
From the Outside, Looking in*

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This paper poses a series of questions concerning the difficulties educators in engineering face in delineating current and emerging career opportunities. The paper questions aspects of the current initial training for engineers and asks where are today's champions.

INTRODUCTION

Engineers have been at the forefront of all major developments affecting mankind. They built our roads and bridges in Roman times; they were there to design machines for the Industrial Revolution; they had a field day developing an industry based on steam and then electricity, and repeated the process when the internal combustion engine became a practical reality; they introduced the computing and information technology revolution and sent men into space. Educators have been able to cater for the career and educational needs flowing from these developments in the past, but what about the future? In the past the public could easily witness the exciting engineering works of the time, the bridges and great ships, but today engineering is largely secret and hidden from the public.

Engineers have refined their careers into such complex and diversified fields that they pose problems for modern educators who have to define the specialities and the relevant educational requirements. It is even necessary to invent new words such as *mechatronics* to cope with the complexity created.

The Regency Institute of TAFE has a large Faculty of Engineering. It encompasses the major disciplines of engineering, including mechanical, electrical, electronics and fabrication, with areas such as building, water technology, the environment, aviation and transport, and management. There are some 200 lecturers and around 7,000 students studying various courses in engineering. Students can commence their courses at the very basic levels in pre-vocational certificates and work their way through the various levels to Advanced Diploma and with articulation and credit transfer with universi-

ties. Regency is investigating the viability of providing a degree level course in engineering technology. Regency provides a great deal of support to assist students who have previously had limited academic success to complete their studies.

This paper raises a range of questions that hopefully will give rise to thoughtful responses from the community of engineering educators. Engineering is certainly not a popular career choice for many young people leaving school, and for many more it is a *no choice* because they do not have the necessary mathematics and science that underlies engineering.

If engineers want to communicate with the general public, to take their proper place in community development and enthuse the young about what must surely be an exciting career, then engineering educators need to address these and like questions.

QUESTION 1

How do we ensure young people in particular, and people wishing to change careers in general, have an accurate understanding of what the generic term *engineering* encompasses?

Read through employment pages of any newspaper to see the enormous range of positions now available with *engineering* somewhere in the title. These can range from *Well Testing Operations Engineer, Design Engineer, Engineering Management, Sales Engineer, Process Technologist Engineer, Mechanical Engineer, Field Service Engineer, Digital and RF Engineer* and *Telecommunications Engineer*. This list is from a weekend newspaper and nowhere near encompasses the full range of careers available in the engineering industry today.

It was so much easier in the past. Everyone knew that engineers were very important people in society.

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Engineers built bridges, roads and railways; they built ships and planes and cars. There were engineering heroes that people learnt about in school: Isambard Brunel for the railways in Great Britain, or Barnes Wallis and the *swing wing* invention for aeroplanes.

Careers in engineering in the past were tangible and reasonably understandable. Today's careers are very different and many are not yet developed. Engineering involves increasingly complex projects and, like software, may even have no physical identity. How can one explain career opportunities in the emerging communications industries to young people? How can young people put faith in a career that does not yet exist? It is difficult enough to get an electrical engineering lecturer to explain in a way that is easily understood what a *programmable logic controller* does.

QUESTION 2

What kind of educational structure can we put in place to enable people to understand the range of options available to them?

So often students commence the study of electronics, or electrical engineering or whatever without fully appreciating what is involved. Are we able to arrange for a generic engineering course in the initial stages that will make understandable the range of options available to them? Are we able to put in place generic programmes that can be studied and then built upon at various stages throughout working lives as new industries and technologies emerge? Can we do this in such a fashion that makes it easy for our customers/students/clients to understand where they have come from and what career paths they can take in the future, or even create these career paths for themselves?

QUESTION 3

How do we make the emerging careers attractive and exciting and understandable to young people?

Today's exciting careers appear to be in sport, medicine, law or the media. All of these industries or vocations have their images spelt out every day on television or in the press. The heroes and heroines in these industries make the headlines on a daily basis. Even a ten year old can make a reasonable guess at what a doctor, lawyer, tennis player or journalist does for a living. Try asking them what engineers do. Can you give me the name of a well known engineer in the public arena who is able to champion the cause of engineering education today? Are there none? Engineers do not communicate their successes well.

QUESTION 4

Are engineers idealists, unable to communicate?

The Snowy Mountain River Scheme, which called for great engineering skills, has well and truly faded into history.

However, it was only two or three years ago that Australia finally completed an all weather highway around the country. That was a great engineering achievement, completed in remote areas, in all temperature zones, and covering an incredible variety of terrains. A letter written by the author to the Australian Broadcasting Commission requesting that a documentary be made of this achievement was never replied to. The skills to complete this highway were many and varied, and provide people with interesting occupations. This achievement is passed into history without comment. The engineers who worked on this project would have had interesting stories to tell, and yet we have not heard any of them. Projects of this kind add to the national understanding of what makes us Australian and increases the knowledge of our country. They could add to the understanding of engineering, but the opportunity is lost.

The mammoth task of building an underwater tunnel for Sydney, the new tunnel to carry traffic through the Adelaide Hills, and the proposed new Alice Springs to Darwin railway are all great engineering projects that are allowed to come and go without comment to the population. These projects have the opportunities to make careers in engineering explicable and exciting. Information about the various engineering occupations involved in such projects would give people a much better understanding of what occupations are available and how they are critical to the infrastructure and life style of us all. Stories about the people involved would give human reality to future engineering careers.

Projects such as these also enable educators to tap into the idealism of young people because these projects are all about improving people's lives: making travel easier and safer, even in this day and age, and opening up new areas of Australia to the general population. These projects seem to epitomise people's desire to improve living conditions for their fellows.

To engineers these projects may seem routine and old hat, and not to reflect the careers that are to come. But the future starts with the present, and young people will be encouraged to learn the necessary skills that will enable them to take up careers in engineering by understanding the activities that are currently underway. This in turn will enable them to take advantage of opportunities as they arise.

QUESTION 5

How do we teach engineers to communicate well?

How do we arrange the curriculum for engineering

courses to allow time for skills to be taught in communication? Report writing always seems to be covered extensively, but the art of talking to one another, or speaking to groups, or presentation skills are not things we teach well. There are communication problems between engineers and other professions, each with their own language and culture; what we need is career multiculturalism. In TAFE, at least, we are dominated by industry and employer demands, by time and cost constraints, and by national curriculum. However, to enable engineers to put their ideas forward, to grow champions for the cause, they need to be able to speak well and articulate their ideas clearly. These skills are as vital as any other skill that they are required to learn.

QUESTION 6

How do we ensure that sufficient young people gain the necessary skills in mathematics and science to enable them to take up such careers?

Students need to be studying these skills long before they know and understand how the mathematics can be actually applied. They need to be encouraged to continue the learning for careers that are not seen currently as attractive. A career in the engineering disciplines will call for constant study and rigorous application to the task. This is not easy in a push button age, six second information bites on television and frenetic clicking on a joy stick in video and computer games.

QUESTION 7

How and when will we as educators find ways to make studies in mathematics and science as interesting and exciting to learn as some of the other disciplines?

Remember as educators that we are teaching people who have grown up in an age of television, video recorders and computers. Today, people are not taught to listen or to read. They are used to absorbing quickly and visually. They are not taught to question the accuracy of the computers they use, and all too often treat the information disseminated as gospel truths. The skills required in the engineering industries require careful attention to detail, an ability to analyse information and a sound knowledge of mathematics and mathematical processes.

QUESTION 8

Where are today's engineering heroes and heroines? Where, today, are the people ready and willing to champion the cause of engineering?

Perhaps we should look to engineers such as Dr Andy Thomas, who was resident on the Russian space station *Mir*. The story of how Dr Thomas decided to become an astronaut, what influenced him at school

or at home to become an engineer, would be of interest to people and give educators some ideas on how to attract young people to the discipline.

We could look to Trevor Baylis, the English inventor of the clockwork radio. He recently made news on television for his decision to build a radio run on clockwork power. His story encompasses idealism, to improve the accessibility of Africans to information, and determination, to overcome all the barriers put in his way to make the radio not only a commercial success, but affordable to people with very little money.

Communication is a two way process requiring sufficient commonality in concepts and language. Engineers are the ones that need to manage the communication, not the young people, and they must communicate within the world and lifestyle of the intended audience.

QUESTION 9

Who would you nominate as a champion for today's newspapers and television?

Interestingly, the Internet has a great deal of information regarding engineering, from careers available all over the planet to jokes about engineers. While the Internet might be the information medium of the future, it is still newspapers and, in particular, television that are the main sources of public information. How can we use these media to bring engineering and its critical role in society to the forefront of public knowledge?

CONCLUSION

In conclusion, the following points are made. Was it not clean water, good housing and sewerage systems that dramatically improved the health of nations, all work undertaken through some of the great engineering projects in the last century?

What great engineering projects are coming up that will equally and dramatically improve the health and welfare of the world today?

What visions for an interesting career are we putting in front of people to persuade them that engineering is the best, the most interesting, the most exciting field of work to be involved in?

Is there anyone to drive the publicity for engineering, because it will not happen on its own? Are engineers so reactive that they expect others to look after their image? Are engineers so intellectually honest that they are afraid of a bit of hype and some blatant journalism?

These many questions are being asked more frequently by increasing numbers of engineering educators all over the world. It is our role and responsibility to provide the best possible education in engineering to all

of our students, for the present and for the future.

BIOGRAPHY



Maureen Morton is the Director of Regency Institute, South Australia. Regency Institute is a major provider of vocational education and training and associated services in Australia, and engineering is a large component of the educational programmes of

the Institute. Regency Institute was nationally recognised in 1997, winning the Australian National Training Provider of the Year Award. Maureen has extensive experience in teaching and educational management. Before her appointment to Regency Institute in 1996, she was the Director of Spencer Institute and before that the Goyder College, and these institutions in rural and remote South Australia are a marked contrast to metropolitan Regency Institute. Maureen is a member of the South Australian Food Advisory Council and the Australian Recognition Council SA, and has international consultancy experience in Indonesia and China.