

OPEN SOURCE SOLUTIONS, INC.

NATIONAL COMPETITIVENESS AND NATIONAL SECURITY:
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PRESENTATION BY

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I want to thank Robert [Steele] for giving Heidi and myself the opportunity to come here today to meet with some people who I think are changing the world, even when, they are not necessarily thinking about doing it.

We are not experts on information technology although we think a lot about the social and economic and political implications of it. As authors, we are in the information business. We collect, store, process, and disseminate data, information, and we hope, knowledge and maybe even a little trace of wisdom. We are outsiders however to the intelligence community and so for us it is a fascinating immersion that we have had.

One does not need to be an insider however, to be aware that the entire intelligence community like all our basic institutions, faces a crisis of restructuring. Our health system is obviously in crisis, our justice system is in crisis, our urban systems are in crisis, our values system is in crisis. Our giant corporations and our government bureaucracy are simultaneously in crisis. The first question is, why not our intelligence systems? And then, the next question is, better yet, why? Why is it all happening?

You know, there is an easier answer to a lot of this, not to the social institution's changes but to the intelligence crisis as with many foreign policy crisis. The easy answer is, well, it is the end of the Cold War. The end of the Cold War is the new Omni-causal factor that we use to explain all kinds of changes.

We would argue that it is not simply the end of the Cold War that is confronting intelligence with a profound crisis, but something far larger. We believe that the intelligence community would face a crisis of restructure even if the Soviet Union was still in business. And the reason for the difference has to do with time horizons. If we take the short view, the end of the Cold War, the Cold War itself, looms as an enormous historical event. It has occupied most of our lives and most of the people in this room have been involved in it in one way or the other; touched by, it affected by it during most of our lives.

But, if we take a longer view and look at this period of history from a vantage point of a future historian writing, say from the year 2100 or another century beyond that, and we look back at this period, I think the conclusion would be that the Cold War was a minor kink in the thread of history compared with another set of changes that were taking place at the same time. In fact, we have written before, that someday we will look back on the Cold War with the same combination of the, I would not say amusement, but bemusement, as we now look back on that bitter conflict between the Guelphs and the Ghibellines in Medieval Italy.

So, if we take a long view, we see something else. Once we focus our sights beyond the immediate we see an enormous difference and that helps explain some of the changes. Many of you, of course, are familiar with the shorthand terminology that Heidi and I use. It saves time if we make this clear. We believe that the first great social transformation in human life was the Agrarian Revolution or the Agriculture Revolution, when some pre-historic Einstein planted a seed for the first time. Probably a woman did that and launched a revolution that moved slowly across the planet at the rate of one kilometer a year for 9,000 years; from the Middle East up to Northern Europe. That revolution is still playing itself out in some parts of the world. In the Amazon, you know, farmers are killing tribal populations to grab hold of the lands so they can continue the final spread of the First Wave of change, the Agrarian Revolution.

The Industrial Revolution brought a second bang or a Second Wave of change across the planet. And now, we believe, as we had written for a long time, basically ever since *Future Shock*, which is almost 25 years old, that we are living through a third massive historical wave of change of the magnitude, comparable to the earlier ones, if not even greater, and that that new wave, like the previous ones, it creates a new civilization. This is the greatest wave of change at least since the Enlightenment. The coming transformation of the intelligence community is an inescapable consequence of that historic upheaval.

The Third Wave is changing people, is changing values, is changing markets, is changing the roles of urban communities, is changing media, is changing cultures, family structures, social relationships, epistemology, logic, even language and so on. That is why we call it more than just a technological change but rather a civilizational change. A new way of life is emerging and that new way is radically different from the way of life of people living in a traditional industrial or smoke-stack civilization and certainly different from the way of life, from the peasants life toiling in an agrarian civilization.

One of the consequences of that, the arrival of a new civilization, historically challenges pre-existing civilizations. We believe that what is happening now with the emergence of a Third Wave society or way of life or civilization, is bringing about the deepest change in the structure of global power since the Industrial Revolution. We also believe that until this larger change is understood, the intelligence community will not only not be able to diagnose its problems correctly, but will not be able to change them very well.

Thirty years ago or so, we began, and not just us, but others as well, began writing about the information revolution, the knowledge revolution, the coming-knowledge society and so forth. Now these words produce a glaze in the eyes when they are repeated in newspaper stories all over the world.

Outside this room, there are very few people, I believe, who have begun to think about the strategic implications of that. What we are talking about is a concept that we call, and Robert (Steele) referred to it earlier - and he has done a lot more about it: the concept of Knowledge Strategy.

If knowledge is central to our activity, I think having a strategic view of it is doubly important. But to grasp the concept of Knowledge Strategy we need to understand, we need to look more closely at the role, at the change in the role of knowledge in the system. We need to begin by just saying that we use the word knowledge very loosely to incorporate data, information knowledge, images, symbols, the whole ball of wax. Basically, what we think is happening is that there is a change in the relationship of knowledge to economic and military power. Let's start with the economy.

We are moving from a brute force to a brain force economy. That has all kinds of social dislocations attached to it and lots and lots of problems that we do not know how to solve. Basically, we are moving from an economy based on brute force to a brain force. The best way to illustrate this is to ask anyone who went through a conventional economics course at the university, probably was taught that the main factors of production are land, labor, and capital; maybe, raw material. Nobody ever mentioned knowledge.

We argue, as we did in *Power Shift*, that knowledge is not only a factor of production, but is the central factor of production because it is ultimately substitutable for all the other factors. If you have the right knowledge, you can build your product or provide your service with less energy. You can cut down on labor, you can cut down on raw materials, you can cut down on the space required to store your stuff, you can cut down on transportation, you can cut down on all the other inputs of the system if you have the right knowledge at the right time in the right place.

This means, if that is true, that driving down the cost of acquiring, processing and distributing knowledge is our most powerful competitive advantage. That is true not just for us but also for other countries. This produces fundamental changes in the structure of the society, the nature of production and so forth. For example, when Heidi and I were factory workers, as we were for a time in our life and we actually worked on assembly lines with our hands. Our job was to turn the largest number of identical gadgets. Today, as we know, you go to an advanced factory, with use of flexible manufacturing we do not have to turn a million identical widgets. We can turn out sixteen of that, three of those and fourteen of the other products continually changing the product. That has been made possible by input of information computer-driven technologies, numerical controls, and so on which is reducing the cost of diversity in the output.

We call that, the demassification of mass production. However, that by itself will be standing fundamental conceptions on its head. We were all taught after all, that mass production was the most advance form of production known to the human race. Here we find that it is possible to do masscustomization or demassification. That is different. If that was all that was happening we would say that that is pretty significant, but it is not all.

If we look more deeply, we find that a comparable or parallel process is occurring in the distribution of goods and services in the economy. We no longer market to undifferentiated markets. We view the public, the so called mass market, we now see is made up of micro markets continually changing. The marketeers are talking about market segmentation and the latest twist is that they are now talking about particle marketing. A particle is a single family or maybe even a single individual. What we are talking about is the capability of precision targeting families or individuals for marketing purposes. That is demassification of distribution in parallel to the demassification of production.

The same thing is happening to our communications systems, which is in fact, the link in our capitalist's advertising-drench society between production and consumption. We go from 3 networks to 500 channels, cutting-up, demassifying the audience - in effect, niche production, niche distribution, niche media, niche family structure. We are going from a relatively homogeneous family structure to a polymorphous family structure in our society. We are seeing niche politics, single issue groups springing all over the place and so on. So what is happening is that the structure of the society is becoming more differentiated and thus becoming more complex and a radically inappropriate system for the provision of mass services, for example by the government bureaucracies which treat the population as uniform.

In addition to demassification, a new society again driven by the availability of knowledge and the combination of knowledge in the economy - we go into more and more symbolic work.

We all know that people who have to use their muscles in the assembly line are an endangered species - and mind work is more and more important. If we look inside most companies or most organizations we see; actually, we are so used to the old forms of economic and business analyses that we seldom stop to track the information that flows inside companies. But if we look at occupations, we see that some people serve the job of transferring the information from inside the company to the outside, there may be public relations people or advertising people. The other side of that are people who go to the outside world and bring information back into the company. And then there are relay people who take the information from one place to another and then switch it back and forth. These are the individuals - we all do all of this - but some jobs call for more emphasis on one than the other.

We also have people in companies who deal with what might be called the flows of information and others that deal with what we might call, with the stocks of information. The stock of information is regenerated by creative invention and new ideas and then you have to have people who generate those and then you have to have other people who cut them down and select the right ones out of that. All of these processing and thinking and communicating is going all the time in every organization, only now that it occupies more and more time and it stands on its head the concept dear to both capitalist and marxist economists that all of this activity is somehow non-productive. The basic traditional economists look upon all of this as wasteful overhead - and that value is created by touching the physical goods and making them in the assembly lines as we did.

We will argue that the creation of added value is directly related to these processes and maybe more a consequence of these processes than of the old processes of fiscal production. The economy then, in addition to this, becomes extremely competitive, it requires more and more rapid innovation; and no one in this room has to be told that the 586 (IBM) is sweeping in before the 486 will be gone; etc, etc, etc.

We are also seeing a scaling down of the work unit size in the economy and that it is not just because of the recession. It is because of a better distribution of technology and more information makes it possible for smaller teams to work together and to produce more. You will never see people building huge factories of the kind we worked in where you had thousands of people doing routine repetitive work on the line. Small units are more and more important. Moreover, small businesses are more important, individual enterprises are becoming more and more important.

So the actual work being done in the economy, the operations in the economy are being done by smaller and smaller groups - in contrast, by the way, to the growth of larger and larger pools of capital. With our electronic financial system it is possible to create huge, oceanic pools of capital virtually overnight by fax or computer for the appropriate investment. The pool of capital becomes larger and the work units, becomes smaller.

Similarly, companies are compelled to go through constant reorganization. The traditional form of the Industrial Era organization, the pyramidal bureaucracy, is now under attack everywhere as we all well know. But I think we do not yet understand what Weiver taught us about bureaucracies, that the bureaucracy is not based on how you organize people; it is primarily based on how you organize knowledge. In fact, Weiver wrote that bureaucracy is domination through knowledge. Every bureaucratic organization has a series of cubby-holes in which specialized information gets filed. There are a series of vertical channels and at the head of each of those cubby-holes and each step of the vertical channels there is a gatekeeper and that gatekeeper has power.

That gatekeeper has the power to move the information laterally or to prevent that it moves up, etc, etc, etc. By attacking bureaucracy we are not simply technically reorganizing the system, we are restructuring, redividing, reallocating power in the system. This reflects an increasingly new organization of knowledge and so we see companies going through constant restructuring, reorganization with all kinds of new experiments with new organizational forms from skunk works to profit centers, etc, etc, etc. Constant restructuring and basically into smaller and smaller units, semiautonomous, with more discretion being moved down below.

By the way, one of the reasons for the empowerment cliché these days, which in fact represent something real, is not because the people on top want to give up their power to the people down below, it is because the people on top cannot know what is going on down below. There is an hidden implicit rule in every pyramidal bureaucracy that is never spoken but is there, and that is, that the people on top not only have more information than the people on the bottom or better information than the people on the bottom; the hidden rule is that the people on the top can specify what the people down below need to know, and that is no longer possible in big, complex, fast changing situations. It is not possible to radically limit, the marketing departments information to the marketeers. The marketing people need to know what is going on in the engineering, what is going on in engineering has to be available to the financial people, that has to be known to the manufacturing folks and so forth and so on.

What is happening to all these companies, as the external environment becomes more unpredictable, changeable and accelerated, what happens is the capability of the information system of the bureaucracy becomes overloaded and several things are the response; one is that, people in the system begin to communicate and pass information among themselves informally, frequently in violation of the reporting rules of the institution in order to get the job done. You cannot get the job done by following the book. You have to work around the book. So that subverts the book. The other thing that happens is that we put in information systems and technologies and of course some of those are very good and very flexible, and effective and powerful, and help the organization change - others are put in merely to help the bureaucracy survive, to continue to try to keep the old structure of information but just give it some technology to help it do so. I think those in the long run will not succeed. These kinds of organizational changes, changes in scales, changes in the differentiations of markets, of society and so forth are required therefore, systems integration.

You know, everyone has written about the Information Revolution, but there has been very little written about why has it occurred. We believe that one reason why it has occurred is because of this process of de-massification and internal differentiation. The more complex the system, the more information has to be exchanged among the components of the system in order to maintain some degree of workability or cohesion. We think, the more de-massified the society becomes the more information has to be exchanged within it. Therefore, we believe the application of the computer to business and to economic activity is a reflection of that reality. Therefore, the consequences of the need for systems integration, the need for an electronic infrastructure, and that infrastructure is not just a question of telecommunications. The infrastructure also includes the media and all of that becomes a central necessity for the economy of the 21st century, for a Third Wave economy. Harvard and Rhodes were in the past century. All of these changes feed into one another.

And finally, one more example; another fundamental change in the system is the speed-up of the internal rates of transactions; the economies accelerate, everything moves faster. That is, it stands that the rate at which operations move or the demand for change in the system requires a continual shift for just-in-time delivery, just-in-time decision making, time-based competition, real-time management, etc, etc, etc.

Now, you put all of those together, plus a lot of other things, if you put all those together, there are not random changes. They form a new kind of system, and that new system is what we call, a new system for the creation of wealth.

It is radically different from the smoke-stack system that preceded it and certainly different from the agrarian world that preceded that. These are just some of the changes that result from a shift in the relationship of knowledge to the production of wealth on the planet. Knowledge therefore creates not only a new economy, but changes the relationship of our economy to the rest of the world or to societies which are using earlier systems of wealth creation.

If in fact, knowledge is a central resource of our economy, it is ironic that we have no concept of Knowledge Strategy. In fact, not to have a concept of Knowledge Strategy as a fundamental issue for the Nation, is as if Saudi Arabia did not what oil was. That is basically where we are today. We have a society and a government that barely appreciates the range of effects and the power potential of all this data information knowledge that we are accumulating, massaging, processing and exchanging.

If this is true, if this transition from brute force to brain force economics is happening, that affects our position in the world, the power structure of the world. It is also happening with respect to military power. There are people in this room that know far more than we do about this, but it is clear that we are moving from a Second Wave brute force military toward a Third Wave brain force military. Just to quote Alan Campen, former Director of Command and Control at the DOD who wrote that the Gulf War, and I quote "was a war where an ounce of silicon in a computer may have had more effect than a ton of uranium ... knowledge came to rival weapons and tactics in importance, giving credence to the notion that an enemy might be brought to its knees principally through destruction and disruption of the means for command and control."

So what we see, and there are many, many other parallels between what is happening in the economy and what is happening in the military. The military too, is undergoing too a process of de-massification. Indeed, what started us in writing the book that most of you have in your hands, was a comment made by a U.S. Army General made to us in 1982, when he said a phrase that has stuck with us and really got us thinking about this. He said, what you are going to see - this is twelve years before the Gulf War, and then we saw it the night our planes bombed Baghdad, we saw it on CNN and we were absolutely gasping, because we had seen that twelve years earlier in what he has shown us - but what he said to us was, that with precision guided weaponry we are moving toward the customization of destruction in parallel to the customization of production. Or as he put it, the de-massification of destruction in parallel to the de-massification of production. That is a deep idea, and if we are moving toward the capability for precision economic activity, we are also moving toward precision capability at warfare.

In 1881, just as an almost amusing sidebar, the British fleet bombarded Alexandria. It fired 3,000 shells; 10 hit Alexandria. The difference in precision produces a fundamental change both in production and in destruction. The scale of military units is going to come down, not just because of the cutbacks, but also because a Brigade before long might be able to do what a Division did in the past. It is not irrelevant that the concept of mass forces, a key Second Wave idea, is being displaced by the idea of dispersed forces capable of creating mass effects as a result of precision and synchronization, all of them based on applications of information and knowledge.

What we see are twin changes taking place in those two areas of human activity most closely connected with global power; economic power, and military power, both changing rapidly, both changing in parallel, both going from brute force to brain force at the same time. By the way, not just in the United States, the economic changes are taking place very rapidly in other parts of the world as well. The other militaries are all studying the Gulf War CNN clips to see what they can learn from that.

Is it possible to introduce such dramatic changes into the nature of production and into the nature of destruction into the world system and expect a stable global order? We think not. We think these changes are affecting the global system in ways that will prove, in the end, to be far deeper than the changes resulting, as we said earlier, the changes resulting from the Cold War. The emergence of a new civilization is an event in history. It is a powerful event and it has only happened twice before in the terms and definitions of history that we are using here. It represents the biggest and most dangerous challenge to the existing structure of world power in at least three centuries or more.

Just as the arrival of the Second Wave industrialism was associated with the rise of Europe, so the rise of the Third Wave civilization is associated with the transfer of the center of economic gravity from the Atlantic basin to the Pacific basin. This is another phenomenal event in history and when you put them together you begin to see a changed planet in the 21st century. But even deeper, perhaps, than that, if you look closely, or I should say, if you look grossly at the world power system over the past century or two, you could not help but notice that it was divided into two. The basic bisection of power on the planet was not between the United States and the Soviet Union. The basic bisection of power, the division of power in two parts was between industrial nations on the top and agricultural nations on the bottom. What we had was a two sided or a split-level global power system.

In *War and Anti-War*, we explain why we believe that what is happening now is a trisection of the world power structure. We are moving into a world in which there will continue to be, at least for the foreseeable future, peasant-base economies with people living as their ancestors did, squabbling at the soil to feed their families. There are an increasing number of smoke-stack countries engaged in the export of cheap labor, to the export of cheap labor mass production of the simple industrial-style type products. There is now, the beginning emergence of a third tier in the system of which we are as yet, the leader, but of course there is Japan, there is Southeast Asia, there is Europe, and pockets of Third Wave technology and the culture that goes with that technology are rapidly being transplanted or planted into remote regions of the world.

Heidi and I just came back, about a month ago, from Comdex, in Sao Paulo, Brazil. The Sao Paulo Comdex is the second largest Comdex in the world. It is larger than the Comdex in Atlanta. Something in the order of about 150,000 people pass through that place everyday. Unbelievable. What is happening is that we, Japan, and others, are implanting Third Wave technologies into various parts of the world. Not just that we are doing it, but others are also eliciting and developing their own.

Now this then represents the deepest change, if you go from a two-level power system into a three-level power system everything changes. Basically, this may be the biggest global fracture of the coming generation. We are changing the nature of wealth creation, we are changing the world's location of key economies, we are changing the structure of power and at the same time proliferating not only the weapons of mass-destruction which are the final results of the old Second Wave military era - the nuclear weapon being the culmination of a weapon of mass-destruction in the mass production age - we are not only proliferating those kinds of weapons, we are proliferating Third Wave technologies that can be fashioned into weapons systems, dual-usage technologies as you will. Even more important than that, we are proliferating Third Wave flexible manufacturing technologies that make it possible to create Third Wave weapons around the world.

Now, that to us, means that the period that we are going to move into is not going to be terribly stable, it is dangerous, we face a degree of turbulence and instability that I think is radically underestimated in the United States and even here in Washington by very, very smart people still trapped in the Cold War paradigm or the end of the Cold War paradigm, if you wish.

In this dangerous era, what is taking place is the emergence of what we would call a Third Wave war form. The Second Wave, brought Second Wave warfare. The Industrial Revolution led to the industrialization of war.

The machine age gave rise to the machine gun. And as I said before, mass production is the duple-gonger of mass destruction. The two go hand in hand.

Each civilization creates its own characteristic war form. And when a war form emerges, that war form does not eliminate previous war forms. Television did not eliminate radio, and the emergence of information warfare does not necessarily eliminate previous kinds of conflict. What it does do, it calls into question all of our assumptions about how to make peace. What we would argue is that each civilization also generates its own characteristic peace form, and that is the way it goes about trying to maintain peace or to limit violence.

Each civilization goes about it in a different way. Agrarians civilizations had a kit of techniques that were used. Industrial societies had a kit of techniques that were used. Third Wave societies as yet, do not have an appropriate kit of tools for making peace in the world, or at least for modifying or moderating conflict. Therefore, we would suggest that the time has come to move as quickly and as smart as possible to move from brute force to brain force in peace-keeping and peace-making as well.

I am not sure we know exactly what that means. It is such an odd notion. It means, it would seem, coordinating all of our knowledge and knowledge-based assets for peaceful purposes to the degree that we can. That implies an increase in monitoring and verification by satellite, it implies, probably more human intelligence to keep tabs on people who want to blow the place up, it implies the use of media.

Take Bosnia as an example. The debate on Bosnia strikes as if having been unbelievably sterile: "Should we send ground troops? No it is another Vietnam, it's a quagmire", I mean if we should get involved at all. "Should we send air strikes? No it might not do the job. Should we lift the arms embargo?" We argue, no, we should lift the information embargo. The reason for this war, can heavily, to a considerable degree shall we say, be traced to Milosevitch's total control of the media in Serbia and the counterparts control of the media in the other countries in the regions, starting up considerable ethnic hate that did not exist before or that had been, at least, diminished before.

What you have in each of these countries are forces, groups, brave enough to want peace, to moderate the conflict, to reach settlements, etc, but they cannot get near a television studio or a radio microphone.

Why could we not provide that? It would seem to me, that the country that is most advance in building a superhighway, the country that is digitizing everything, the country that is going to multi-media, the country that has the most persuasive advertising and the most popular movies and television in the world, ought to somehow have been able to muster some of that in pursuit of its national objective if, indeed, its national objective was to moderate the conflict in the Balkans.

I would suggest that, what we need is to developed a Rapid Reaction Media Force for various parts of the world. At a minimum we ought to just open up the channels so that at least they can see CNN or the BBC or NHK in their own language, at a minimum. I believe that there are knowledge resources, not to mention, manipulations of cyberspace and so forth and so on that could be used in pursuit of peace-keeping or peace-making. Lots of complicated political, theoretical and moral issues in what I am saying. But, nevertheless, I believe that is the way in which we must move and do that intelligently.

When Yeltsin was there, and it look like its opposition was going to seize what, the television station, it seems to me that I do not know what redundant facilities were available to Yeltsin, but it is not beyond imagination to imagine a situation in which in fact, the United States decides to support a foreign leader faced by a potential coup d'etat and the coup-makers want to seize the television station, that the appropriate answer is, let them. We happen to have the capability of jamming that station and providing the key to the satellite or the transmission to the power that we support.

Maybe that is technologically complicated now, I do not know, but it seems to me not beyond our reach. We were amused to read that the American government has finally agreed to create a Radio Free Serbia but only on short-wave because it would be too expensive and costly and complicated to do more than that. In 1920, the Marconi Corporation broadcasted an opera from London to Greece. We somehow, could not do it just right across the border. I think we need to start thinking more deeply about the applications of all this.

Finally. Clearly, counter-proliferation implies an advance in the way in which we access, organize and use knowledge. One of the things, to us terrifying, was our failure to recognize that Saddam Hussein was using kaleutron technology, because we all thought it was inefficient. Yes, you could build nukes with it, but there are better ways to do it, so why would he do that. The reason that is terrifying is not just because of Saddam Hussein, but it also suggest that if we are going to try counter-proliferation, we are also going to have to monitor a fantastic range of technologies and to keep track of their history because it is possible to dip back into the past for techniques that can be used in the future.

Can be assembled or used in a new context to create the same kinds of weapons that others create with more advance technology. This raises questions of precursors, of precursors, of precursors. And, if that is not a challenge for information systems and for intelligence, I do not what it is?

It may mean the ability of peace keeping via brain force may mean the ability to pull the plug on a country's or a group's infrastructure if it threatens regional peace and if in fact they have an infrastructure. It means the wide application of high technology, information-based, non-lethal weaponry. It seems to us that there is an enormous opportunity for the creation of a wide range of non-lethal weapons or technologies that could be used in situations that are now lethal. There is no excuse for Waco [Texas]. Whatever our goals were, there is no excuse that a country as smart, technologically as we are, could not have created, had we set our minds to it, technologies that would have made Waco less likely.

And there is no excuse for Yeltsin having blowing up the Parliament and killed half the people in it. In a world in which non-lethal technologies are on drawing boards, in a lot of different places, but have not yet been finished, have not yet been brought together, have not been given a doctrine, have not yet been thought through very deeply. All of this implies a very different role for intelligence in the future.

Finally, I come back to the question of a knowledge strategy. If it is true, that knowledge is a new key to economic and military power, America can increase its competitiveness and, it its implied, its military clout by enhancing its knowledge resources and substituting wherever possible smarts for muscles and for money as well - because a lot of this may very well turnout to save a lot of money. It means looking at our knowledge assets and our knowledge producing and disseminating systems as related to one another, not as separate. They form a system.

Any national knowledge strategy must confront the issue of education. If we look at a country's knowledge assets, clearly education and its apparatus for education is a key part of the national knowledge resource base. Ours, we barely have to discuss the weaknesses and failures of our education system. Until we redefine education to see it in relationship to other parts of the knowledge system we are not going to solve the problem. We are looking at the problem in a purely Carthesian Second Wave way. We need to see education in relationship to media, in relationship to networks, we need to see it in relationship to a whole a lot of other parts of the knowledge system, rather than as a segregated, separated, compartmentalized activity. I think that as long as we do that, we will not solve the problem.

One way to think of the basic elements of any knowledge strategy is in terms of acquisition, which would include, in terms of a national knowledge strategy, it would include intelligence, of course, as a central activity, research and development, perhaps directing the flow of brain-drains or preventing brain-drains as we have tried to do to keep former Soviet scientist from going to, lets say, Libya, or North Korea, or Iran. It will require in addition to acquisition, attention to processing in the broadest sense, meaning, the use of advance information technologies, software, software to make software and so forth. It means looking at acquisition, processing - it means looking at dissemination. That, of course, includes education, training, global media, maybe as I said a moment ago, I think we need to create a Rapid Reaction Media Force.

And finally, it means looking at protection because, as it was pointed out earlier here today, our systems are one of the most vulnerable in the world. We are more dependent on the electronic infrastructure and the information infrastructure than anybody, and we pay, probably, the least attention to its security.

We can, by pinpointing these and other components of a knowledge strategy, and beginning to shape them systematically, we can enhance, deepen, all of these knowledge assets and radically strengthen the United States in its relationships with the rest of the world and that would increase our economic competitive advantage in the emerging world system. In doing so, of course, we have to do something a lot of other countries do not have to do. We have to avoid the temptation to think in terms of central planning of knowledge or central control. We have to do it within our constitutional limitations and so on. We need to set out what would be the democratic principles of the knowledge strategy including redundancy for safety but also open access. If America does not come to understand the concept of a Knowledge Strategy, we could be certain that our competitors and rivals will. We have one tremendous edge, it is call openness in sources and in the society as a whole.

It is a fantastic moment in human history. The Third Wave has galvanized all of the Asian Pacific region, and with us included, that means we could raise a billion human beings out of poverty within the next generation. Between 1968 and 1990, despite many forecasts, per capita food supplies in the world increased faster than population. According to the World Food Organization the number of chronically undernourished human beings actually fell by 16 percent in that period. The Third Wave technologies, information-intensive technologies are less energy wasteful than the previous technologies in that they can be replaced. Work, until now a brutalizing process for most human beings could in fact, become for those who have what we call paid work, a creative and fulfilling process.

If we do not think in terms of knowledge strategies in business, in diplomacy, in war, and in the other activities in which any society engages in, then others will, and it will be they who set the rules for centuries to come.

Thank you.

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