

Engineers as Managers and Leaders

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Abstract

A significant number of engineers reach senior management levels in industry, academia and the public service. Many achieve this despite inadequate training during their engineering careers in non-technical subjects such as management, leadership, HR, law, finance and commerce.

The terms management and leadership are often used interchangeably, which causes confusion. Kotter's definitions are widely accepted: management is about coping with complexity (e.g. planning, budgeting, organising, staffing, controlling and problem-solving), whereas leadership is about coping with rapid change (e.g. setting direction, and aligning and motivating people).

The innate skills of most engineers, such as objectivity, numeracy and problem-solving ability, equip them well for management roles. But many engineers take responsibility for the work of others only a few years after graduation, and thus become managers whether they realise it or not. So formal training in the responsibilities, duties and practice of management is needed early in engineers' careers. Unfortunately, this often fails to occur because of the widespread belief amongst engineers that the really "hard" work is technical work (e.g. design, equipment and plant operation, maintenance) and it must therefore have the highest priority, and that non-technical, or "soft", work (e.g. HR-related activities, management and leadership training) is far less important. Experienced senior managers know the reverse is true!

Recent major international studies show that companies which have superior HR practices and formal leadership development programs are significantly more successful financially, and that leadership development is the most important issue facing companies today.

In summary, management and leadership skills can be acquired through appropriate training, but the engineering profession has been too slow to promote the importance of improving these competencies. Engineers Australia's initiative in establishing CELM is therefore an important step in redressing this gap in engineers' skills.

“Managers are people who do *things* right;
leaders are people who do the *right* thing.” (1)

Introduction

A significant number of engineers reach senior management levels in industry, academia and the public service. Many company directors, chief executives and senior managers have qualifications in engineering, but unless their backgrounds are disclosed publicly, e.g. in the Annual Report of a public company, this may not be apparent to the community at large. Australian engineers don't populate just resource, manufacturing, energy, consulting and contracting companies; they can also be found at senior management levels and on the boards of business, academic and financial institutions as well.

Some might argue that such managers doing “non-technical” work are no longer engineers in the true sense, but the engineering profession does not argue that engineers must do only “technical” work, *viz.* design, construction, project management, plant and equipment operation, maintenance, etc. An engineer bringing his/her analytical and numerical skills and problem-solving ability to bear on non-technical problems is still entitled to be seen as an engineer. And engineers routinely think strategically, negotiate contracts, and recruit and supervise staff and contractors, none of which is true “technical” work.

Many engineers who have risen to high management and leadership positions in organisations have achieved their career progress without much formal training in non-technical subjects such as management, leadership, HR, finance, accounting, commerce and law. They no doubt supplemented whatever formal training they had with “on-the-job” learning and self-teaching, being driven primarily by personal ambition.

The thesis of this paper is that more formal training in such non-technical subjects should be available throughout an engineer's career to maximise the career opportunities available to him or her. It is recognised that in some industries (e.g. oil), the major companies are diligent in providing such training, but in many industries and in smaller companies this type of training is sadly lacking.

1. The Difference between Management and Leadership

The terms management and leadership are often used interchangeably, which causes confusion. John P. Kotter has pointed out that management and leadership are very different activities requiring different competencies (2). To quote from the *Harvard Business Review OnPoint* summary of his paper:

The most pernicious half-truth about leadership is that it's just a matter of charisma and vision – you either have it or you don't. The fact of the matter is that leadership skills are not innate. They can be acquired, and honed. But first you have to appreciate how they differ from management skills.

Management is about coping with COMPLEXITY: it brings order and predictability to a situation. But that's no longer enough – to succeed, companies must be able to adapt to change. Leadership, then, is about learning how to cope with rapid CHANGE.

Kotter compared the functions of each as follows:

Management	Leadership
Planning and budgeting	Setting direction
Organising and staffing	Aligning people
Control and problem-solving	Motivation

The difficulty here is that, although management and leadership require different competencies, a manager needs to be skilled at both, but is likely to be more skilled at one or the other.

Jaques, whose *Stratified Systems Theory* (3) revolutionised the traditional theories of organisational structures, puts it simply: Managers carry leadership accountability by the nature of their roles (4). He therefore uses the term *Managerial Leadership* as a fundamental description of the concept, but at first sight this may cause confusion about the separate functions of management and leadership.

The point of this brief discussion is to alert engineers to the fact that, as managers, they need to develop their separate competencies in leadership while improving their management skills.

2. Career Development: The Progressive Move into Management

Engineers are typically analytical, numerate, objective, practical, problem-solving and solution oriented, skilled in IT, comfortable with technology, and adaptable. They are used to working alone or in teams. And the work patterns they have adopted, e.g. travelling to numerous locations and working long hours to meet deadlines, serve them well in their future career. In fact, their innate skills and work practices equip them very well for management roles.

But many engineers take responsibility for the work of others only a few years after graduating, and thus become managers whether they realise it or not. As senior or principal engineers, they may not realise that, in taking on responsibility for the work of others, they have assumed the role of manager with the associated accountability. So, formal training in the responsibilities, duties and practice of management is needed early in engineers' careers. For example, Jaques (5) lists the "minimum requisite authority" of a manager in relation to subordinates as the ability to:

- veto the appointment of an unacceptable newcomer
- assign types of work and specific tasks
- appraise work performance and carry out merit reviews
- initiate removal of an unacceptable performer.

How many engineers in their first management position have had principles of management explained to them in advance? Unfortunately, one of the reasons that management training and other non-technical training fails to be delivered in some organisations is that many managers and subordinates undervalue such learning. One of the causes of this is the widespread belief amongst engineers that the really "hard" work is technical work (e.g. design, construction, equipment and plant operation, maintenance) and it must therefore have the highest priority, and that non-technical, or "soft", work (e.g. HR-related activities, management and leadership training) is far less important. Experienced senior managers know the reverse is true! For example, an adequate solution or approximation can almost

always be developed for a difficult technical problem if more time, money and resources are allocated. This is not necessarily the case with a difficult “people” problem, and the worst such problems may be unresolvable within an organisation. Recent high-profile personnel disputes in major Australian organisations provide the evidence.

3. Individual Performance Enhancement

3.1 Performance Capability

Advertising for financial investments often carries the warning: “Past performance is not an indication of future performance”. It may be surprising to some that this is true of job performance. Unless a new position is very similar to previous positions, the past performance of an individual is not indicative of his/her future performance. Hence the occasional validity of the “Peter Principle”: everyone rises in an organisation to his/her level of incompetence.

The success of any organisation depends critically on the performance of its personnel. Every individual has a level of potential competence which is determined by his/her cognitive capability (the ability to handle complexity of information) and emotional capability (the ability to remain emotionally coherent), as shown in Figure 1.

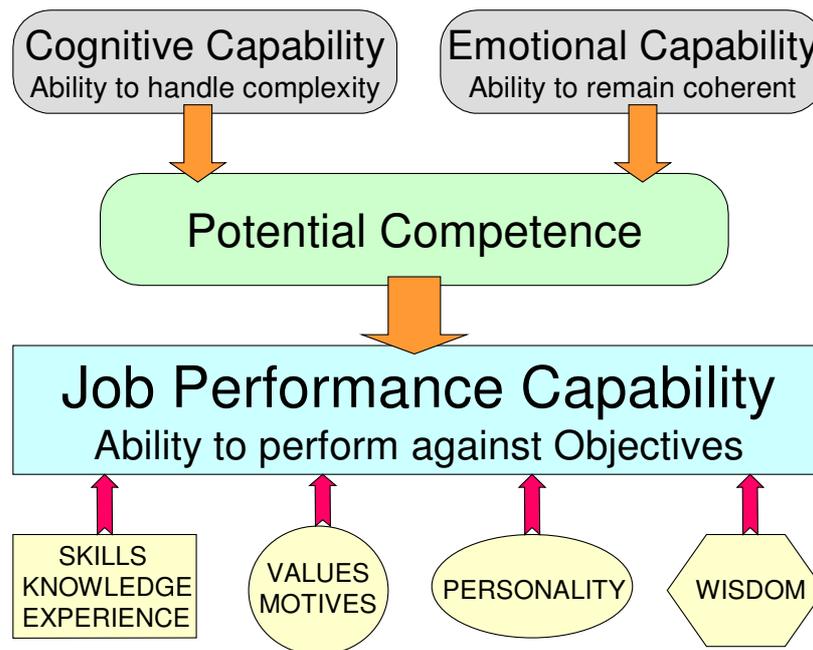


Figure 1. Factors determining Job Performance Capability

According to Jaques, cognitive capability is dependent not on IQ but on the ability to think using one of four methods of mental processing: declarative, cumulative, serial and parallel. These are used in five different orders of information complexity: pre-verbal, concrete, symbolic, conceptual abstract and universal (6). These can be better described as the worlds of infants, children, most adults, very intelligent adults and geniuses, respectively. It seems doubtful that cognitive capability can be seriously increased through training, but training can significantly improve emotional capability.

Just as cognitive capability can be related to, but not defined by, IQ, emotional capability can be related to emotional intelligence (or EQ). Goleman (7) built on the work of others to publicise the principles and application of emotional intelligence. Its elements are:

Self-awareness	The ability to recognise one's moods, ambitions and drives, as well as their effect on others
Self-regulation	The ability to control or redirect disruptive impulses and moods The propensity to suspend judgement – to think before acting
Motivation	A passion to work for reasons that go beyond money or status A propensity to pursue goals with energy and persistence
Empathy	The ability to understand the emotional make-up of other people Skill in treating people according to their emotional reactions
Social skill	Proficiency in managing relationships and building networks An ability to find common ground and build rapport.

The concept of emotional intelligence is not new. Inscribed on the temple of Apollo at Delphi are the famous words in ancient Greek: *know thyself*.

Goleman's research shows that the most effective leaders all have high emotional intelligence. They also have threshold levels of cognitive capability and technical skills, but Goleman found that emotional intelligence was twice as important as these other capabilities, for jobs at all levels. At high management levels, nearly 90% of the difference in leader effectiveness was attributable to emotional intelligence factors rather than cognitive abilities.

Figure 1 shows the determinants of job performance capability (8). Cognitive and emotional capabilities determine the potential competence of every individual. Potential competence is a major influence on each person's job performance capability, but other determining factors are the skills, knowledge and experience of the individual, his/her personal values and motivation, personality, and wisdom and judgement. There are psychometric instruments available to measure an individual's capability in some of these areas as well as for cognitive and emotional capabilities. Formal training related to these capability areas (except perhaps cognitive capability) will improve to varying degrees an individual's understanding of the issues involved and hence his/her level of expertise in each area.

For example, it might be thought that an individual's personality is unchangeable. In fact, the way people choose to operate as individuals may be unlikely to change, but an understanding of basic psychology can certainly assist engineers to understand themselves and others better. Myers Briggs theory (9), based on the lifelong work of the famous Swiss psychologist Carl Jung, is readily available and widely used to help people understand their own orientation to the external world, and how they make decisions. In particular, the theory covers people's preferences:

- how much energy they get from themselves or others (the introvert/extrovert scale)
- how much they experience the current world in detail, or think about opportunities and principles in a more abstract way (sensing and facts versus ideas and opportunities)

- whether they make decisions logically or from personal values (thinking versus feeling), and
- how they plan and organise their own and others' lives (planning versus flexibility).

Furthermore, Myers Briggs theory directly impacts almost all areas of emotional intelligence: *viz.* self-awareness, self-regulation, empathy and social skill.

For an engineer, dealing with people is unavoidable. Understanding principles like those mentioned above can change the processes by which engineers live their lives and understand themselves and others. This will increase their emotional capability and in turn their job performance capability. Hence, engineers who have previously had little or no exposure to theories of intra- and inter-personal psychology will benefit considerably from increased knowledge in this area. And this is at a time when the quality of engineers' relationships with their managers, subordinates, colleagues, customers and suppliers, not to mention families and friends, is at an increasingly high level of importance for their careers and for their personal satisfaction and happiness.

3.2 Actual Performance

The actual performance of an individual at work depends largely on his/her performance capability, as discussed above. There are many other factors which will also determine actual performance, and these can be categorised into work issues, both physical and people-related, and personal issues, as shown in Figure 2.

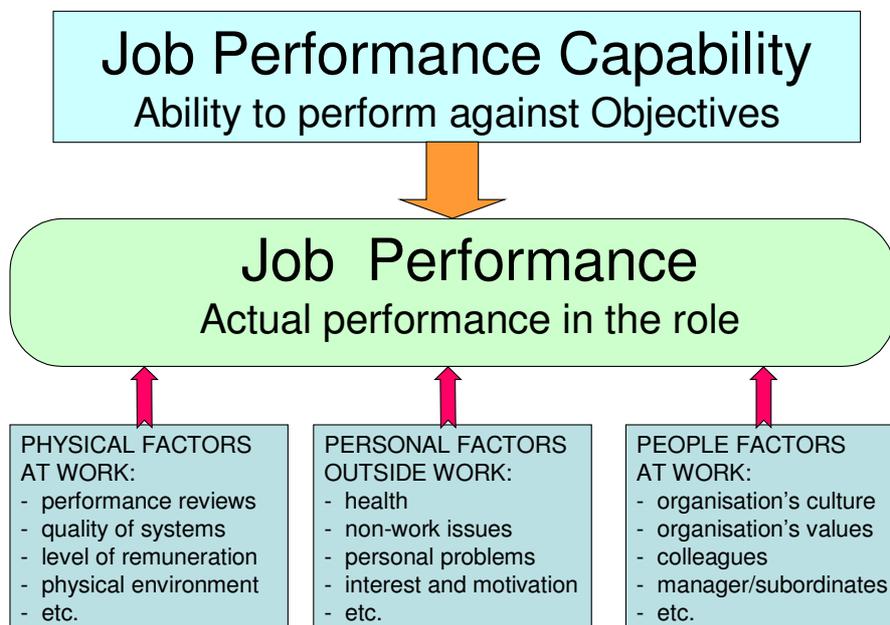


Figure 2. Factors determining Actual Job Performance

Whilst this paper mainly addresses how improvements in performance capability can be achieved, it is clearly in an organisation's interest to optimise the effect of the other factors

which determine the actual performance of its personnel. While many organisations concentrate on the physical factors (e.g. performance reviews, systems performance, remuneration levels, office spacing and layout), they may not be so concerned about the “people factors” at work, e.g. organisational culture, values and leadership. They do so at their own risk.

4. HR and Leadership Programs Bring Financial Success

Recent major international studies show that companies which have superior HR practices and formal leadership development programs are significantly more successful financially. In a 1997 study by international consultants Watson Wyatt of more than 2,000 senior executives across the Americas, Europe and Asia Pacific, leadership development was cited as the most important HR issue facing their organisations, followed by motivational pay and then training and development of their workforces (10). A follow-up study in 2000 of more than 1,000 executives across 18 countries showed that the more organisations develop their leaders, the greater their financial success (11). They found the best way to build leaders at all levels is through formal development programs.

Watson Wyatt suggested that organisations first need to establish their:

- core corporate values
- future business scenarios for the company
- strategic business objectives
- over-arching leadership concept, such as “establishing direction, aligning people and resources, and motivating people”, and
- core competencies which support the leadership model and which relate to the company’s strategic business objectives.

A solid leadership pool can then be built by:

- defining what leadership means in the organisation
- ensuring that high quality leaders are recruited
- assessing leaders on a regular basis
- providing meaningful leadership developmental opportunities, and
- rewarding effective leadership.

New studies by Watson Wyatt in 2000 and 2001 investigating whether human capital is a lead indicator of shareholder value were merged to produce a respondent base of more than 750 companies in North America and Europe, all with more than 1,000 employees and revenue or market value greater than US\$100 million (12). The financial results surveyed were objective economic measures, including market value, 3 and 5 year total shareholder returns, and the ability of the company to create value beyond its physical assets. By studying specific HR practices, Watson Wyatt found that there was a positive relationship between the quality of a company’s HR practices and its financial results. They also established that superior HR practices drive financial success, and not vice versa, a very important distinction.

5. The Role of Engineers Australia

As discussed above, management and leadership skills can be acquired through appropriate training, which is needed throughout an engineer’s career to enhance performance. Engineers Australia’s initiative in establishing the Centre for Engineering Leadership and Management is therefore an important step in redressing the current gap in satisfying the development needs of engineers.

Conclusions

Engineers are well placed to reach high levels of management in most organisations and to be both competent managers and leaders in either technical or non-technical roles. Formal training in the theory and practice of management and leadership is needed early in their careers as well as later. Non-technical training to increase their emotional capability and understanding of the other issues determining job performance is as essential as technical training. And organisations which implement formal staff development programs should realise improved financial results.

This paper has addressed ways of assisting engineers to progress their careers and to be more effective managers and leaders through provision of relevant training, which can lead to financial benefits to their organisations. The principles stated herein are applicable to the development needs of graduates in all “technical” professions, including science, accountancy, finance, law and medicine.

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