

S. HRG. 106-1062

**THE ROLE OF STANDARDS IN THE GROWTH
OF GLOBAL ELECTRONIC COMMERCE**

HEARING

BEFORE THE

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND
SPACE

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION

UNITED STATES SENATE

ONE HUNDRED SIXTH CONGRESS

FIRST SESSION

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OCTOBER 28, 1999
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ONE HUNDRED SIXTH CONGRESS

FIRST SESSION

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THE ROLE OF STANDARDS IN THE GROWTH OF GLOBAL ELECTRONIC COMMERCE

THURSDAY, OCTOBER 28, 1999

U.S. SENATE,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:05 a.m., in room SR-253, Russell Senate Office Building, Hon. Bill Frist, chairman of the subcommittee, presiding.

Staff members assigned to this hearing: Floyd DesChamps and Elizabeth Prostic, Republican professional staff; and Jean Toal Eisen, Democratic professional staff.

OPENING STATEMENT OF HON. BILL FRIST, U.S. SENATOR FROM TENNESSEE

Senator FRIST. Good morning, and welcome to the Science, Technology, and Space Subcommittee hearing on the role of standards in the growth of global electronic commerce. E-commerce, as we all know, has fundamentally changed how businesses operate, how business-customer relationships are cultivated, and how we ourselves; as well as businesses, purchase goods.

E-commerce has been widely embraced both for its promise to reduce the cost of doing business, as well as its potential to provide businesses with greater reach to their customers. Essentially nonexistent just a few years ago, e-commerce is expected to top a staggering \$1 trillion by the year 2003.

The market for e-commerce application software is expected to grow almost 300 percent in 1999 alone, to \$1.7 billion, and projected to jump to \$13.1 billion by the year 2003.

Today's hearing focuses on the importance of standards to enable the growth of global economic commerce. E-commerce as an application on the Internet is inherently global. There are no geographic borders. As such, our discussion today will be global in nature. If we define electronic commerce as the electronic transactions involved in the purchase of goods and services, then for e-commerce to reach its full potential, these transactions must be completed in a seamless manner regardless of regulatory or geographical borders.

Thus, an important enabler for global electronic commerce is the ability of one system to communicate with another and be able to exchange data, commonly referred to as system interoperability. The continued growth of e-commerce depends on a fundamental set of technical standards that enables essential technologies to inter-

operate, and on a policy and a legal framework that supports the development that the market demands.

A lack of interoperability introduces inefficiency into the e-commerce system, preventing it from reaching its maximum potential. We are interested in hearing about this impact on your current and future business operations. In discussing standards, we can, and should consider the issues at two different levels: (1) the development of technology-specific specifications and (2) the establishment of technology neutral frameworks.

Consider, for example, the technology neutral framework being proposed for the use of electronic authentication, which does not presuppose any technology-specific solutions. Traditional standards organizations such as the International Standards Organization are often slow to accommodate the rapidly changing environment of the market of e-commerce. Moreover, the perceived permanence and monopolistic nature of formal standards often results in fierce competition between companies struggling to protect their intellectual property assets and investments.

In response to this situation, a proliferation of industry consortia has been formed, usually by groups of companies who are collaborating to develop interoperable systems that can quickly address market needs. Both types of organizations, the formal standards organizations and the new industry consortia have roles to play in establishing interoperability of e-commerce systems.

Through both formal standards bodies and industry consortia, the private sector is aggressively building a suite of standards to support both the global electronic commerce infrastructure and the specific needs of global electronic commerce services. However, to be effective, these industry-led standards should eliminate barriers to trade and competition while at the same time stimulating innovation. They must be flexible, responsive, and directed toward non-proprietary solutions.

Several of the witnesses today will address these issues. Now, we are also interested in your recommendations on what, if any, role the Government should play in establishing a framework that will be conducive to achieving the objectives I have just stated, and help facilitate the development of relevant standards, thus ensuring continued growth of e-commerce. Agreeing on such a framework establishes a common foundation which we can use for future discussions.

Today's hearing represents our efforts at establishing a three-way dialog on these subject matters between the private sector, between the administration, and the U.S. Congress. The administration position will be represented by the Department of Commerce.

We have also invited a foremost academic expert who wrote one of the first textbooks on e-commerce from the private sector. Commerce Net and the Financial Services Technology Consortium are representative of the mixture of both industrial consortia and formal standards bodies collaboration. We are interested in hearing how the financial sector is addressing the interoperability issue, as it is the glue at the center of e-commerce services.

As a larger retailer, Wal-Mart represents one of the most innovative companies in industry today that has integrated e-commerce into its current and future business operations.

As for procedure today, I have asked each witness to limit their presentations to approximately 5 minutes in the oral testimony, and the witnesses' entire written testimony will be made a part of the official record. I will be in and out during the hearing because I have to testify, due to a scheduling conflict, myself at another hearing, where I will be leaving for a few minutes.

Senator Breaux will be here shortly, and Senator Conrad Burns, I am delighted to welcome you. I am just about to introduce our first panel. Would you like to make any opening comments as we go forward?

[The prepared statement of Senator Frist follows:]

PREPARED STATEMENT OF HON. BILL FRIST,
U.S. SENATOR FROM TENNESSEE

Good morning and welcome to the Science, Technology, and Space Subcommittee hearing on "The Role of Standards in the Growth of Global Electronic Commerce."

Electronic commerce, or "e-commerce," has fundamentally changed the paradigm for how businesses operate, how business-customer relationships are cultivated, and how we ourselves purchase goods.

E-commerce has been widely embraced, both for its promise to significantly reduce the cost of doing business, and for its potential to provide businesses with greater reach to potential customers. This is evident in the growth of the electronic commerce market which, though almost non-existent just a few years ago, is expected to top a staggering \$1 trillion by 2003, according to market research reports. The market for e-commerce application software is expected to grow 280 percent in 1999 to \$1.7 billion, and projected to jump to \$13.1 billion by 2003.

Today's hearing focuses on the importance of standards in enabling the growth of global electronic commerce. Electronic commerce, as an application on the Internet, is inherently global. As such, our discussion must be global in nature.

If we define e-commerce as the electronic transactions involved in the purchase of goods and services, then for e-commerce to reach its full potential, these transactions must be able to be completed seamlessly, regardless of geographical or regulatory borders.

Thus, an important enabler for global electronic commerce is the ability of different systems to communicate and exchange data, commonly referred to as "system interoperability." The continued growth of e-commerce depends on a fundamental set of technical standards that enables essential technologies to interoperate, and on a policy and legal framework that supports the development that the market demands. A lack of interoperability introduces inefficiency into the e-commerce system, preventing it from realizing its maximum potential. We are interested in hearing about this impact on your current and future business operations.

In discussing standards, we can consider - at a minimum - the issues at two different levels:

- (1) the development of technology-specific specifications, and
- (2) the establishment of technology-neutral frameworks.

Consider, for example, the technology-neutral framework being proposed for the use of electronic authentication, which does not presuppose any technology-specific solutions.

Traditional standards organizations such as the International Standards Organization are often slow to accommodate the rapidly changing environment of a new market such as e-commerce. Moreover, the perceived permanence and monopolistic nature of formal standards often results in fierce competition between companies struggling to protect their intellectual property assets and investments.

In response to this situation, a proliferation industry consortia has been formed, usually by groups of companies who are collaborating to develop interoperable systems that can quickly address market needs. Both types of organizations - the formal standards organizations and the new industry consortia - have roles to play in establishing interoperability of e-commerce systems.

Through both formal standards bodies and industry consortia, the private sector is aggressively building a suite of standards to support both the global electronic commerce infrastructure and the specific needs of global electronic commerce services.

However, to be effective, these industry-led standards should eliminate barriers to trade and competition while stimulating innovation. They must also be flexible, responsive, and directed toward non-proprietary solutions. Several of the witnesses today will address these issues.

We are also interested in your recommendations on what, if any, role the government should play in establishing a framework that will be conducive to achieving the objectives I have just stated, and help facilitate the development of relevant standards, thus ensuring the continued growth of electronic commerce. Agreeing on such a framework establishes a common foundation which we can use for future discussions.

Today's hearing represents our efforts at establishing a three-way dialogue on these subject matters, between the private sector, the Administration, and the Congress.

The Administration position will be well represented by the Department of Commerce. We have also invited a foremost academic expert who wrote one of the first textbooks on electronic commerce.

From the private sector, CommerceNet and the Financial Services Technology Consortium are representative of the mixture of both industrial consortia and formal standards bodies collaboration. We are interested in hearing how the financial sector is addressing the interoperability issue as it is the glue at the center of e-commerce services.

As a large retailer, Wal-Mart represents one of the most innovative companies in industry today that has integrated e-commerce into its current and future business operations.

**STATEMENT OF HON. CONRAD BURNS,
U.S. SENATOR FROM MONTANA**

Senator BURNS. Let me see if I have got any comments here. I tell you what, Mr. Chairman, thank you, this is an important hearing, although you know, we are down to the shank of this first half of this Congress, but we know we have got work ahead of us in order to really realize the full potential of e-commerce on the Internet, and it continues to grow, because Government has not figured out how to tax it or how to regulate it, and then once we do so, I think some exciting things along the lines of digital signatures, encryption security, privacy, and these type things, it will grow even more.

So thank you for holding this hearing today.

Senator FRIST. Thank you very much, and we will turn to our first panel, Hon. Andrew Pincus, General Counsel, U.S. Department of Commerce. Thank you so much for being with us, and we will have some questioning right after your presentation. Mr. Pincus.

**STATEMENT OF HON. ANDREW J. PINCUS, GENERAL COUNSEL,
U.S. DEPARTMENT OF COMMERCE**

Mr. PINCUS. Thank you, Mr. Chairman, and thank you for the invitation to testify on what we agree with you and Senator Burns is a very, very important and timely topic. As you look across the economy there is nothing more important, nothing that is driving our economic growth more than information technology and electronic commerce, and so we believe in the administration that focusing on that question and making sure that Government is doing everything it can to foster that development is a very, very important topic.

As you said, Mr. Chairman, the essential genius of the Internet is its interoperability, the fact that it allows millions of users to connect with each other, and facilitates what are fast becoming an

infinite variety of applications from e-commerce to telemedicine, to remote education—the list goes on and on.

This interoperability is essential and so the question really is, what do we do to preserve it, and protect it and promote it? In the framework for global electronic commerce that Vice President Clinton and Vice President Gore issued now about 2½ years ago they identified the question of standards as an important issue for the Administration to focus on and tasked Secretary Daley with that mission.

In the framework, the President and Vice President emphasized the private sector should lead generally with respect to e-commerce. As Senator Burns said, we in the Government do not know enough about what is going on, and do not know enough about what is coming in the future to really devise regulatory schemes that are going to work, and the risk is that we will devise a scheme that will skew e-commerce's development maybe in the wrong direction, rather than enabling the market to carry those developments forward, and we believe that is especially true in this area.

We believe that an open market-driven consensus-based process is the best way to arrive at standards that ensure interoperability. Government cannot drive this process, the private sector must, but it has to be open, and it has to be consensus-based, because we certainly do not want the standards process to be used for anti-competitive or other improper ends.

We believe Government can play a supporting role, but ultimately, as I said, cannot force the adoption of standards that the market is not ready to recognize and cannot really direct the process in any direction. That has to be something that the private sector does.

Of course, that has been our policy not just with respect to standards, not just in the e-commerce area, but across the board, and we at the Commerce Department are proud that NIST has played an important role in supporting the private sector standard development process in our country in a way that we believe has worked very well with respect to e-commerce.

As you said, Mr. Chairman, one look at our economy indicates our system is working well. We are the leader in the world in the development of the stuff that makes the Internet, and in coming up with most of the applications, and figuring out new ways to use this technology.

So we think domestically our system is working quite well. Of course, as you said, e-commerce is global, so we have to consider these issues on a global basis, and that means the private sector standard development has to be global in nature, and that has happened in the Internet context. As you mentioned, organizations like the IATF and formal standards have really played a very, very important role in its development.

When one looks at the international scene, one concern, of course, is that not all Governments share our view about how the standard-setting process should work. Many of the most important, what are important trading partners articulate a view that has Government intervening much more aggressively in setting standards, and one example of that situation you both mentioned is the

electronic signature situation, which we at the Commerce Department are also working on on behalf of the Administration.

As you know, the Administration and Congress and the States, through the Uniform Electronic Transactions Act, have been very strongly in favor of the technology-neutral standard or process for electronic signatures, not wanting to specify a particular technology that carries legal validity, but rather enabling all technologies, and allowing the market to choose among them.

Unfortunately, the European Union seems to be taking a different approach, and is in the process of promulgating a directive which, although it does leave room for the market to operate, also has provisions that direct Governments to identify specific technologies and specific standards that will carry a legal presumption of validity, and we find that a very troubling development.

We think that what this means for the Government is that in addition to what I mentioned about playing a supporting role with respect to standards development, we have to work around the world to prevent other Governments from using a standardization process to impose technical barriers to trade, or special use requirements that will interfere with the development of the Internet.

We also have to be sure the international standard-setting process is market-driven and open and consensus-based, and there are not Governments or Government surrogates trying to put a finger on the scales and push for the development of standards that will skew the international market in a way that will hurt U.S. companies, so that is something that we and the U.S. Trade Representatives are very focused on internationally.

We have a standard attache in Brussels that works on this issue, and we are looking to place people in other parts of the world to aggressively pursue an open, international standard-setting process.

Thank you very much, Mr. Chairman. I would be happy to answer your questions.

[The prepared statement of Mr. Pincus follows:]

PREPARED STATEMENT OF HON. ANDREW J. PINCUS, GENERAL COUNSEL,
U.S. DEPARTMENT OF COMMERCE

Mr. Chairman and members of the Subcommittee, it is a pleasure to appear before you today to discuss the importance of standards in the growth of global Electronic Commerce.

Principles of Electronic Commerce

In the *Framework for Global Electronic Commerce*, President Clinton outlined the key principles that the U.S. Government should apply in this area to promote use of the Internet and to enhance global electronic commerce:

- First, the U.S. Government recognizes that timely and appropriate standards are critical to the long-term commercial success of the Internet, as they allow products and services from different vendors—and different regions—to work together, facilitate robust competition, and reduce uncertainty in the global marketplace.
- Second, the needs and dynamics of the marketplace, and not governments, must guide standard development and implementation activities. Governments should refrain from issuing technical regulations and instead should rely, to the maximum extent possible, on the private sector to self-regulate, using standards developed by voluntary, industry-led, open, consensus-based organizations at both the national and international levels. Because interoperability and reliability of the Internet are crucial for the success of e-commerce, the private sector has a strong incentive to develop needed standards and to self-regulate.

- Third, the U.S. Government should advance private sector leadership in the development of such standards in bilateral, regional, and multilateral fora, and should strive to reduce the abuse of standards by governments to create technical barriers to global electronic trade.
- Fourth, as indicated in the Framework, the Government can play a useful, supportive role—working in partnership with the private sector—to enhance the standard-setting processes and achieve commercial and public policy goals.

In outlining these principles which are fundamental to our policy to promote electronic commerce, it is important to realize that “standards” can mean many things in today’s fast-paced, dynamic information technology-driven economy. For example, there are technical standards that are the products of traditional standard-setting organizations, both at national and international levels. Similar to these kinds of standards are the protocols and techniques developed by groups like the Internet Engineering Task Force which form the technical foundation for running this new global medium for electronic commerce. There are also standards and related issues of telecommunications networks where treaty-based organizations like the International Telecommunications Union predominate.

But, more often than not, the standards we take for granted today are in fact products and services that are broadly used and implemented on a global and national basis. These so-called “de facto” standards are driving the growth and use of applications of the Internet, and are moving faster than both traditional and non-traditional standards-setting organizations can keep pace with.

How to Encourage and Facilitate Standards?

Our challenge, then, is to recognize that no one forum or single solution to standards can be achieved. In fact, the multitude and diversity of ways in which standards are developed and implemented by different regions and different commercial sectors makes it imperative that the U.S. Government promote our principles outlined above aggressively. But how best to do it?

Clearly, both businesses and users can participate more effectively when systems work together, and the standardization process can contribute mightily to achieving this success. Business-to-business e-commerce demands the integration of many complex business and technical interfaces across entire supply chains. And the participation by small and medium-sized enterprises is enhanced when supply chains utilize robust standards that interoperate properly and deliver on their potential. Similarly, individual consumers will feel more confident when systems operate seamlessly, efficiently, securely and effectively through common approaches.

In October 1997, leaders of industry, along with representatives of technical organizations and governments, met at the Global Standards Conference on “Building the Global Information Society for the 21st Century.” The challenge to those attending was how to shape a coherent approach to this important issue of standards. Industry leaders recognized the essential role of private sector leadership in the areas of standards, and highlighted the most important areas where industry standards efforts needed to be placed:

- The key to e-commerce is interoperability. However, interoperability need not mean single, uniform solutions to e-commerce applications. Different implementations will likely be needed to accommodate local requirements. The greater degree to which these different approaches can interoperate, the more likely e-commerce will be successful.
- Standardization to promote e-commerce should focus on making technologies work together—through so-called standard “interfaces”—and not try to specify the technologies themselves, which could severely hamper innovation.

In the view of the U.S. Government, it is the private sector that should lead in this area. It is incumbent on the private sector to take up the mantle of this issue. And, in our view, the best results are achieved when the market—not governments—determine how best to achieve the goal of different systems working together on a global basis. Businesses have a strong incentive, and the necessary technical expertise, to achieve this goal. Governments should, however, make clear their needs so that standards support government responsibilities to provide services and meet society’s needs. We are able to do this through participating directly in standards-development activities in the United States and internationally. We all share the goal of having electronic commerce be fast, inexpensive and easy to use. It is in the interest of business and of consumers. Our experience tells us that this vision will be accomplished more readily in a competitive, market-driven environment.

This view is shared by industry in all corners of the world. I call to the attention of the Committee the similar recommendations of business groups such as the Glob-

al Business Dialogue, the US-Japan Business Council, and the TransAtlantic Business Dialogue (which is meeting tomorrow and Saturday).

Unfortunately, not all other governments share this view. Indeed, many of the most important nations and regions of the world articulate a view of global electronic commerce that has government intervening more aggressively in setting standards. One example that I am personally involved in is the area of electronic signatures. The United States is taking a market-driven approach to ensuring that parties may determine the appropriate technologies and rules for assuring the confidence and validity of an electronic transaction. The role of government, in this example, is to promote a technology-neutral legal framework, and remove paper-based obstacles that are found in our laws and which impede engaging in commerce electronically. By contrast, our colleagues in Europe are in the final stages of adopting their Directive on Electronic Signatures. One of the main concerns that we and US industry have is that the proposal calls for adopting specific technical standards for digital signatures—and having those determinations ultimately made entirely by a committee of government representatives.

U.S. Government Policy in Action

The U.S. Government is taking steps consistent with the principles of the President's *Framework* and as directed by the President to carry out our vision for standards in global electronic commerce.

Our Technology Administration's National Institute of Standards and Technology (NIST) is working closely with U.S. industry to support market-driven, voluntary e-commerce standards and deployment. As one of the witnesses here today, Mr. Randall Whiting, recently wrote regarding the role of NIST in e-commerce: "It is essential that there be a close partnership between industry and government to effectively address the many infrastructure, technology and process issues that will face e-commerce in the near future. Having an agency such as NIST in that role will ensure industry has a partner that (1) understands the demands of technology and business innovation, (2) is experienced in key infrastructure standards, (3) is independent of political motivations, and (4) has adequate resources to help keep the U.S. in the forefront of e-commerce."

An example of how NIST is currently working with industry to improve interoperability at the interface level is the National Wireless Electronic Systems Testbed (N-WEST) project that is working to develop and define technical standards for broadband wireless access technology. NIST's efforts are accelerating private sector standardization, which is critical to making this alternative access network affordable and widely available (potentially for high-speed wireless Internet access). NIST involvement has also made the difference in ensuring broad industry participation in the standardization effort by serving as a neutral forum and facilitator of industry dialogue.

NIST is also working with industry to create the new Advanced Encryption Standard. This open, transparent and international collaboration is unique, and the results will benefit not only U.S. industry and users, but global participants in the Internet as well. The global cryptographic community has been actively participating in the process managed by NIST, and the process is on track to meet its goal of having the standard completed by the summer of 2001.

The U.S. Government is also advocating for U.S.-developed standards on a global basis as a partner with industry in international standards organizations such as the ISO/IEC Joint Technical Committee which is engaged in cutting-edge technology and communications standards with applicability to global electronic commerce. The U.S. Government is also supporting US industry by stationing standards experts in leading capitals to monitor and track potential barriers, as well as ensuring opportunities for U.S. businesses to participate and benefit from standards activities world-wide.

And, finally, the U.S. Government is determined to prevent other governments from using the standardization process to impose either technical barriers to trade or special-use requirements that would interfere with the unique nature of the Internet as a global enterprise. As US-developed standards move into the global arena, we are also concerned with assuring that the process for setting international standards, however defined, is fair and open to all interested parties. It must be market driven; technical and commercial considerations, not political ones, should drive standards promulgation in these bodies. In bilateral, regional, and multilateral forums, the US Trade Representative and the Department of Commerce are working aggressively to have our principles of the *Framework for Global Electronic Commerce* adopted internationally.

Thank you again for the opportunity to testify and at this time I would be happy to answer any questions that the Subcommittee might have.

Senator FRIST. Thank you, Mr. Pincus. Could you update us on the efforts to develop an international framework for global e-commerce?

Mr. PINCUS. In general terms?

Senator FRIST. Yes.

Mr. PINCUS. One of the things the President and Vice President directed in July 1997 was that we pursue the policy issues that were identified, the nine policy issues that were identified, not just domestically but globally.

As you said, Mr. Chairman, standards is one element of that, but really there is a whole policy framework involving privacy and consumer protection and security and intellectual property that is relevant to the development of the Internet, and one of the things that we have been doing as we pursue those issues domestically is to talk about them internationally.

For example, with respect to privacy, I know you are familiar with the controversy that we have with the European Union with respect to our approaches on how to protect privacy in the electronic environment. The European Union has gone a route that requires laws. We think that self-regulation can work, and is now working in our country, that the private sector has taken the leadership role and has formed the Online Privacy Alliance, and has established good standards and established privacy protection that is better, as good or better than anywhere else in the world.

But we have a dispute or discussions ongoing with the Europeans as to the status of their self-regulatory efforts under that directive, and those discussions are still ongoing. We are engaged in discussions about consumer protection. How do we do that in the cross-border environment? It raises questions on down the line.

The Administration is engaged not just with Europe but Japan and other countries around the world on all of these issues to be sure that rules that develop around the world are ones that enable the cross-border nature of the Internet and do not obstruct it.

Senator FRIST. Would it be fair to characterize our interaction or presence being a leadership presence, or when these international discussions are ongoing are we another player?

Mr. PINCUS. No, we have taken the leadership on this issue really when we started. The President focused on these issues in July 1997. We were at the cutting edge and I think really setting the agenda in a large sense for the rest of the world.

Right after that report was issued I was privileged to join some of my colleagues from the interagency group in visiting some capitals in Europe and then in Asia to discuss our report and to urge them to focus on these issues because of the great potential of e-commerce if we got it right.

So that really kicked off a global discussion that had not really been on the agenda until then and since then, both informally and in multilateral fora like the OECD, in a new organization, the Transatlantic Business Dialogue, which is meeting now in Berlin, which has really made e-commerce the focus of its discussions, in the Global Business Dialogue, a group that the private sector formed really largely under the leadership of the U.S. and the European private sectors that brought together private sector people from around the world last September to discuss all of these very

same issues and talk about the private sector's needs and really present Government, the U.S., Europeans and other Governments around the world with an agenda of what the private sector thought it needed to get things done.

In all of those places we have been taking a very up-front role in pursuing our policies of private sector leadership, of promoting self-regulation, and of avoiding barriers that would prevent this medium from realizing its potential.

Senator FRIST. Looking industry by industry I know is difficult, but if you had to characterize the field of health care in terms of progress being made in the standards field, is it slower, faster, or about the same in terms of the success of standards, standard development? Obviously, it has real application from a Medicare-Medicaid standpoint, but also private industry.

Mr. PINCUS. I think I probably want to get back to you. I do not know the specifics. I can give you one e-commerce-related health care example that I think indicates that things are moving ahead.

Secretary Daley led a trade mission a couple of weeks ago to the Middle East, and one of the participants in that trade mission was Cedars Sinai, a hospital from Los Angeles, because they were interested in establishing telemedicine offices and operations in the countries that we visited, in Israel, in Egypt, in Saudi Arabia with respect to the Palestinian authority and the United Arab Emirates.

So I think that at least told me something I really wasn't familiar with on that intimate a basis, having a chance to interact with the people from that entity that were on that trip, that they were very focused on using the Internet to bring U.S. medical expertise to other countries around the world in a very active way. I mean, they were really talking about setting up operations right now to start doing that.

Senator FRIST. Thank you.

Senator Burns.

Senator BURNS. Counselor, I wanted to ask you just a couple of questions, and the announcement the other day of the Administration on the movement of medical records and how we want to do that electronically, and you said that in the Administration is on the cutting edge of trying to do something about privacy, and then you also put a note on it that the industry has taken a step on this in the right direction, but do you think that the industry has not aggressively gone as far as it should, as far as ensuring privacy, as far as medical records and the movement of such things?

Mr. PINCUS. Yes. I think as a general matter we think we have a good regulatory structure with respect to generally personally identifiable information that might be transferred in the context of a routine commercial transaction, but we believe very strongly that with respect to certain highly important and sensitive information like medical records, there has to be a strong Government framework, because that information is so sensitive to people and has to be very strongly protected, and that is why the President moved forward in the way he did in making the announcement he did, because we think with respect to that issue there has got to be a regulatory framework in place.

Senator BURNS. We cannot really get together up here as far as that is concerned, and I applaud the President for taking this step

forward. Maybe it will get us—I think we have been high-centered here a little bit, and it may get us off of that.

Would the Administration be amenable to working with Congress up here and making sure we can fashion that privacy bill and maybe move it along, and that Senator Wyden and I have, and maybe come to terms with some objections the Administration might have?

Mr. PINCUS. I think that—this is the medical privacy bill?

Senator BURNS. Well, no. We have an e-privacy, period. It is a bill that maybe we can move with special inclusions for medical records to be handled in a different, maybe a different manner than, say, general information or through e-commerce.

Mr. PINCUS. We have been working—and it is not principally our Department. It is principally HHS—with Congress on the question of medical privacy. I think there are some bills up here, and we have been working to try and move those along, and I think it was the concern that that process wasn't moving that led to the announcement.

I think with respect to privacy generally, the Administration's view has been that we should take a sectoral approach, and that the need for legislation—this committee was a leader in the children's privacy bill last year, which we felt was very important, because that is another sensitive kind of information.

But with respect to privacy generally, our view has been—

Senator BURNS. They were a little Johnny Come Lately on that, by the way. Let's be fair.

Mr. PINCUS. No, I was saying the committee, but with respect to privacy generally our view has been in the electronic environment that the self-regulatory process seems to be working, and that we should give that a little bit of a chance, because it does seem as if we have got good standards.

We are getting increasing participation. We have got a lot of companies stepping up to the plate in terms of not only joining themselves but saying we will not advertise, we will not put our advertising dollars on a Web site that does not have good privacy. We will not partner with companies that do not have good privacy.

So we think that is really disseminating through the system in a way that is beneficial, and so we think that we should allow that process a chance to go forward and see it how it develops and see whether and to what extent Government intervention is needed if that begins to fall short.

Senator BURNS. Are you supportive of S. 1494, the Administration?

Mr. PINCUS. Our view is—we have not taken a position on the bill. Our view is it is very important to help do what the Government can do to help small and medium-sized companies use e-commerce.

We think that is incredibly important. We have been working through the MEP's ourselves toward that end, and we would like to work with the committee on something that builds on the MEP's rather than create—I mean, we may not need a whole new structure.

We have some very good manufacturing extension partnerships, as you know, throughout the country that have good relationships

with the business community that we think could be a launching pad for increased activity in the e-commerce area.

Senator BURNS. I guess the chairman wants to suspend the hearing for about 15 minutes or so and wait for Senator Breaux, who will be here at 10:45, and I shall honor the chairman's wishes, so these hearings are suspended for 15 minutes.

[Recess.]

**STATEMENT OF HON. JOHN B. BREAUX,
U.S. SENATOR FROM LOUISIANA**

Senator BREAUX. The committee will please resume order. The guests will take their seats, and we are delighted to welcome our second panel, and I am going to ask them to take their seats as we call their name: Professor Andrew Whinston, Director, Center for Research in Electronic Commerce, Department of Management Science and Information Systems at the University of Texas at Austin; Mr. Randy Whiting, president, CEO of CommerceNet in Cupertino, California; Mr. Glenn Habern, senior vice president, new business development at Wal-Mart, Bentonville, Arkansas; and Mr. Dan Schutzer, who is chairman of the board of the Financial Services Technology Consortium, vice president and director of external standards and advanced technologies at Citigroup. We welcome all of you for being with us, and apologize for missing our first witness, but look forward to the comments of the witnesses in our second panel, and would ask our guest, Professor Whinston, we have you listed first. If you would like to begin we would be pleased to have your testimony.

STATEMENT OF PROFESSOR ANDREW B. WHINSTON, DIRECTOR, CENTER FOR RESEARCH IN ELECTRONIC COMMERCE, DEPARTMENT OF MANAGEMENT SCIENCE AND INFORMATION SYSTEMS, COLLEGE OF BUSINESS ADMINISTRATION

Mr. WHINSTON. Thank you very much, Mr. Chairman. I am going to try to summarize the material I submitted to the committee that gives a somewhat academic overview to the economic and technological issues involved with the interoperability question.

In less than a decade the Internet and digital technologies have changed the way we communicate, exchange information, purchase products and services, educate and entertain ourselves, and participate in the social and political processes.

Electronic commerce, by revolutionizing business-to-business and business-to-consumer transactions appears to be the leading technological innovation of the 20th Century that will determine the future of the global economy in the coming years, and I just mention parenthetically that I have been in Washington the last few days when we released the Cisco-sponsored study.

Cisco sponsored a study at the University of Texas to look at the growth of the Internet economy, and we announced that as our projection for 1999 we have an estimate of \$500 billion as the total amount of revenue generated in the U.S. by U.S. companies selling in the U.S. and selling overseas, and we have roughly 2.3 million jobs created in the U.S. involved with those companies.

Interestingly, one-third of the companies that we surveyed did not exist 3 years ago, so it is an industry of many new companies

moving into an exciting arena that we think will propel the U.S. economy at the high rates that it is at, and even maybe higher levels of growth, without inflation.

So to maintain global competitiveness and our leadership in this unprecedented economic prosperity, it is imperative to understand how networks and computer technology impact commerce and economic activities, and to act proactively to assure continued progress. This hearing is an evidence of how committed our Government leaders are toward each goal, and it is my pleasure and honor to communicate to the subcommittee on the subject of interoperability and global economic commerce.

So to look at the issues in terms of interoperability in global electronic commerce, let me just bring up some points of view that would emanate from the economics profession.

The most important idea behind electronic commerce is the notion of network externalities, meaning that if we look at the telephone, when we have a few telephones in existence, the value of a telephone is fairly limited. As telephones have expanded in the U.S. and around the world, we have tremendous value from the innovation of telephones, but that innovation is really maintained by the fact that lots of groups can introduce telephone technology in local and regional areas, yet the telephone system worldwide inter-operates.

I can make phone calls all over the world, so I as a user am not aware of the fact that there are many different technologies that are used to support communications, and certainly the innovations in the Internet are based on the idea of IP, that is, Internet protocol, which allows different networks with different technology to communicate with each other, and therefore we have a worldwide network of computers, many operating in different ways.

So that is a fundamental economic force that drives electronic commerce which is built on this amazing worldwide infrastructure.

Now, we see electronic commerce as having very special features that differ from the traditional bricks and mortar economy, and one is the ability to customize, to take different components, put them together, and deliver them to the customer in a way that the customer most desires it.

So for example, in the operating system area we have an innovation that is referred to by the company as Red Hat, where we have lots of different groups developing specific components that can be put together and, in effect, eventually delivered to customers, meaning corporate customers and user customers, that give them an operating system that is oriented toward their needs.

So a Red Hat company is an integrator of software components, most of them developed by small software developers, and in effect they can come up with a competitive operating system to Microsoft, which has a standard, but it is a de facto standard set by a particular company, versus an open standard that we are looking for here in these hearings.

So we have in the development of the standards a tension between the possibility of having a company-defined standard, which in effect many people would say gives the company the opportunity of having a monopoly in the area that they own the standard in, versus an open standard that many companies can then enter and

compete, and their products can be combined with other products that deliver what the customer is looking for.

So in looking at the horizon out there in terms of standards and lack of standards, as I indicated, companies would love to have an industry built around their standard, while for competitive purposes we would like to have lots of standards and interoperability, where companies can do what they think is best from their point of view, and what they see the consumers wanting, and then things can be transformed from one representation to the other.

So for example, in the browser arena, and HTML, which is a mark-up language, we have variations in these mark-up languages, which are reflected in the different browsers, and the inability of a company to produce one store-front that all customers in the world with the browsers that are available can have access to.

So companies, to the extent that there is not a common standard that is adhered to for HTML, companies that are in the business of providing commerce, that is, providing goods to consumers, or business to business, have the extra cost of trying to deal with multiple browsers because they want to really appeal to all the customers in the world.

We have situations where there is this language standard, Java, which is a language which would be used in providing software environments that are essentially interoperable, that is, everybody can get access to the basic Java environment, but again we have variations of that that are introduced for competitive purposes.

So again, there is this ideal world that we would like to achieve, and lots of benefits for consumers and companies to be in this world, the world of interoperability, where you do what is best from your point of view, and then things can be combined, they can be converted, a sort of Adam Smith description of a world updated several hundred years to reflect the developments in software, hardware, and communications.

But there is also a desire by companies to make a unique position for them to make profits over and above what they would in a purely idealistic world, and these things then contribute to variations of standards, to alterations on the edges, to what are called improvements, which can then cause difficulties in maintaining standards.

So these are, I think, complex economic, political, technological issues that will be resolved both in the private sector and probably by some help from Government agencies that ensure that standard-setting groups, when they get together, are really acting on behalf of the consumers, and are not ending up in some cases to really attempt to introduce monopoly power into a particular industry.

So in summary, I think we have tremendous opportunity in the next century. We believe in terms of our work that is sponsored by Cisco that the Internet economy in the U.S. will continue to grow at unprecedented levels, 50 to 100 percent a year, compared with our red hot U.S. economy in primarily its traditional form, which is growing at 4 percent and 4½ percent, which causes supposedly the Federal Reserve some concern.

So we see a day where maybe the total U.S. economy is growing at 8 or 10 percent a year, but it is more of an Internet-based economy, more productive in its use of inputs, more oriented to what

the consumers are looking for, and much more vigilant in its recognition that there is a collective benefit by having standards and interoperability that allows all companies to play on an even field.

Thank you very much.

[The prepared statement of Mr. Whinston follows:]

PREPARED STATEMENT OF ANDREW B. WHINSTON, DIRECTOR, CENTER FOR RESEARCH IN ELECTRONIC COMMERCE, DEPARTMENT OF MANAGEMENT SCIENCE AND INFORMATION SYSTEMS, COLLEGE OF BUSINESS ADMINISTRATION

INTEROPERABILITY IN GLOBAL ELECTRONIC COMMERCE

In less than a decade, the Internet and digital technologies have changed the way we communicate, exchange information, purchase products and services, educate and entertain ourselves and participate in the social and political processes. Electronic commerce, by revolutionizing business-to-business and business-to-consumer transactions, appears to be the leading technological and economic innovation of the 20th century that will determine the future of the global economy in the coming years. To maintain global competitiveness and our leadership in this unprecedented economic prosperity, it is imperative to understand how network and computer technologies impact commerce and economic activities and to act proactively to assure continued progress. This hearing is an evidence of how committed our government leaders are toward such goal and it is my pleasure and honor to communicate to this Subcommittee on the subject of interoperability and the global electronic commerce.

The Internet is by definition a global network. Any business or a consumer with an access to a computer that is connected to the Internet is a global economic player. But this global environment will be of purely theoretical significance if these economic players are unable to communicate and carry out transactions globally because of artificial barriers of technological and commercial nature. An interoperable global electronic commerce system is necessary if we are to maximize potential benefits of digital networking and computing technologies. There are three fundamental advantages of using a global network for commercial transactions and other economic activities. The degree to which we achieve interoperability in network protocols and commercial applications will determine how different the digital economy of the next century will be from the industrial economy of the past century.

ECONOMIC BENEFITS OF INTEROPERABILITY

Interoperability and standardization have played an important role in lowering costs and prices, increasing competitiveness, and improving consumer benefits in the physical economy based on industrial production. But they will play an even more critical role in the networked, digital economy which is built upon an interoperable network infrastructure such as the Internet. Before we go into more detail, we may present a list of economic benefits from interoperability:

- Interoperability is one of the key ingredients that allow consumers to substitute one product with another that is manufactured by a different company. This substitutability enhances competition among various manufacturers in the same product market.
- This substitutability and interchangeability implies larger market size, lower unit costs, and lower consumer prices.
- In addition to larger market size, interoperability and standardization enable new market entrants to tap into existing product users. This translates into lowered barriers to entry, further enhancing market competition.
- Interoperability and standardization allow process automation, lowering transaction costs.

The need for interoperability will increase as we focus on process automation. In the Internet economy, businesses and consumers are increasingly dependent on automated, interactive processes using real time Web-based interactions, software agents, and market innovations such as online auctions. An increasing level of personalization in products and services rendered in the Internet economy also implies an integrated economy where manufacturing, distribution, retailing and consumption occur simultaneously in real time. If this vision is what we intend to promote in the global Internet economy, interoperability in products, services and business processes become a key component in any e-commerce system.

MAXIMIZING BENEFITS OF THE NETWORKED ECONOMY

Although the interoperability has played an important role in the industrial economy, its need is magnified in an economy where interactions and exchanges among firms and consumers occur constantly, in real time, throughout the entire stage of the value chain, and with an increasing number of partners. In the physical economy, interoperability is often a simple matter of standards and technological compatibility. For example, two interoperable computers can establish a connection with each other; interoperable word processors may exchange files with one another; interoperable VCRs can read and play the same video tape; and most electric appliances can operate regardless of who provides electric service or with peripheral equipment produced by a wide range of manufacturers. Without interoperability, computer users will find difficulties in performing simple tasks such as swapping disks and files, or using third party auxiliary equipment, macro programs and extensions.

The Internet-enabled economy goes further than compatibility between manufactured goods. It is based on networks, and the interoperability is a fundamental requirement for an efficient network. From previous experience in telecommunications and transportation economics, researchers are well aware of the economic benefit of interoperability in a network. Through standardization and interoperability, communications software and business applications lower costs for producers and increase user benefits in the form of network externality by which consumers benefit from having one standard product. With network externality, the value of a product goes up as more people have the same product. A typical example is a telephone network where consumption benefits increase as more people join the network (positive network externality). If there are two types of telephone networks, we would be required to have two phones in order to communicate with our friends who might use either of the two telephone systems.

An externality is an effect on costs or benefits that is not accounted for by market mechanisms such as price. For example, there is no market mechanism to require a neighbor to pay for such benefit even if the neighbor gets some benefit from the tree you plant. In this sense, an externality distorts the resource allocation process and creates market inefficiency. A network externality is an externality related to the number of users (or networks) for a group of products. A negative network externality exists when more users result in congestion, thereby diminishing the amount of total benefits.

Network effects may be direct effects as in the case of telephone, where the issue is whether competing products can be used together (a horizontal interoperability). There are also indirect network effects commonly found in hardware-software platforms in computer, video and audio, and computer games industries, where the issue is whether a complementary product can be used with competing products (a vertical interoperability). Numerous studies have shown that the competition among upstream products (e.g. VHS or Beta video players) critically depends on how many downstream products (video tapes) there are (Katz and Shapiro 1985; Chou and Shy 1990; Church and Gandal 1992). A horizontal interoperability may be established through cooperation among firms who recognize the benefit of having one standard. But competing standards, although inefficient, often present more choices to consumers than under a mandated standardization. In this case, the market and consumers will determine which becomes the de facto standard. Many components of the Internet communications standards such as TCP/IP, domain name systems, e-mail standards and the World Wide Web, have been developed through consensus and accepted by the marketplace.

A vertical interoperability is somewhat more difficult to achieve since vertically-related products are highly integrated or provided by many vendors. In a typical setup to access the Internet, there may be several layers of vertically related products and applications: PC hardware, operating system software, applications such as an e-mail client or a Web browser, and communication service including e-mail servers and Internet access providers. All these components are needed to send and receive an e-mail over the Internet. The interoperability in terms of using an e-mail is established by the Internet standards on electronic mail. This guarantees that one on a PC may communicate via e-mail with someone on a Macintosh or a UNIX system. But as application vendors add new features to existing e-mail software, some of these features may not be available to users of different applications. The interoperability will cease to exist.

Vertically integrated hardware-software firms are commonly observed. For example, audio equipment manufacturers such as Sony are selling musical CDs. However, Sony CDs have no inherent advantage over non-Sony CDs in terms of operation (being played) in a Sony-produced CD player. In the computer industry, how-

ever, such a seamless interoperability is less common. For example, two competing Web browser applications, Netscape's Navigator and Microsoft's Internet Explorer, are implementing different sets of HTML standards and scripting languages. As a result, Web storefront builders are forced to spend enormous time and effort to accommodate users on different browsers.

INTEROPERABILITY FOR COMPLEX ORGANIZATIONS AND PROCESSES

The need for interoperability in the Internet economy is becoming critical in order to support a growing list of business and social applications of new technologies. A primary example is the use of the Internet for managing supply chain and distribution which involve a number of suppliers or distributors. An open, interoperable network such as the Internet has provided a cost efficient tool to gain tremendous efficiency in managing multi-partner transactions where multiple trades occur among thousands of participants who may be widely dispersed geographically.

An integrated business operation means more than minimizing transaction costs through process automation. While the latter has been a primary reason for the success of computer-assisted transactions such as electronic data exchange (EDI), electronic fund transfer (EFT) and a variety of initial applications of the Internet network, new Internet applications that connect front-end with back-end operations are aimed at more than simply reducing transactions costs. Their goal is to improve efficiency in product design, manufacturing, and distribution, and to increase choices and satisfaction offered to their customers. Setting up a Web page for suppliers and customers may provide a firm with a cost-efficient alternative to physical stores but, more fundamentally, it enables flexible production methods as well as innovative contracting and selling schemes. Unlike gains in transactional efficiencies, these changes in basic organization and operation of a firm are unique in a networked environment.

For these purposes, data collected from sales outlets can be fed into product research and pricing as well as manufacturing, while supply chain and inventory management activities are ready to respond to changing demands and market conditions. Such a process presupposes that demand data, product information, and transaction data must flow seamlessly among manufacturers, suppliers, distributors, sellers, and their customers. These players may rely on different hardware, software and e-commerce applications, but they must be enabled within an interoperable e-commerce system.

INTEROPERABILITY SUPPORTING CUSTOMIZED GOODS AND SERVICES

E-commerce market is fundamentally global in the sense not only of its global reach but also of its breaking down product market boundaries. Internet technologies allow firms to overcome physical constraints that often prevent them from doing business with someone across a market boundary. As network and distributed computing technologies advance, killer applications for consumers will be those that allow mixing and matching products and services on a personal basis and in real time. Agent technologies, smart cards and XML all point to an increasing level of customization and integration of products that bundle different products into a distinct item. An interoperable e-commerce system is one that support seamless transactions across product market boundaries as well as across territorial boundaries. An integrated product is substantially different from bundled products common in physical markets. Bundling usually refers to a quantity bundle that offers a discount when multiple units of a same product is purchased. For digital products, software site licensing may be the closest form of quantity bundling. But most digital products resist bundling as they have no normal wear and tear which force consumers to buy multiple units. A second type of bundling is when similar products are sold as a bundle as in portfolio bundling. Portfolio bundling is common for content sellers. Information buyers, for example, subscribe to a number of news articles which deal with different topics and stock traders prefer a portfolio of securities. Application software may be subject to portfolio bundling as word processor, graphics program and other software may be bundled.

Another type of bundling is for a combination of products which may be needed for a common task or related in the way we consume. These products may be vertically related. For example, an OS and a Web browser are an upstream and a downstream product which must work together to accomplish a task. Other combinations may be a collection of complementary goods and services. A combination of airline tickets, hotel rooms, a rental car, meals and amusement park admission tickets can be bundled as a packaged leisure product.

Products combined in this manner are often personalized and constitute a distinct product or service taking on an enhanced value from its components. For example,

a browser-OS combination may be considered as a new type of software. Stock brokers may integrate market information, company reports, stock trading and financial management into a distinct service. Finding, assembling and personalizing various products for an individual customer would be extremely costly and pose an enormous challenge in pricing and managing in physical markets.

The need for interoperability in technologies is evident if we are to facilitate transactions of goods and services that may involve firms and consumers in traditionally separated markets. In order to support production, trading and consumption of these products and services in an integrated manner, computing and networking technologies must be interoperable with other products, Web pages, payment systems and user interfaces based on different computing platforms as well as different needs and preferences of users. Developers of next generations of HTML, agent software, mobile networks and smart card applications should also be aware of how technologies change the characteristics of products and consumption behaviors.

GLOBAL ELECTRONIC COMMERCE AND INTEROPERABILITY

Not many of the issues in electronic commerce and the digital economy are local. The internationalization of the Internet goes far beyond the expansion we witnessed in the last century. For most of the 20th century, corporations have operated as multinational entities “knowing no national boundaries.” Literally, now we see free trade zones springing up in North America, Europe, and around the Pacific Rim. While these large economic blocks of countries represent the most recent achievement in fostering the free movement of goods, the Internet was created from its inception without borders. For the goods and services that can be ordered and delivered over the network, the Internet is truly a global marketplace.

As political borders cease to be barriers to trade, global electronic commerce has implications that reach far beyond mere economic gains from trading. For example, can nations control the movement of digital goods based on content or isolate themselves from the rest of the Internet? Can governments exercise their regulatory powers on the Internet? And how would the effort to set up a uniform legal and commercial environment for the global electronic commerce affect physical markets?

But these questions assume that the Internet indeed offers an interoperable global economic market. However, the language barrier itself poses serious challenge to such an open global market. English speakers cannot access Web stores presented in Chinese or German language. Some governments believe that communications on the Internet can be controlled through legal and artificial barriers. For example, through content and access control, minors are protected from obscene and indecent materials (the Communications Decency Act of 1996 in the U.S.); consumers in some countries are protected from “misinformation” and other harmful effects of uninhibited exchange of information; and a nation can even prevent “spiritual pollution” by denying access to Internet sites which contain politically sensitive materials. In other cases, some European governments choose to be isolated by insisting on local languages as the communications standard instead of English, which has become the *de facto* language of the Internet. In this case, languages, not communications protocols, becomes the barrier to interoperability.

Thus interoperability on a global scale is more of a political or cultural nature than a technological or an economic process. Nevertheless, there is a need to have a global, not regional, perspective in securing a workable commercial environment for electronic commerce. Establishing some form of uniform commercial environment is essential in promoting the global electronic commerce. This will imply an interoperability in terms of setting ground rules for commercial transactions over the Internet rather than technological interoperability.

INTEROPERABILITY IN THE E-COMMERCE LAYER

The Internet economy can be divided into several layers in order to categorize and quantify economic activities associated with particular products and services. Barua et al (1999) have identified four layers of the Internet economy in their measurement of the Internet Economy Indicators. The first two—Internet infrastructure and Internet applications layers—together represent the IP or Internet communications network infrastructure. These layers provide the basic technological foundation for Internet, intranet and extranet applications. The intermediary/market maker layer facilitates the meeting and interaction of buyers and sellers over the Internet. Through this layer, investments in the infrastructure and applications layers are transformed into business transactions. The Internet commerce layer involves the sales of products and services to consumers or businesses. The following table summarizes the four layers and gives examples of firms in each layer.

Table 1: The four layers of the Internet economy

The Internet infrastructure layer	<ul style="list-style-type: none"> • Internet backbone providers (Qwest, MCI Worldcom) • Internet service providers (AOL, Mindspring) • Networking hardware and software (Cisco, Lucent, 3Com) • PC and server manufacturers (Dell, Compaq, HP) • Security vendors (Axent, Network Associates) • Fiber optics makers (Corning) • Line acceleration hardware (Ciena, Tellabs)
The Internet applications layer	<ul style="list-style-type: none"> • Internet consultants (USWeb/CKS, Scient) • Internet commerce applications (Netscape, Microsoft, Sun, IBM) • Multimedia applications (RealNetworks, Macromedia) • Web development software (Adobe, NetObjects, Allaire, Vignette) • Search engine software (Inktomi, Verity) • Online training (Sylvan Prometric, Assymetrix) • Web-enabled databases (Oracle, IBM DB2, Microsoft SQL)
The Internet intermediary layer	<ul style="list-style-type: none"> • Market makers in vertical industries (VerticalNet, PCOrder) • Online travel agents (TravelWeb.com, ITravel.com) • Online brokerages (E*Trade, Schwab.com, DLJDirect) • Content aggregators (Cnet, Zdnet, Broadcast.com) • Portals/content providers (Yahoo, Excite, Geocities) • Internet ad brokers (Doubleclick, 24/7 Media) • Online advertising (Yahoo, ESPNsportzone)
The Internet commerce layer	<ul style="list-style-type: none"> • E-tailers (Amazon.com, eToys.com) • Manufacturers selling online (Cisco, Dell, IBM) • Fee/subscription-based companies (thastreet.com, WSJ.com) • Airlines selling online tickets • Online entertainment and professional services

Source: Barua et al., 1999.

According to their measurements, the Internet economy generated an estimated \$301 billion in US revenues and created 1.2 million jobs in 1998. Estimates of revenues and jobs contributions by each layer are presented in the next table.

Table 2: Internet revenues and jobs in 1998, US.

	Estimated Internet Revenues (millions of dollars)	Attributed Internet Jobs
Internet infrastructure layer	114,982.8	372,462
Applications layer	56,277.6	230,629
Intermediary/market maker layer	58,240.0	252,473
Internet commerce layer	101,893.2	481,990
Total	301,393.6	1,203,799

Source: Barua et al., 1999.

Technical standards and networking interoperability have been key ingredients in the Internet's success as an information infrastructure. Players in the Internet infrastructure layer, providing hardware and software products and services, have demonstrated that the open Internet can be maintained through voluntary efforts toward establishing technical standards. The real challenge for assuring an open, interoperable Internet economy will be in the applications and Internet intermediary layers. These layers are the basis of business processes and transactions carried out by firms in the Internet commerce layer (i.e. e-business firms). For example, electronic retailers such as Amazon.com rely on software and services to operate their Web stores, and utilize auxiliary Internet services such as Web search, online payment clearing, online auction services and real time distribution support as an integral part of their daily business. Being an Internet business goes far beyond having a Web-based storefront. It means that all of the firm's business processes must be integrated and connected with the rest of the online economy. Aug-

menting interoperability in the applications and intermediary layers will be a critical factor in achieving a truly digital economy.

E-commerce business interoperability is built upon technological interoperability which provides an open computer and networking infrastructure. However, technological standards at the infrastructure level are relatively easier to reach than those at the applications and business process levels. A few process-level standards have been proposed and defined through worldwide industry players including Open Buying on the Internet (OBI), trading protocols (OTP), and CommerceNet's XML-based eCo e-commerce framework.

But as we move toward setting standards that deal not only with information exchange, transaction and billing automation and payment clearing services but also with trading practices, negotiation, pricing and other market making activities, our effort to standardize and codify these processes will become extremely difficult. Cultural and practical differences are only one of many pitfalls in trying to establish standards in the applications layer. In addition, time and effort required to reach a consensus among international players and governments may prove to be too slow to support rapidly changing technologies and practices in the Internet economy.

COOPERATION TOWARD UNIFORM COMMERCE INFRASTRUCTURE

Standards and interoperability in the global e-commerce can be implemented through standard setting efforts by market players. An active role by a government is practically unwarranted primarily because of the nature of the open, global Internet. However, such efforts within the business applications and process layers must account for economic, cultural and legal differences that are prevalent in the physical markets. Corporations and industry groups alone may not be able to overcome such barriers.

Thus, any effort toward global interoperability in electronic commerce must walk the fine line between market-driven solutions and government initiatives. According to the U.S. and the European Union, the principal approach to achieve global electronic commerce is to rely on the market itself (ITF 1996; European Council 1994). But the primary role of governments is to provide a predictable international legal and commercial environment upon which business processes can be standardized and codified. A uniform commercial environment can only be achieved through widespread international negotiation and cooperation. Several exceptions exist in the areas of copyright, key encryption, and electronic contract standards. Even in these areas, the uniformity underlying these efforts is procedural rather than specific. That is, the goal is to lay a framework within which governments can verify, recognize, enforce, and promote international transactions. Businesses are left to solve the problem of automating and facilitating online transactions.

A uniform commercial environment for the global information infrastructure (GII) must represent both international standardization and national interests to promote economic well-being. The question is whether a uniform law or regulation can avoid having differential impacts on individual countries. For example, using a closed-economy model of trade, countries leverage tariffs and income tax policies to manipulate economic performance. However, a uniform import/export tax—such as no tax, making all Internet transactions duty-free—implies an open international economy which may result in the loss of policy control over domestic economy. Domestic industries are often protected by high tariffs, and a country's balance-of-payment position depends on selectively controlling exports and imports. Simple uniformity may not be acceptable to many countries if it means relinquishing this tool.

There is growing optimism at least in the beginning phase of the international cooperation toward interoperability. For example, recent agreements negotiated by the World Trade Organization lay a solid foundation for global electronic commerce (see attached chapter for details). The urgency to establish an international framework will grow as digital products become the main commodity of the global information infrastructure. Toward this goal, the World Intellectual Property Organization and the Working Group on Electronic Commerce of the United Nations Commission on International Trade Law (UNCITRAL) have worked toward providing the basic framework to establish the copyrights and legality of digital documents.

MARKET-DRIVEN INTEROPERABILITY AND GOVERNMENTS' ROLE

Within the general and uniform international e-commerce environment, specifics of technical and procedural standardization have to rely on market players. Standardization may be achieved either through standard-setting efforts—e.g. by defining and agreeing what features need to be interoperable for everyone's benefit—or through competition. However, leaving standardization entirely up to market players will not guarantee that such an effort will not be anticompetitive. For example,

a standard-setting session among competitors may be a disguised conference for collusion. Although market-driven solutions often encourage competition and efficiency without the follies of artificial government intervention, economists and market analysts need to provide clearer definitions and analyses of the effects of interoperability, standardization and dominance on competition, efficiency and economic performance. Governments then need to establish general guidelines as to what type of interoperability and standardization are efficiency enhancing.

A vigorous enforcement to prevent industry collusion may in fact discourage standard-setting activities (Lemley 1996). Alternatively, through competition, one product becomes a *de facto* standard by dominating the market and forcing all others to comply with the product's standards. But, its producer is not obligated to reveal its specifications unlike the case of industry-wide standard setting. Should governments require that all *de facto* standard products reveal their product specifications to competitors and producers of related products? This will necessarily involve a complex process of guaranteeing profits for the standard-setter, which is far from an improvement over government regulations.

Our experience with the videocassette competition between Betamax and VHS is often mentioned in order to illustrate the market's ability to standardize products. Betamax vs. VHS is similar to having two different sizes for floppy disks. When the VHS became the industry standard, however, it didn't result in only one firm producing VCRs. Under the interoperable standard (i.e. VHS), the healthy competitive market supports numerous competitors and lower prices for VCRs.

Despite this success driven by markets, governments will need to establish a set of regulatory principles. For example, the case of word processing programs or computer operating system (OS) software is fundamentally different from Betamax/VHS standards because the competition in word processing programs or operating system software is not about standards. Instead, it often involves a variety of products that are vertically integrated—e.g. microprocessors, computer hardware, OSs, application programs and contents. In fact, we witness vertically integrated monopolists in a wide range of product markets in the Internet economy because of the very fact that lowering costs often implies integrating software and business processes vertically. Such an integrated business and a dominance by a few integrated software and service providers will become common in the globally networked economy, especially under the assumed economic benefits of network effects and interoperability. Traditional economic concerns on inefficient monopolists should not simply be abandoned to promote interoperability. Governments' role is to clearly establish a regulatory guideline which promotes both technical and procedural standards and the market efficiency inherent in the Internet-based economy.

Senator BREAUX. Thank you very much.

Mr. Whiting, you are next, and we would ask the witnesses to please try and summarize your statements.

**STATEMENT OF MR. RANDY WHITING, PRESIDENT AND CEO,
COMMERCE NET**

Mr. WHITING. Thank you. Good morning. It is my sincere honor to be here to provide what I think will be a little bit of a different background and a different perspective from Professor Whinston on the issue of interoperability and standards.

I am going to talk a little bit about what probably could be termed as being nothing short of pursuing what might be considered a free market architecture for the Internet, and something that is much broader than just simply a discussion of standards in this area, although standards are a critically important component of this.

I would like to address probably something more fundamental, and that would be the impact of what this environment is going to have on overall business and how we approach this in terms of the new economy.

I am here representing CommerceNet, an organization that literally has been at the center of a lot of these emerging Internet businesses. We are a nonprofit organization created back in 1994

as a partnership with the Government and private industry to start researching some of these new technologies and some of the new business models that will grow out of the commercialization of the Internet.

We currently have about 750 members worldwide that we do next generation research and prototyping for in the area of specifically new business models related to electronic commerce, with a significant emphasis on interoperability.

Interoperability started a number of years ago from a software industry where we were able to take different components and plug them together in a much easier manner, and that was at that time a very revolutionary concept in the idea of designing software, and it changed the economics of it, and what we are really now looking at is changing the economics of e-commerce.

We have seen a revolution that has happened until now, but what we are on the verge of is a second phase of that revolution. It is something that is going to change, I think, many of the economics of what we are doing today on the Internet.

Whereas today we have been focusing on the concepts of plugging pieces of software together on our own Web site, we or most companies have focused on the idea of their Web site, the Internet as applied to their specific company.

The concept of interoperability fundamentally is much broader than that. It literally changes the concept from looking at my Web site to being able to apply the power of the Internet to the relationships that sit between organizations.

Now, as you can imagine, this could potentially have a very profound impact, in that it lowers the barriers of the connectivity, and the barriers that usually exist between two organizations collaborating together on a variety of activities.

This could change the dynamics and the economics of our supply chain, literally moving from rigid supply chains to much more dynamic, flexible supply Webs, giving the opportunity for both small and large companies to dynamically and spontaneously being able to respond to market requirements and market changes.

I think this is something that is very different from what we have seen in the past, and will challenge many of the most fundamental concepts that we have about electronic commerce, and even physical commerce.

It is going to challenge the ways we look at laws. I would contend that many of the processes and approaches we are currently looking at in terms of Government regulation, standards, technology development, and business models are all going to change very, very significantly over the next couple of years, not just because of the Internet, but literally because we have lowered the barriers to allowing companies to work together and collaborate in new ways.

Now, from a standpoint of standards, which is one of the things we wanted to look at in this committee today, I would like to start off by quoting D. Hoeck, who was the founder and CEO emeritus of Visa. Visa, as you might remember, was—or at least the banking industry in the late 1960's and early seventies was in a very similar situation, in many ways, that we are today with the Internet. There was a proliferation of different financial service organiza-

tions, all not necessarily interoperating, and Visa was formed to be able to help develop and manage some of that collaborative space.

Mr. Hoeck made I think a very profound statement in describing some of the work that went on there, and he said that everything has intended and unintended consequences. Intended consequences may or may not happen, but the unintended ones always will, and I think that that is a very telling statement that reflects the current position we are with standards and electronic commerce.

The concept of standards, we may find here in the next few years is—I probably would suggest maybe even broken, but at least not able to respond to the fast pace, the Internet time, if you will, and the spontaneity of the marketplace that we are finding ourselves.

We are going to have to approach this from a totally new direction, one that does not set very structured standards or structured laws that control the way that we do business, but trying to find a more open framework that allows for negotiation and interoperation between these organizations.

We a few years ago started looking at this issue, and we, partially to our benefit from a funding grant from NIST, who I think has been one of the leading Government organizations in helping to look at some of the new technologies in this area, went off with about 30 organizations and companies like Hewlett-Packard, IBM, Sun Microsystems, Microsoft, and so on, as well as a number of industry associations such as SFTC, and we started to look at this from a totally different perspective of trying to create a framework that was open that would represent and recognize the unique contribution of specific vertical markets.

Because we know that certain industries are going to develop their way of doing business, but our challenge with the Internet is being able to bridge those things, and being able to interconnect them and link them together.

So we started on this project just a couple of years ago, and just recently announced what may not be the solution to this problem, but we think it is a very major step forward, something we call the ecoframework.

This was an endeavor to build a semantic model and framework that would allow negotiation and collaboration between different technologies, different standards, and different companies to be able to share information in a different way that would encourage this level of interoperability.

Luckily, and we are very proud to say that in a number of prototypes, some of which have been with the Government, some in private industry, we have seen both the test bed implementation and actual commercial implementations of this approach, very successfully to encourage this type of next generation of interoperability.

Now, we also believe that there is a clear role for Government in all of these efforts for interoperability, and they fall into a couple of areas. Rather than simply stating that Government should stay out of this area of the evolution of e-commerce, like I think many industry associations might state, we feel kind of that there is a mid-point here, that Government can actively help accelerate the effective utilization of interoperability in e-commerce, and I would like to suggest a couple of very fundamental ways that that can happen.

One, I think Government needs to continue to partner with industry to move these things forward and to implement them internally in the Government. I think there is an opportunity for the U.S. Government to be a first mover, to use one of the Internet concepts now that is often bantered about, that the idea of taking a very strong advantage of a new technology in a new direction to break new ground.

The Government has a huge amount of procurement, a large number of e-commerce programs underway, and I would argue that very few of them are on the leading edge. Many of them are, let us take the very old business models and apply mediocre e-commerce ideas to those, and we will try to be somewhat out on the front.

I would suggest, though, that, on the other hand, there are a few pockets within the U.S. Government that are on the leading edge. One of these, I might suggest, is a project that is an interagency activity called FinanceNet, and Auctions At Your Disposal, which is a program that will allow agencies to interoperate with one another as well as industry to increase the effectiveness of disposing of Government surplus assets over the Internet.

Another way I think that has been very successful to date, and could be even more so in the future, is continued support of research and development. Many of the issues that have been brought up having to do with standards are starting to be addressed from the standpoint of technology.

Privacy issues are being addressed by new technologies and new technological approaches. We need to continue to research and develop these new technologies that will take the place of policy and regulation that we have today in the future.

NIST has done a wonderful job for this to date, and I think should be congratulated on their success in helping fund programs that have actually commercialized some of these activities, although we have found in the private sector that working with Government in funding and support in these activities is often much too slow, and often too late, that Internet speed and new commercialization projects runs at a speed that I think many of the agencies in Washington here do not understand or are able to cope with.

Next, I think that there is a significant issue having to do with our current trade programs and legislation having to do with laws regarding the Internet. There is clearly a role for Government to play in the setting of laws in this area, but my concern, and I think the concern of many of our members as we start to look at this new world of interoperability, is that we are building law and doing trade negotiation based on what the model is today, at best, if not what the model was yesterday.

As I stated, we feel that interoperability is going to dramatically change the way that we do business. Our new trade negotiation, our legal development from new frameworks, laws, and so on, need to start thinking about how interoperability is going to change business models.

By the time these laws get put into place, by the time the trade negotiations get done, we will be doing business in a totally different way than we are today, and I think that is one of the biggest

challenges that Government has to do in terms of understanding how this is going to impact.

Last, we continue to see in the marketplace concerns about patent law, and I think in terms of interoperability in creating new business processes, patent law has -- there is a significant risk in terms of slowing down the adoption of these new business processes. Today, you can patent business processes and start to try to extract fees and other funds from other companies that you are not even involved with, because they have created or innovated in a business process that you may have thought about somewhat before and had the foresight to patent.

That is going to slow down these new business models. We need to clarify and get the patent organization up to speed, and again moving in Internet time.

Internet interoperability is going to have a profound and extraordinary impact on how we do business, and Government and industry has to work together to ensure these concepts pervade everything we do, from research to procurement, trade negotiation, and so on. The stakes are simply too high, I think, for us to do anything but work together in that environment.

So with that, I thank you for your kind consideration this morning.

Senator BREAUX. Thank you. Next is Mr. Habern.

STATEMENT OF MR. GLENN HABERN, SENIOR VICE-PRESIDENT FOR NEW BUSINESS DEVELOPMENT, WAL-MART STORES, INC.

Mr. HABERN. Thank you, Mr. Chairman, members of the subcommittee. I am Glenn Habern, senior vice president of new business development for Wal-Mart. I appreciate this opportunity to present Wal-Mart's views on Internet standards for e-commerce and compatibility, and enabling the growth of global electronic commerce.

Wal-Mart was built on two simple principles, to provide customers the best value and the best service in the industry. What has set Wal-Mart apart, however, is its ability to deliver on these promises every day. Wal-Mart is about commerce, not just e-commerce. We are focusing on delivering the products to our customers in a manner that they want to shop.

Wal-Mart.com's operations mirror our bricks and mortar store systems, operational standards, and customer service. In 2000, Wal-Mart.com will bring Internet access to more than 90 million customers who currently shop with us on a weekly basis. Through the implementation of an in-store kiosk system, customers that may not have Internet access at home can shop Wal-Mart.com via the kiosk in their local stores.

Technology is becoming available to everyone. The free market is working and, as a result, the consumer is the winner. We do not believe that regulations are needed in e-commerce space to enable its growth. Allowing space for innovation has propelled the technology industry to grow rapidly in the last 5 years. The evolution of technology is still in its infancy, and to place an overriding structure on it in its current stage would freeze progress.

We believe that the period of dynamic growth is just beginning, and some conditions will hold true in the future, namely that no standard-setting body can hope to replicate the innovations that will be introduced accordingly as demands are increased in the commerce industry itself.

Accordingly, we recommend the Government should not try to force standards on industry artificially, but should continue to permit the market to determine what standards should evolve and at what pace.

One of the key reasons that Wal-Mart continues to lead the retail industry is the company's commitment to applying the latest technologies to improve our operations. Wal-Mart has streamlined its supply chain and improved its in-store operations.

One example of the technology that has propelled us is our Retail Link™. This system enables Wal-Mart to deliver every-day low prices and the best customer service in the industry. Giving our customers the product they want, with the value and low prices they expect and deserve.

Retail Link™ allows our suppliers to make better informed business decisions by having immediate access to sales information. As customers' needs evolve and change, so will their buying patterns. The successful retailers are the ones that adjust their businesses in sync with these transitions.

The standards important to retailers and suppliers can exist on a number of technologies and platforms. Standards needed in the retail industry are commerce-based, not technology-based. For example, we interact with suppliers that use UNIX-based systems, PC's, as well as traditional IBM mainframes.

Already, various organizations are improving retail supply relationships by focusing on improving the efficiency of the entire supply chain.

In addition, Wal-Mart recently has joined a group of the world's leading companies representing more than 800,000 small and large companies to create the first organization dedicated to simplifying worldwide commerce for the consumer goods industry. Again, standards needed in the retail industry are commerce-based, not technology-based.

I would like to thank you for this opportunity to speak here today on behalf of Wal-Mart. Thank you, sir.

[The prepared statement of Mr. Habern follows:]

PREPARED STATEMENT OF GLENN HABERN, SENIOR VICE-PRESIDENT FOR NEW BUSINESS DEVELOPMENT, WAL-MART STORES INC.

Mr. Chairman and members of the Subcommittee, I am Glenn Habern, Senior Vice President for New Business Development at Wal-Mart Stores, Inc. I appreciate this opportunity to present Wal-Mart's views on Internet standards for e-commerce and compatibility in enabling the growth of global electronic commerce.

Wal-Mart was built on two simple principles: to provide customers the best available value and the best service in the industry. What has set Wal-Mart apart, however, is its ability to deliver on these promises every day. Wal-Mart is about commerce, not just e-commerce. We are focused on delivering the products that our customers want in the manner that they want to shop. Wal-Mart.com operations mirror our brick and mortar stores systems, operational standards and customer service.

In 2000, Wal-Mart.com will bring Internet access to the more than 90 million customers that currently shop our stores weekly. Through the implementation of an in-store kiosk system, customers that may not have Internet access at home can shop Wal-Mart.com via the kiosk in our store locations. We are focused on delivering the

products that our customers want in the manner that they want to shop. Technology is becoming available to everyone. The free market is working and we expect prices will continue to fall with both innovation and competition increasing. As a result, the consumer is the winner.

We do not believe that regulations are needed in the e-commerce space to enable its growth. Allowing space for innovation has propelled the technology field within the last five years. The evolution of technology is still in its infancy, and to place an overriding structure on it at its current stage would freeze progress.

In the following pages, I will describe at length Wal-Mart's approach to e-commerce. However, let me pause to make one observation. Wal-Mart's e-commerce program has evolved over a number of years. If several years ago a standard setting body or a government agency had sat down and tried to define e-commerce standards or structures, no person, no matter how enlightened could have hoped to envision the future and develop protocols to serve all the needs that have emerged.

We believe that this period of dynamic growth is just beginning, and some conditions will hold true in the future, namely that no standard setting body could hope to replicate the innovations that will be introduced according to the demands of commerce itself.

Accordingly, we recommend that government should not try to force standards on industry artificially but should continue to permit the market to determine what standards should evolve and at what pace.

Providing the ultimate in value means keeping costs low, making the supply chain as efficient as possible and ensuring that the right products, offered in the right packages, are available when and where customers want and need them. To maintain the highest levels of service, Wal-Mart must ensure that proper levels of inventory are maintained; that associates are available to assist customers; that pricing is always up to date; and that customers can quickly find what they need and move through the check-out area.

One of the key reasons that Wal-Mart continues to lead the retail industry is the company's commitment to applying the latest networking, information technology and Internet technology to improve operations. By using innovative high-tech solutions to address each of the needs outlined above, Wal-Mart has:

- Streamlined its supply chain. Supplier relationships have been largely automated. Computers in-store and at Wal-Mart headquarters keep track of inventory as it is sold, and purchase orders are sent to vendors automatically to ensure each store is capable of meeting customer demand. And vendors can access sales information and forecasts for the products they provide, allowing them to adjust manufacturing levels in sync with Wal-Mart sales. These automated, on-line systems help Wal-Mart keep its overhead low, which translates to lower prices for customers.
- Improved in-store operations. Wal-Mart's in-store computers are connected to corporate headquarters through a powerful frame relay network, allowing near real-time tracking of inventory, prices and purchase orders on a store-by-store basis.

Retail Link™ enables Wal-Mart to deliver Every Day Low Prices and the best customer service in the industry.

RETAIL LINK™

Wal-Mart works with more than 7,600 suppliers that manufacture the range of products offered in its stores. To coordinate this massive supply chain, Wal-Mart takes advantage of the latest Internet and wireless communications technology to provide a constant link™ between its suppliers, its fleet and its stores.

One of the cornerstones of Wal-Mart's philosophy is making sure that the products customers need are on the shelves whenever customers need them. With the vast array of products available at Wal-Mart and the fluctuating nature of customer demand, this is also one of Wal-Mart's biggest challenges.

To meet customers' needs, Wal-Mart's suppliers often must be as flexible and fleet-footed as Wal-Mart itself. To help suppliers meet the challenge, Wal-Mart established Retail Link™, an Internet-based resource that provides suppliers with a full range of information on their business with Wal-Mart, updated on a daily basis.

Through Retail Link™, suppliers can:

- Download purchase orders from Wal-Mart.
- Check the status of their invoices to Wal-Mart.
- Determine how many of their products were sold at Wal-Mart stores the previous day.

- Examine the effects of markdowns or returns on their inventory.
- Access reports on sales over a period of up to two years, as well as sales forecasts for their products for up to one year.
- Upload reports and updates for Wal-Mart.

Invoices, purchase orders and other documentation is processed through a system called Electronic Data Interchange. Suppliers use standardized formats for a variety of forms, and can search for and access specific information from the database at any time. The system is used by about 5,000 suppliers to process purchase orders from Wal-Mart, and about 2,600 suppliers use the system to send invoices to Wal-Mart. This accounts for about 93 percent of purchase orders and 85 percent of invoices processed by Wal-Mart.

The constantly updated flow of information through the Retail Link™ and Electronic Data Interchange systems allows Wal-Mart and its vendors to work together seamlessly to ensure that inventories match consumer demand. It also allows suppliers to more efficiently serve Wal-Mart, meaning lower costs and better prices for customers.

Retail Link™ is now the industry leader for collaboration via the worldwide web. Suppliers access and share data over the Internet and work hand-in-hand with Wal-Mart buyers to better serve their mutual customer, the consumer. Retail Link™ was first implemented in 1991 as a limited-capacity, closed-network system for suppliers. Initially the system required dedicated hardware, which Wal-Mart provided to suppliers. In 1997, the system was transferred to the Internet, allowing fast, secure access through nearly any personal computer. The system now processes an average of 120,000 supplier queries each week.

Wal-Mart maintains the Retail Link™ system, trains vendors on its use and maintains a technical support team to assist suppliers. The Retail Link™ system is composed of Windows NT-based servers, which handle client requests, and UNIX-based servers that handle applications processing. Many information queries from suppliers are processed through Wal-Mart's massive NCR teradata data warehouse, which stores 100 terabytes of information on all aspects of the company's operations.

We recently announced a major expansion of our data warehouse designed to expand the level of cooperation with our merchandise suppliers. This expansion allows for significant growth in the amount of sales history available for analysis. In the past, suppliers were able to analyze up to five quarters of sales history. With this expansion, they now have up to two years of data to examine, enhancing their ability to spot and react to long term trends.

“We have high expectations for our suppliers, and we provide a great amount in terms of business systems capability,” says Randy Mott, Wal-Mart Sr. Vice President and CIO. “Retail Link™ gives Wal-Mart buyers and suppliers the information they need to treat each store as if it were the only one in the chain.”

Wal-Mart's data warehouse, which is two times greater than the next largest Fortune 500 data warehouse, was expanded to 101 terabytes from 44 terabytes. Previous day's information, through midnight, on over 10 million customer transactions is available for every store in every country before 4 a.m. the following day. Today, over 7,000 suppliers access Retail Link™ and get answers to any question at any time. Wal-Mart currently averages 120,000 of these complex trend analysis questions each week.

“It's really all about service to our customers,” says Tom Coughlin, President and CEO of the Wal-Mart Stores Division. “Our investment in this technology helps our supplier partners and Wal-Mart buyers provide customers with what they want: the right product in the right store at the right price.”

These databases allow Wal-Mart to quickly and effectively predict the needs of customers in different areas and from different backgrounds. And by ensuring that each store receives products that closely match its customers' needs, Wal-Mart keeps inventory costs down.

PRIVACY, TREND ANALYSIS AND CONSUMER PREFERENCE

As customers needs evolve and change, so will buying patterns. The successful retailers are the ones that adjust their business in sync with these transitions.

Wal-Mart uses its frame relay data network and the most expansive, powerful teradata storage facility in the industry to keep its finger on the pulse of customers' buying patterns. Every transaction every day at every Wal-Mart store is cataloged and examined to find ways to improve the product mix and customer service. While the system is used to determine a full range of customers' preferences and buying patterns, it is important to note that it is our corporate policy that no information

on individual customers is shared. Wal-Mart is committed to making every effort to better serve its customers, but it also respects customers' privacy.

Wal-Mart's website, Wal-Mart.com does not share personal data with anyone outside the company.

Following are just a few examples of how this information is used:

- Forecasts are used to help ensure that inventory levels match customers' purchasing habits at different stores and different times of year.
- Purchasing patterns are used to determine item affinity, or the relationships between purchases of multiple items. For example, if Wal-Mart sees a pattern where many customers purchase toothpaste and aspirin during the same trip, the items will be placed closer to each other in Wal-Mart stores, making it easier for customers to find what they're looking for.
- Wal-Mart provides feedback to suppliers on how customers are purchasing their products. For instance, if many customers were purchasing three of the same item, Wal-Mart might suggest that the supplier provide the item in packages of three. Information from the teradata system also is provided to suppliers through the Retail Link™ program.
- By comparing sales data for the like items at varying price points, Wal-Mart can determine whether increased sales would allow the company to sell an item for a lower price without affecting the bottom line.

Information for Wal-Mart's trend analysis efforts is gathered automatically at each Wal-Mart store. Point-of-sale registers record each item sold at every Wal-Mart store. This information is collected by servers located in the stores' back offices, and transmitted to the teradata facility at Wal-Mart's headquarters via high-speed frame relay data connections. Information on a given day's transactions is processed by the teradata system overnight and is available for analysis the following morning.

The teradata storage facility holds 101 terabytes of information, or 101 trillion bytes of information. This is enough storage to maintain every Wal-Mart transaction record for a two-year period. The system processes an average of 120,000 complex information requests per week from Wal-Mart associates and suppliers.

Trend analysis and consumer preference efforts were launched in 1991, when a sales tracking system was implemented. Additional features were added through the years to create today's industry-leading system, and Wal-Mart will continue to develop new applications for the system.

GLOBAL COMMERCE INITIATIVE

The standards important to retailers and suppliers can exist upon a number of technologies and platforms. Standards needed in the retail industry are commerce-based not technology based. For example, we interact with suppliers that are UNIX based and PC based as well as those who operate on an IBM mainframe.

Already, various organizations are improving retailer supplier relationships. Since 1986, VICS, the Voluntary Interindustry Commerce Standards Association, has worked to improve the efficiency of the entire supply chain. VICS establishes cross-industry standards that simplify the flow of product and information in the general merchandise retail industry for retailers and suppliers alike.

One of VICS current focuses is Direct to Consumer commerce (DTC). This evolved from the interaction and development of trends both surrounding and within the retail environment. These trends involve the retailers and manufacturers interested in DTC, the consumers driving the need for it, and the technology that has facilitated the development and growth of this movement. Optimizing the shopping experience has never been more important. Direct to Consumer Commerce gives the retailer and manufacturer the opportunity to offer the consumer a vast number of products in a small amount of real estate, with consumer prompting as opposed to mandatory interaction with sales associates. As consumer acceptance of this alternative grows, new relationships between consumers, retailers, and manufacturers will form. As retailers and manufacturers explore this form of Direct to Consumer commerce, the need to standardize the information flow between the interested parties will occur. The Voluntary Interindustry Commerce Standards Association's (VICS) Direct to Consumer committee was formed to address this issue. The retail industry will continue to experiment and move forward adopting standards as they are created and approved.

Recently Wal-Mart joined a group of the world's leading companies representing more than 800,000 large and small companies to create the first organization dedicated to simplifying worldwide commerce for the consumer goods industry. The newly formed board identified five initial activities to streamline relationships be-

tween manufacturers and retailers to better meet the needs and expectations of consumers across the world.

This board is concentrating on key technologies and processes that enable consumer goods to move more efficiently across the global supply chain. Those include electronic data interchange, product numbering and identification, standardized product tagging, global scorecard development and unleashing the power of the Internet through Industry Extranets.

The Global Commerce Initiative is the result of joint industry efforts in North and South America, Europe and Asia that since the early-nineties have been building strategic collaborations between stakeholders large and small across the complex supply chain for modern consumer goods. They include the Efficient Consumer Response (ECR) movements in Europe, North and South America and Asia, together with the Voluntary Interindustry Commerce Standards Association (VICS) in North America, EAN International and UCC, CIES—The Food Business Forum, FMI, AIM and GMA.

The board seeks to smooth out international variations in supply chain standards. While much progress has been made locally within the Americas, Europe and parts of Asia, there remain substantial process barriers between continents. Simplifying international commerce practices has become an immediate and pressing priority. Despite technological advances, business processes, systems and standards that will enable optimization of the supply chain across continental boundaries have not been developed. These are needed to deliver better consumer value.

Again, standards needed in the retail industry are commerce-based not technology based.

SUPPLIER DEVELOPMENT

Wal-Mart is committed to purchasing products from local and regional vendors and suppliers through its Vendor Development Department. During the fiscal year ending January 31, 1999, Wal-Mart spent \$67 billion with some 96,000 U.S. suppliers. Wal-Mart has a variety of vendor development programs, including:

MINORITY & WOMEN-OWNED BUSINESS DEVELOPMENT PROGRAM

Wal-Mart believes that cultural diversity translates into customer satisfaction. We are always looking for ways to better reflect the communities in which we operate and the broad marketplace we serve. The Minority & Women-Owned Business Development Program coordinates services that encourage and support businesses owned by minorities and women.

The program offers minority and women-owned businesses:

- The opportunity to become Wal-Mart vendors and tap into the company's huge retail potential.
- The opportunity to provide services and non-resale products to Wal-Mart Stores, Inc.
- Start-up support through the Wal-Mart Innovation Network (WIN), designed to nurture innovative products in development and those that have sales histories of less than six months.

WIN: WAL-MART INNOVATION NETWORK

The Wal-Mart Innovation Network encourages new products and ideas. It offers inexperienced inventors and entrepreneurs the advice of professionals to determine the commercial potential of products that are still in development stage or have a sales history of less than six months. The process also helps identify the risks involved with bringing the product to market.

The program offers referrals to government or university economic development organizations that may assist with further development, production or marketing of new products.

Senator BREAUX. Mr. Schutzer.

STATEMENT OF MR. DAN SCHUTZER, CHAIRMAN OF THE BOARD OF THE FINANCIAL SERVICES TECHNOLOGY CONSORTIUM, VICE PRESIDENT AND DIRECTOR OF EXTERNAL STANDARDS AND ADVANCED TECHNOLOGIES, e-CITI, CITIGROUP

Mr. SCHUTZER. It gives me pleasure to be here today. I represent the Financial Services Technology Consortium, which is a consortium of financial service firms, technology companies, Government bodies, and academia, and I have prepared a written statement for the record, but I am going to spend just a few minutes highlighting a few of the key points.

First, interoperability. We certainly support interoperability. We see, as was discussed before, that the ability to have interoperability, particularly in a network technology like the Internet, just opens up the markets to the greatest number of firms and consumers. It lowers the barriers to entry in many different businesses, and it forces a lot of competition and innovation, which is what we are seeing in the Internet today in the field of electronic commerce.

It gives our customers greater choice, and the service providers a much larger potential marketplace, which they can engage in business.

One key component of which we are talking about here is standards. Because we help achieve interoperability through technical standards, I do want to mention that standards are needed, but it is not the only thing needed to achieve interoperability in commerce.

To achieve interoperability we need technical standards, but we also need agreed-to business operating rules, warranties, and other things such as that to accompany the standards. We just do not achieve the interoperability in the commerce sense.

FSTC supports the principle of open standards. By open standards we mean standards that are available for everyone to use, and not controlled by any one party to the exclusion of others. Of course, it does not mean that the standards could not have been developed by a single company. They could be, but provided those standards are then made available and controlled or managed by many different organizations or companies, I would deem that to be an open standard.

There is a lot happening in the standards area today. Standards have been evolving for a period of time, but most especially in this new era of the Internet, where we are driven by the globality and internationalization of it, and by the real pressing need for speed, time to market. Actually, through the Internet, where standards are evolving in a more ad hoc, market-driven manner, rather than legislated by any one body, we are seeing a lot of change.

In fact, we are beginning to see a marketplace of standards bodies as we are evolving to what will be a new model for standards, and so we see many different standards bodies, the old, more formal standards bodies, as well as the more ad hoc ones. Even the existing standards bodies are evolving themselves. The formal ones are restructuring themselves to work more rapidly.

The more informal ones, like the IETF, the Internet Engineering Task Force, have had to accommodate for the fact that the growing

popularity of the Internet has just made it much, much larger, and therefore they have had to adapt to working in the face of that unwieldy large number.

So we are seeing those changes, and what that means is, we are seeing a drive here where we will have many different experiments, many different standards organizations, and it is mostly going to be market-driven and ad hoc, and the standards that evolve will be minimalist in nature to allow the greatest amount of innovation around those standards to evolve.

I believe that it seems to be working, and sometime in this new century we will probably see some new models evolve, and it will be very market-place driven and very ad hoc in terms of how these standards will evolve, and I would say we should let that happen, because that will produce the best-of-the-breed standards that really have been tested in the marketplace as working.

For the moment the government should just keep a watchful eye. We are going to have to watch. You certainly do not want to get yourself in a situation, where you have one particular company or organization that could dominate and control the evolution of the standard, but I just do not see that happening right now.

On the Internet there is just too many different players involved, growing numbers, to keep that from occurring. So the Government should just participate and support the various standards process and let them evolve naturally. As was mentioned, there has been a lot of exemplary examples for that, and we should all watch as we see this thing evolve.

Of course, it is like commerce over the Internet. We do not really know how it is going to evolve until it is over.

You wanted us to comment on what we see as the major component of e-commerce systems, what really needs to interoperate in order to support this.

From our point of view, we think it is those elements necessary to support the confidential exchange of authenticated electronic documents and information that could be readily processed by both people and by machines. Included in that reliable exchange is the exchange of things of value, such as payments in a safe and trusted manner that is capable of nonrepudiation. This is where FSTC has focused.

We have helped to develop many standards, and we support many of other standards. For example we are active in developing standards for digital wallets. We developed a concept we now have operating with the U.S. Treasury called electronic check. CommerceNet is working with us in this regard. Electronic check moves the old checkbook into the Internet era and actually makes use of digital signatures, which is something that is very much in your attention. Most recently are focusing in on the area of authentication in electronic commerce.

We view authentication as a key linchpin. It is fundamental to many of the issues we are talking about now. It is the linchpin behind which you would be able to resolve information topics such as privacy and security. I want to highlight that when we talk about authentication, it is broader than a notion of digital signature. It also involves the concept of an identity, a person's attributes. People have lots of different identities and attributes.

To give you an example of how it is broader, lets talk about digital signatures. As a digital certificate issuer, one of the main things I would have to do there is to issue people digital certificates, that would link™ people to their digital signatures.

Well, the way in which I would have to issue those digital certificates, if I want to do it in the spirit of the Internet, is online. That means I somehow have to authenticate remotely online who that person is that I am delivering that certificate to, or who I am vouching for.

We think this is an important issue which we have not really properly understood. We are working now to add to some of the understanding of those issues, both the technical and the other business aspects of it, and exploring the various technologies that contribute to it, of which digital signatures is just one piece.

We call this project FAST, for Financial Agents Secure Transaction, and we welcome participation, and people to participate in the dialog.

Thank you for your time. I am ready to answer any questions you might have.

[The prepared statement of Mr. Schutzer follows:]

PREPARED STATEMENT OF DAN SCHUTZER, CHAIRMAN OF THE BOARD OF THE FINANCIAL SERVICES TECHNOLOGY CONSORTIUM, VICE PRESIDENT AND DIRECTOR OF EXTERNAL STANDARDS AND ADVANCED TECHNOLOGIES, E-CITI, CITIGROUP

Interoperability is an important element that enables commerce. It allows two or more systems, built and operated by different parties, to successfully exchange and process information. Successful examples of open standards that enable interoperability and commerce is the Internet and the US telephone system. The Internet provides interoperability of many important services built on top of its information transport, email and web standards and the telephone systems allows parties to make seamless connections and to converse with each other globally across many different telephone systems run by many different companies. The Credit Card System is another good example. It enables customers of many different financial institutions to purchase goods, conveniently and safely, at many different merchants, both in the U.S. and abroad.

Interoperability opens up markets to the greatest number of firms, lowers the barriers of entry and fosters competition and innovation. It gives customers a greater choice and the service providers a much larger potential marketplace.

Global electronic commerce advances has forced increasing reliance on interoperability, in order to enable people to exchange many types of information and perform many types of transactions seamlessly for different business uses and across borders. Thus, Interoperability is critical for the "seamless" interaction of users in the electronic marketplace. The lack of interoperability translates to inefficiency, loss in productivity, confusion, and failures.

One key component for achieving interoperability is through standards. The word "standard" covers several different types of specifications, including:

- An API published by a software provider. One needs a contract to use it, and it may change at any time;
- A complete specification openly published by a corporation (e.g., Sun's Java language or the Microsoft/Intel-driven PC architecture). This gives rise to a "club" in which members have some control over changes;
- An open specification published by a neutral institution, such as the Web consortium or the IETF. The process enables multiple actors to control the standard without running afoul of the antitrust laws;
- A standard that is enforced by some regulation authority, such as for example radio transmission standards attached to the right to use a specific frequency.

The challenge is for these standards to be widely adopted, to be clear and unambiguous, but minimal enough to allow for the introduction of a rich array of competing and differentiated services.

FSTC activities support the principle of open standards, which enable interoperability. Open standards basically mean that a standard is available for everyone to use and not controlled by one party to the exclusion of others. FSTC has found open standards, such as the Internet protocols, foster an open marketplace where competition is encouraged. Increased competition provides innovation in development of new products and choices for end users. Innovation and competition frequently results in lower costs and better products.

The Web has achieved rapid growth due to such a set of open standards. Users from many countries can exchange information given that they follow the Web's underlying standards (HTML, HTTP and other Internet protocols). These standards are very clear and have few interoperability issues. From the perspective of customers, an open Internet maximizes the benefits that users obtain according to Metcalfe's law. As long as everyone has the same service, then adding a new user benefits everyone on the network (not just users on a single ISP).

Generally closed systems do not have market share and do not interoperate with other closed systems, and frequently do not interoperate with open systems. And even when closed systems have great market share, there are interoperability issues. For example, word processing software applications that produce data in proprietary formats pose particular interoperability issues for users, when the formats or applications change. Many users have experienced that of lack of interoperability when trying to share documents, with different versions of the same software.

However open standards alone are not enough to produce interoperability. The lack of interoperability within open standards (or the implementations based on those standards) also causes failures and impediments to global commerce. The more complex the system and the standard, the harder it is to achieve interoperability. Also, in an open marketplace there may be multiple approaches to accomplish a similar function. Open standards are arrived at through a consensus building process and this often takes time or does not always produce the best standard. And standards may not interoperate between each other and between different versions of the standard. Interoperability issues are often a result of the complexity of the technology combined with different business requirements. Also Interoperability issues are not easy to solve once standards are implemented and in use.

FSTC recognizes the issues with interoperability and works in a cooperative environment to resolve those issues, especially in the formative stages of technologies and standards. Achieving interoperability does require cooperation, industry debate, testing of solutions, as well as vetting of solutions within the marketplace. FSTC provides a forum for the financial and technology industries to come together to work on these issues.

But there are many challenges to the open standards process. Chief among these is that technical issues are becoming complicated by the desire to optimize a competitive or proprietary advantage. People frequently call for optimization, for reasons including performance needs, lack of reliability, security issues, and poor control over bandwidth or latency. On the other hand, today's optimization is tomorrow's roadblock; design choices made to optimize a particular application may or may not prove the right ones to make when a new application emerges. And optimization in a decentralized network such as the Internet is delimited by difficulties in reaching agreement to deploy optimizations network-wide and could lead to vendor lock-in.

Customer requirements offer an argument against the likelihood of such a lock-in. Chief among these is that anonymous rendezvous is an essential capability. Business-to-business e-commerce is an important application; it depends on the ability to establish connections between two previously-non-corresponding companies; without this capability you cannot get any new customers. In fact, there are many customers whose requirements are characterized by the explicit need to work across multiple organizational overlays without having to agree on a common service provider. The automobile industry, for example, requires that manufacturers and parts suppliers are able to interact with each other absent agreement on a single network provider to serve them all.

Reflecting the fact that the Internet Commerce is today a major commercial market, and growth in the financial interest, the growing stakes involved in the standards process itself threaten to overwhelm the traditional mechanisms. First, a wider market and more widespread interest means that the number of participants has grown; it is impossible for a working group of 100 or 200 people to do design work, and the inevitable compromises often degrade quality and crispness. Another factor is that the IETF does not hold the monopoly on Internet standards development. A proliferation of groups affects standards in the Internet, including the World Wide Web Consortium and the Wireless Access Protocol Forum. These are more closed, narrow in scope, and more industry-centered. Companies and industry groups, in

developing Internet standards, generally use whichever standards body they believe to be the most effective avenue for their business plan. The same company may pursue different standardization efforts in different forums simultaneously, for this reason.

Institutions have reacted to these challenges in many different ways. The IETF standard process underwent several revisions, which all tended towards more formality in order to cope with the increased attendance. The ITU and ANSI have tried to streamline its process, in order to shorten the standard cycles. Various forums have arisen that focus on specific subjects; they have adopted policies that expedite the development of standards while coping with the antitrust regulations.

Standards are currently being developed today in an active and very mobile market space—a model that parallels the freewheeling creativity of the Internet. There are two basic and conflicting attitudes toward standards. One view is that there should be exactly one standard for any function, and that this standard should be debated in an environment that guarantees fair representation of all parties and fair processing of all contributions. Another view is that there may well be many competing specifications for the same function, and that market competition will select which products serve best a given function. The telecommunications world of the old CCITT and CCIR, now the International Telecommunications Union (ITU), traditionally adopted the first view. The reality of the Internet market, on the other hand, points toward the second view. Today it can be argued that the market impact of standards from treaty bodies such as ITU is essentially indistinguishable from the impact of those of other bodies. The acceptance and use of a standard has more to do with its applicability to marketplace demand than who approved it. In fact, examples such as Java, developed by Sun, or the initial Web protocols, which were developed by an informal group of research institutions, show that the market can also widely adopt solutions before they are blessed by any standard group.

The right formula for standards evolution and maintenance is still evolving and uncertain, but market forces are likely to produce the right result. We believe that watchful waiting is the appropriate course of action.

The major components of ecommerce systems, what needs to interoperate for a global system of electronic commerce to operate seamlessly, include those elements necessary to support the confidential exchange of authenticated electronic documents and information that can be readily processed by both humans and computer systems. This includes the reliable exchange of value (e.g. payment) in a safe, trusted manner, capable of non-repudiation. An example of such a standards effort is the Electronic Commerce Modeling Language, an effort which FSTC supports and belongs to that is developing standards in the digital wallet area involving the exchange of payment, shipping and billing information. Another FSTC secure payment initiative has been its Electronic Check project; a secure means of paying by check electronically over the Internet.

Besides working on the interoperability of open standards and their implementations in the area of electronic payments, FSTC has identified that the lack of trusted authentication in electronic commerce may inhibit the growth of electronic commerce. Today it is not possible for entities unknown to one another to authenticate each other and/or validate information needed to securely complete transactions on the Internet. Authentication is available only when the entities know each other in some manner or share a common credential authority. Existing solutions are not widely distributed to date and have been technically difficult and expensive to implement. Most do not fully address issues of attribute validation, privacy, anonymity, or warranty. The growth in many areas of e-commerce is hindered by these authentication/validation inadequacies.

To understand this problem more and what the issues are with existing technology, FSTC has brought together organizations in the financial and technology industries to explore issues, in a project it calls Financial Agent Secure Transaction (FAST). Given the trust relationships financial institutions have with their customers, Financial Institutions are in a position to provide authentication services to their customers on the Internet. FAST hopes to leverage these trust relationships by creating a framework and protocol that will allow financial institutions to provide the authentication/validation services to each other on behalf of their respective customers. This enables e-commerce to securely take place while protecting anonymity of the parties, privacy of sensitive data, and guarantee of any payment obligations.

Providing Authentication services needs to be understood in the context of industry requirements, other initiatives, and technologies. Issues with current technologies, including interoperability will be identified. The goal of the project is to develop an interoperable framework that leverages as much of the existing technology infrastructure, but that also addresses gaps in the systems and improves

ease of use. FSTC is seeking participation from all market segments to help define business requirements and to work together to identify issues and solutions.

FSTC's main focus is on technology issues that face the Financial Industry, and not on legal issues. However FSTC recognizes the importance that business and legal requirements have upon the implementation of technology and routinely seeks the advice and support of others that are working in these areas.

FSTC is only now in the beginning of its FAST project formation and discussion. It is not clear how to establish a legal or policy framework that would be conducive to developing a framework for authentication services. However, FSTC believes that by working together, the project may be able to make some recommendations in this area. Members of the government are invited and have come to some of the FSTC FAST Project formation meetings. FSTC seeks participation and input to the FAST project to help work through these questions.

FSTC is also eager to work with other organizations to share results of its research, support the effort of other cooperative initiatives, and/or to solve problems jointly within and across industries. More information can be found about FSTC at www.fstc.org.

Senator BREAUX. Thank you, Mr. Schutzer, and the rest of the panel.

I take it I am hearing from Mr. Habern, I guess, an expression that the Government really should not be directing the standards and being the driving force in the implementation of standardization and activities associated with it, and that the marketplace will pretty much be able to develop these standards themselves without involvement or interference by the Government.

Mr. Whiting, Mr. Whinston, do you have any thoughts about that, or should we just butt out and get out of the way?

Mr. WHINSTON. Well, I am certainly in favor of the free enterprise system handling these things. As I was trying to indicate, there are lots of examples in history where standards are established and they inhibit innovation, and so standards are in effect a way of drawing everybody to one approach to something.

There may be then new innovations that come out after the standards are set, and it is very hard for that new innovation, if it were to upset that standard, to get adherence, so we have to understand the tension between standards interoperability, which lets us convert from one approach to another and the whole—

Senator BREAUX. Well, what is the proper role of Government in trying to develop or set these standards?

Mr. WHINSTON. I think in terms of setting standards, as I suggested, there has to be an understanding that there should not be in any way an attempt to establish a monopolistic or oligopolistic approach to that industry, and so I would suggest that any standards meetings should be meetings which are open to everyone.

There should not be a meeting to set standards which has only a certain group involved, and does not take input from the outside. All the standards that are established should be published so everybody has access to those standards.

So I think there, it may be a role of the Government because of the antitrust laws. That is, various companies cannot just come together and meet. They have to have sanction from people involved in antitrust enforcement.

So I think these ways of having open meetings, and understanding that everything that comes out has to be published and available to everyone, including newcomers in industry, should be something that the Government should enforce.

Senator BREAUX. Mr. Whiting, do you have any comments?

Mr. WHITING. I think, simply stated, that Government should not lead the standards efforts when and if there are standards that need to be specifically stated broadly for electronic commerce, although I think from the perspective of recognizing that the U.S. Government at the Federal level as well as at the State and local level plays an enormous role in terms of commerce in our country as well as worldwide, the Government should be an active participant and partner, and I would encourage the Government to work as a member of industry in participating in that.

I do not think Government should specify how we should be doing business. I think we have discussed, it is going to limit innovation. We run into a number of other concerns that have been voiced today.

The other comment that I would make is that I think that the concern about whether it is broad industry-driven standards or even Government-specified standards of how to do business with the Internet today, one thing we have learned is that the innovation of the American business person will find a way around standards that do not make sense.

So I think that if we spend a lot of time and effort and Government resources to specify how we should be doing business, quote-unquote, over the Internet, the business people who are creating new entrepreneurial efforts and new startup companies around our country will clearly find ways around that, and will find ways to innovate, making all of our efforts to specify how they should do business a less than worthwhile activity.

Senator BREAUX. Can anybody give me some discussion on how do we interact globally in this whole area if the United States has progressed probably further than other countries, at least a majority of other countries, along the area of e-commerce, and how we deal with it?

I mean, can we unilaterally decide what the standards in this industry are going to be, and other countries will follow us, or are we going to end up having two different sets of rules and regulations when we deal globally and internationally with electronic commerce?

How do we handle this on a worldwide basis? I mean, do we go off and have our industry set standards and rules and level playing fields for this country and then we are buying widgets from Bangladesh?

I mean, how do we guarantee to consumers that everybody is playing by the same rules internationally, unless the Governments are going to do it separately from industry?

Mr. WHINSTON. Well, there are, of course, groups that are by nature international. There are standards groups in the communication field. There are groups that involve intellectual property and patent which are international. The World Trade Organization is getting much more involved in this area, as in some sense electronic commerce is really a force for liberalizing trade, and so electronic commerce is by nature international.

Now from a practical point of view, many of the technology developments in recent years in terms of electronic commerce happen to be U.S.-based, and so you get these de facto standards, ways of creating software that emanates from the U.S., and in effect the

standards, to the extent they make sense on a global basis, get adopted globally.

Senator BREAUX. Are other countries—I mean, you have experience in these areas. Are other countries just going to accept the standards of the United States, or are they going to come up with their own, which may be different from ours, and we will not be able to deal and communicate with them.

Mr. WHINSTON. I just was in Europe lecturing and talking with people about electronic commerce. If you go on your own as a country, and again, keep in mind that this is an international business, you may be cutoff from commerce. If you decide in your country you are going to do something on your own, you may be cutoff.

Now, there are national laws that make life complicated, for example, in many countries, and this affects, for example, Amazon. Prices are set by the publisher.

We have in effect these laws that we have in the past where the supplier can set the price, so Amazon has to adhere, in the countries that it is doing business that have these laws, it has to adhere to those laws, and it makes things very complicated, because it is hard to tell where the customer is coming from.

It is hard to know until at certain stages of the transaction, that you are dealing with a person in a certain country, and so you have to then change the way you are going to do the billing. You have to keep up with all of these national laws, which can be constantly changing, so countries have laws that differ in terms of commerce from the way we operate, and that causes a lot of cost and a lot of extra grief to companies who are operating worldwide, but I think that is something that may over time evolve.

Senator BREAUX. Mr. Habern, I am a big Wal-Mart fan. I get a Wal-Mart fix about every weekend.

Mr. HABERN. We appreciate that, sir.

Senator BREAUX. When I go running around your stores—you spoke about having kiosks set up in the Wal-Mart stores. What would the function of that be, just out of curiosity? If I am already in the Wal-Mart store, I am just going to walk up and down the aisles and pick things off the shelf and throw it in a basket and leave. What would the purpose of this added feature be?

Mr. HABERN. There are two things we are trying to address with the kiosk. Currently, the statistics are about 35 million people have access to the Internet, and it grows daily. There are still a large number of people who do not.

Many of our stores are in rural communities, and in those communities we do not have the same assortment that we do in some of our newer, larger stores, so we believe that it allows the customer to have access to a larger assortment, perhaps, than they would in that particular store.

Second, we believe it offers the consumer an opportunity to buy something as a gift and have us worry about getting it to their grandchildren in Green Bay, Wisconsin, even though they may live in Florida.

Senator BREAUX. So they would actually be able to do the transaction over the Internet in your store, have your company, wherever the product is, send it out?

Mr. HABERN. Yes, sir. It is really the Wal-Mart.com site on a kiosk, that they have access to all the goods and services that we have in our entire assortment on Wal-Mart.com.

Senator BREAUX. You talked about, Mr. Whiting, a supply Web, and maybe along the lines of what Mr. Habern is talking about, what were you talking about when you talked about the supply Web concept?

Mr. WHITING. Well, the concept we have been looking at relates to, if you think about the way that many supply chains are built today, they are oftentimes built on existing relationships with long-time suppliers, and they are oftentimes very structured, defined by voluminous contracts and rules, and oftentimes even the technology that has developed over time that is proprietary within a company of how they manage their supply chain.

I am going to do business with supplier A, because I have always done business with them, and I have a 20-year-long relationship with them, and by the way, I have a contract that pretty much makes it real expensive for me to try to go to anybody else.

What we are looking at is the Internet, and especially this ability to improve the ease with which you can linkTM with other companies. Wal-Mart, for example, the linkTMing with a supplier of clothing, of being able to reduce the barriers, the technological and the legacy information technology barriers to adding or eliminating current suppliers that they may not want to do business with.

So if you go in that direction and you start to lower those barriers of interoperability between suppliers and vendors, you have a greater degree of flexibility that is automatically interjected into the system, so you literally can start to see in some instances supply Webs, literally a very disconnected kind of spontaneous model, where companies can go in and say, I want to carry a new line of product, who is the best supplier for this, and being able to go out on the Internet and linkTM the two, the logistics and the supply line together very quickly without historically the large degree of negotiation and machinations that oftentimes have to go around of adding a new supplier.

Senator BREAUX. I was also intrigued by the FAST concept you talked about, Mr. Schutzer, that stands for the Financial Agents Secure Transactions, with the explosion of utilization of e-commerce and buying everything and having everything sold over the electronic network, obviously that creates incredible opportunities for con men with great imaginations to try and con the average buyer out of their dollars.

How does someone feel secure in buying something over the Internet, particularly with a supplier that you have never had dealings with in the past? How would the FAST program perhaps help in that regard? How would it work?

Mr. SCHUTZER. Well, we feel that if we could evolve some kind of a framework, both technology wise for interoperability and businesswise, whereby organizations that you have a relationship with and could trust could provide authentication services regarding different individuals and corporations and attributes thereof, this could then provide some of this kind of needed glue to address the issue you noted. Of course this information would only be provided with the consent of the individual or corporation.

So that when you wandered somewhere where you were not quite sure who you are dealing with, or you are not quite sure what they were providing [for example, they had some promises and guarantees, perhaps privacy warranties, but you were not quite sure whether they would fulfill that promise], these could be verifying by a trusted third party.

Senator BREAU. Do you mean like a screening service of suppliers, perhaps?

Mr. SCHUTZER. Perhaps. For example, let us say I have a wallet, and you are wanting to provide information to a Web merchant via the wallet. This information can include shipping information and financial information. You might be concerned about that particular merchant, are they really who they say they are, can I trust their privacy statement as to how they will treat my information. Well then, we could be providing, or we could be working with the agent of that merchant, to provide some degree of assurance and recourse.

So how could we provide a framework that is neutral on the technology—there are lots of different technologies we are experimenting with—and still achieve the necessary interoperability to allow those services to grow and prosper?

Senator BREAU. So this is still a developing system?

Mr. SCHUTZER. Right. Right now we are basically and mostly at the issues stage. In other words, what is the concept? What are the issues? What are the various technologies? Then we hope to evolve into some piloting or prototyping, of a suitable framework.

Senator BREAU. Would it be fair to call it some kind of a clearinghouse type of operation?

Mr. SCHUTZER. Well, it might involve in a sense a clearinghouse. That is where the business rules would come in. In other words, how would I, indeed, know who that other agent is that is doing the certification? How would I trust them, and how would we share the liability?

In the business space there are some of those kinds of certifying organizations cropping up. In fact, we participate in one, Citigroup does, and it is a global organization, which has large financial institutions from the U.S. and Europe and Asia.

Senator BREAU. I take it all of you would agree that this is something that the private sector should be allowed to develop and Congress should not come in and pass a law requiring it, is that right?

Mr. WHITING. Yes, sir.

Senator BREAU. I got that impression. Thank you all very much. It has been very interesting. The chairman is going to have some questions since he has returned.

Senator FRIST. Again, I apologize for having to step out.

Coming back to some of the comments I made in my opening statement about the interoperability aspect, could each of you or any of you comment on the role of formal standards of interoperability specifications from industry consortia, from the de facto standards and establishing interoperability of e-commerce systems, and help put that in perspective for me?

Then I also want to ask a followup question as a part of that as to the small- and medium- and large-size businesses' ability to participate equitably in all of these arenas, so let me throw that out.

Again, it is fairly broad, but it really is trying to tie all three together.

Mr. WHINSTON. The interoperability issue has been the main basis for the growth of the infrastructure, for the Internet infrastructure growth, and there you have lots of committees looking at defining new protocols as the technology improves, so that you maintain this interoperability.

So it is well established at the technological end of the spectrum to develop standards, to recognize that technology is constantly improving, and to make sure that those standards for interoperability are updated so that the full benefits of the new technology can be achieved.

Now, on the issue of small and medium, the examples that I would give which relate to the issue would be things like eBay, Amazon, Yahoo. What they have done is to define a marketplace and to tell small business you are welcome to come to this marketplace, and we are going to evaluate you.

So eBay has an evaluation procedure. They have got various stars and thumbs up and thumbs down that come from looking at the experience that customers have in dealing with that small business, so my feeling is that the value, the stock market value of eBay is not in the fact that they have auctions, per se, or not in the auctions software, but in the fact that they have established a worldwide marketplace and a recognized system of evaluating customers of eBay, both buyers and sellers, so that people who go to this site know that they have some degree of trust.

Amazon, to compete with eBay, offers a certain amount of guarantee, money-back guarantee. Now, I do not know the details of that, and of course any of these guarantees, the devil is in the detail, but you are seeing a competition to bring small business, which is really the creative basis of the economy, into the marketplace, but dealing with the trust issue on a commercial basis by having these well-recognized brand names, in effect monetizing their worldwide brand name through the conveyance of trust to the participants in the marketplace.

Senator FRIST. Mr. Schutzer.

Mr. SCHUTZER. I believe we are seeing a new ecology of standards bodies evolving, and that is being driven by the need for time to market.

What we have learned is that if you go through a formal standards process, that oftentimes, (a) they overspecify, which is bad, because then we stifle innovation, (b) they are consensus-driven, which means we often do not get the best of the breed, we get a compromise, and it takes a long time for it to come out. (I do not really know how—and it is because it is internationalized?)

Many times these bodies are very hierarchical in nature. For example, we will do things in the U.S. under ANSI and then will put it up to ISO, the international body. Many times we have different organizations, and different Governments take opposing positions, and they play that kind of game.

So those (standards) organizations are trying to come to become more rapid and responsive. In the meantime what we are starting to see another trend.

What we are seeing is groups of companies, and it could be just one or two, that care the most about something, will actually go out and develop a standard, and that standard will be proven through the fact that it actually works. There may be some competing standards, in which case we let the marketplace sort of play that out.

Then what happens is, because we all want that network externality, that network effect, we want to have the widest, broadest market, it becomes in your best interest to then turn these standards over to a more formal standards process where the standard can gain wider acceptance and participation in the future evolution.

So I am not saying—we do not know exactly how it is going to turn out, but it is beginning to look like that. Those of us that care the most about something begin to develop it, we rapidly produce some standard, we cooperate within a smaller number, then we turn it over to some of the more formal standards bodies, and the speed at which it goes from the U.S. to the international is very rapid. Sometimes it is in parallel.

Senator FRIST. Thank you.

Mr. Whiting.

Mr. WHITING. There is a couple of very fundamental things to remember when we talk about standards, and I think both of the two previous comments bear this out. There will never be a single standard for e-commerce, and we recognize that standards change and evolve, and there is always innovation happening, even in the standards area, and so our real challenge is not necessarily to create the standard, but really is to figure out how we can create an environment and operate in an environment that companies can come in and find out how another company does business.

For example, if I go out and I want to sell into a particular marketplace, I want to go find out what standards they may adhere to. There may be technology standards, there may be business process standards, and I need to be able to go to some place, almost like we had mentioned earlier, the idea of a clearinghouse or clearinghouses that I can go and find out how the potential partner does business, and I can use some technologies—in fact, there are technologies being developed today to facilitate negotiation between different ways of doing businesses.

I can go out and say I do business this way, I support the Rosetta Net standard for procurement, or I do business this way, and I support a competing standard, and having technology that negotiates the common basis between those two that allows us to establish a trading relationship, and that is the really fundamental part to it, and so we have to think about standards as a way to interface and not to create common technology, or a common piece of software that we all use. So that is, I think, the first point.

In terms of the small- and medium-size enterprises, the same concept plays out. If we have large companies building standards and driving that, which is one of the down sides of the historic standards process, is that large companies tended to overly influ-

ence the development of those much oftentimes to the detriment of small businesses.

The concept of building interfaces and having an environment that allows software and e-commerce to literally plug and play businesses, that I can create new value and new entrepreneurial advantage by being able to plug in my business lots of other places.

So if I have a set of interfaces that I know I can plug my business into, or I know how companies work in that way, the small and medium-sized enterprise actually I believe has a significant opportunity. I think this is being borne out by the new class of the Internet startups.

We really have two classes of small- and medium-sized enterprises in this country. We have the old school that says, I have kind of boundaries around my company, and I am going to kind of maybe have a Web site.

There are other companies that come in and say, I have an open interface as a philosophy and a culture in my company, I will plug in and partner with anybody, small or large, in the marketplace, and I am using the Internet as a way to enable that.

That is really the nature of a lot of these new, very aggressive fast-growth small companies that are being very, very effective in the marketplace, and I think that is a model many other small- and medium-sized enterprises can emulate and gain a lot of success in the marketplace.

Mr. HABERN. We operate, Senator, with a number of standards. The mass merchandising business, which is our original business, had one standard. When we got into the super center business, and got into the food business, there was another standard. We have elected to adopt the support of all of those standards.

I think as has been pointed out earlier, these are sometimes very specific, and to have one overriding, grand standard I think would be so complicated to implement, particularly for small- and medium-sized businesses, it would be onerous. It would not help the growth of e-commerce.

So I think that the standards that are set by whether they be industry groups, or more formal organizations, we are not going to see them in this country or worldwide. I think the fact that there are some out there today—and many of them, quite frankly, allow small businesses to do business with us today on an efficient basis, as well as some of our largest suppliers who have a vast amount of technology and business process expertise.

So I think the Internet has allowed us to have smaller companies participate with us in the business-to-business transactions and the startup and the .com industry. It is just brand-new, and to see how fast that has grown, and the fact that they have been able to innovate I think is, on its own it gives us some indication of how fast things can happen in that industry without specific standards.

Senator FRIST. One of the barriers of integrating electronic commerce into a business operation is the perceived, and maybe it just may be perceived, and you can comment on that, high startup costs.

You have a dynamic changing marketplace, and a marketplace for standards out there very quickly, and this whole concept of having a small- or a medium-sized business investing in whatever

startup costs there might be, could be comment on that, the perception of high startup cost? Is it truly a barrier, and could you comment on the effects of the different types of standards, and the interoperability specifications on those startup costs?

Mr. HABERN. Well, I think 20 years ago certainly, the startup costs were very large, to support some of these e-commerce standards that are in place today. We have new suppliers probably more so in our .com business, because we are taking on some new suppliers, but also in our innovation area of doing business with small and minority-owned companies, that you can buy a PC and for a few hundred dollars, literally you can get into the commerce business to do business-to-business transactions very effectively, and keep costs down and yet participate in e-commerce.

So I think that it may be a perceived issue more than it is a real issue, Senator, in the cost of getting into that business.

Senator FRIST. Other comments.

Mr. WHINSTON. Well, the startup issue for small business, I would agree, is not really that great. You can, if you are a merchant you can decide to go on the Web, get somebody to, or get some company to develop a Web site for you, get involved with these companies that will give you the trust, or the trust issue so people pay attention to you, and have access to your site, and then you are in business, and to the extent you do business, you pay transactions fees, and so there are more and more small businesses that have abandoned their physical site.

I think there is a big startup for large companies. I think that—and it is more of a culture issue. Large companies have a tradition of operating in the bricks-and-mortar space. They have huge investments in that.

They have got huge staff, and to the extent they go into the .com area, it raises concerns about the direction of the company, whether people who have training and jobs in the areas that depend on the physical bricks-and-mortar to continue have a concern, and so there is a strategy issue of making that transition from a traditional, whether it is established bank or brokerage firm that is doing traditional telephone business and high commissions, or a traditional bricks-and-mortar merchant, there is, I think, a significant challenge in shifting over to this new, what we consider more efficient economy.

So I think for small business, people just jump into it, and people have unique ideas these days. You can walk to a dozen venture capital companies and spend a week or two and probably walk away with a couple of million dollars to finance, so I think the U.S. economy is so vibrant in electronic commerce because of the behavior and the initiative of people who are starting businesses that 1 day and a year later they're public companies with market values that rival companies that have been in business for 100 years.

Mr. WHITING. The issue for small businesses in this area is—I would agree with my panelist on this—is not the cost of acquiring new technology. That has really been an opportunity that service companies have stepped in and built a whole new industry of application, service provider and commerce service provider over the Internet, where small businesses can come in and very quickly get online and do it.

The cost for small businesses today is probably more in the area of having the right business expertise. It is a very different thing of having an old time small business, mom and pop type store moving to the Internet and thinking about the right business models and the right value proposition that they can bring to the Internet.

That is where the cost comes in, because I think they start getting in and saying, they have these visions of glory on the Internet, and not really know what they are doing, and/or try to find people who can really advise them properly on the right way to do business on the Internet. That is probably where the expense comes from, is not getting the application of services or the Web site up. It is finding out somebody that is actually going to be honest with you to help those small businesses understand how to bring their business onto the Web and into a new environment.

The concern is, is that if you listen to the radio today, how many advertisements do you hear saying, you need no Internet experience, I will train you to be an Internet consultant, you can make hundreds of thousands of dollars because small business people will give you lots of money to have you tell them how to do business.

This is a big concern, and it is not the technology side, it is the expertise side, and that is the biggest challenge I think that small business people have, is who to trust and how to find best practices, and how really to do this.

If you have got a good idea, just as Professor Whinston said, you will have venture capitalists coming after you wanting to give you money, giving you systems, doing everything for you to put you onto the Web, but you have to have that basic understanding of a good business concept.

Mr. SCHUTZER. I would think the beauty of the Internet is that because of the interoperability it has driven all of these components down to commodity prices, and so you find that the PC's, the communications, even the storage you can have is very low, and your cost, your barrier of entry, is really low. This makes it easier to succeed provided you have the insights and the intuition on how to start up a business.

Just a case in point, there is a company called Blue Mountain.com. Blue Mountain.com was a small, little card company in Colorado that actually had more of a philosophy of life in terms of how to communicate to people, rather than trying to make money. Their son was somewhat knowledgeable about the Web.

They got this notion that they would—(actually a notion that came out of some work from MIT and other places), make greeting cards electronically, and allow people to customize them and send e-mails to their friends, allowing them to pick up their customized greeting cards on the web site. These cards had animation, and sound, and all sorts of neat things. When you send your friends these electronic cards, you would also let them know it came from Blue Mountain.com, and so Blue Mountain's advertising was by word of mouth.

They became, I think, number 5 or number 6, correct me if I am wrong, in terms of the most visited sites, and just recently they were bought out by Excite@home, which was also another new startup for, and I forget the exact number, but I think we are looking at about \$800 million or something, with zero revenue.

So that is the perfect case. Out of nothing, a small ma and pa shop had a better idea, nice startup, and were successful.

Senator FRIST. We will close down with this, but let me ask you again, and I asked the first panel, as you heard, something about health care, and it seems to me on this subcommittee, which is Science, Technology, and Space, we do a lot in terms of broadband Internet communication.

It is pretty amazing to me how inadequately applied is the technology to the field of health care, yet it is the largest industry in the aggregate that is in the United States of America, and so I want you to help me with this in terms of the standards, the interoperability, the specification for standards, the private development of standards, what Government does.

As a physician, I see a patient. I have my Palm VII, or whatever the latest is, in my pocket, where I have just gotten the news, the weather, the directions to wherever I am driving, the score on the ongoing baseball game. It is in my pocket, though, and I do not pull it out.

I see the patient, I spend, say, 30 minutes doing a physical exam, and I order probably maybe \$3,000 worth of tests, a series of tests. That might be an MRI for a head ache, or a CAT scan, or an electroencephalogram, or it might be an X-ray. I write that down on a piece of paper, and give it to somebody, a person who walks in the room, with my staff, and they go to the telephone and call and order the tests.

I do the physical exam, and after that 30 minutes I pick up the dictaphone and go and dictate that physical exam, history of the present illness, past medical history, review of systems, physical exam. It takes me probably 4 to 5 minutes to dictate through that experience.

That is given to a transcriptionist who is in—typically if it is four or five physicians she will have to hire a transcriptionist. That transcriptionist puts a paper record into a huge chart that sits in my office, but there is a chart just like that over in the rheumatologist's office who she saw 2 weeks ago, and over in the neurologist's office when she fell, and then a whole different one in the hospital.

In my own office, because of Federal regulations that are constantly changing every 3 months to 6 months, we have several thousand codes, not just for the tests, but also for the interaction, how many minutes were spent, what the diagnosis was.

Because of another series of regulations there are lawsuits today where people will come in as to whether you upcode, appropriately code, or down code, because we as policymakers have got to get the waste, the fraud, and abuse out of the system.

So the physician pays for a coder that does nothing but look through these thousands of codes, trying to match how much time you spent, what the presumptive diagnosis was, past medical history, how complex, and pulls out a code that this physician is paying for, or that office is paying for, because he or she does not want to be sued or put in jail.

Then you start the billing process, which is a whole different track that this coder does not talk to, and you have somebody who is going through doing the same thing off the hard record that has

been dictated, transcribed, and in the chart, reading through it to figure out how much you are actually charging, either Medicare to send the claims, or the private company, but you belong to 12 different managed care companies today in the private sector, and all of them do not seem to be communicating very well.

So you have to have somebody actually going through and saying, how much will this particular company, managed care, or HMO, or PPO, how much will they reimburse for a 15-minute office visit, routine history, and physical exam, which is very different.

The billing for that then is sent off, and if it is for Medicare, the regulations vary among, I do not know, 15 or 16 different entities that the Government contracts with using certain codes, but the 16 different agencies really do not communicate.

They use different standards, and therefore the risk of fraud and abuse is therefore even higher, because the Federal Government will come in and say you billed too much, or too little, and yet there is a lack of consistency among these adjudicators, these 16 different—I do not know if it is 16, maybe 12 entities chosen by the Medicare system.

Again, at-risk, because of the lack of standardization among those.

The medical record, of course, is sitting as a hard copy here, because there are no uniform standards there, and the risk of privacy. The billing claim forms, there is a lack of uniformity there.

Is that an interoperability problem? Is it the fact they have not gotten together, or is it a competitive problem that has kept them apart?

Now, clearly, what I envision is taking the Palm Pilot out, just going through very quickly, or some equivalent of that, where instantaneously you get rid of the code, or you get rid of the transcriptionist, the medical record—you may have a hard copy somewhere, but it can be shared among physicians and hospitals appropriately.

Is that a problem—all of that that I just told you, because clearly we have got the technology. Is the problem a lack of standards? Is it industry? Is there a role for Government?

We have got Medicare, which is the largest health care entity in the United States. Do we have some responsibility for accelerating that process by forcing some standards, maybe just the framework in which it would give all of these small companies and the managed care companies some sort of incentive to come into and allow the innovation, the creativity, and the dynamics that all of you are talking about, or do we stay away and allow the system to work its way out, but recognize that we are at this revolution which we may be only 20 percent through, but health care is still in the dark ages as far as I am concerned.

A big question, but there is a potential Federal role that I do not want to start walking down that if it is going to put clamps on innovation and creativity. I am looking for efficiencies. I am looking for higher quality of care. I am looking for eliminating this sphere of fraud and abuse that physicians now are operating under in the daily practice of medicine.

A big question, and I know all of you have thought about part of that, but do not spend a long time on that, but it is something I am struggling with.

Mr. WHITING. This is an area that is very close to my heart, as well as, I am sure, yours, given your background. I am actually kind of—separate from CommerceNet, one of my secondary endeavors is, I sit on the board of one of the new Internet health startup companies called Medecentric that is dealing with some of these issues, and so I spend a lot of time with my board of directors—primarily they are all doctors—talking about these issues.

There are—and I think you hit on the one key word in this in terms of incentive. Today, as you know, in medical practice, doctors, to be able to be motivated to implement some of these new technologies, there are a lot of doctors that they see it in terms of singularly as reduction in cost, or avoidance of costs, and that is why they are not doing it.

Standards, the HMO practices, the conformance with HPIC, some of the other standards that are coming out, to them look like additional cost and additional overhead in terms of their practice.

Additionally, you have increasing legislation under the start guidelines having to do with being able to sell pharmaceuticals, or nutraceuticals. That fact is that doctors again are being pushed on all sides to reduce the amount of entrepreneurial activities, appropriate entrepreneurial activities that they can engage in.

I think this is also one of the challenges even on the Internet health care side, is that there are so many regulations of what to do and what not to do that it has gone beyond that of just defining what is the appropriate basis and how you do business, or what you do, to how you do it.

We have—and I think this is kind of the dark side of the whole standards effort. I would point possibly to some of the down sides of HPIC. I think the basis of HPIC was to define a certain way of making sure that the health care data records flow from one organization to the next, but where it went wrong was not defining what it should do, but how it should be done, and starting to specify it so definitively that you cannot innovate in process or in practice.

I think that that is the challenge with a lot of the health care standards, and in our startup with Medecentric of looking at where we can add value, particularly in the patient-doctor relationship, and using the Internet to facilitate that, the challenges with all of the regulation and standards that are seemingly on the surface, more inhibiting than acting as a watch-dog, an appropriate watch-dog in this, it is a very daunting task.

So I would challenge the Government in this one particular area. There is an enormous amount of revenue and an enormous amount of commerce, and an enormous opportunity for innovation, but because of the long-term structure that has been put in place in this area, it makes it very, very difficult for innovation to happen, and there is very little incentive, as I am sure you know, from the physician's standpoint, to be able to interoperate even with other physicians in sharing patient data records and so on. It is very, very difficult.

Senator FRIST. Thank you. Any other comments?

Mr. WHINSTON. I guess I would just make a suggestion that, following along the way you were describing how things could be altered, to set up demonstration programs, that is, to invest with certain hospitals in introducing more powerful technology that is, let us say, patientcentric, that tries to deal with these organizational structural issues, and then to suggest that reimbursement to hospitals in the future would be calibrated based on these demonstration programs.

That is, there is a best effort, a best practice which is possibly much better than what is going on in general, and to start pushing those hospitals by calibrating reimbursement based on your demonstration programs.

Senator FRIST. That comes to the issue of how we might incentivize.

Mr. WHITING. Particularly getting the HMO's involved. That has always been one of the challenges, starting to tie the HUDIS guideline compliance and the rankings of the HMO's, and then provide a way that that incentive can flow back to doctors, because today, again as you know, as I understand, it is very difficult for a doctor to be incented to help the HMO's to do efficient work.

I think kind of just as the professor had indicated of tying things like the HUDIS guidelines, and HUDIS rankings I guess is the appropriate term, or proper term, to things that are more incentive-based, or technology developed test beds, prototypes and so on, would be a great step.

Senator FRIST. Any comments?

Mr. SCHUTZER. I agree with the comments that were made. I do not have anything to add.

Senator FRIST. Those of you who studied it, would you say that health care—would you agree with my assessment, which is really more just observational, that health care is lagging behind other industries in the total integration, or not?

I know we are seeing a lot in terms of startups, but I can tell you right today, if you go to the banking industry you do not see thousands of ledgers and green papers and pencils there, and you go into the doctor's office, and you see exactly that, and where the call for information, I would argue, in comprehensive health care is totally dependant on the exchange of that information, and yet the exchange now is like a bunch of silos that are sitting out there.

So that is just sort of an observation. I guess, Mr. Whiting, you are in the middle of a startup, so you could say there is a lot going on out there.

Mr. WHITING. There is a huge amount of investment. There seems to be a lot of money flowing into IT and health care, but there seems to be correspondingly a relatively low amount of innovation.

Most of the innovation I think is happening to literally disintermediate the physician. If you look at everything from onhealth.com, myhealth.com, healthcenter.com, et cetera, et cetera, all of those are in essence attempting to disintermediate the doctor, because they can step out of that space. That is kind of from the doctor upstream.

Hospitals, labs, HMO's, insurance company, Medicare and so on is a morass that few of the innovative entrepreneurial organiza-

tions want to even get close to. I have talked with a number of software companies who have developed very good patient management systems and technologies, and literally have put it on the shelf because it is too difficult to market, and there is not the innovation level of investment that is going on kind of upstream.

Most of the investment you see, and the innovation, is happening, again—go on to the Internet and find health care information. I will just forget my doctor, and I will not go to him. If I am worried about my cholesterol level and I want to find out about Zocor or Provacol, I am not going to go to my doctor. I am going to go to one of the Web sites and type in a search engine and learn about this.

I think that is where all of the investment and innovation—and there is a huge risk in that, because disintermediating the doctor is not what we want to do. That is absolutely the wrong thing that is happening, but the plan and the program as it is set is incenting us to do that.

Senator FRIST. Well, listen, thank you all very much. As you can tell, I really view this as the start of an ongoing dialog on an important issue that all of you have contributed to greatly in terms of our understanding, our initial analysis as we go forward, and I personally appreciate all of you taking time from your very busy schedules to participate in that dialog, and look forward to continuing that as we go forward.

Thank you very much.

[Whereupon, at 11:55 a.m., the subcommittee adjourned.]

APPENDIX

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL FRIST
TO DAN SCHUTZER

Question 1. Whereas the North American marketplace seems more willing to accept non-standard solutions, this has not always been the case internationally. This has led some governments to set and use local standards as trade barriers. There have also been examples of marketplace standards that have been usurped by more costly formal standards due to local practices.

a. Can you comment on these practices in general, and then specifically as it relates to e-commerce.

Answer. With respect to the Internet and Information Processing, we have seen the reverse of this practice. TCP/IP, and other associated IETF standards, has replaced the ISO standards in this area, even in Europe. The IETF and W3C are global organizations which have active participation and adoption of their standards in Europe, Asia, etc. as well as the U.S. Also in the area of computers - first IBM's operating systems and hardware interfaces became the de facto standard throughout the world, now Microsoft operating systems and Intel-compatible PC's have become a similar world-wide defacto standard. It seems in many cases, a defacto marketplace standard that is in place because of a combination of being a superior technology and/or has succeeded in capturing a dominant marketshare, will succeed in making the more formal standards obsolete. Of course there are exceptions to the successful emergence of an industry-accepted de facto standard. A recent example is the wireless digital cellular phones - but here much of the outcome could be attributed more to the slow introduction of digital wireless in the U.S. and the confusing array of non-compatible standards being offered by competing companies in the U.S. than any other reason.

b. Can you comment how these issues affect many of the small businesses either involved in the e-commerce software application market or contemplating using e-commerce technologies in their business operations?

Answer. If anything, it encourages small businesses in the e-commerce area, who think they have a superior technology, to try to develop and set new standards based on their technology. They try to gain acceptance for their standards by both actively promoting these new technologies in the standards arena, and by moving quickly, with sufficient partners, to gain a critical mass of customer acceptance fast, so they can dominate in the marketplace. And market domination, in the end, seems to be the major determinant as to which technology standards will become widely adopted.

Question 2. What is e-Citi? Can you elaborate on some of Citigroup's e-commerce practices and some of the interoperability issues that it has faced in implementing its e-commerce strategies?

Answer. e-Citi is the part of Citigroup that is responsible for, among other things, Citigroup's Internet strategy and for the creation of Citigroup e-commerce and e-financial products and services, and their delivery via the Internet, telephone access devices, and ATM networks. Because we deliver services over the public networks (voice, data, wireless and wired) and need to interface with many other financial institutions and exchanges, interoperability is key to all our e-commerce strategies. As a result, we are very active in the standards arena, building our solutions to existing standards and helping to define new standards where they are needed, as in the case of electronic bill presentment and payment and remote authentication.

Question 3. You mentioned that the growing stakes in the standards process threaten to overwhelm the traditional mechanisms. What can the government do to ensure that the "playing field" is level throughout this process?

Answer. This process currently seems to be proceeding well. It could fail for many reasons, but for the moment does not seem to need any special attention, other than watchful waiting - to see if any unfair practices or imbalances occur. However, it is important that government agencies, such as NIST, continue to participate in the

new, open standards processes, such as W3C, IETF, and other more informal industry groups, as well as the more formal standards bodies, such as ANSI. In this way, the government can encourage the standards processes, express government user requirements and gain a better understanding of the process in order to detect unfair practices.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL FRIST
TO ANDREW B. WHINSTON

Question 1. You mentioned that augmenting interoperability in the applications and intermediary layers of the Internet economy will be a critical factor in achieving a truly digital economy. Can you elaborate on why interoperability in these two layers are so important to the overall Internet economy?

Answer. In the applications and intermediary layers of the Internet economy, the key enabling factor is the network connectivity. By being networked, firms and consumers can interact in a degree that couldn't be imagined before the Internet and the World Wide Web came to dominate information technology applications. Major business-to-business and business-to-consumer applications such as supply chain management, logistics applications, knowledge management within a corporation, online retailing and auction markets take advantage of the networked economy.

Interoperability is essential if these market participants must communicate, exchange information, deliver and use products and services in real time. In addition to the fact that these processes have become much more sophisticated and dependent on third-party technologies and products, many products and services themselves have become portfolio or bundled products and involve multiple vendors and users who must interact with each other. Interoperability and standards must exist not only in communications networks and data types transmitted over these networks but also in products and business processes which are the basis of integrated, networked economy.

The effort to promote interoperability should be distinguished from standardization. Interoperability is often equated with making products and processes conform to the same standards, which may imply making products the same. This would reduce the level of competition and innovation by discouraging differentiation. However, interoperability in the applications and intermediary layers means establishing a common set of product specifications and procedures such that businesses and consumers can interconnect to carry out economic activities. Such interoperability will promote competition and create more opportunities. For example, TCP/IP standard, the Internet protocol, is behind this explosive growth of the Internet economy by assuring interoperability among all business applications developed for the Internet. Such interoperability at the basic communications networking should be carried over, to the extent it is feasible, to other levels of the networked economy.

Question 2. Can you elaborate further on the differentiation between monopolistic behavior and cost-effective vertically integrated product offerings?

Answer. Monopolistic behavior is usually analyzed within a product market while vertically integrated firms will operated in two or more product markets that are distinct. Mergers of two firms in the same product market have direct effects on competition and consumer welfare. However, mergers of two firms operating in different markets, for example in upstream (e.g. Dell Computers who produces computer hardware) and downstream (e.g. RedHat who produces operating system software) markets, may or may not be anticompetitive.

When a firm can prove that it can save costs and improve efficiency by vertically integrating, although it is seldom a matter that can be verified, this by any means imply an anticompetitive behavior or create a monopoly. However, if the vertical integration is used to influence downstream or upstream market where the firm does not have market power, it will have the potential to lower competition.

A firm may dominate a market and its status as a monopoly may set the standards that have to be followed by other firms so that their products can interoperate with that of the leader. Such behaviors are not monopolistic by nature. However, if interoperability and standards in one market are enforced by another firm whose primary market power is in upstream or downstream market, that would pose serious doubt on its legality. If that firm happens to be integrated vertically, there is no doubt that any benefit from cost reduction will be negated by anticompetitive behaviors.

Question 3. You have made the argument that electronic commerce is a new market that should be treated differently. Are there any legal ramifications and what is the effect on existing laws?

Answer. Electronic commerce and Internet-based economic activities represent fundamental changes or improvements over those in the physical economy. In this regard, online book seller Amazon.com is not in the same market as those who sell books through physical stores. This is true even though Amazon.com sells physical books like other physical bookstores. Still, Amazon.com is able to expand into other products and services more rapidly than a book store owner. This simple fact indicates that Amazon.com is not simply a book seller but an Internet-based firm which should be regarded differently from all firms that operate in the physical economy.

Existing laws governing physical markets and firms have evolved within the very context of market characteristics. For example, laws governing sales taxes, shop lifting, copyrights and security presuppose physical dimensions of a business or a store. Different laws apply to different firms in each specific market and location. When these market boundaries do not exist or are extremely fluid, such distinctions cannot be enforced.

It is highly doubtful whether governments can revise existing laws for the Internet expecting they can still fulfill their intended purposes. Many laws stem from non-market considerations. Local sales taxes, for example, are levied to raise educational and social spending. These needs will persist in the Internet economy as they have been for decades. The question is whether existing laws designed to address physical market players and processes will be effective in the Internet economy where markets and economic agents follow entirely different sets of economic processes. Governments need to focus on new laws governing electronic commerce and the Internet economy. These laws may require new thinking and an entirely new way of raising revenues, protecting privacy and security, and so on.

