

Human Capital: The Profitable Investment

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Nineteenth in a series of
perspectives on employing
technology to solve the
pressing problems of society.

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The 1970s may be remembered as the decade when mounting evidence made it impossible to ignore potential disasters in the areas of energy, food, natural resources, education and other concerns of worldwide dimension.

The 1980s could be the decade that will be remembered as the time when appropriate tools were resolutely put to work to solve those serious problems.

Technology is one word for those tools. In this series of papers, William C. Norris, chairman of Control Data, reflects on how to find, develop and apply technology and its many uses in our society.

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Human Capital: The Profitable Investment

I welcome this opportunity to address the urgently important subject of investing to create human capital.

It has long been recognized in our country that public expenditures for education are both socially and economically desirable. Indeed, on occasions in the past, this country has taken daring and visionary actions to address educational needs. Two examples that come to mind are the Morrill Acts and the G.I. Bill.

The Morrill Acts are often cited as the single greatest contribution to higher education in America, with an incalculable value to society; and, I should add, to large numbers of individuals including me. I was born and raised on a farm in Nebraska. Fifty years ago, my opportunity for higher education would not have been possible without access to a low-cost public institution.

The G.I. Bill squarely faced the educational deficit caused by World War II and the Korean War, and more than erased it. In fact, a much larger number of young persons gained education and training than if there had been no wars at all. This great increase in education fueled the surge in industrial innovation and economic growth in the 50s, 60s, and early 70s.

“Except in a vague sense, public expenditures for education have not been viewed as investments.”

The costs of the G.I. Bill and the Morrill Acts were clearly an investment which provided enormous profits to the government and benefits to us all, both economic and social. Except in a vague sense, public expenditures for education have not been viewed as investments. There has been little effort to quantify benefits. If such an accounting had been made with respect to the G.I. Bill, we wouldn't be underinvesting today in the creation of human capital, nor would we be underutilizing past investments.

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As will be more evident later, I am not advocating a replication of the Morrill Act or the G.I. Bill. It would be a grave mistake to plan on a large increase in direct public expenditures for education. There are already more demands for public funds than there are funds available. And, in a milieu of serious economic deterioration and budgeting constraints, making a case for preferred treatment for education over other social programs is unrealistic.

“New investments in institutions that presently make little use of advanced technology in the teaching process is akin to investing in a manufacturing plant with inadequate and obsolete capital equipment.”

Furthermore, even if government funds were available, it would not be economical or wise to invest heavily in an outmoded educational system. New investments in institutions that presently make little use of advanced technology in the teaching process is akin to investing in a manufacturing plant with inadequate and obsolete capital equipment.

Along with an outmoded teaching system, underinvestment and underutilization of past investments are the most significant underlying reasons for the frightening amount of deterioration in education. Therefore, a quick scan of the educational scene will suffice to refresh memories.

Most distressing are the millions of disadvantaged persons lacking employable skills; millions more disabled who could be trained but aren't; the spector of a very large technologically illiterate underclass; and, at the other end of the spectrum, a scarcity of technically skilled persons essential to our economic well-being and national security.

Underlying this litany of woes at the pre-college level are such problems as the decline for many years in performance on Scholastic Aptitude Tests, the high percentage of college freshmen who require remediation, the growing shortage of math and science teachers, and the fact that only about one-sixth of all high school students take a junior or senior year science course.

At the college level, due to budget constraints, engineering schools are unable to pay salaries adequate to retain high-quality professionals. Obsolescence of laboratory facilities is another manifestation of the financial squeeze. And the rate of creation of new knowledge has slowed because of the lower level of funding for research available from the federal government, the major source of such support.

“The U.S. ranks fourth in science literacy behind the USSR, West Germany, and Japan.”

By contrast, other countries are making significant strides in developing human capital. For example, in the Soviet Union, the ten-year curriculum in math includes two years of calculus, two of solid geometry, five years of physics, four years of chemistry, and one to four years of biology. The U.S. ranks fourth in science literacy behind the USSR, West Germany, and Japan. The USSR graduates three times as many engineers as the U.S., and Japan, with half our population, produces 5,000 more electrical engineers per year.

At the same time that a high percentage of high school graduates are technologically illiterate and our engineering schools are faltering, there is a swelling need for skilled people in high technology industries. In my industry, a job growth of 147 percent is predicted during the 80s for computer maintenance technicians and a 107 percent growth for computer systems analysts. In robotics and microelectronics, it is still higher.

Moreover, a lower level and an inadequate emphasis on research affects our ability to address, in a timely manner, such massive societal needs as new sources of energy, more energy conservation, revitalization of our poverty-stricken urban and rural areas, replacement of an outmoded food producing system and, most important, the need to create new jobs.

“... access to existing knowledge must be improved.”

Not only is there a lack of knowledge, but access to existing knowledge must be improved. During the past twenty-five years or so, research and development has become concentrated in government laboratories, universities, and big corporations. Enormous volumes of information and technology are created by these organizations, yet much of it is unused or underutilized, and little is transferred to small companies and entrepreneurs.

Lack of access to existing technology by small businesses is especially serious because of the great importance of this sector in our society. It was the foundation on which America was built and achieved greatness. Small business is the primary means for realizing individual initiative. And it provides more products, services, and jobs relative to our GNP than it does in other countries. For example, small firms generate 80 percent of all new jobs and

produce 24 times more technological innovations than larger ones. I will have more to say about small business later.

Perhaps at this point, to avoid confusion, I should mention that I use the words "technology" and "knowledge" interchangeably. Further, I broadly define them as a way of doing things or organizing actions to achieve desired results.

"...our once strong competitive position in technology has been steadily eroding..."

In addition to their adverse effects domestically, the litany of problems I have been describing is contributing to the grave threat to our technological leadership in the world. Too few people in our society fully understand that our once strong competitive position in technology has been steadily eroding as other countries have taken a number of steps to accelerate its development and application. Broadly speaking, our competitors have expanded research and development through increased government subsidies and cooperation, increased the number of trained scientific and technical personnel, reduced the cost of capital for industry, and fostered growth in targeted areas.

Clearly, the greatest progress in advancing and exploiting technology has been made by Japan in targeted industries. Automobile, steel, shipbuilding, and consumer electronics were the principal Japanese industries targeted for development in the generation after World War II. And the large amount of unemployment in our country attesting to the success of that strategy is all too evident. Today, microelectronics and computers have replaced them as the most highly subsidized industries. This approach is an ominous threat which has serious implications for virtually all modern industries because of the pervasive and rapidly growing application within them of microelectronics and computer technology products and services.

"...the degree of required improvement cannot be achieved without the widespread usage of technology in the educational process..."

Enough about problems. Solutions will require many actions. For the purpose of this booklet, actions will be grouped under the broad categories of teaching, creating knowledge, applying knowledge, and developing high quality human capital. And it is important to note at the outset that the degree of required improvement cannot be achieved without the widespread usage of technology in the educational process, a vast increase in cooperation among all sectors of our society, especially between industry and academia, and widespread adoption of the view that the cost of education and training is an attractive investment in human capital. Further, that an accounting for the profit from such an investment should be made in a manner similar to investments by a business in capital equipment.

CONTROL DATA STRATEGY

Much of what I will be proposing is drawn from experience gained in implementing Control Data's strategy of investing in unmet educational needs as profit generating opportunities in cooperation with government, educational institutions, foundations, churches, and other sectors.

"Central to our strategy is PLATO computer-based education."

Central to our strategy is PLATO computer-based education. PLATO is an educational system of the first order, using virtually all other media, including video and audio tapes and discs, slides, and digital inputs and outputs. PLATO is nearly limitless in its versatility and its delivery of more accessible, less costly, and uniformly high quality education and training. PLATO is quick, accurate, and easy to use. It has infinite patience, unlimited memory, and each student gets personal attention and immediate feedback.

The development of PLATO has been underway for more than 20 years. It includes hundreds of cooperative projects with universities, secondary schools, government, foundations, large companies, small companies, and individuals. As a result, a wide range of high quality courseware is available consisting of 12,000 hours of lesson material in a broad range of subjects.

One program for secondary schools consists of courses in math, science, language, and social studies. These can be offered with or without instructors, at the option of the school. For an initial cost of \$1,500 for a small PLATO system and an ongoing annual cost of \$500, a half dozen students can be served. Therefore, every high school can afford to offer a high quality math and science curriculum.

A second curriculum is Computer Literacy. It will not only meet the needs of students and teachers to become computer literate, but it should also prove effective in motivating young people to select careers in technology fields.

“Another action . . . is to foster the establishment of partnerships which link education to jobs . . .”

Another action taken by Control Data to attract young people into math and science careers, especially those who are disadvantaged, is to foster the establishment of partnerships which link education to jobs among businesses, high schools, universities, students, community organizations, and local, state, and federal government. The program is called Career Outreach and is presently aimed at tenth and eleventh grade students. The academic portion includes math and science, basic skills necessary for remediation, and life-coping skills.

“Job participation is linked to the student’s academic pursuit to the fullest extent possible.”

Job participation is linked to the student’s academic pursuit to the fullest extent possible. Employment is part-time during the school year and full-time during summer months. After high school, vocational training or college is financed by Control Data loans, plus job income.

The program is currently being offered in four cities, with plans to add more and to extend the academic portion into elementary schools.

To address the faculty and financial squeezes in engineering schools, Control Data is participating in a consortium which includes some of your member institutions to develop a PLATO Lower Division Engineering Curriculum. Members of the consortium include the engineering schools at the universities of Minnesota, Nebraska, California State, and others. A complete freshman and sophomore curriculum is being developed consisting of mathematics, chemistry, physics, and computer science, plus additional humanities, english and writing courses. The first courses in the series are being offered this fall. Colleges will be able to combine classroom instruction and PLATO instruction as they wish and to deliver instruction at remote locations—even in homes.

“We have shortened the time necessary to acquire entry-level technician skills in computer maintenance, operation and programming.”

The only other Control Data activities I will mention are those in proprietary education. Through the use of computer-based education in our 47 vocational schools, called Control Data Institutes, we have shortened the time necessary to acquire entry-level technician skills in computer maintenance, operation and programming. The average time required to complete a high quality course of instruction in these subjects is six months. Soon to be added is a robotics technician course.

In addition to the vocational institutes, there are some 120 Control Data Learning Centers. Each center offers the full range of lesson material. The number of centers will gradually increase to several thousand by the turn of the century.

Our extensive library of lesson material and nationwide facilities for delivering education and training represent a great potential for cooperation with colleges. It can take a variety of forms. One community college is delivering our Control Data Institute courses. Sixteen colleges are delivering the Basic Skills Curriculum. Most recently, a collaboration program commenced with a college where its students take courses for credit in a Control Data Learning Center. There are many other cooperative possibilities being considered.

“History tells us that 200 years went by after the book was introduced before it was used by teachers.”

TEACHING

Despite the growing advantages of decreasing cost, higher quality and greater accessibility, acceptance of the computer in the educational process has been relatively slow. History tells us that 200 years went by after the book was introduced before it was used by teachers. Considered in that light, present usage is remarkable. Unfortunately, our pressing, unmet major societal needs and the pressures of competition from other countries, notably Japan, don't allow us that much time. Therefore, we need to vastly improve our output of high quality human capital within the next decade and to do it efficiently.

“...essential to accomplishing these objectives are the widespread usage of computer-based education and expanded cooperation between industry and academia.”

Again, it must be emphasized that essential to accomplishing these objectives are the widespread usage of computer-based education and expanded cooperation between industry and academia. Several examples have already been cited as to how this can be accomplished and more will be mentioned.

Equally important as improving the efficiency of teaching is to wisely determine what is to be taught so that investments are channeled to human capital most in need. Clearly more emphasis has to be placed on technological literacy and problem solving that will reduce the time between the creation of technology and its application and that will permit graduates to accommodate to the ever changing demand for new skills.

“...post secondary institutions must train students to a much greater extent in problem solving...”

This adds up to the requirement that post-secondary institutions must train students to a much greater extent in problem solving utilizing the latest technologies and, equally important, teachers must be trained in that approach. In the past, there has been great emphasis on methods of teaching at primary and secondary levels, but too little emphasis on the problem solving approach which could make it increasingly possible for teachers to work not only in elementary and secondary schools but also to teach in industry, labor unions, and government where adults—particularly dislocated workers—need to be taught new skills. Also, industry which is directly involved in solving problems and has access to relevant knowledge, instruments and equipment can be called upon to participate in the training of teachers—in cooperation with colleges.

“...access to existing knowledge is presently inadequate, and we are in need of more technology.”

CREATING & APPLYING TECHNOLOGY

Effectively teaching problem solving, or indeed solving problems efficiently, can only be accomplished if there is ready access to the required knowledge. However, as mentioned earlier, access to existing knowledge is presently inadequate, and we are in need of more technology. Thus, we must facilitate both the creation and application of technology, and, again, the single most important action to achieve these objectives is increased cooperation between business and academia.

One example of how this can be accomplished is the Microelectronics and Information Sciences Center at the University of Minnesota. The Center is an industry-university collaboration with initial funding of five million dollars committed by industry, another five million to follow; and the likelihood of government matching funds. The Center will not have to make the usual huge investment in laboratory and processing facilities because it will have access to facilities in industry which represent an additional investment of more than one hundred million dollars. Thus, scarce research dollars will not be diluted by the cost of expensive facilities or salaries for operating personnel, who are in critically short supply.

The Center will greatly expand work/study programs by providing more instruction at work. Computer-based education will play an important role in helping to deliver instruction and administer examinations, thereby avoiding additional burdens on the faculty caused by the remoteness of the students from the university.

Even though a major part of the industry funding is provided by big business, another important and essential aspect of the program is that small enterprises will have access to the results of the R&D. It is expected that many new companies will be spawned.

“... there are strong beliefs by both industry and university participants that academic integrity and the cooperative advancement and application of technologies are compatible.”

The final point to be made about the Center is that there are strong beliefs by both industry and university participants that academic integrity and the cooperative advancement and application of technologies are compatible.

While the industry/university cooperation just cited involves a large research university, by no means am I implying that other institutions do not have an important role in creating and transferring knowledge. All are of critical im-

portance, especially in creating and applying computer data bases of knowledge essential to problem solving. Thousands of computer data bases will be required to collect, store, and provide efficient access to information and knowledge in a multitude of fields. In addition, these data bases must be supplemented by education and training in applying the knowledge.

“... ‘A system which assists the engineer in defining his problem and identifying the information needed to solve it’ ...”

An example is a cooperative project in the area of industrial energy conservation. The objective is to help engineers solve the new types of problems they encounter as they perform their jobs. Two concepts are involved. The first is an “adaptive reference structure,” a system which assists the engineer in defining his problem and identifying the information needed to solve it; the second is a set of educational materials organized into small modules which can be studied separately to satisfy individual needs.

More specifically, the adaptive reference guides the engineer to the knowledge module or modules needed to help solve a *specific* energy conservation problem. These modules, themselves, are discrete bits of technological information from multiple disciplines, plus regulatory, legal, financial and other relevant information focused to specific problems. Corresponding modules from computer-based education and training courses are also available.

“... a computer data base which includes how-to information about crop and livestock production, alternate energy sources, irrigation practices...”

A second example of cooperation between industry and academia is called AGTECH, a computer data base which includes how-to information about crop and livestock production, alternate energy sources, irrigation practices, and so on. Many of the technologies are organized by farm enterprise. For example, one of the entries describes technology for sheep production and management and is accompanied by an intensive PLATO course that provides the basic knowledge to run a sheep operation. Technologies for AG-

TECH, along with necessary education and training materials, are being obtained from some 50 educational institutions.

In addition to playing an important role in creating and applying knowledge through the use of data bases, colleges, especially community colleges, are well positioned to be of much greater assistance to small business in other ways.

"The objective then, in each community, should be to stimulate the startup and profitable growth of small enterprise."

Widespread and persistent unemployment teaches that virtually every community needs a more effective means of creating jobs through resources under local control rather than relying on large companies to expand existing operations or establish new ones. The objective then, in each community, should be to stimulate the start-up and profitable growth of small enterprise. This can best be accomplished by public/private cooperative efforts which marshal community resources to assist small enterprise. In addition to their highly important role in education and training by teaching the many needed job skills—including the skill of entrepreneurship—colleges must reach out into the community to assist small businesses in the application of technology and as general consultants. Small businesses, especially minority businesses, have a virtually insatiable need for professional help which is critically important but too often unavailable. Much to their credit, many colleges are offering courses in starting and operating small businesses, but there is a much greater capacity—largely underutilized—for identifying commercializable technology within the institution, generating ideas for new products and services, and consulting. Better utilizing these resources is primarily a matter of colleges liberalizing policies on consulting and participating in public/private partnerships along with corporations and community groups in cooperative efforts to assist small businesses. I will only take time to describe one such partnership which is called a Business and Technology Center.

Each Business and Technology Center contains shared laboratory, manufacturing, and office facilities. In addition, computer-based education and training, technology transfer and other services are offered to facilitate the start-up and growth of small businesses. Economies of scale make it possible to provide occupants with needed facilities and services of much higher quality and considerably lower cost than any would be capable of obtaining or providing for itself.

"... a technology and enterprise match room... a place for a continuing interchange to consider technological possibilities for new business or new products and services for existing enterprises."

Also, each BTC has a Technology and Enterprise Match Room which provides a place for a continuing interchange to consider technological possibilities for new business or new products and services for existing enterprises. Faculty members and students from college science, engineering and business schools participate along with engineers and executives from industry. Interchange occurs either through face-to-face meetings or through the use of computer communications. Using the computer terminal is often more effective in some respects than face-to-face communications.

"Using the computer terminal is often more effective in some respects than face-to-face communications."

Seven BTCs are now in operation, and many more are in the process of being established or planned. The BTC concept is already yielding significant results. For example, the national failure rate for small businesses is 80 percent after five years. At the oldest BTC, which is in St. Paul, this failure rate has been cut to 14 percent after three years. Although this is not a direct comparison, the trend toward a vastly reduced failure rate is unmistakable.

INVESTING TO CREATE HUMAN CAPITAL

We come now to the question of financing the investment in human capital.

First to be considered is the student. Simply stated, it is my belief that post-secondary education should primarily be financed by its recipients. Placing

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responsibility for financing post-secondary education and training squarely on the shoulders of the recipient will help assure investment in high quality education and training that will result in marketable skills. In other words, the management of the investment is in the hands of those with the incentive and capability to assure the highest rate of return. More specifically, upon graduation from high school, everyone would become eligible for a loan for post-secondary education—a birthright, if you will. Legislation establishing such a program would provide that the debts could not be escaped through bankruptcy and would be collected through the IRS. Interest payments would not start until after graduation. Repayment would be based on a percentage of earnings.

“... the individual’s investment in education could be capitalized and amortized against income...”

Others have made similar proposals; I would take them a step further and suggest that legislation would also provide that the individual’s investment in education could be capitalized and amortized against income similar to the treatment of capital equipment in business. Equipment wears out or becomes obsolete and through depreciation, a business can recover a substantial part of the cost to provide funds to reinvest in new equipment. So it should be in education because skills of today become obsolete tomorrow, and investment in retraining is required.

“... it not only brings equality of opportunity to all who want to learn, it allows educational institutions of all sizes to compete fairly for a role in the education process.”

Let me point out here that the approach to financing human capital development I have just outlined is a uniform financing method—it not only brings equality of opportunity to all who want to learn, it allows educational institutions of all sizes to compete fairly for a role in the education process.

At this point, I should acknowledge that I know of your Association's long opposition to full-cost pricing and education financed by large student loans. I am also aware that low tuition is an article of faith. I am certainly not taking issue with the past. Your institutions have served millions of people who would not otherwise have been able to acquire higher education, and you have served them well. The record attests to that.

“...fundamental change is required not just by academia but also by industry and indeed other sectors of society.”

I also understand full well that such an approach involves great change and pain for the institutions you represent; but if it is any comfort, fundamental change is required not just by academia but also by industry and indeed other sectors of society. We are being swept into a new era by such tidal forces as industrial competition from other countries, mounting unmet social needs, transition to knowledge-based industries, and a growing scarcity of resources. Obviously, the old ways aren't working well enough and those organizations, be they corporations or colleges, that don't adapt to the new circumstances won't survive.

“With stability of income assumed, colleges can invest wisely in the means for developing highest quality human capital.”

I believe the availability of full financing by student loans can provide the foundation for the change required by colleges. The major advantage of loan financing to a college is that tuition rates can be set commensurate with costs of operation. This provides the opportunity for stability which is unattainable where there is major reliance on capricious government tuition assistance, grants or annual budget allocations. With stability of income assumed, colleges can invest wisely in the means for developing highest quality human capital. This is accomplished by budgeting income and costs, paying competitive salaries to attract the most competent teachers, and maintaining

efficient facilities. In other words, operate like a business using industrial management and accounting practices.

Business, too, is investing, indeed investing heavily, in the development of more capable human capital. The National Association of Training and Development estimates that industry investment in education and training is almost as great as public expenditures for post-secondary education. My own company is committed to a greatly expanded program of employee education and training. Three years ago, we launched an internal education and training program for all types of employees which has the goal of a tenfold increase over traditional levels. And I should add that such a massive offering would be neither feasible nor affordable without computer-based education.

Industry investment in education is, of course, not limited to internal purposes. A growing number of companies are investing in the creation of information and knowledge data bases, courseware and delivery of education. On the one hand, the converging interests of colleges and corporations in education and training means competition; but, on the other, it also means increasing opportunities for collaboration. Unbridled competition would be in neither's interest, nor would it be in the public's.

Cooperation can bring great benefits to all. There are wide-ranging opportunities for gaining efficiency through the sharing of facilities and personnel. I have already cited the example of MEIS at the University of Minnesota. There are numerous others.

Another area with great potential is that of extending the reach of any college—no matter how small—far beyond its own campus. This can readily be accomplished by cooperation with industry. One of the cooperative arrangements between Control Data and a college, mentioned earlier, is in this category. Since Control Data Learning Centers are used for delivery of a significant amount of the curriculum, great flexibility is provided in what, where, and when courses are offered.

“Through the use of technology and cooperation, colleges can reduce costs and increase quality and responsiveness.”

Through the use of technology and cooperation, colleges can reduce costs and increase quality and responsiveness. This will allow them to maximize the advantage of being better able to create knowledge and also enable them to integrate the most advanced social and technical knowledge into a broader learning experience. Hence, with businesslike management and extensive cooperation, colleges will be able to compete effectively.

Last, but not least important with respect to financing education, is the special case of education and training for the disadvantaged and handicapped. Availability of government loans to all on the same terms provides equality of access and choice. However, disadvantaged and disabled persons need additional assistance like that provided by the Outreach program described earlier to be able to cope with the opportunity.

“What is needed is legislation . . . which provides tax credits for employers of disadvantaged and disabled persons . . .”

Outreach is costly; hence, such a program will not be widely implemented unless participating businesses can both recover the extra costs incurred and realize a profit. What is needed is legislation, either federal or state, which provides tax credits for employers of disadvantaged and disabled persons, extending over a 7-10 year period, to assure that they are launched in a career.

“ . . . without government support, there will not be technology created to meet all of society's needs.”

Having outlined a sound method for investing in the delivery of post-secondary education to develop human capital, it is time to look at financing research to create knowledge. Here we must continue to rely on the government to underwrite a major portion of the cost. In fact, financing the creation of knowledge over the broad range essential to the economic and social welfare of the nation requires some increase in the present level of government research grants. To minimize this increase, institutions should obtain more industry funding and increased efficiency through cooperative efforts with industry. There are, however, important problems to be solved where investment or risks are beyond private industries' capacity or do not provide an acceptable return on the investment. Therefore, without government support, there will not be technology created to meet all of society's needs. Therein lies the major reason why a number of our most important needs are not being met in a timely manner.

VALUE OF A JOB

Having reviewed investments by individuals, industry, and government in education, we should relate those investments to the value of employment both for individuals and society.

"... post-secondary education is the difference between being employed or unemployed as more and more unskilled workers are replaced by robots and office automation."

To an ever-increasing extent, for individuals, post-secondary education is the difference between being employed or unemployed as more and more unskilled workers are replaced by robots and office automation. Consequently, one does not need to spend much time calculating the return on the investment by an individual in post-secondary education. For most, it is the most profitable investment available.

"... a job is conservatively estimated as being worth \$52,000 to the federal government each year the job exists."

Handsome profits for society are probably not quite as obvious; however, they can be easily seen by looking at the dollar value of a job. Studies have shown that, on the average, a job is conservatively estimated as being worth \$52,000 to the federal government each year the job exists. Since a high percentage of the cost of delivering post-secondary education is covered by tuition under the proposed approach, and most of the cost of creating the job was borne by industry, the return to federal government for every job that is filled is very high.

CONCLUSION

There are many more educational issues which could be reviewed; however, there isn't time. At this point, although admittedly sketchy, the framework has been outlined for a sound approach for all of the major aspects of investing to create high quality human capital.

Let me restate its essential features:

- Individual students acquire the means to finance and manage their own education and training and thereby maximize profits on those investments.
- Disadvantaged and disabled persons gain their right to compete equally for employment and to become productive.
- Higher education is less costly to government and savings can be channeled into other areas needing more support, such as elementary and secondary education and assistance for the disadvantaged and handicapped.
- Colleges become financially self-supporting and therefore can be efficiently managed, pay competitive salaries to attract the most competent teachers, and be more responsive to the ever-changing panorama of skill needs of our nation.
- Through increased cooperation between industry and academia, knowledge can be created more efficiently and the time required to get it applied is reduced.
- Colleges become much more closely linked with business, especially with small businesses, and make a much greater contribution to the process of creating new jobs.

All the elements of the proposed program are already being used in one form or another—evidence that it *will* work. I wish it was possible to proceed simultaneously with aggressive implementation of all parts; however, that isn't possible.

Getting legislation to establish a policy of loans for the full cost of post-secondary education will require the development and support of a broadly based constituency. Since public interest in education is increasing, and it is likely to be an issue in the next presidential campaign, there will be numerous forums for all of us to express our views. If colleges were to support the full cost student loan approach, I believe politicians would respond quickly and favorably.

“The guiding principle . . . ‘efficiently investing to create the highest quality of human capital.’”

Meanwhile, each educational institution can and must move ahead with the introduction of advanced technology in the teaching process and with the expansion of cooperation with industry, both in delivering and in creating knowledge. You can reach out into the neighborhood to facilitate the process of creating jobs by working with small businesses, and you can adopt the

most efficient management practices. The guiding principle for all actions is simply that of *most efficiently investing to create the highest quality of human capital.*

“...the cost of education and training to create human capital is clearly a profitable investment...”

By taking these actions, you can begin the process of developing a widespread understanding that the cost of education and training to create human capital is clearly a profitable investment; that human capital is more important than financial capital in a knowledge-based society; and that we can most efficiently create the highest quality human capital and once again assure that the United States can maintain its position of technological leadership in the world and thereby facilitate the creation of the new jobs that are so badly needed.