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# **A**n Academic Perspective of 21st Century Education in Singapore: A 'Submarine' Vision

Khoo Guan Seng

*This article is inspired by the cover story of the August 24th, 1998 edition of Business Week (McGraw-Hill), "The 21st Century Economy".*

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## **INTRODUCTION: BACKGROUND ON THE INNOVATION WAVE**

As the 1990s come to a close, all the elements are in place in the education system to propel Singapore into the next stage of a knowledge-based economy. Education systems and economies, like living organisms, always evolve in response to challenges and opportunities. The changes, though, can be dramatic.

Only 3 years ago, the Asia-Pacific economies were triumphant and the 'excellence' of the Asian systems was reflected in the high rankings of the Asian (including Singaporean) students in international mathematics and science tests. The high rankings are still there, but Asian governments and educationists are now beginning to come round to the idea that to spur the innovation that will be necessary for success in the 21st century, their education systems have to lend themselves to more of the 'openness and unstructuredness' of the American system without sacrificing the content-based foundation-laying styles which has served Asia well these past few decades.

A lot of these changes and re-orientation in outlook have been influenced or propelled by globalization and information technology in particular. The global innovation pipeline is fuller than it has been in decades and with the advent of the Internet, the information revolution seems to be spreading and accelerating rather than slowing down. Moreover, most major economies seem to be undergoing wholesale rejuvenation. Businesses, financial services firms and even educational institutions and universities are reinventing themselves. Luckily, our politicians and policymakers have grasped the new technological and economic realities earlier than most.

No doubt, the path from the current education system to the 21st century education system will likely be a bumpy one. In the economic

field, each innovative surge creates economic and social ills, from recessions to stock-market crashes to widespread job losses. The change in the education system will be no different. But that is the price a nation must pay to attain the benefits of dynamic change.

In society, 'mature' is a euphemism for getting old. In finance, a mature economy is one without much growth potential and cannot sustain the high growth rates of newly-emerging economies. This was the term applied to the US economy in the 1970s and 1980s as growth slowed. However, today, there is nothing old about the US economy. There has been such a slew of creativity and entrepreneurial vigour that the economic growth is still in positive territories, with productivity rising steadily at 1.9 per cent. Growing evidence suggests that the US economy is in the early stages of a powerful new wave of innovation, mainly driven by the information revolution which permeates every sector of the economy. In the long run, the success of the US economy will depend on whether technological progress will continue to drive growth. That would be a big change from the 1970s and 1980s during the economic stagnation where technology contributed almost nothing to growth. Then, the computer revolution had yet to take off, and earlier innovations like jet travel were no longer new.

The 1990s have been different with the sudden re-emergence of technological progress a culmination of years of research in diverse fields that are finally reaching critical mass. The Internet, which was only commercialized in the mid-1990s, originated from ARPANET, which was begun by the Defense Department in the 1960s. Similarly, biotechnology is only now set to explode although the first gene-splicing experiment was done in the 1970s. The innovation wave is also being given more force by the globalization of the economy. Bright ideas developed in Africa, India or China can quickly find world markets. Technologically-savvy immigrants drive the high-tech companies and Silicon Valley. The result — it becomes more attractive to speed up R&D in hopes of getting a competitive edge (*Business Week*, 24 Aug 1998).

So, what are the implications for Singapore and Singapore's education system in the 21st century in particular? Let us focus on the key elements of the "Thinking Schools Learning Nation" (TSLN) concept — Information Technology (IT) integration, national education, critical and creative thinking skills and other issues like ranking and foreign students.

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## INFORMATION TECHNOLOGY

The information revolution will continue to boost productivity across the economy. Over the next few years and into the next millennium, information-dependent industries like finance, media, education, wholesale and resale trade will be affected most. But, how do you measure the gains especially in a field like education? One way is to learn from progressive companies like Cisco Systems Inc. (Cisco) and General Electric Co. (GE) and transfer or transform some of their best practices to educational institutions (*Business Week*, 24 Aug 1998). Transformed, these management 'mantras' include the following:

### NETWORK, NETWORK AND NETWORK

Technology allows links with principals, teachers, MOE administrators, support staff and students. In addition, the linkages also encompass the business partners and suppliers. Hence, the networking infrastructure will provide the advantage of speed and productivity. To attain this advantage implies a modification in the monitoring and feedback process as well as changes in the way equipment or necessities are purchased, for example, price comparisons can be made immediately and sales and purchases can be made through the e-commerce infrastructure in place.

### FOCUS ON THE CLIENTS (THE STUDENTS AND INDUSTRY)

Know more about what they need so that the teaching and learning is made relevant to the global economy and information revolution. The 'new' knowledge-based economy would require a paradigm shift in teaching strategies and case studies used for illustrations.

### TEACH SMART

The information revolution and the huge amount of data available on the Internet mean that educators and students mutually have to learn to capture the intellectual assets and information sifted from the noise (data-mining) and have exposure to knowledge of next-generation products against the background of a fast-changing economic landscape so that obsolescence would not be an obstacle to acquiring knowledge and purchase of IT equipment, for example, video-conferencing through handphones or wristwatches, and so on.

## **TEAM UP FOR SUCCESS**

Create alliances with partners like schools and institutions (could be feeder schools) in the neighbourhood, in neighbouring countries or elsewhere and equipment suppliers (or between teachers and students) based on trust and the potential for achieving mutual short- and long-term gains and not be short-sighted. Never ask your partners or teachers or students to do something you would not do yourself.

## **SHARE THE INTELLECTUAL WEALTH**

Devise broad-based strategies and options to reward and retain key partners, personnel and students, for example, fund enrichment trips and participation in conferences, free computers, and so on.

## **THE PERSONAL TOUCH**

Technology goes only so far. Face-time counts and educational leaders and teachers must spend a lot of time coaching, mentoring and communicating with employees or students in person.

The 6th primer, the personal touch, is probably the most relevant to education, and educators must never forget for a second that IT accessories or environments are merely tools which may value-add or increase productivity some of the time but not all of the time, depending on how they are used in the context of a learning environment.

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## **NATIONAL EDUCATION AND WORLD HISTORY (CULTURAL HISTORY AND BIOGRAPHIES)**

At the start of the 20th century, immigrant labour and innovation helped turn the United States into a powerful manufacturing nation. Today, technologically-savvy immigrants jam the corridors of Silicon Valley, helping to propel America's IT growth. As the 21st century dawns, yet another wave of immigrants will once again help transform the economy. In other words, the continued economic dynamism of the United States will depend on a continuing stream of foreign-born workers. Of course, it is not all about sheer numbers, but to lift productivity and spur growth, immigrants must provide creativity, entrepreneurial energy or simply initiative that the United States cannot find otherwise.

What are the lessons for our National Education (NE) policy? While it is important and timely to focus on enhancing the students' awareness of Singapore's vulnerabilities against the backdrop of separation from Malaysia and the progressive economic development into a developed city-state in spite of the lack of natural resources since Raffles' time, emphasis should also be placed on the original immigrant societies and their contribution to Singapore's growth, in comparison to America's situation this century and the next. The interconnectedness of immigrant workers and the economic prosperity of the United States means that Singapore must continue to invest not just on the local, but also encourage qualified foreign workers or students to stay and contribute to Singapore's economy. If the United States, which is considered the leading nation in innovation and entrepreneurship, continues to scout for talent around the globe in spite of its leading position, can Singapore afford not to do so? Such issues should also be pondered by our young in the context of NE and our immigration policies which have their roots in our historical immigrant society. The economic crisis and job disappearance make this even more imperative so that our people understand the circumstances surrounding the issue of foreign talent.

What about an emphasis on World and Cultural History as well? In this age of computers and statistics, it is easy to forget that our insights only come when we stand back and reflect. In an IT environment, a mere mass of data, no matter how gathered, is in itself meaningless until an organizing intelligence works upon it to discern its patterns and trace its implications (data-mining). Every science has its associated art, for example, in medical diagnostics, a good practitioner recognises disease where his patients and students see nothing but incoherent symptoms. The same is true of History.

*When we seek the date of battles or the duration of empires, we begin with primary sources in documents and inscriptions and set about interpreting them. But if we wish to understand that yet more subtle and important thing, the history of the human spirit, we have to attempt the much harder task of feeling our way into the minds of the dead by interpreting their literature, art and architecture. This sensitive and delicate task is cultural history.*

A.C. Grayling  
*Financial Times*, 1 Aug 1998

Do our young realize that even a so-called barbaric society, the uncivilized Mongolians under the reign of Genghiz Khan, was the first to design and use the compound bow to maximum effect in their conquest of the world and till this day, is still being used by archery enthusiasts all over the world? Are they aware that the leadership and management styles of Rear Admiral Sir Horatio Nelson were way ahead of his times and could have come from a modern-day textbook? Even in the toughest boardroom battle today, very few people have to carry the level of responsibility Nelson bore in 1798. He did it in the following ways:

- developing teamwork with defined roles and close personal relationships;
- allowing the expression of different ideas;
- providing clear, shared and understandable goals;
- permitting participation in decision-making and fostering initiative; and
- promoting a sense of ownership and commitment.

All today are at least recognized as valuable and all figured in his conduct of the campaign against the French at the Battle of the Nile. His personal relationship with his captains and their terrific common understanding prompted him to say later, "I had the happiness to command a band of brothers" (the 6th primer above: the personal touch) (*Financial Times*, 1 Aug 1998).

On the same level, a reinforcement of students' values in their heritage and human spirit can be achieved by analysing historical biographical movies like Disney's animated *Mulan* based on the legendary Lady-General Hua Mu Lan or documentaries on ancient civilizations. Questions like: "Do the West (or Hollywood) have a different perception of the East?" could be posed and the students can also be asked to think about the Chinese version of the "Opium War" in comparison to the facts in their history texts which may be more Eurocentric. As the 21st century will be more global in nature, our young may have to criss-cross the world more often and interact with a far diverse personalities and cultures to sustain Singapore's future economic growth. Hence, there are many more examples from World History whose lessons and relevance may have a profound impact on Singapore's education system and its future.

## CRITICAL AND CREATIVE THINKING SKILLS

The global economy in the next millennium also implies a need to rethink the thinking skills to be imparted to our students. In industry, the realms of biotechnology and materials science are not the sole domain of the purists but of engineers, physicists, chemists, biologists and businessmen. Computer scientists are now writing algorithms based on biology and the natural sciences to mimic intelligence and global financial firms hire mathematicians and physicists to structure new products based on the derivatives of the underlying assets giving rise to a new field, phynance. To keep pace with the new economy which will be driven by the technological revolution, institutions must encourage teamwork across age-old disciplines, bringing together educators and students in computer science, science and engineering, medicine, the humanities and business. **Arousing and maintaining the intellectual curiosity should also be a forte of 21st century education.** Schools should encourage students to take part in in-house or external innovation and invention competitions across disciplines. To foster risk-taking, take advantage of the IT environment to perform scenario modelling and simulation with the accompanying virtual failures and risks. While it does not substitute for real-life experiences, it puts the students in good stead when faced with a similar real-life scenario to handle the circumstances or situations better.

Higher education too has to embark on a quest for relevance by courting industry — aggressively seek technology-transfer and licensing deals, while canvassing companies worldwide for research funding that will spur new discoveries. A lot of new technologies and innovations are adopted by the business community first before they reach the education sector. Thus, interaction with the industry or business community may help hasten the adoption or awareness of state-of-the-art technologies. Higher institutions should also encourage entrepreneurship by creating local business hot spots, developing ties with development officials, business executives and venture capitalists.

At the same time, a commitment to science has to be renewed because basic scientific research is the backbone of innovation. While seeking partnerships, universities must, at the same time, find a balance in continuing to resist restrictions or constraints on research grants. At its best, innovation should spur a virtuous circle — generating revenue that can be applied to more basic research. That could help produce the breakthroughs that drive economic growth.



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## EXAMINATION AND SCHOOL RANKING

To achieve the level of innovation required to drive the economy, it does not mean that the content of the subject matter has to be sacrificed to allow for more thinking processes. In order to be creative and be critical, a knowledge and appreciation of the foundations of the subject matter is crucial, especially at the critical thinking stage. With more information and knowledge at hand, a worker is able to arrive at a better alternative solution to his problem than one with superficial knowledge. This is especially crucial with knowledge-based industries coming to the fore in the next century. Hence, examinations should always be part and parcel of the assessment system as content knowledge is served well through this assessment methodology.

As for ranking, it is felt that it is highly relevant and there is also room for further improvement down the road. One of the reasons for the occurrence of the economic crisis in SE Asia is the lack of transparent data from the emerging economies. This held back the credit rating agencies from giving a truer picture or reflection of the latent deficiencies of the economic situations and when the crisis started last year, a lot of people and investors were caught by surprise. Of course, the small number of rating agencies did not help either, but foreign investors still glue to every rating upgrade or downgrade which these agencies provide on companies and countries. What are the lessons we can apply to education?

Ratings or rankings will always be inherent in any industrial, commercial or political decision. Similarly, there is a need to rank schools so that the Ministry, parents and pupils are aware of their 'returns' (value-added quality) and 'risks' (underperformance) in investing in specific 'assets' (schools). The Ministry receives a good feedback on which probably 'risky' institutions to monitor and introduce pre-emptive measures to reduce the risk. Parents and pupils gain information to make a better choice. However, the current ranking system does not identify a trend or quirks in the performance of schools due to the lack of data since ranking was only introduced in the early 1990s. Statistically, a dataset of more than 10 years should be available before a more in-depth analysis can be made to unearth the trends or randomness in the performance.

Suppose we are now in the year 2010. With over 15 years of ranking, we can confidently analyse the standard deviation (volatility) of the changes in the T-Score (note: we are not calculating the standard

deviation of the T-scores directly but their changes). At the same time, their expected returns (value-addedness) can be culled from the direct T-scores. But if the volatility of a high T-score is also high, it may suggest that the performance is not trend-based and this year's performance is no guarantee for future performance. On the other hand, if the high T-score is accompanied by a low volatility in its changes through the years, it suggests the emergence of a trend and reflects the more stable value-added capabilities of the school concerned. Hence, it is important to store and re-analyse the school ranking data a few years down the road when the statistical significance becomes important with the larger dataset.

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## CONCLUDING REMARKS

The current restructuring and evolution of our education system has put or are putting in place the elements to address the knowledge-based economic and global climate which our young of today will face when they graduate and start working. However, the crux of the foreseeable problem is in the implementation and this is where teamwork among the various ministries, schools and NIE is critical. The world is changing rapidly and not always in a pleasant manner but the people involved should be bold enough to see beyond the dark clouds of these rapid changes and economic crisis to leverage on the golden opportunities and excitement that the next millennium will offer.

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