



Engineering Management Education A Strategic Imperative?

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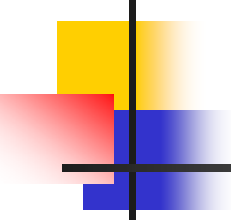
Peter Gibson

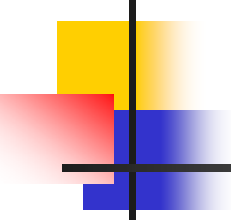
**Associate Professor, Faculty of Engineering,
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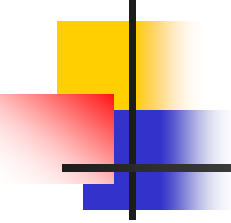


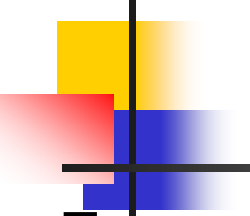
Is there an issue?

- *'That current methods and curricula content of engineering management education does not meet the needs of businesses (employers) and that engineers, as currently trained, do not have the necessary management skills to assist businesses in achieving their organisational goals and objectives.'*
- *(Do we REALLY need to worry?)*

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- From a 3rd year part-time student recently having taken employment as a cadet engineer working in a construction company: 'I learned more in the first 3 months in my work than I did in the previous 3 years of uni studies'.

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- From a second year student: "I am becoming disillusioned with my studies and thinking of a change of career path' I thought civil engineering would be about building stuff but all we seem to do here is mostly a lot of mathematical structures, mechanics and scientific stuff, a lot of which I already studied at school anyway.

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- From 3rd year student: 'My dad is a civil engineering consultant. He is a drainage expert, managing some major projects. We don't seem to do anything like the work he does but he says its all necessary if we want to be professional construction engineers.'



From a 4th year student: 'I'm really enjoying my thesis in Project Management which is applied to a real-life construction project where I get to visit the site and talk with practicing civil engineers. I am very excited about the prospect of a job doing this type of work. It does not seem to have much to do with my last 3 years of study but I think it will help me when I start to apply for real jobs'.



And just to show some balance...

From a 4th year student

I hate the management subjects. They are useless waffle, marking is very arbitrary and they are likely to influence my final degree outcome... That's just not fair in assessing my ability as an engineer.



**Lets look at some of Australia's
acknowledged leaders.....**

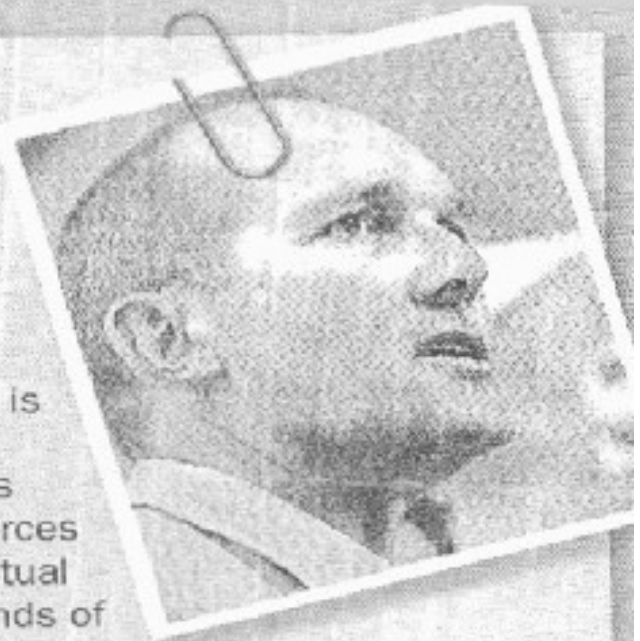
**(Yes, many of them come from an
engineering background...)**

Jon Young

■ **Age:** 45

Santos executive vice-president operations

- **Market's view:** Manages the largest and most challenging business for Santos, the Australian operations. A tough asset to manage because it is past its peak.
- **His view:** In the oil and gas business ... the hubs are not where the resources are ... the resources are the intellectual property and that is found in the minds of men and women.
- **Achievements:** showed extraordinary ability in managing an incident crisis after the major fire in Santos' Cooper Basin (Jan 2004), extricating the company from a very sticky situation.
- **Career path:** Prior to joining Santos in 2000, he worked at Mobil Corporation for 17 years. His last job at Mobil was as chief executive officer, Indo Mobil, in New Delhi.
- **Academic cv:** B.S., B.Eng.



Kathryn Fagg

Age: 43

Bluescope president, market and logistics solutions

- **Market's view:** Very capable operator, highly regarded in the marketplace. The combination of her functional experience and academic qualifications gives her the skills set to perform just about any job she likes.
- **Her view:** There's no point just making promises - you need to prove you can do it.
- **Career path:** Before joining Bluescope in 2000, she worked at ANZ. She started her career as a petroleum engineer with Esso before working for McKinsey & Co.
- **Achievement:** She has used her strengths in marketing, operations and strategy to maximise technology in order meet customers' needs more quickly and efficiently.
- **Academic cv:** B.E. (Chemical Engineering) (hons), M. Comm. (hons)



Betsy Donaghey

■ **Age:** 47

Woodside Petroleum director Australian business unit

- **Market's view:** She has the skill to move up the chain of command. She can cut it with the best of them in a heavily male dominated sector.
- **Her view:** Woodside must get competitive or get out ... The keys to success are having the right places, focus, people and tools.
- **Achievements:** She has helped to shift Woodside's strategy from looking at the whole world to looking at just a few areas. The market has accepted that strategy well.
- **Career path:** Has worked in the oil and gas sector for 25 years, including with BHP Billiton.
- **Academic cv:** B.Civil Engineering, M.Operation Research.





WHY?

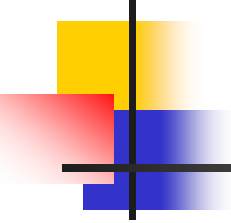
- *"For the majority of engineers, the development of managerial skills will be essential and cannot be picked up on the job. The engineer will, in general, increasingly need to understand the interaction of design with quality control, commercial and product planning, organisation and finances, and will need to develop the managerial skill of financial control, industrial relations and Marketing."*
- Lord Flowers, FRS, Rector, Imperial College of Science and Technology, London at the Second World Conference on Continuing Engineering Education, Paris, France in 1983 (cited by Martinec (1984)).



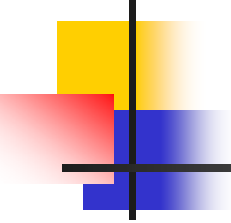
- Other comments made by researchers are as follows:

'British management and managers have been castigated for an apparent lack of professionalism. This has been equated with the lack of relevant professional qualifications. By this we mean that people who end up in managing a team, department, or even a division, usually have (in industry, for example) a first degree in Mechanical Engineering, but by implication, know nothing about, say, motivation or the mystique of managing other people.'

Holfield and Thomas (1999)

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- "... expert enough to practice engineering, all in 4 years of education. It has always been a point of tension to achieve both breadth and depth in 4 years, and the engineering accreditation process has accepted the notion that between one-eighth and one-quarter of the engineering curriculum should be devoted to humanities and the social sciences."

Wei (2005)

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- In 2005 Robinson et al researched the attributes that a design engineer should possess. The authors , in collaboration with an aerospace organisation identified 42 competencies for design engineers. They were then divided into six competency groups. These were:

- Personal attributes
- Project management
- Cognitive strategies
- Cognitive abilities
- Technical abilities and
- Communication.

These include such attributes as motivation, problem solving, process management, and ethics and integrity. Surprisingly there is no mention of financial skills. The attributes identified are about 50% managerially based.



Literature

- Aldridge et al (1990), Brisk (1997), Carmichael & Gibson (2001), Director (1996) Jenson (1983),, Kocaoglu (1984), (1994), (2003), Martinec (1984), McCahon and Lavelle (1998), Nambisan and Wilemon (2003), Wilkinson (2002) and others.



A Management Perspective

- In the 1955 paper R.L. Katz in the Harvard Business Review (HBR) listed out the skills of an effective administrator (manager). My comments appear after each definition
- These were listed as:
- *Technical – (he) need sufficient technical skill to accomplish the mechanics of a particular job for which he is responsible*
 - (these skills would presumably be part of an undergraduate degree curriculum)
- *Human – (have) sufficient human skill in working with others to be an effective group member and to be able to build cooperative effort within the team he leads.*
 - (generally not taught as an integral part of an undergraduate degree)
- *Conceptual – (have) sufficient conceptual skills to recognize the interrelationships of the various factors involved in his situation which will lead him to take that action which achieves the maximum good for the total organization.*
 - (generally not taught as an integral part of an undergraduate degree)



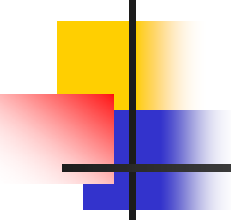
Management Skills Proposed

- **Skill 1 - Decision Making Ability**

- *To be able to assess and decide between competing solutions to a particular problem. This skill will have been taught in relation to their technical skills but not necessarily in relation to the decision that a manager needs to make.*

- **Skill 2 - Human Skills**

- *a) To be able to work with, communicate, negotiate and relate to others both within the organisation as well as outside the organisation.*

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- *b) Also be able to teach others, work in groups and with individuals at various levels of management. Resolve conflicts.*

- ***Skill 3 - Communication***

- *Be able to send and receive information, thoughts and feelings, which create common understanding and meaning.*

- ***Skill 4 - Interpersonal***

- *Ability to develop and maintain a trusting and open relationship with superiors, subordinates, peers and external personnel to facilitate the free exchange of information and a provide productive work setting.*



■ Skill 5 - Conceptual

- *Ability to see the organisation as a whole and to solve problems from a systematic point of view.*

■ Skill 6 - Diagnostic

- *Ability to determine the probable cause(s) of a problem from examining the symptoms and which are observed by the manager*

■ Skill 7 - Flexible

- *Ability to deal with ambiguous and complex situations*

■ Skill 8 - Administrative

- *Ability to follow policies and procedures, process paper work in an orderly manner and manage expenditures within the limits set by budgets. pidly changing demands.*



3 Questions....

1. *Do we need to worry about teaching management at all?*
2. *How do we assess what employers want?*
3. *How do we best meet their perceived needs?*
4. *By the way.... Why do engineers view management studies as a 'distraction'?*