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The Future of Professional Engineers in the Public Service

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ABSTRACT *The last two decades have not been kind to professional engineers in the public service. Numbers have been slashed, their status has declined and engineering advice does not carry the weight it once did. While it has been said that non-engineers do not appreciate the benefits of engineering advice, part of the reason for this is that engineers themselves and the engineering profession have taken a low-key approach to promoting the benefits of engineering advice. If engineers want to have a positive future in the public sector, this attitude needs to change. Engineers and the engineering profession need to be proactive in promoting the benefits of sound engineering advice, professional judgment and the skills of engineers. This paper suggests a number of ways of accomplishing these goals.*

Keywords: public service reform, engineers, managerialism, skills.

Introduction

On 17 February 2000, a forum was held in Canberra on the future of engineers in the public sector. The *Engineering Futures Forum* identified the impact of public sector reforms on engineers and the skills that public sector engineers will need in the future. This paper uses the forum's outcomes as the basis for developing ideas on how engineers can position themselves so that they are considered by public sector managers as integral to achieving the objectives of government. The *Engineering Futures Forum* was organised by the Canberra Division of the Institution of Engineers, Australia (IEAust) and the Association of Professional Engineers, Scientists and Managers (APESMA).

The statistics contained in this paper are taken from the Australian Public Service (APS) because these are more comprehensive than those of other public services. However, the information is equally applicable to engineers who work in State, Territory and local government.

Public Sector Reforms and Their Impact on Engineers

Public sector management reforms over the last two decades have had a significant impact on the number of engineers employed in the public sector. The major

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Table 1. Public sector reforms[a]

Structural reforms	Internal reforms
Purchaser/provider splits	Benchmarking
Cross program approaches	Quality programs
Contracting-in/out	Program evaluation
Outsourcing	Total quality management
Commercialising	Risk management
Privatising	Performance management
Competition policy	

[a] Based on the table 'Building a contestable public sector' in Public Service and Merit Protection Commission, *Management Systems to Help Navigate Change in the Public Sector*, 1997, p. 15.

reforms can be grouped together as either structural reforms or internal reforms, according to the Public Service and Merit Protection Commission. Table 1 lists the major reforms.

Of these reforms, the most significant for engineers have been competition policy, privatisation, contracting out and commercialisation.[1] One other trend which has had an enormous impact on engineers but which is noticeably absent from government human resource documents is managerialism.

The reduction in the number of engineers employed by the public sector due to these reforms has been so significant that the engineering profession has coined the term *de-engineering* to describe it. The process of 'de-professionalising' agencies is strikingly similar for all specialist occupations. The first stage consists of the deletion of the professional noun in the position title. The second stage involves the reclassification of the position as an administrative position with no requirement for professional qualifications. An example of this is the progression of the position of Professional Engineering Officer to Professional Officer with mandatory engineering qualifications to Senior Officer with no mandatory qualifications required.

Evidence indicates that there was a reduction of between 20 and 50% in the number of professional engineers in the Commonwealth, State and local government public sectors between 1990 and 1999. The evidence is provided by analysing membership data from the IEAust, and employment data from the Public Service and Merit Protection Commission (PSMPC).[2]

Figure 1 illustrates the decline in the percentage of IEAust members who worked in the public sector between 1990 and 1998. It decreased from 38.4 to 19.8%, a reduction of 48%. There are three uncertainties in these figures. Firstly, the surveying techniques between 1990 and 1998 changed. Secondly, the level of IEAust membership among engineers may have changed between 1990 and 1998. Thirdly, membership coverage in the public sector may have changed relative to the coverage in the private sector. The author considers that these uncertainties will not make a significant difference to the trend identified. If the rate of decline continues unchanged, then it is expected that by 2001, only 14% of engineers will be employed in the public sector.

Data provided from the PSMPC are presented in Figure 2 and Table 2. They illustrate the decline in the number of permanent APS Professional Officers and

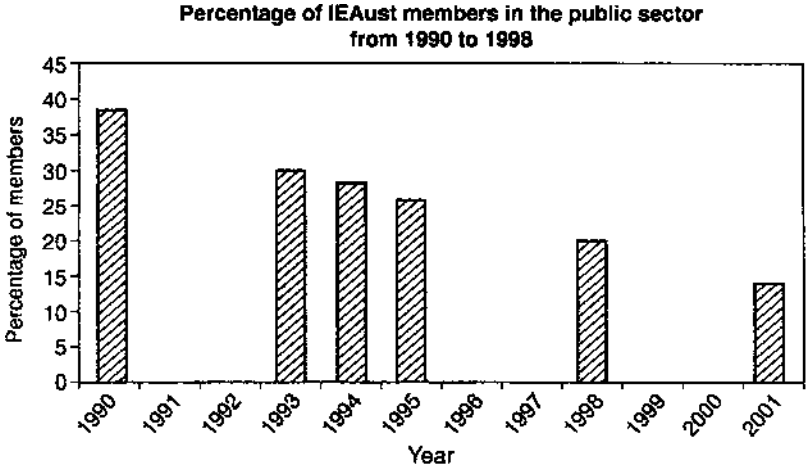

Figure 1. Percentage of employed IEAust members in the public sector from 1990 to 1998 (data is unavailable for 1991, 1992, 1996 and 1997).

Senior Professional Officers over the last decade. The Professional Officer and Senior Professional Officer category includes engineers but does not include legal or veterinary professionals. These figures indicate there has been a 24% decline in the number of professional officers employed by the public sector over the last 10 years. There are three uncertainties in this figure. Firstly, the grade Professional Officers includes both engineering and non-engineering occupations. Non-engineering occupations include inspector (air safety), marine surveyor, librarian, aboriginal cadet and research scientist. Secondly, the mandatory qualification requirements of many positions have been removed over the last decade so it is possible for people to fill a Professional Officer (Engineering) position without having professional engineering qualifications. Thirdly, engineers are employed in positions which are

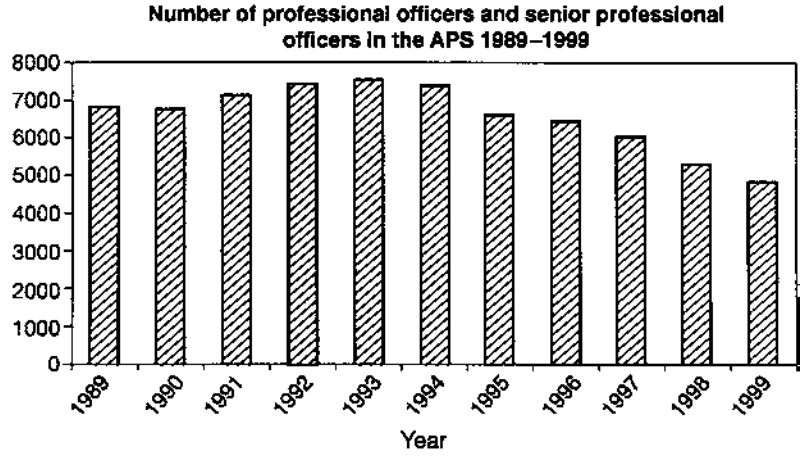

Figure 2. Number of Professional Officers and Senior Professional Officers in the APS 1989–97.

Table 2. The change in the number of APS Professional Officers between 1989 and 1998[a]

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Number of APS Professional Officers	6830	6740	7087	7364	7422	7366	6539	6398	5954	5201
Percentage change	0	–1.3	3.8	7.8	8.7	7.8	–4.3	–6.3	–12.8	–23.8
Number of APS permanent staff[b]	140,191	136,372	140,721	143,280	143,716	142,483	130,341	129,147	119,295	108,785
Percentage of Professional Officers to APS permanent staff	4.9%	4.9%	5.0%	5.1%	5.2%	5.2%	5.0%	4.9%	5.0%	4.8%

[a] Unpublished data provided by Peter Kennedy, Deputy Public Service Commissioner, Public Service and Merit Protection Commission, 1999.

[b] Public Service and Merit Protection Commission, *Australian Public Service Statistical Bulletin 1997–98*, Canberra, 1998, p. 12.

not defined as Professional Officers. The author considers that these uncertainties make it difficult to determine the actual reduction in the number of professional engineers, however, the table gives an indication there has been a significant reduction in the last few years. If this trend was to continue unchanged, then by the year 2008, there would be no Professional Officers in the APS.

Comparison of Changes in APS Numbers of Three Occupations

Table 3 lists percentage changes in the number of positions in various APS professional classifications compared with a baseline year of 1989. Between 1989 and 1998, the legal occupation grew by 27% while both the professional and veterinary positions shrank by 24 and 14%, respectively.

Ageing of Professional Engineers in the Public Sector

Evidence indicates that the professional engineering workforce in the public sector has aged considerably between 1990 and 1999. The evidence is provided by

Table 3. The percentage change in the number of positions in various APS professional classifications compared with a baseline year of 1989

Occupation classification	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Professional Officers	0	–1.32	3.76	7.82	8.67	7.85	–4.26	–6.33	–12.83	–23.85
Legal Officers	0	6.75	24.7	29.82	34.82	40.08	44.26	46.83	38.33	27.13
Veterinary Officers	0	0.95	0	–5.24	–9.05	–11.9	–20.0	–10.95	–13.33	–14.26
Total for the APS	0	–2.72	0.38	2.2	2.51	1.63	–7.03	–7.88	–14.91	–22.4

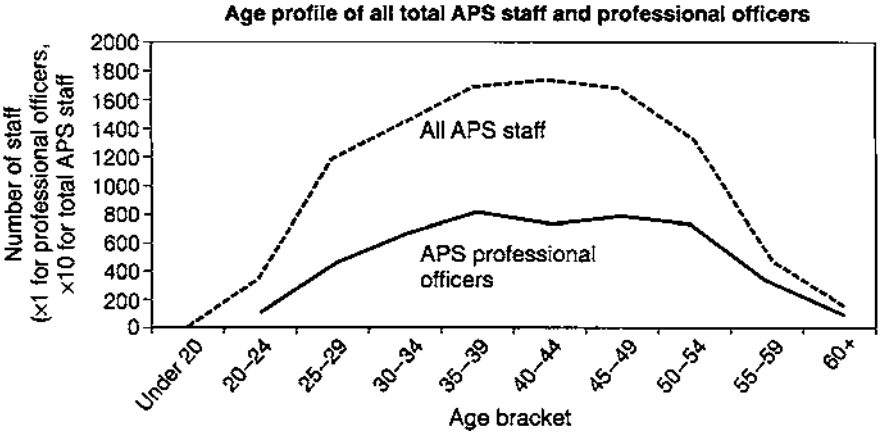

Figure 3. Permanent staff: age distribution, June 1990–June 1999 (Public Service and Merit Protection Commission, *Australian Public Service Statistical Bulletin 1997–98*, Canberra, 1998, Figure 1, p. 6).

analysing IEAust membership data from the IEAust and employment data from the Public Service and Merit Protection Commission.

Analysing the PSMPC data, in June 1990, the median age of all permanent APS staff was about 35. In June 1999, it was 40.4.[3] Figure 3 illustrates the changed age distribution for permanent APS staff over the last decade.

In June 1999, the median age of Professional Officers and Senior Professional Officers was 41.2 years.[4]

Like the APS workforce, the average age of Professional Officers in the public service has increased between 1990 and 1999. In June 1990, the median age of all permanent APS staff was about 36. In June 1999, it was 40.3[5] (see Figure 2). In 1990, the median age of professional officers was about 36, and in 1999, it was 41 years.[6] Figure 4 illustrates that the age profile is similar for APS and all Professional Officers.

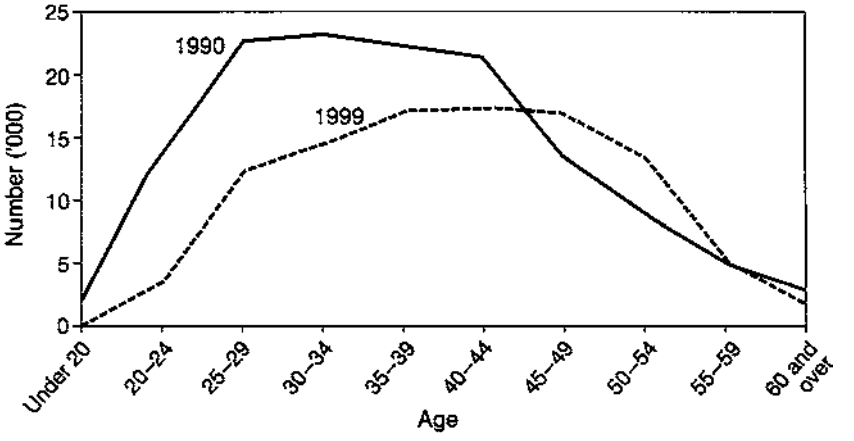

Figure 4. Age profile for all APS staff and all Professional Officers, June 1999 (Public Service and Merit Protection Commission, *Australian Public Service Statistical Bulletin 1997–98*, Canberra, 1998, Figure 1, p. 6).

Table 4. Age of IEAust members in the public and private sector[a]

	Private sector	Commonwealth government	Armed forces	Corporatised & statutory bodies	State government	Local government	Total of government, armed forces & corporatised bodies
Median age	44.5	47.3	39.2	47.2	47.1	45.6	47.2
Percentage of members between 50 and 54	14.9	21.4	19.2	20.6	23	17.9	21

[a] Institution of Engineers, Australia, *Membership Survey Project* (unpublished), Canberra, 1999.

The PSMPC data for June 1999 indicates that 15% of all Professional Officers are between 50 and 54. Given the Commonwealth superannuation arrangements for long-term employees, many of this group will leave the public service at 55.

Comparing IEAust membership data with PSMPC data, a difference in the median age and the percentage of engineers between 50 and 54 is identified. Table 4 provides information on IEAust membership groups.

The IEAust data does not align exactly with that from the PSMPC, possibly reflecting the fact that the PSMPC Professional Officer figures include many non-engineers who may on average be younger than engineers, and that the IEAust attracts more senior engineers.

The conclusions which can be drawn from the PSMPC and IEAust figures are that:

1. the median age of professional engineers in the public sector is between 41 and 47;
2. the median age of professional engineers is probably slightly older than the median age for all APS staff;
3. the median age of professional engineers in the public sector is increasing at the rate of between 0.5 and 1.0 year per year (which is three times faster than the entire Australian workforce);
4. between 15 and 21% of public sector professional engineers will retire over the next 5 years;
5. the median age of professional engineers who work in the Commonwealth government, State governments and corporatised and statutory bodies is about 3 years older than professional engineers in the private sector; and
6. the median age of professional engineers who work in the Commonwealth government, State governments and corporatised and statutory bodies is about 2 years older than professional engineers who work in local government.

Main Work Responsibilities of Engineers in the Public Service

Table 5 provides information on the main work responsibilities of IEAust members in the public service in local, State and Commonwealth governments. Not shown in

Table 5. Main work responsibilities of IEAust members[a]

Main work responsibilities	IEAust members % (number)		
	Local	State	Commonwealth
Management	40% (804)	26% (928)	18% (160)
Construction supervision and contract administration	15% (294)	11% (396)	2% (20)
Project management and planning	13% (268)	19% (664)	18% (154)
Design of product, equipment and processes	7% (150)	7% (250)	6% (54)
Studies and investigations	5% (102)	8% (294)	7% (60)
Research and development	0% (8)	3% (96)	24% (204)
Sales and marketing	0% (6)	1% (34)	0% (0)
Teaching and training	0% (10)	3% (98)	2% (16)
Production quality and maintenance	0% (12)	3% (90)	2% (18)
Other and not specified	17% (336)	20% 722	21% (180)
Total	(1990)	(3572)	866

[a] Institution of Engineers, Australia, *Membership Survey Project* (unpublished), Canberra, 1999.

the table are another 2802 IEAust members employed in corporatised and statutory bodies. In both the local and State governments, the main work responsibility is management. In the Commonwealth government, the main responsibility is research and development. This reflects the large number of IEAust members who work for CSIRO and the Defence Science and Technology Organisation (DSTO). If this group is put aside, then the three responsibilities which account for most members' work are:

1. management;
2. construction supervision and contract administration; and
3. project management and planning.

From these figures, it is apparent that the number of engineers who do technical engineering work, such as design and studies, is small in comparison to the number performing management activities.

Explaining the Decline in the Number and Status of Professional Engineers in Government

There are five main reasons why the number and status of professional engineers in government have declined. All are inter-related.

Changing Role of Government from Rowing to Steering

One of the major reasons for the reduction of engineering within the public service is that governments have become directing organisations which set policy, deliver funds to operational bodies, and evaluate performance. The operational bodies, which are increasingly in the private sector, deliver the services. This is colloquially known as government steering and not rowing. Engineers undertaking technical activities are mostly in operational bodies.

Outsourcing and Privatisation of Engineering Activities

The outsourcing and privatisation of engineering services has transferred large numbers of engineers from the public to the private sector. Examples of engineering services previously undertaken by the public sector include bridge design, road construction and military equipment manufacturing. The consequence of this change has been the closure, sale or downsizing of agencies which delivered engineering services.

Redefining Engineering Organisations as Commercial Organisations

A change in the nature of many government organisations has resulted in declines in the number and level of engineers.

Until the early 1980s, a number of government organisations could be defined as engineering organisations because engineering was seen as the reason for their existence. These organisations, such as state electricity commissions, were normally run by engineers, and relied on engineering to deliver their goods and services.

However, with the focus shifting from production to profitability, these engineering organisations become transformed into commercial organisations with an engineering arm. This transformation is illustrated in comments attributed to Vince O'Rourke, Chief Executive of Queensland Rail and reported in the *Australian Financial Review*. 'When QR embarked on the largest investment program of any railway system in Australia some eight years ago, it aimed at reforming and rebuilding what was at the time an engineering-driven railway. That had to be transformed into a tough competitive player that could meet the needs of customers.'[7]

The change from an engineering focused organisation to a commercial one has resulted in a reduction of the number of engineers in management and the perception that engineering is just a support function, no different from information technology or accounting. Another impact was the downgrading of the remaining engineering positions.

Today, in most Commonwealth government agencies besides defence, any engineer who wishes to continue to practice a technical engineering activity such as design—as distinct from engineering management—will hit a promotion ceiling of Senior Professional Officer Grade B (SPOB). In small agencies, the ceiling is even lower. Even in the large Department of Defence, the number of senior engineering positions is small and the opportunity for promotion after the Senior Professional Officer Grade C level is quite limited.

Rise of the Generalist Manager

The rise of the generalist manager in government has resulted in a corresponding decline in the number of engineers in management positions. A basic tenet of managerialism is that one does not need to have specific knowledge, let alone be a specialist, to manage a technical function. This view is summed up in the catch phrase—'keep specialists on-tap, not on-top'.

Concern over the rise of generalist managers and the decrease of specialists in government is not new. For example, the 1995 parliamentary report, *Public Business in the Public Interest: An inquiry into commercialisation in the Commonwealth Public Sector*, stated that 'the Committee is extremely concerned at the effect of the public sector's loss of skills and the belief that generalists on their own can effectively

manage technological operations. There is clearly a need for managers to keep a closer watch on the expertise available for carrying out core activities as agencies are commercialised'.[8]

Many generalist managers consider that engineers are not business focused. This is readily seen in the frequent but incorrect accusation that solutions advocated by engineers are always gold-plated. This view is an amalgamation of inaccurate prejudices, including that engineers:

1. are narrowly focused on technical issues with no understanding of other issues such as social and environmental impacts;
2. are determined to get the perfect answer by ignoring the financial and political realities; and
3. always advocate solutions which are too expensive.

This perception undermines all sound engineering arguments. For example, arguing that redundancy is required to guarantee reliability is interpreted as wasteful duplication. The arguments that building in flexibility allows multiple use of an asset is interpreted as wasteful complexity, and arguments for building in maintainability are interpreted as a subterfuge to introduce unnecessary expanded capability or unnecessary maintenance.

Another common perception held by generalist managers is that technical issues are easy and consequently non-technical people can competently make technical decisions. This view may be a consequence of extrapolating the generalist manager's typical view of new skill acquisition. As generalist managers regularly change careers and consequently are continually learning new skills, they assume that it is easy to pick up any new skill. However, this view does not differentiate between the level of skill required to use a new computer program and that required to make specialised professional judgments. Nor does it recognise that many of the 'new' skills they acquire are simply extensions of existing ones such as a new project management approach or a new computer program. Consequently, generalist managers are more likely to underestimate the time, experience and difficulty required to obtain the depth of knowledge necessary to solve engineering problems. Interestingly, these same people would rarely consider it appropriate to make decisions involving medical or legal expertise.

It appears that one consequence of the rise in generalist managers is a decline in the seeking and use of engineering advice. This view is supported by a 2000 survey which found that in only about 70% of engineering contracts are the views of technical experts sought prior to and during the contract preparation.[9] The reasons for this include a lack of awareness of the engineering dimensions in a project and a lack of understanding on how engineers contribute to a solution. An example of the consequence of the former is a cost blow-out of purchased equipment before it can be brought into service. This can arise, for example, when commercial off-the-shelf technology is selected without undertaking a detailed engineering analysis of the operating environment in which the equipment is to be used. An engineering analysis may have shown that the physical environment in which it is used required expensive equipment hardening modifications.

A common perception held by specialists is that generalist managers are more likely to distrust the work and advice of engineers. This is often due to the influence of public choice theory in their thinking and their discomfort with complex analytical approaches typically used by engineers.

Public choice theory. The last few decades have seen an increasing acceptance by graduates of business schools of public choice theory to explain interest groups such as professional engineers. Public choice theory adopts the premises of neo-classical economics, taking rational individual self-interest as the foundation for analysis. Public choice theory implies that professions are irredeemably self-seeking, possessing no larger interests than the preservation of sectional privileges. Consequently, views expressed by engineers that engineering input is essential for a project or that a complex solution is the most appropriate one can be dismissed as simply engineers pursuing their own interests. People who accept public choice theory do not see engineers as a group of people with a specialised body of knowledge, ethical code and a measure of autonomy from those outside the profession. Rather they see engineers as a group trying to establish a monopoly in providing engineering advice and to exclude non-engineers. Consequently if the motives of engineers are suspect, so is their advice.

Complex analytical analysis. For those who are not exposed to complex analytical decision-making tools, such tools are often seen as threatening or not to be trusted. This is because the analysis is not understood or cannot be challenged due to a lack of information. Examples include Cost Analysis and Strategy Assessment (CASA) and probabilistic modelling as a risk management tool. A small number of people find most analytical analysis inimical to their decision-making process. There are four main reasons for this. Firstly, it requires people to declare their assumptions and beliefs. This exposes them to scrutiny and if the person is not well informed or is inconsistent, this often becomes apparent. Secondly, it requires people to actually express what they think, and to understand objectively what others say. Both of these can be difficult for some people, particularly those who have rigid views on issues. Thirdly, it requires that everyone starts from an agreed view of reality and causal relationships. Reaching this starting point can often challenge preconceived ideas. A final reason is that for people used to making decisions based on partial information, the longer time required to make analytical decisions is seen as wasteful, indecisive and procrastination.

Process Focus Eliminating the Need for Specialist Input

The introduction of formalised processes and procedures, technical standards and computer-aided engineering software has reduced the need for experience engineering judgment in order to complete a task compared with a decade ago. The consequences of introducing formalised processes are best illustrated in the example of replacing formal quality inspection with a quality assurance process. Prior to quality assurance, acceptance of contractors' work by the public service depended on experienced engineers inspecting the work. With the introduction of quality assurance, contractors have developed procedures with the aim of guaranteeing consistent outcomes, thus eliminating the need for inspections. This has reduced the role of the public sector to one of auditing quality documentation, and seeking legal recourse when outcomes are not as per the contract. To reduce costs, lower paid administrative officers rather than professional engineers are increasingly being used for auditing quality documentation. Consequently over time, the importance of the competency of the auditors declines and the only holders of operational knowledge are the contractors.

The Need for Professional Engineers in the Future

Public sector activities can be divided into the four main areas of:

. administration and engineering services: e.g. maintenance management, project management, design and research;
. contract management: e.g. commissioning project definition studies, writing and managing contracts;
. regulation: e.g. developing regulatory and legislative systems, conformance and auditing of regulatory compliance, inspection and certification; and
. policy: e.g. policy analysis and development for industry policy and R&D grant development.

Discussions with engineers led to the conclusion that opportunities in:

1. administration and engineering services appear to be shrinking (reasons for this include privatisation, outsourcing, fewer new projects, the need to close large areas of operations to achieve staff reduction targets, and deferring infrastructure maintenance);
2. contract management appear to be growing (reasons for this include reductions in in-house engineering activities, and the belief that contracting always results in increased value for money);
3. regulation appear to be shrinking (reasons for this include the development of formalised regulatory processes, which are mostly auditing functions and hence reduce the need for specialists, the introduction of non-government industry self-regulation, deregulation or co-regulation regimes, and the introduction of mutual recognition agreements that reduce the number of in-house standards); and
4. policy analysis and development appear to be growing, but this currently has little effect on engineers as they are not seen as policy contributors.

The above predictions will change if the government's attitude to government intervention, public sector outsourcing and industry regulation changes. This is a possibility given the results of recent outsourcing activities, public disenchantment with privatisation, and the failure of a number of deregulatory and self-regulatory systems. In addition, the government's realisation of the need to be an informed buyer may result in increased recognition of the need for engineers in engineering services and contract management.

Skills Required by Public Sector Engineers in the Future

Is there a future for engineers in the public service? The answer depends on both the public's and politicians' view of the role of government. As most reform is cyclical, public disenchantment with outsourcing, privatisation, market-driven service levels, infrastructure quality and self-regulation systems, may result in an expansion of government. More importantly, opportunities for skilled technical professionals will increase if the long-term cost of reducing the technical competence of the public sector is recognised. A lack of technical competence impacts upon the ability of the public sector to procure technical services, to offer technically competent advice and to develop technically robust regulation systems.

While it is impossible to provide a detailed forecast of skills that the public sector will require over the next decade, there appears to be a number of skills which engineers should consider acquiring to increase their employability. These skills can be divided into the following categories:

1. formally recognised generic skills of public sector employees;
2. non-stated generic skills of public sector employees; and
3. specific engineering-related skills.

Before these skills are discussed, an understanding of the environment for engineers in the public sector is needed. Below is a list of observations concerning the environment in which engineers work.

1. Engineering is no longer seen as the justification for any public sector organisation. Engineering is now seen as a non-core, support activity, no different from information technology or accounting.
2. The status of engineers, like all professions, is declining. In the status totem pole, engineers are below scientists and doctors, but above dentists, accountants and lawyers.[10]
3. The views of professional engineers do not automatically carry more weight than a non-technical person, even on engineering issues.
4. The public sector is becoming more attuned to meeting the needs of government and ministers. This means that the minister's wishes are less likely to be challenged even when they can be shown to be impractical or too costly. An example of a common problem with ministers is that they believe the cost of changes they require to computer systems due to legislation or regulatory changes are far less than they actually are. Engineers who can prove that the minister is wrong are labelled non-team players. In addition, decisions based on technical grounds without consideration of the political impact are seen as naive.
5. There may be tension between engineers' long-term perspective and the short-term political perspective of many managers.
6. Engineers wanting to practice a technical engineering activity such as design, as distinct from management, will hit a promotion ceiling at about the Senior Professional Grade B level. While government reports may recommend separate remuneration streams or skill loading for technical specialists,[11] the reality is that this will not be occurring in the near future in any systematic fashion.
7. Public sector managers generally consider that private sector engineers are more capable than public sector engineers. Therefore, working in the private sector, even for a short while, improves your status.

Formally Recognised Generic Skills of Public Sector Employees

The Federal government's Public Service and Merit Protection Commission has produced information on the future skills of senior public sector employees. This information is contained in the *Senior Executive Leadership Capability Framework*. The framework identifies the five core criteria for high performance by senior executives, and under each criteria are a group of inter-related capabilities. According to PSMPC, 'the capabilities are based on the requirements of the APS now and into the future'. The Portfolio Secretaries have endorsed the realignment

of SES selection procedures and processes so that the criteria are now the basis for position selection. Below is a summary of the criteria.[12]

Criterion 1:
1. Shapes strategic thinking.
2. Inspires a sense of purpose and direction.
3. Focuses strategically.
4. Harnesses information and opportunities.
5. Shows judgment, intelligence and commonsense.

Criterion 2:
1. Achieves results.
2. Builds organisational capability and responsiveness.
3. Marshals professional expertise.
4. Steers and implements change and deals with uncertainty.
5. Ensures closure and delivers on intended results.

Criterion 3:
1. Cultivates productive working relationships.
2. Nurtures internal and external relationships.
3. Facilitates cooperation and partnerships.
4. Values individual differences and diversity.
5. Guides, mentors and develops people.

Criterion 4:
1. Exemplifies personal drive and integrity.
2. Demonstrates public service professionalism and probity.
3. Engages with risk and shows personal courage.
4. Commits to action.
5. Displays resilience.
6. Demonstrates self awareness and a commitment to personal development.

Criterion 5:
1. Communicates with influence.
2. Communicates clearly.
3. Listens, understands and adapts to audience.
4. Negotiates persuasively.

The importance of communication skills and a client focus was highlighted in an analysis of 1419 engineering position advertisements which appeared in the April and May 2000 editions of *IEAust Jobscan*. The analysis revealed that 48% of positions required at least one of the following skills: communication/interpersonal skills, team approach and customer/client focus. Table 6 provides details of the analysis.

Non-stated Generic Skills of Public Sector Employees

Discussions with engineers identified a range of unstated but essential generic skills required by public sector engineers. These are rarely discussed publicly but were believed to be essential to advancement. They are:

Table 6. Skills cited in engineering advertisements

Skills cited in advertisements	Skills sought in 1419 engineering position advertisements	
	No of advertisements	% of advertisements
Communication/interpersonal skills – written and oral	341	24%
Team approach	429	30%
Customer/client focus	204	14%
At least one of communication/ interpersonal skills, team approach and customer/client focus	678	48%

1. **networking**: networking is what separates successful managers (defined in terms of speed of promotion) and effective managers (defined in terms of the quantity and quality of their performance and the satisfaction and commitment of their subordinates). Successful managers spend nearly 50% of their time networking while effective managers spend 11%. This challenges the assumption that promotions are based on performance and vividly illustrates the importance of social and political skills in getting ahead in organisations. In this analysis, the four managerial activities undertaken by managers are traditional management (decision making, planning and controlling), communication (exchanging routine information and processing paperwork), human resource management (motivating, disciplining, managing conflict, staffing and training), and networking (socialising, politicking and interacting with outsiders);[13]
2. **knowledge of your agency's real and stated agendas**: there is always a difference between publicly stated objectives and privately held ones. To know the difference between them allows you to pitch the appropriate agenda at the appropriate time to achieve your desired outcome;
3. **writing, speaking and listening skills**: of these three, the most important appears to be speaking skills. This is because with the reduction in time available to read and the increase in volume of paperwork, people are being influenced more by conversations. The printed word is also important in raising the author's status within organisations;
4. **salesmanship**: engineering advice is no different from any other advice offered in a contestable market. Engineering advice does not sell itself, it needs to be sold via networking, cold calling and marketing;
5. **secondary qualifications**: due to credential creep and multi-skilling, a single qualification is becoming an inadequate academic base. Gain a secondary qualification, such as economics, law and accounting;
6. **well rounded experience**: gone are the days when public sector organisations would grow their staff by rotating them through their branches. Nowadays it is essential that you identify areas in which you need experience, such as policy development, and work to get positions in which you can develop these skills;
7. **identifying opportunities**: identifying new opportunities and initiating new approaches is increasingly more important for both financial and internal

political reasons. As engineers are perceived as problem solvers rather than initiators of new ideas, individuals need to frequently demonstrate their innovation ability to ensure that they are involved in the initial stages of projects rather that just at their implementation stage; and

8. **other non-technical skills**: other non-technical skills believed to be increasingly important include performance management, economic analysis, legal knowledge, occupational health and safety, and auditing skills.

Specific Engineering-related Skills

There appear to be several engineering skills that are becoming more important. These are:

1. **project management**: demonstrating success in project management demonstrates ability with people and performance management, finance, contracting and a host of other disciplines essential for senior management;
2. **strategic procurement**: people with general contracting skills are becoming more common in the public sector, however, there are few with strategic procurement skills;
3. **life cycle costing**: life cycle costing (LCC) is becoming increasingly important in achieving value for money procurement. It is time-consuming and labour intensive so a significant number of engineers are needed for major LCC projects. For example, the Department of Defence's Lead-in Fighter Project required 32 weeks of staff effort in life cycle costing planning, preparation, training and analysis.[14] There is currently a dearth of experienced public sector engineers to meet the existing demand, let alone the anticipated expansion of demand;
4. **risk management**: risk management is a growing skill of interest for government and the private sector. It has both engineering and non-engineering relevance;
5. **systems engineering**: systems engineering approaches are becoming more important in engineering projects and have considerable application in non-engineering activities; and
6. **asset management and integrated logistics support**: both skills are becoming more important as whole of life asset management and support is essential to maximising the outcome of assets while extending their life.

Raising the Value of Engineering Input to Your Organisation

The future of the professional engineer in the public sector depends as much on the overall perception of the engineering profession as it does on each individual's skills. For this reason, it is essential that employing organisations appreciate the value of professional engineering advice.

While the public sector needs engineering input to ensure that it achieves value for money for engineering activity, this need is often not recognised by senior executives due to their inaccurate perceptions of engineers. To overcome this problem, engineers and the engineering profession need to be proactive in promoting the benefits of sound engineering advice and the skills of engineers.

This requires engineers to promote their competitive skill advantage, correct inaccurate perceptions of engineers and put engineering expertise into other people's value sets.

Table 7. Exploiting engineers' competitive skill advantage

Promote . . .	**Take advantage of . . .**
engineering input by emphasising that it is essential to making cost-effective, defendable and risk managed decisions;	the increasing risk adverseness of organisations by arguing that engineering input reduces risk. Also take advantage of people's fear of being questioned about their decisions before management, a parliamentary committee or a court of law by arguing that their decisions can be better defended by demonstrating their engineering experts were consulted and their advice considered;
engineers' extensive experience with current management tools, such as systems thinking and risk management;	management interest in applying engineering derived tools. Emphasise the practical experience of engineers with them, and their applicability to non-engineering activities. Exploit the perceived lack of experience by management consultants and others who advocate these tools;
life cycle costing and its link with value for money.	the difficulty many people have in translating the principles of life cycle costing into reality. As government policy is focused on value for money and most agencies have difficulty in showing that this principle is being applied correctly or consistently, engineers who can rigorously demonstrate achieving value for money will attract attention.

Table 8. Correcting perceptions of engineers' personal qualities

Inaccurate perception	**Correct perceptions by demonstrating that engineers are . . .**
Engineers are seen as small picture people, focused on a narrow technical view and seeking impractical, gold plated solutions.	• innovative; • focused on providing solutions which incorporate social, environmental, financial and political issues; • sympathetic to social, environmental, financial and political issues; • able to step back from the detail to see the big picture; • looking for the most simple but effective solution; • aware of management's agenda by emphasising that their advice best meets that agenda.
Engineers are seen as having poor people and management skills.	• able to explain technical issues in a non-technical way without being superior (e.g. avoiding the resentment that many women feel when being treated as idiots by arrogant motor mechanics); • able to listen carefully to the concerns of others and address their concerns; • capable of compromise; • not socially inept.
Engineers are seen as a necessary evil and often resented.	• essential to protecting management decisions by ensuring that the details are right and errors prevented (e.g. become like lawyers who are there to provide advice which protects clients); • providers of valuable specialist advice which saves many times what it costs.

Table 9. Correcting perceptions of engineers' advice

Inaccurate perception	Correct perceptions by . . .
Users did not know they needed engineering advice or that engineers can provide the required advice.	• educating users on what engineers can do; • actively identifying projects which require engineering input and suggesting that engineering advice may be useful; • promoting engineering successes internally and externally.
Users are not confident that the advice of engineers will be worthwhile as it will be too complicated or expensive.	• anticipating users' preference for an off-the-shelf solution and if it is not suitable, explaining why; • educating users on the need for whole of life costing and how it meets the agency's objectives.
Users consider that the advice is not internally politically acceptable.	• being sensitive to any preconceived ideas and initiatives, regardless of their relevance; • emphasising how the solution supports a political agenda.
Users prefer to remain ignorant.	• emphasising the personal liability of not being informed; • documenting concerns about issues ignored.

Exploiting Engineers' Competitive Skill Advantage

Engineers identified a number of skills which they consider they have and non-engineers do not. They are, in order of priority:

1. technical understanding resulting in sound judgments being made on technical matters, an understanding of what is practical and will work, and being able to provide a reality check on proposed technical solutions;
2. problem-solving ability based on logical, analytical thinking which results in practical solutions;
3. big picture understanding and systems approach, which includes the ability to take a strategic view of the situation and identify causal relationships; and
4. special engineering and management skills, including whole of life, systems engineering, mathematics and contracting skills, and being able to define measurable performance and quality indicators.

Engineers can capitalise on their competitive skill advantage to increase the perceived benefits of engineers within their agencies as indicated in Table 7.

Correcting Inaccurate Perceptions of Engineers

Incorrect perceptions of engineers can be divided into two groups: perceptions of engineers' personal qualities and perceptions of engineers' advice. Obviously both are related. Tables 8 and 9 list inaccurate perceptions of engineers and what actions can be taken to correct them.

Putting Engineering Expertise into Other People's Value Sets

Engineering expertise can be injected into other people's value sets by encouraging them to see the benefits it brings to achieving success and minimising failure. Ways to do this are listed in Table 10.

Table 10. Putting engineering expertise into other people's value sets

Action	Comment
Promote the contribution that engineering made to the success of a project.	This can be done by circulating project reviews with a covering letter emphasising that engineering advice was critical to its success, and encouraging the agency's or minister's media unit to promote the success of the project to the media, again emphasising the engineering contribution.
When it is wrongly claimed that inadequate engineering resulted in a project's failure, contest the allegation.	There are numerous instances where the blame for a project failure is wrongly attributed to engineers. Contesting such allegations ensures that engineers are not used as convenient scapegoats.
Develop internal guidelines which state specifically that engineering input must be sought for relevant projects.	Such guidelines could state that engineering input is mandatory for a list of activities, or recommend certain amounts be spent on project definition or design.
Make management aware that engineering advice is essential to minimising their exposure, in the same way that legal advice is perceived.	To do this may require that you document any concerns you have about a lack of engineering input into a particular project. The purpose of this is to ensure that the person who approves the project realises that to ignore this advice may mean that their decision is not defensible.
Shape advice so that management sees the advocated solution as meeting its objectives.	For example, emphasise the benefits to the agency of avoiding problems by preventative maintenance in contrast to political risky consequences of reactive failure maintenance, and emphasise the need to minimise the risk of failure by designing reliable and maintainable systems rather than advocating system redundancy.
Develop a culture of a strong and committed engineering leadership in the organisation.	Advocacy at the senior level is essential to ensuring that other senior managers appreciate engineering input and as a way of encouraging junior engineers to voice their opinions.

Conclusion

The future of engineering in the public sector is not as positive as it was in the past but is far from bleak. If engineers become more active in promoting and broadening their skills sets, value themselves for how much they are worth rather than what they cost, and work to create an image of engineers as cost-effective, outcome-orientated managers who take a holistic approach to the solution and are sensitive to political agendas, then engineers can create a powerful demand for their profession.

Notes and References

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