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Proactive measures to shape community attitudes towards engineering

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ABSTRACT: The object of this article is to present and discuss proactive measures for the purpose of informing, affecting and shaping community attitudes towards engineering. The need for this is obvious: there is wide spread ignorance and apathy in contemporary society concerning the role of engineering, science and technology. This is all the more disturbing in view of society's critical dependence on technology. This article tenders observations on this effect, and presents a range of counter-measures developed and applied in Australia at different levels, including those undertaken by governments, the profession and universities.

INTRODUCTION

Global trends of falling enrolments, and hence reduced graduations from engineering and technology programmes, have seized the attention of stakeholders. Concerns have been expressed that the advancement of our technological society is at risk if there is a shortage of suitably skilled professional engineers and technologists. The paradox is that society is increasingly dependent on technology and technology development, yet there is a profound lack of recognition for the engineering achievements that undergird daily life.

Stakeholders of strategic importance in contemporary society have proactively developed a range of measures in order to counter the prevailing apathy in the society at large. The objective has been to raise awareness of the critical role of engineering and technology in everyone's life, and to encourage active engagement in engineering and technology, covering the gamut from hobbies and games to the exercise of the profession.

This article discusses a number of positive measures that have been developed and implemented in Australia in order to counteract the lack of awareness of the role of engineering in contemporary life and to encourage greater participation. These vary from government initiatives, through to schemes by the profession and industry, to educational strategies both at school and in higher education.

THE NEED FOR PROACTIVE MEASURES

The image of technology and engineering has been steadily devalued in recent times, surprisingly mainly in the industrial nations of the developed *west*. This is all the more remarkable because advanced technological achievements have been the main branding feature for societies of the developed nations, making them the envy and the role models for developing nations.

This paradoxical situation exists in Australia, where the lack of community interest in science and technology is reflected in the dramatic decline in both the number of applicants for engineering and science programmes and the number of suitably qualified candidates for jobs in these areas. Stakeholders are uneasy and alarmed by such trends since suitably qualified practitioners are vitally important to the maintenance and enhancement of the quality of life in contemporary society and to its economic welfare.

It would seem that sustained proactive measures need to be instituted and vigorously pursued by all stakeholders – which include federal and state governments, the engineering profession, industry, welfare agencies and educators – if the attractiveness of engineering as a worthy career choice is to be revitalised. Several such measures have already been formulated and undertaken with varying degrees of success.

GOVERNMENT MEASURES

Mainly driven by economic imperatives, the Australian Government currently proactively supports efforts to raise the profile of science and technology. It does this through a range of initiatives, the most notable of which in recent years is that entitled: *Backing Australia's Ability: an Innovation Action Plan for the Future* [1]. A key aim of the initiative is declared to be to:

> *… strengthen Australia's research capability, to ensure the flow of new ideas which underpin innovation, to create critical mass in leading research fields, and to build competitive advantage in ICT and biotechnology.*

The initiative aims at reinforcing science, technology and mathematics education programmes in schools. It offers funding for the development of innovative programmes, including online curricula. Teaching and teacher education are also under focus, subject to rigorous review, conducted in consultation with State and Territory governments. This action seems well directed. The existing lack of awareness and the shortage of remedial in service provision in schools are all too apparent [2].

In parallel with this initiative, the Federal Department of Industry, Science and Resources operates a *Science and Technology Awareness Program* [3]. The programme's aim is to change community attitudes towards engineering by raising awareness of the critically important role that engineering and science play in the functioning of a complex contemporary society. Elements of this programme include National Science Week, during which achievements of engineering are prominently highlighted, project grants made for the promotion of science and technology awareness, and the Australia Prize awarded for excellence in engineering and science.

MEASURES BY THE PROFESSION

The engineering profession in Australia is represented by the Institution of Engineers, Australia, (IEAust), which exerts a powerful influence on engineering education by virtue of its accreditation role. IEAust has been gravely concerned about the declining quality and number of entrants into professional engineering programmes, which it sees as being linked to the reduced numbers of high school students taking science and mathematics in their senior years. It has sought to counter the lack of reliable information and inadequacy of associated resources that fuel that decline. The IEAust has mounted a range of initiatives. These incorporate nationwide public events, such as Engineering Week, featuring extensive publicity, school competitions, visits to engineering sites, media interviews and public lectures.

More directly, the Institution prepares and distributes resources within a *Schools Outreach Program*, which primarily aims at raising awareness for the value of engineering in modern societies. Innovative teaching resources, such as *Engineering Our Future* on CD-ROM, are made available to school communities. The aim is to assist both teachers and students to acquire a basic appreciation for the foundations of engineering and to provide exciting avenues for young minds to explore, without getting bogged down with seemingly threatening concepts. The underlying notion is that engineering is fun, which can be exhilarating! The language is simple, and presentations are backed up by easy-to-understand and easy-to-do exercises. Simple, but challenging, projects are included that encourage the formation of problem-solving skills.

Engineers Make It Happen is another multimedia resource on CD-ROM designed to promote awareness of the importance of engineering and technology in modern life, as well as the indispensable part played by engineers and information technologists.

The *Neighbourhood Engineers Scheme* is yet another initiative of IEAust, attempting to bring practising engineers right into the schools, ostensibly to provide tutorial assistance in mathematics and sciences in particular, but also providing first hand information to students about the profession and its achievements. It is hoped that this will help students to be better prepared and be able to make more informed career choices. This should be to the extent that peers and parents get to hear about what is going on, the image of the profession will be enhanced in society at large [4].

MEASURES BY UNIVERSITIES

Universities also have been developing a number of measures to increase the attractiveness of their engineering programmes to cohorts of school leavers. Many of these initiatives are developed in close collaboration with industry, including framework and content advice for various proposals, guest lectures, industry visits and placements, small projects and the provision of scholarships and prizes for students embarking on engineering study.

In the case of the University of South Australia (UniSA), Adelaide, Australia, the scope is broad and consists of activities that complement each other in a holistic way, such as large scale mentoring, organising workshops, seminars and summer schools. Particular attention is paid to the disadvantaged, such as low socio-economic and ethnic groups. The authors' own School has invited scores of senior school students to industrial seminar days showcasing final year engineering projects, in the hope that witnessing the achievements and observing the enthusiasm of engineering students will motivate secondary students to want to study and ultimately practise engineering. Conventional wisdom has it that school students will be favourably influenced by the realisation that these young presenters can accomplish so much, even though they are only a few years older than themselves.

UNIVERSITY OF SOUTH AUSTRALIA SCIENCE AND TECHNOLOGY AWARENESS PROGRAM

The University of South Australia (UniSA) has its own *Science and Technology Awareness Program*, which is a community service initiative of the School of Electrical and Information Engineering (EIE). The programme is based on the previous experiences gained from similar initiatives of the School [5]. It aims at addressing the problem of lack of awareness of the importance of engineering to all facets of modern life. It endeavours to motivate young people to take up the study of engineering by targeting pre-tertiary schools in the first instance. Staff and students (Student Ambassadors) of EIE regularly participate in high school and UniSA events to promote engineering and science. These activities are undertaken in close cooperation with relevant community sectors that include industry, professional bodies and interest groups.

This initiative extends the University's core activities in teaching by substantially fostering graduate qualities related to the body of knowledge, working in teams and alone, and communicating effectively [6]. Those University students who participate in the programme develop confidence in public speaking, human relations and dealing with organisational issues. They are also made aware of the importance of professional service to the community and the associated responsibilities. The initiative demonstrates a significant community benefit enhancing awareness and enthusiasm for Science, Technology and Engineering (STE), as evidenced by the response of the target segments. It emphasises the importance of STE to Australian society and the world at large

in terms of well-being and wealth creation. It also enables high school students to make informed career choices.

The programme enjoys substantial input from a number of community partners in the planning, implementation and evaluation undertaken both through the community partners individually and South Australian Science and Technology Awareness Raising (SASTAR) Task Force. Partners include schools, industry and community interest groups. Currently, some 13 schools have been scheduled for the participation in the mentoring part of the scheme, involving altogether some 100 people to date, with a similar number of schools to be added in 2004. Industry partners include eLabtronics, ITEK Pty Ltd (a wholly owned commercialisation company of the University of South Australia) and a large sector of South Australian industry represented by Electronics Industry Association (EIA). The School of EIE has played a key role in the formation of SASTAR Task Force, which is to act as an advisory body to decision makers and curriculum developers.

The Science and Technology Awareness Program of the University of South Australia provides mutual benefits to the community and UniSA in that it raises the awareness of the role UniSA plays in the community, enhancing the quality of UniSA graduates in engineering and their commitment to community service. It provides a training service to school communities and contributes to increasing the pool of candidates who may favour furthering their education in STE areas and choose relevant career paths.

University teaching is inextricably linked to this activity since it involves the education of students in a multifaceted way. Under the guidance and active participation of staff, undergraduate students of the School take part in awareness-raising and training activities in schools in collaboration with industry partners.

Beneficiaries of this activity cover the following:

- School communities, with special emphasis on the socio-economically disadvantaged;
- Industry, in sectors of information and communication technology, as well as engineering;
- The community at large, by raising awareness of the role of science, technology and engineering in the process, and by providing motivation for participation.

The target communities are designated on the basis of concerns about the shrinking pool of suitably qualified entrants in the workforce with a visible negative impact on the South Australian economy.

The planning process has been extensive and has involved the following elements:

- Training via practical placement, plus hands-on tuition of EIE students (in industry and at UniSA);
- Students so trained to tutor the next generation of students;
- The training of teachers and pupils in schools;
- Technology coordinators and principals in schools are also involved.

The intended benefits are as follows:

- Raising awareness of science and technology as major contributors to the welfare of society;
- Enabling career options for school leavers for choices to be made on the basis of aptitude and knowledge;
- Providing staff development for school teachers who otherwise would not have access to that level of training;
- Providing impetus and support for economic development of both the region and the country.

Demand for this community service is on the increase. This is evidenced by the additional applications from schools that want to be included. This is a long-term community project with outcomes visible already. The value of the project has been evaluated at the levels of participating schools, industry, profession and the University. The verdict has been most complimentary thus far.

Distinctive characteristics of the project are as follows:

- Well-focused target;
- Large scope with both short-term and long-term outcomes;
- Inculcation of the spirit of the University's mission in undergraduate students;
- Recognition of student involvement in the project as part of their academic programme.

From small beginnings, the project has grown both in scope and the number of participants. Initially, seven EIE students were trained in collaboration between the School and industry. At present, 20 further EIE students are being trained to cope with the rapid expansion. Students' commitment and keenness are inspirational; the participation is voluntary and with no expectation of monetary rewards.

CONCLUSION

The need to raise the profile of the engineering profession by enhancing awareness in the community of the vital role engineers and engineering play in the functioning of the temporal society is widely recognised. The underlying anxiety is based on the recognition that an adequate number of suitably qualified candidates must be recruited into the profession to ensure the continued sustainability of the modern technological society.

The initiatives described in this article stem from this observation. It is probable that the initiatives described here may fall short of achieving their mission; namely that of attracting bright young minds into the study of engineering, and contributing to the maintenance and sustainability of the technological prowess of the society. However, much is at stake! Action is required before it is too late.

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