rising independent workforce.

Our members—who now total over 93,000—join either as individuals or through one of the 25 organizations that has signed on with the Working Today Network to date. Most are working in flexible employment arrangements as temps, part-timers, freelancers, or self-employed workers. They range from low-income contingent workers to well-paid consultants.

We promote the interests of independent workers in three ways. First, Working Today offers immediate support and practical tools to help independent workers solve common problems. We offer members access to group-rate health insurance for individuals and free consumer-oriented legal, tax, and retirement planning advice. We also serve as a consumers' union by negotiating group discounts for members on travel, office supplies, and computers.

Second, Working Today provides information and support to create a sense of shared experience across the traditional boundaries of interest groups. We complement the efforts of organizations that support independent workers by linking them together to create a network with the buying power and advocacy strength needed to help independent workers at all income levels create their own safety nets. To this end, Working Today is building a service-rich coordination hub that will strengthen small, industry-specific associations and multiply what they can offer their members.

Third, we work with research institutions, foundations, and other groups to understand the implications of changes in the economy and to develop solutions to the larger, structural problems faced by our members (and, often, their employers). Our work is based on the idea that the old model of the large industrial workplace is no longer relevant to a growing sector of the workforce, nor are the benefit systems, legal protections, and labor laws that were created in the 1930s to support that model.

Our goal is to create a new structure that addresses the needs of the new workforce—a structure based on the notion of portability. Specifically, we believe that benefits and legal protections should not be tied exclusively to the employer, but should remain with individuals as they move from job to job and assignment to assignment. This new structure will not only protect the mobile workforce, but also encourage people to join together to devise valuable self-help and mutual aid strategies.

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## New Media Portable Health Fund
**Executive Summary – June 14, 1999**

Working Today is seeking assistance from the New York State Legislature to launch a Portable Benefits Fund (the "Fund") for freelancers, independent contractors, part-timers, and contingent workers in New York City's new media industry. Specifically, we are seeking $500,000 in economic development support and a State income tax exemption for the first $5,000 deposited into the Fund's proposed retirement product.

### The Problem: No Safety Net for the New Workforce

As legislators are well aware, a restructuring of the labor market has resulted in a health care crisis. As over 33 percent of Americans are now working in nontraditional employment arrangements, more and more of them are living without health insurance and pensions. While the majority of independent workers are good insurance risks—particularly as flexible work arrangements become more common among young people—insurance options that encourage participation by the healthy majority in a community-rated market have steadily declined. Nor can today's mobile workers keep their benefits as they move from employer to employer.

In New York City, there is ample evidence of these problems. Nearly a third of the city's residents have no health coverage, even though 75 percent of the uninsured work. Moreover, it has been estimated that one out of every four uninsured New Yorkers is between the ages of 19 and 49.[1] These trends are even more pronounced in new media, a highly flexible and dynamic industry with over 50,000 independent workers in the city who are mostly young, under- and uninsured, and employed by small companies that rarely offer benefits packages.[2] Since this industry is a source of high-quality jobs, and since New York is facing competition from other cities as the use of the Internet becomes central to many industries, it is imperative that we devise a new system for delivering benefits to the new workforce.

### The Solution: Portable Benefits for Independent Workers

Working Today is creating a pilot Portable Benefits Fund to deliver affordable, portable insurance and pensions to New York's new media industry. We are currently conducting a feasibility study for the pilot, which is set to launch in March 2000. To learn more about existing models of portability, we met with plan administrators, health policy experts, insurance industry leaders, lawyers, accountants, and other officials for existing portable benefit plans like those created by the International Alliance of Theatre and Stage Employees (IATSE), the Building Trades (Carpenters Union), and TIAA-CREF (the portable university pension plan). Using this research, we have developed a viable plan that will address adverse selection and premium collective concerns, as well as meet the needs of independent new media workers, by:

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[1] *Taking Steps, Losing Ground: The Challenge of New Yorkers without Health Insurance*, Special Report of the United Hospital Fund, 1998.

[2] Coopers & Lybrand, *2nd New York New Media Industry Survey: Opportunities & Challenges of New York's Emerging Cyber-Industry*, 1997.

- significantly reducing the cost of insurance and retirement products through group purchasing, as well as reduced marketing and administration costs;
- providing incentives for commencing and then maintaining coverage over time to flexible and part-time workers;
- linking health insurance to a retirement product; and
- allowing workers to retain benefits while moving from job to job by serving workers from a central fund.

We believe that, if successful, the Portable Benefits Fund could serve as a model for providing benefits to independents—particularly low-wage workers—in other industries and geographic areas. As the Portable Benefits Fund widens the risk pool and reduces costs, we anticipate that the market demand it creates will ease the replication process. In doing so, the Fund will promote cross-subsidization across health and income lines and make affordable solutions to the health care problem in the individual market more politically and economically feasible. New York State would be the first to innovate in this new benefit delivery system.

## Retaining Quality Jobs in New York City

A 1997 Coopers & Lybrand study showed that the new media industry employed over 100,000 New Yorkers and estimated that the job market would increase to over 180,000 by the year 2000. These figures do not include the thousands of new media-related jobs in New York's most high-profile industries, such as finance, advertising, and publishing. In addition to creating new jobs across the skill and wage spectrum, New York City's new media industry generated gross revenues of $5.7 billion in 1997.[3]

Despite this success, New York still lags behind Silicon Valley, greater Boston, and Seattle as a new media center. As with the biotechnology industry in the 1980s, which was lured away from New York to Boston with attractive business incentive packages, New York City stands a chance of losing out to new media competitors in other cities.

In light of these variables, it is critical to consider initiatives that meet the particular needs of the small employers, entrepreneurs, and mobile workers who have fueled new media's rapid growth. One of the sector's most pressing challenges in supporting the new media industry is the lack of affordable health insurance and benefits packages to attract and retain this mobile workforce.

## Design of the Portable Benefits Fund

Working Today's Portable Benefits Fund will serve as a delivery system for essential benefits like health insurance and pensions for freelancers, consultants, independent workers, temps, and contingent workers. Because the Fund's core health insurance and pension benefits are likely to be highly regulated, many of its components will be determined by what we can do in the current legal and regulatory environment. Our analysis of the environment has led us to an initial fund structure, outlined below.

### A. Insurance

Working Today's staff is exploring the various insurance options, products, and riders available in the market to better understand our constraints on the insurance company and product availability side. With help from insurance experts in our working group, we are refining the three most likely plans to be offered. The potential designs are borne out by our preliminary surveys and interviews, and will be thoroughly market tested for the Portable Benefits Fund by a market research firm. Our current proposed options include:

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[3] Coopers & Lybrand, *2nd New York New Media Industry Survey.*

- A high-deductible, MSA-eligible plan with catastrophic coverage—mainly hospitalization, emergency care, and surgery. If this were an HMO plan, it would include a preset number of office visits per annum for preventative checkups, etc. The pretax medical savings account would help fund the high deductible in case of serious injury or hospitalization. Because of their administrative complexity, MSAs have not become very popular since their inception in the 1996 HIPA Act. Also, the brokers able to establish them do not tend to make a lot of money from them until the balances reach a large amount, so MSAs are not actively marketed. We are currently exploring how Working Today could streamline the administration and offer them at a lower monthly fee.

- A plan with a medium-level deductible ($500 for HMO hospital coverage, or $500 to $1,000 in general with a PPO); higher-end co-payments ($15 to $25 for office visits and lab tests); and standard levels of coverage for hospitalization, surgery, emergency care, mental health, substance abuse, maternity, etc. Out-of-network coverage, if applicable, would be in the 70 percent range, and out-of-pocket maximums would be in the $2,000 range. Prescriptions would be included.

- A low-deductible ($250 to $500), low co-payment ($10) plan with fairly comprehensive coverage for all the above listed items and a POS option. Prescriptions would be included.

## Challenge: Countering Adverse Selection

Adverse selection is the single greatest concern in the individual insurance market today. Because of the unaffordable nature of health insurance, many young people choose to go without it. The pilot Fund is designed to mitigate the effects of this problem by making insurance cheaper and creating incentives to remain in the program and in the community-rated pool. As the real and perceived price of insurance to the individual goes down, it will become economically rational for greater numbers of healthy people to join a plan long-term.

### Promoting Long-Term Use

In order to partially counter adverse selection, Working Today is meeting with experts to define possible structural aspects of the Fund that would promote long-term participation. Some of them are outlined below. All of these are currently under consideration, and none should be considered finalized.

- Once eligible, participants can enter into the plan at any time. They become eligible for membership in the Fund by either paying dues to a participating association for 12 months, or being sponsored into the plan by a participating employer. If sponsored, they need to hold membership in the Fund, at no cost to them, for three months before they are able to access any of the Fund's services. After the first 12 months, participants can change insurance options during a yearly four-week open period (mid-October to mid-November). Plan selections and changes can be made in between open periods only in the case of a major life event—marriage, birth, etc.

- Participants can upgrade or downgrade only one option level at a time. If an individual leaves the Fund, he or she will have to requalify for membership in the Fund as per its eligibility rules prior to being able to utilize its services again, or show an alternative source of insurance for a large portion of the time they were not in the Fund. This would lower the marketing costs for our target market, which would translate to a lower administrative fee for the participants.

- Participants have access to additional health services once they purchase the health insurance. Among the offerings being considered is a dental insurance arrangement or discount card at a low annual fee, as well as a vision discount card through a national vision care retailer with a managed care program. We are currently finalizing a partnership with an alternative care network for acupuncture, massage therapy, etc.

- The Fund will also offer a cost-effective retirement plan to reduce turnover and create incentives for continuous participation. We are also exploring other relevant discounts.

Incentivizing People to Join by Lowering Costs

Working Today has learned by working with insurance companies and policy experts, and from providing health insurance to our current members, that:

- large insurance purchasers get the best rates;
- sales people approach small businesses from multiple insurance companies, and the costs associated with marketing are passed on to consumers; and
- products in the individual market cost the most.

As a first step the Fund will bring together members of the various new media associations to provide them small group-rated health insurance, which will reduce premiums by approximately 15 to 20 percent. Secondly, by distributing the product via associations using the Internet, we would reduce advertising and marketing costs. Also, if members of an association receive information about a plan that has the association's stamp of approval, then the plan essentially "sells itself." Lastly, by streamlining premium collection by using a direct debit billing system (eventually combined with a credit card billing system), the Fund will reduce the costs of collection and unpaid premium (bad debt).

Working Today is in discussions with benefits experts at Segal & Company and other firms to identify and evaluate competitive products and negotiate fair rates. We anticipate that over the long run, greater consumer information and clout will cause insurance providers to offer lower, more competitive rates. In addition, our unique position will enable us to balance the concerns of workers in the new media industry against those of workers generally. We will use our leadership to broaden insurance coverage to other groups of workers, particularly the low-income working uninsured.

## B. Retirement Savings and Financial Services

As the rate of nontraditional employment increases, and with IRA's capped at $2,000 post-tax and the Social Security system in decline, a whole group of people is essentially losing the ability to save on a pretax basis for retirement. And although Keoghs and SEP IRAs are available to individuals, they are not accessible to contingent workers, and their use demands financial savvy.

To address the problem of retirement savings over the short term, and to increase perceived switching costs with regard to health insurance, Working Today is considering offering a TIAA-CREF non-qualified annuity product with both fixed and variable accumulation accounts. TIAA-CREF is a reputable pension provider whose annuity product has one of the lowest expense costs (.37 percent) in the industry, with no front-end or back-end loads.

## Request from the State

1. In order to lower premiums further in the short run, we are asking the Legislature for a subsidy of 10 to 20 percent of total premium payment for Fund participants over the next five years. The Fund would receive the total amount of the subsidy from the State, prorate it by provider, and pay them accordingly.

   Since Working Today represents a much broader constituency of independent workers in all industries across economic lines, we are not interested in creating an association plan that simply pulls young, healthy people out of the general pool. This would be detrimental to all of our members. Although we cannot single-handedly change the nature of the insurance market to reflect the changing workforce, our final aim is to reintroduce younger and healthier individuals into the community-rated pool.

   To meet this goal, we would also attempt to have the Fund qualified under NYS Insurance Regulation 360.8 within the next three to five years, even though it may not have the requisite 10,000 participants. Such a qualification would provide the Fund with the option of offering a blended rate based on a combination of the

Fund's claims experience and community rates over the following few years. The lower blended rate would allow for the phase-out of the subsidy while keeping participation in the Fund continuous. Over time, this would help introduce a portion of the healthy and currently uninsured population back into the pool.

2. To enhance the retirement portion of the Fund, we ask that it be supplemented with a New York State income tax exemption for the first $5,000 deposited into the proposed annuity account by the individual.

## Conclusion

The Portable Benefits Fund is an innovative, viable system of delivering benefits to a new workforce in the new economy. In commencing with new media, the Fund will also support an industry critical to the economic development of New York City. By assisting this project in its pilot stage, New York State would be at the cutting edge of creating a unique delivery system to support, create, and retain jobs in an emerging economic growth sector by providing essential benefits in keeping with the way people work today.

**PREPARED STATEMENT OF SENATOR CHARLES S. ROBB**

Thank you, Mr. Chairman. I wanted to begin this morning by thanking my colleague from Florida for calling this summit. As a Senator from Virginia, with one of the world's most vibrant and dynamic high-tech communities, I've seen first-hand how technology is revolutionizing the country, and I'm glad that the Joint Economic Committee is taking the time to examine the vital role this industry plays in our New Economy. The witnesses we'll be hearing from over the next three days have helped redefine our traditional conceptions of business and growth, and I'd like to thank each of them in advance of their testimony for coming to this summit.

My interest in exploiting technology to foster economic growth dates back to my days as Virginia governor. One of my first actions in the governor's office was to establish a special commission on science and technology, charged with examining the ways that Virginia could help companies bring new technology to the marketplace and support technology-based economic development across our Commonwealth. This Commission led to the founding of Virginia's Center for Innovative Technology, an organization that helped plant the seed for the technology boom we've seen around my state today.

With technology driving economic growth, we're finally starting to see more attention focused on the policies that affect the industry. Steve Case, the CEO of America Online, recently stated that over the next five years, he believes the future of this medium will be determined more by policy choices than by technological choices. And indeed, the choices we make over the next few years will play a tremendous role in shaping the industry.

I think that many in Congress have finally come to understand that the free and open marketplace is what drives the New Economy. The high tech industry exemplifies how the vigorous competition of the free market has resulted in innovation, and while there are certain important areas where government should be involved, a consensus is fast developing that the government ought not to be a competitor or player in the industry.

Where government does have a proper role is to serve as the "referee," making sure that the marketplace is not undermined. Innovation flourishes when markets operate freely and fairly, and government should ensure that there is a level playing field for all competitors.

In addition, we also should craft policies to help ensure America's technology industry can to lead the world in growth and

innovation. And the first place we should revamp is our research policy.

Not a single one of the companies testifying before this committee would be here if it wasn't for years of strong public and private commitment to research and development. Unfortunately, while these past investments are paying off with the New Economy we have today, current investments in R & D are far below what they used to be, as a percentage of GDP, and support for basic research is faltering in the private sector.

With R & D so integral to our continued growth, we ought to be doing more to encourage it. One place we can start is by permanently extending the R & D tax credit. With all the attention given to the importance of research, it is disappointing that Congress has failed to authorize this important credit on anything more than a year-by-year basis. If we're serious about preserving and expanding the strength of our high tech economy, we should allocate the resources to support this initiative permanently.

Finally, I hope our panels of witnesses over the next three days will offer their suggestions as to how we can address the labor shortages that plague the high-tech industry. In Northern Virginia alone, there are more than 20,000 high-tech jobs unfilled, and across the country, well over 200,000. The fact that we've had to raise caps on H-1B visas in the past year to help the tech industry meet their demand for skilled workers shows how dire our need is to invest more in strengthening our education system. The New Economy thrives off of knowledge, particularly in the sciences, and our continued economic success will depend in part upon our ability to develop new learning systems that give all Americans access to top quality education.

Again, Mr. Chairman, I thank you for bringing this hearing together, and I look forward to hearing from our witnesses.

**PREPARED STATEMENT OF**
**REPRESENTATIVE PETE STARK, RANKING MINORITY MEMBER**

I wish to thank Chairman Mack for hosting this High-Tech Summit. Recent technological breakthroughs in computers, software and information networks are already having a significant impact on the U.S. economy and the society more broadly. The fruits of this information technology revolution have become integral to everything we do. Most members of Congress have computers on their desks — although you will have to ask them yourself to find out if they actually know how to use them! In fact, Mr. Chairman, I know we have a full agenda before us over the next few days, but given the group coming before us, I was going to ask if we might dedicate some time over the next few days for technical questions.

Technology is transforming the way we do almost everything. Yet there is still a lot we need to learn, not only about how to use the technology, but also how to insure that we maximize its benefits and insure that those benefits are shared throughout the economy.

In that regard, I want to welcome Chairman Greenspan to the Committee this morning. One place to start this learning process is by trying to identify what impact the information technology revolution is having on the overall economy. Do we need to rethink some of the long-standing economic relationships upon which we rely in making economic policy? For example, already there is quite a debate over how all this new technology is effecting productivity. If, in fact, we are experiencing a step-up in productivity growth, might that change the old ways we think about inflation, unemployment and economic growth?

Mr. Greenspan has graciously agreed to come before the Committee twice this week. I guess with the economy performing as well as it is, you have more time to share with us. As always, we look forward to your insights whenever you appear before us.

I also want to welcome all of the other witnesses who have taken time from their busy schedules to participate in this High-Tech Summit. By my count, we will hear from more than two dozen executives, representing some of the most innovative businesses in the country, a member of President Clinton's cabinet, a university president and other noted scholars. With all this talent collected here, I wonder if we run the risk of a brief economic slowdown over the next three days!

One thing should be made clear at the outset of these hearings. When I ask what impact technology has on the economy, I am referring specifically to what impact it has on jobs, incomes and the

standard of living of all Americans. Obviously, businesses need to prosper in order for individuals to improve their economic situation, but as elected officials, we must be concerned that their lives are improved. I hope we will look beyond stock prices and company valuations and examine job creation and income growth over the next three days.

Technology is not just some new gadget or game, but rather it is an invaluable nutrient for the economy. In most cases, the more technology we have, the better off we are. And eventually, most technologies are beneficial to everyone. But in the short run, as new technologies are introduced and defused, there is a real risk of leaving some people behind. Education and worker training are the key to insuring that everyone can use this new technology and benefit from it.

Our—both the public and private sector—success in managing this information technology revolution will be measured by how its benefits are shared.

Over the next three days we are going to hear from a collection of some of the nation's most successful business executives, as well as other experts—probably one of the largest collections of talent to come before a Congressional Committee in recent memory. I hope we will have the opportunity to take advantage of your being here to help us better understand the changes that are taking place, as well as help us think about ways to insure that the technology you create and sell is used appropriately and in ways that makes all Americans better off.

In particular, I am asking for you, those who have participated in these innovations, to lend use your creativity and skills in trying to develop responses to important questions concerning how technology is used. For example, I have a 100 percent voting record with the ACLU. I am one of Congress's strongest supporters of freedom of expression. But I will tell you in all honesty that I questioned how children can be shielded from pornography on the Internet when I learned several years ago that the person taking care of my child was accessing pornography on my home computer. I certainly hope some of our witnesses will address this serious concern over the next few days.

On the question of privacy, I appreciate the benefit of sharing information. The question is, how can we prevent information from causing harm to unsuspecting individuals who may or may not have even granted permission to have that information shared in the first place?

I believe it is too easy to call for extreme measures to solve problems such as pornography and privacy on the web. We need to be

thoughtful and creative, if only to insure that our solutions do not cause more problems. That's where you come in. I want to enlist your assistance in helping us consider some of the public policy issues which have grown out of the information technology revolution. You and your creative colleagues may be able to develop technologies which address some of these hard problems.

After all the testimony and discussion, we, the Members of Congress, will be left with two important questions. First, how does this explosion in information technology affect the economy and in particular, workers and families? How do we insure that as many people as possible benefit from these new technologies and their uses?

Second, what does all this mean for the way we make economic policy? For example, can we allow monetary policy to be more flexible in light of stronger productivity gains? Will technology change the nature of the business cycle as we currently know it? What is the appropriate role for the government in fostering and promoting technology and innovation? For we should not lose sight of the fact that the US Government, with all its investments in research and development, set the stage for this information technology revolution in the first place.

I come with many questions, few answers and a great appetite to learn more about the information technology revolution we are currently experiencing. Mr. Chairman, I look forward to the opportunity to ask these questions and others to some of the nation's most talented individuals.

Thank you.

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