

# Technology, Education, and the New Workforce

The national science and technology policy must be in sync with the future demand by enhancing science and engineering education and the training of the workforce. A healthy workforce is an informed workforce.

by Jennie S Hwang



THE WORLD is faced with the new economy characterised by changes and uncertainties. The “newness” enables a high-growth and low-inflation economy that was never seen before. To many, it is amazing that the low interest rate, low unemployment, healthy consumer spending, and good wages can all happen in confluence. The United States’ gross domestic product continues to grow at a rate exceeding 4 per cent, inflation is below 2 per cent, and unemployment is at a 29-year low – below 5 per cent. Most economists finally agree that the economy is indeed going through a fundamental transformation. This transformation is fueled by three elements – technology, innovation, and globalisation. As a result, a profound increase in productivity has materialised in almost every sector. The new economy is also fueled by information and knowledge and the way the information and knowledge are used. Therefore, we may call this new era, knowledge economy, Internet economy, or technology economy.

## Role of Technology

Technology has changed the way we learn, we do business, how we live – toward higher efficiency and a fuller and richer life. Look at the things we use on a daily basis – television, microwave ovens, cell phones, computers, E-mail, and the Worldwide Web. All these “good stuff” are incorporated with the essential principles and practice of science and engineering.

We may define “Science” as the understanding of natural phenomena and the pursuit of greater and deeper knowledge; and “Engineering” as taking discoveries and putting them into practical use for the betterment of life and society. In the food chain of science → technology → product → society, engineering is a bridge between science and society, making useful products available to us.

To maintain the momentum of the new economy, we have to continue to focus on productivity through the effective use of technology. This can vividly be demonstrated in all industries from high technology to heavy machinery to retailing. For example, at General Motors, computer-aided design cut the design time from 40 months to less than 24 months; and the information flow within Caterpillar Corporation via satellite facilitates the containment of problems and provide

faster solutions. Wal-Mart Stores, Inc's inventory management has been drastically improved with the help of computer systems. The development of technologies in turn depends heavily on education and the workforce and on the investments in the acquisition of knowledge and skills.

### Education

Education has continuously been a priority on the US national agenda in recent years. President Clinton has implemented an education reform programme, known as the "Goals 2000: Educate American Act". Having US students as the first in the world in Science and Mathematics by the year 2000 is one of Clinton's education goals.

During George Bush's presidency, six national educational goals were set:

- All children will start school ready to learn
- High school graduation rate will increase from 72 to 92 per cent or more
- Students will leave grades 4, 8, and 12 having passed tests showing they are competent in challenging subjects like English, Math, and Science
- US students will be first in the world in Science and Mathematics
- Every American adult will be literate, and
- Every school in America will be free of drugs and violence.

Why is education so important? Its purpose is to replace an empty mind with an open one (Malcolm S Forbes). In a straightforward food chain: better education provides an individual more opportunities in the job market. Collectively, it forms a better-educated workforce for the nation, which in turn is the foundation to maintain global competitiveness.

To achieve better education for the nation as a whole, we must set high academic standards in the core curriculum, particularly in Math and Science. Universities must provide all students a solid foundation in science and engineering and an understanding of the relevance of these subjects to everyday life. We also need to build in the curriculum the necessary programmes to facilitate successful transition

from school to work.

Equally important, we must understand that education starts at home and that education starts at birth.

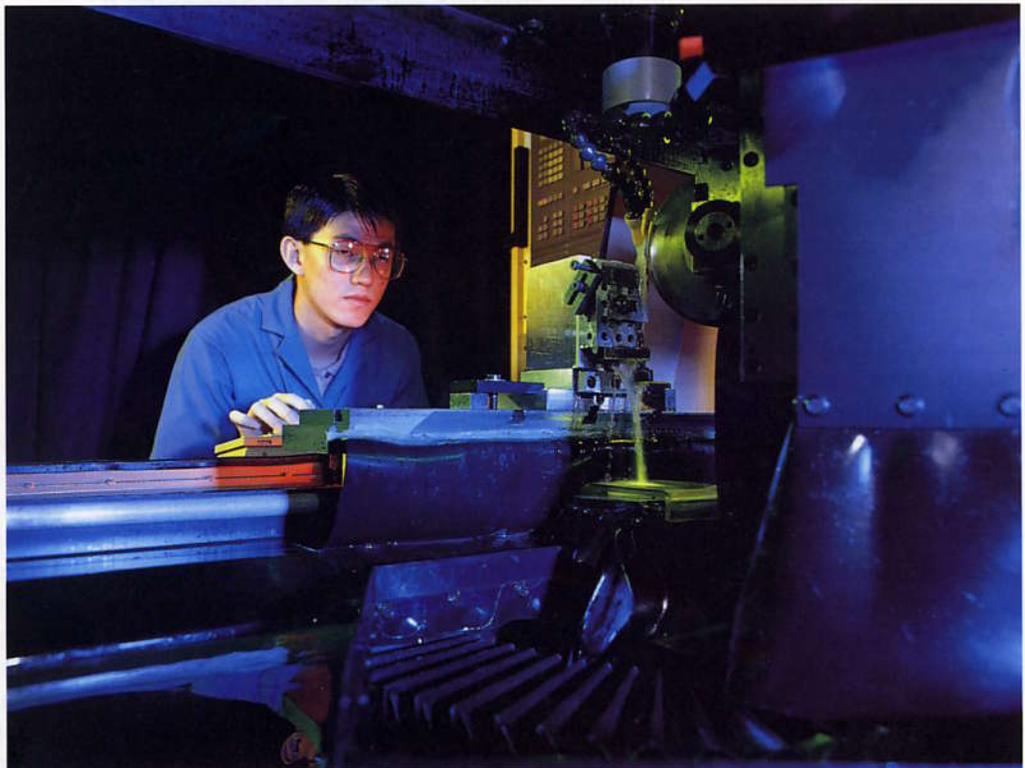
In this information age, higher education becomes the engine of every national economy. "About the one thing more expensive than going to college is not going to college," said Tom Mortenson. The current data indicate there is a 75 per cent wage gap between college and high school students.

### Science and Engineering Education

The national science and technology policy must be in sync with the future demand by enhancing science and engineering education and the training of the workforce. A healthy workforce is an in-

formed workforce. This can be achieved with the help of sound formal engineering education, continued training, and constant learning. As to formal science and education, it is not a particularly demanding task for a school to deliver specialty courses or core subjects. However, it takes a long view and foresight to make the right decisions to offer a proper balance between the core courses that are mandatory to all science and engineering majors and the selective courses that fit current and future needs.

Basic Science and Math courses form the foundation crucial to any engineering discipline and should not be substituted. The curricular offerings in specialty courses pave the groundwork for the life-long ability to acquire new knowledge.



A cost-conscious workforce accounts for the effectiveness and efficiency of an operation.

Engineering education must change to meet the increasing demands in versatility and diversity of skills and knowledge for the graduates to master in preparation for their future jobs and career development. Equally important is equipping the students with diverse intellectual acumen above and beyond their specialisations.

Some engineering colleges have launched programmes that are geared to provide the students with a science and engineering education while fostering the ability to cope with real-world demands. Only those school systems offering the curricula that are integrated with industry interaction and in sync with the market needs are providing premium education. For example, there are programmes designed to give the engineering graduates a mix of skills in addition to the technical specialty (skills such as ability to deal with customers/clients, handle contracts, help close the deal, and working with others). Programmes range from coaching teamwork and tackling manufacturing problems to building written and verbal communication capability and business negotiation acumen.

The ability to adapt and to change is another orientation pivotal for success in the future workplace on a global intellectual platform.

Having been a 100,000 air miles traveler per year for the past 20 years, I appreciate and have fully benefited from the global exposure to businesses and cultures and science and technology. There is a time to give back. I am happy to be in the position to set up an endowment fund at my alma mater in support of educational programmes. I have focused on some objectives that are historically less well-funded. Specifically, my top two objectives are to fund enrichment activities that require international travel for university faculty and students; and to encourage technology transfer of inquisitive inventions and discoveries from university campus to actual commercial applications.

### **Workforce**

On an individual basis, an engineering graduate with only technical training will not be construed as the best candidate for a job. A well-versed professional possessing both technical depth and intellectual breadth will be in highest demand in the future job market. With the shorter product cycle and time-to-market, the ability to learn is no longer an attribute but a

necessity. For some who are keen about his/her compensation package, a human resource department often specifies that "the compensation package will commensurate with experience and skills."

Nowadays, what one earns depends on what one learns and how fast one learns. This translates into the level of contribution one can truly make in a timely fashion.

From the employer side, it is imperative that the workforce is able to understand how and why the process works. It is also important to be able to follow procedures in the meantime to innovate. It is also increasingly important that engineers are able to grasp new technologies. Inevitably companies are required to provide timely training to existing and new workers. To run a successful business, cost control and cost reduction are on-going efforts. Every level of workforce should be more closely linked to "cost". A cost-conscious workforce, as a whole, accounts for the effectiveness and efficiency of an operation.

The "pipeline" issue has recently attracted close attention. Asking whether there is an adequate supply of educated engineers is a legitimate question. The answer largely depends on whether there are sufficient high school and college graduates entering the education and training end of the pipeline. This is a particularly important issue when the need for scientific and technical workforce is increasing.

The future workforce will have to deal with increasing complexity, diversity, ambiguity and fast change. We need to encourage all talents and engage all employees to bridge the workforce and the marketplace. It is believed that diversity is one of the greatest things that can happen within an organisation. Diversity facilitates the creation of new ideas, breeds new markets, and enhances the adaptability to the continuously changing market. A diverse workforce enriches the quality of intellectual discourse and brings diverse thoughts.

Technology that transfers the discoveries and knowledge from science to useful products through the principles and practice of engineering will continue playing an important role in the future economy. It is estimated that 60 per cent of new jobs in the next two decades will require technology skills. The science and

engineering training not only provides the base for technology skills but also paves the solid ground for continuous learning. With continuous learning, we will meet the demands in the technologically challenging new millennium. No time in the history was nearly as exciting and glorious as the new century. Be prepared.

To prepare for the new millennium, one of the most valuable and abundant human resources is women. The next part in the next issue of *Today's Manager* will focus on the role and status of women in technology and the workforce. ■

Dr. Hwang's work is highlighted by national and international awards and honors, including being elected to National Academy of Engineering, WIT International Hall of Fame, Ohio Women's Hall of Fame, and R&D-Star-to-Watch. Her wide-ranging career encompasses corporate executive, CEO of startup companies, international business, worldwide technology services, and corporate board directors. She has held various "woman pioneering" capacities. She is also a worldwide speaker and a prolific author with five international-used textbooks and more than 200 publications. E-mail: JSLHWANG@aol.com