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SPEECH (AMENDED) BY DR JOHN CHEN, MINISTER OF STATE FOR COMMUNICATIONS & INFORMATION  
TECHNOLOGY

AND MINISTER OF STATE FOR NATIONAL DEVELOPMENT,

AT THE FACULTY OF ENGINEERING'S 30TH ANNIVERSARY

ON 4TH SEP 1999 AT 10.00 AM

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It is a great honour to be back in NUS Engineering Faculty on the occasion of its 30th anniversary. Speaking as an alumni and former staff member, I am very happy to see not just the building of new facilities, but more importantly signs of continuing intellectual renewal and invigoration in the Engineering Faculty. It has played a crucial role in educating many of today's leaders in industry and the public sector, and will continue to do so.

I entered politics in 1988 and left NUS in 1991. The world has changed profoundly since then, and these changes have made education an even more urgent concern. In the past 11 years, we have seen the end of the Cold War, the widespread adoption of market economics, and rapid development of information & communications technologies. These and other factors have given rise to the following trends:

- a) First, national borders are becoming more and more permeable. Skilled manpower, capital and technology now cross borders more freely. Economies are now more globally linked than ever before and businesses now operate in a global environment.
- b) The second trend is that improved connectivity and communication capability at very low cost is enabling many once centralised functions to be globally distributed and even outsourced. Jobs are lost as a result of this while new ones are created, at a rapid rate.
- c) The third trend is that of rapid generation of new knowledge, its dissemination and application. The unprecedented rate of knowledge generation has often involved cross fertilisation of separate mature disciplines: for example, the life sciences and engineering. Emergence of completely new domains of knowledge has become a regular phenomenon. As a result, knowledge becomes obsolete very fast. It is possible for a well-established blue-chip corporation to go under in a few years, its competitive advantage eroded by new knowledge. On the other hand, new enterprises can grow quickly to companies worth several billion dollars by exploiting new knowledge. In short, the status quo does not seem to last for long, if indeed it lasts at all.

How should engineers be educated for a life long career in this atmosphere of revolution and ferment?

Let me outline a few important requirements that an engineering education programme should have.

1. First, the engineering curriculum should have broad-based fundamentals incorporating a wider coverage. Over-specialisation, even in areas which conventional wisdom regards as "hot" may be short sighted when seen from the perspective of a 20 or 30-year long career. The economy of the future will be characterised by rapid and unexpected changes. When climbing the mountain looks like the right thing to do, someone else will try to move the mountain. You may be still struggling to climb, or worse, you may be at the top when the mountain gets unexpectedly displaced. Those who do not have a broad-based education will find it difficult to survive in that kind of a fiercely competitive environment. You will never know in advance what you will really need to know in order to survive a lifetime.
2. Second, the engineering curriculum should aspire to educate each engineer to become a leader and an innovator, not a cog to fit into the wheel of status quo. At the same time, it should aspire to educate each engineer to be an effective and willing team player, willing to subsume personal interests to that of the team. The future work place will have plentiful opportunities for those who are leaders, innovators and team players. Let me elaborate on good leadership. Someone who does it all by himself is not a leader. When the team members do the work exactly as instructed by the leader then that also does not refer to a good leadership. A good leader ensures that every member of the team finds his own place in the team and contributes his best on his own accord with the leader acting like a conductor of an orchestra. Now let me turn to the innovators. Innovators are those who scrutinise what they see as a regular habit. They notice things that could do with a change. They dream up potential and viable changes. They pursue their dreams seeking fulfilment. Leaders, innovators and all good players see failures as opportunities

to learn. They accept having to work with people or things that are less than ideal. They accept the need to make assumptions and form opinions. They are willing to stick their neck out for things they believe in. This is about a mindset vastly different from that of a model worker of the past.

3. This brings me to the next point that engineering educators should demonstrate to students the multi faceted links between business and technology. Students should be enabled and empowered to appreciate how technology can be applied to add value to businesses. Great business opportunities arise from unexpected developments triggered by technological achievements, like those currently arising from the widespread use of the Internet. Engineers who are familiar with the inner workings of various technologies would spot these best and early. Engineers can see the gaps in technological capabilities. They can work towards closing these gaps thereby creating new opportunities suitable for commercial exploitation. Advances in technologies open ways of creating new products and new markets. Engineers should see themselves as builders and creators who generate wealth for the community by plugging into multi faceted ventures. Being effective in research, design, development and production would not be sufficient to effectively generate wealth. There is marketing, business administration and financial matters to deal with, for the work of engineers to achieve fulfilment.

These are diverse and demanding requirements for a university degree programme. But we have to admit that the direction to proceed from where we are is clear and we do not have many other options if we want to keep up with the developments happening in the rest of the world.

To carry out the programme effectively, we must achieve 3 things in the educational environment.

1. First and foremost, in the educational environment learning should take precedence over teaching. Just as you can take a horse to the water but you cannot force it to drink, learning requires an act of will on the part of the learner. But you can add salt to the food so that the horse gets thirstier. Teachers can motivate the students to learn. Teaching should be seen as the act of motivating students to learn rather than the act of delivery of descriptions and demonstrations of methods and procedures. So curriculum should become increasingly subscription rather than prescriptive in emphasis.

2. The second key feature of the educational environment is diversity. The curriculum should not only offer a diverse variety of technical specialities, it should also accommodate diverse rates of progress through the programme, catering to a diverse student body. Experience of working in multi-disciplinary and multi-cultural teams is already regarded as an advantage in a modern résumé, and is expected to continue to be so. A diverse student body would similarly enhance the educational experience. The diversity of backgrounds and capabilities will ensure that there will always be some students who will show excellence and leadership in curricular as well as extra-curricular activities. In this regard, I am pleased to note that the Committee on University Admission System has recommended that admission requirements should include GCE 'A' level examination, reasoning test, project work and ECAs. Faculties could also choose to supplement these requirements with interviews or other aptitude tests. In addition, direct admission should be considered for exceptional students with outstanding singular talents, be they in mathematics, science, project work, arts or sports. Although the new admission

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requirements will only be implemented starting Year 2003, it would not be too early for Faculties to start taking a keen interest in the types of talents you want to attract into the student body. Just as a successful technopreneur such as Bill Gates would bring tremendous wealth and jobs to the country, a highly talented student in mathematics, fine arts or sports would bring to the University immense benefits. Universities must therefore be ready and quick to embrace talent when they come across any. There is no reason why they should wait till Year 2003.

3. Thirdly, students should be able to enjoy the things they do. Fun and humour should not be seen as diametrically opposite to serious learning. Indeed learning should be fun.

I am very pleased to know that the Engineering Faculty have carried out some deep soul-searching and are introducing a bold new approach to engineering education. The emphasis on what the teacher does in front of the class is to get replaced by the emphasis on what the student actually learns, becomes enabled of doing and becomes empowered to achieve. More prescriptions of the past will give way to choices and options. The curriculum is to become broad-based with diverse opportunities for the learners. Creativity is already getting recognised as a part of the curriculum proper and life on campus. "Team-up, design, build and show" events are more and more becoming part of engineering modules. The Faculty will reach out to the community and develop bonds with the upstream educational establishments that nurture the future students. The organised student bodies in the Faculty will be strengthened and given opportunities to participate as contributors to the education process. The cultural diversity will become broader. In short, engineering education will be thought of as a wholesome moulding process of future achievers.

Looking at what has been planned, I can see that the Faculty is heading steadily in the right direction. I am confident that it will achieve what it has set out to do under a new and dynamic leadership.

May the NUS Faculty of Engineering grow from strength to strength, educating and moulding generations of leaders in the new millennium.

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