



# Engineers and the Big Five

To the optimist the glass is half-full, to the pessimist it's half-empty, and to the engineer it's twice as big as it needs to be. Many people believe the typical engineer is logical, practical and more interested in tasks than people. STEWART FORSYTH and ELIZABETH HOWELLS investigate the stereotype and argue that personality factors can provide important clues for attracting and retaining engineers in a tight talent market.

**RECENT RESEARCH** by Leigh Newport and David Elms DistFIPENZ of the University of Canterbury<sup>1</sup> used a rigorous approach to identify possible qualities that might be characteristic of effective engineers, then identified which of these qualities related to actual effectiveness. They achieved this by asking supervisors to rate their engineers (who had at least five years' work experience) on a range of qualities and then rate their levels of effectiveness.

Since that research was undertaken, the big breakthrough in personality work has been an emerging consensus on a five-dimensional or "Big Five" model of personality.

### It's a matter of chemistry

This consensus about the structure of personality is comparable in terms of potential impact on people management, as the development of the periodic table on the practice of chemistry. Before you accuse us of extreme cheek in applying the respectability of a hard science to the soft area of psychology, bear with us while we make our case.

For years the scientific community disagreed about what distinguished different chemical substances, but in 1869 Russian chemistry professor Dmitri Mendeleev sorted the elements by mass to develop the first periodic table.

Mendeleev's key insight in devising the periodic table was

to lay out the elements to illustrate recurring or "periodic" chemical properties. Mendeleev began new rows in his table so that elements with similar properties fell into the same vertical columns or "groups". These groups had characteristic levels of reactivity – the noble gases, for example, are relatively inert.

The Big Five personality model claims that different personal attributes – the elements of behaviour – can be usefully grouped into personality factors. Just as membership of a chemical group helps predict the chemical reactivity of constituent elements, human behaviour can be predicted by overarching personality factors.

One demonstration of this is the practical relationships between the Big Five personality factors (neuroticism, agreeableness, conscientiousness, openness to experience and extroversion) and real-world work performance. Analysis of substantial data-sets clearly indicates that more "conscientious" workers are rated as better performers by their supervisors, less "neurotic" workers do better in high-pressure jobs such as police work, and more "agreeable" employees tend to have more satisfied customers<sup>2</sup>.

### Applying the Big Five

The personal qualities that Newport and Elms identified in their work can be seen as markers of underlying personality. Fitting

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these results into a Big Five personality model helps us see broader themes and make some interesting predictions.

We allocated Newport and Elms' attributes to the 30 personality

facets that define the five personality dimensions – six facets for each of the Big Five factors<sup>3</sup>. The table below shows how we consider the 30 attributes are distributed.

NEWPORT AND ELMS' ATTRIBUTES OF EFFECTIVE ENGINEERS MAPPED TO THE BIG FIVE FACTORS		
Big Five factors	Big Five underlying facets	Newport and Elms' attributes of effective engineers
Extroversion	Warmth	Sociability; Interpersonal skills
	Gregariousness	People orientation; Extroversion
	Assertiveness	Leadership; Negotiation skills
	Activity level	Energy; Activeness
	Excitement seeking	Willingness to take risks
	Positive emotions	Humour
Openness to experience	Ideas	Lateral-thinking ability; Flexibility; Intelligence; Ability to recognise the wider issues of an engineering project; Economic, environmental, political and community awareness; Resourcefulness; Perception
	Fantasy	Creativity
	Actions	Inquisitiveness
	Aesthetics (-)	Practicality
	Feelings	
	Values	
Conscientiousness	Achievement striving	Ambition; Initiative; Motivation; Likes challenges; Alertness
	Competence	Confidence; Decisiveness
	Deliberate	Judgement
	Order	
	Dutifulness	
	Self-discipline	
Agreeableness	Trust	Respect for others' opinions
	Compliance	Teamwork skills
	Straightforward	
	Altruism	
	Modesty	
	Tender-minded	
Neuroticism	Vulnerability (-)	Ability to work under pressure; Ability to separate feelings from ideas
	Anxiety	
	Angry hostility	
	Depression	
	Self-consciousness	
	Impulsive	

The overall picture is that effective engineers are relatively extroverted, open-minded and conscientious (as illustrated in the table on page 47). They are particularly likely to be “ideas people” with an affinity for mental challenges, and to be achievement-striving, friendly, gregarious, assertive and active.

What might this profile imply? On the positive side, it means engineers are inclined to be assertive, active and talkative, relish excitement and stimulation, see the big picture, deal well with complexity and work hard to achieve goals. But the downside is they also have the potential to be bored by the mundane, inclined

to the radical, have workaholic tendencies and be seen as pushy and self-centred.

Effective engineers are likely to be individuals who say “Yes!” or “Let’s go!” to opportunities, tending to be enthusiastic and action-oriented. They are also likely to love to play with new and unusual ideas, thinking in symbols and abstractions far removed from concrete experience. Conversely, repetitive processes may not get them excited.

They may at times act in individualistic or non-conforming ways, however, their ability to think about future consequences

PERSONALITY PROFILE OF EFFECTIVE ENGINEERS			
Big Five personality factor	Low	Medium	High
Neuroticism			
Vulnerability (-)			
Agreeableness			
Trust; Compliance			
Conscientiousness			
Achievement-striving; Competence; Deliberate			
Openness to Experience			
Ideas; Fantasy; Actions; Aesthetics (-)			
Extroversion			
Warmth; Gregariousness; Assertiveness; Active; Excitement-seeking; Positive emotions			

and see the big picture provides the necessary impulse control. Their likely drive to be recognised as successful keeps them on track towards lofty goals. But this also makes them candidates for burn-out, and others may see them as being out for the main chance, perhaps making it hard for them to consolidate support for team-wide or organisation-wide initiatives.

## Spotting, attracting, hiring

Having identified the personality profile of effective engineers, how do you spot them, attract them, and keep them in your organisation?

There is no simple answer, but being aware of the general personality type of your target audience enables you to tailor your employment brand and positioning. For example, as well as advertising at job fairs, employment sites, universities and in industry publications, you could target active, adventurous and open-minded engineers by advertising at extreme sports events or in adventure tourism magazines. Similarly, when it comes to clinching the deal, employment packages that combine remuneration with personal development opportunities, career planning and flexibility may be more attractive.

In addition to helping identify and attract effective engineers, the personality profile may also help identify developmental areas. Some may argue that personality is relatively stable over time and is difficult (or impossible) to change, but there is evidence that mastery of life challenges can have a significant and long-term impact on personality<sup>4</sup>. In the same way that evidence from leadership training has dispelled the notion that leaders are born not made, with the right training and development tailored around personality, strong introverts may rival or surpass the effectiveness of their extroverted counterparts. Similarly, it could be worth investing in team-skills development for the more free-wheeling and “out-there” extroverts. These development experiences could help them learn the value of listening to the views of somewhat quieter individuals, and

# BriefCase

## Fine manifestly inadequate

The High Court increased the total fine imposed on Golden Bay Cement for failing to take all practical steps to ensure the safety of an employee at work.

A quarry driver was injured when a 15-metre quarry face gave way and his truck went over the edge. The quarry’s manager had failed to carry out company practice and inspect the cliff face before it was accessed by the driver.

The High Court found that the original fine of \$10,000 was manifestly inadequate and a proper starting point was \$25,000. The Court recognised that Golden Bay Cement pleaded guilty thereby acknowledging a failure on its part to do all it could to ensure the employee’s safety. It also took into account the company’s two previous convictions since 2001 and its status as “a large employer of substantial means”. The Court imposed a total sanction of \$22,000 including \$6,000 in reparation.

*Source: The Capital Letter, 18 September 2007  
Department of Labour v Fletcher Concrete and Infrastructure Ltd T/A Golden Bay Cement HC WHA CRI 2007 488 0001, 10 August 2007*

## Harnessing solar resources

Through its website [www.energywise.govt.nz/solar](http://www.energywise.govt.nz/solar) the Energy Efficiency Conservation Authority (EECA) provides a range of information designed to assist consumers and building professionals with decisions about solar water heating technologies. This includes technical information, system performance models, case studies and an online calculator. Also available is information on packaged systems, industry-accredited suppliers and approved installers, and EECA’s solar finance scheme criteria.

The EECA finance schemes offer funding to assist with feasibility studies and installations. The schemes include grants and loans for homeowners, grants for volume builders, and grants for publicly-owned buildings. In addition, an innovation fund has been launched which aims to encourage smart innovations that will increase the uptake of solar water heating and heat pump water heating technologies, and lead to developments in the sector.

## What is waste?

Carter Holt Harvey Ltd successfully appealed the High Court’s decision that the bylaws of North Shore City Council and other Auckland region authorities were valid in licensing privately-acquired recyclable paper as the “collection and transportation of waste”.

The Court of Appeal decided that “waste” meant material abandoned by its owner, not material that cannot be re-used in its existing form for its original or similar purposes. It found that this definition is in line with common sense and usage, and provides a clear and practical way of distinguishing between what is waste and what is not.

*Source: The Capital Letter, 9 October 2007  
Carter Holt Harvey Ltd v North Shore City Council & Ors CA78/06, 26 September 2007*

of submerging their ego to achieve consensus in some situations.

Being au fait with the personality profile of your workforce enables you to shape your business design, structure and management around the aspects that are likely to work for those individuals. For example, with predominantly extroverted, open-minded personnel, it may be advantageous to allow individuals to operate within a flexible structure that facilitates and rewards innovation. For instance, setting challenging goals, introducing novel projects and providing public recognition for success is likely to increase motivation.

Moving from personality to human resources strategies might seem a big leap. But we all know that a good fit with job, team and organisational culture is vital to success. An accurate understanding of personality is one tool for assessing that fit.

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# BriefCase

## Subdivision blues

Dobson and other residents sought judicial review of the Western Bay of Plenty District Council's decision to grant subdivision consent to a road bisecting an area and creating different lots on either side of it. The Council had previously rejected a private plan change to rezone the land.

The High Court dismissed the application for interim orders. It held that the fact the land was zoned “rural” did not mean all uses had to be for rural purposes. Although the amount of cut and fill involved in the road (a controlled activity) might appear to involve exceptional circumstances for notification, the developer had a strong argument that section 17 of the Resource Management Act 1991 (Duty to avoid, remedy, or mitigate adverse effects) had precedence over other relevant considerations.

The fact that Dobson and other residents were not adversely affected by the decision but brought the proceeding as a matter of principle was a relevant factor but did not exclude them from an interim order.

*Source: The Capital Letter, 20 November 2007*

*Dobson & Ors v Western Bay of Plenty District Council & Anor HC TAU CIV 2007 470 814, 28 September 2007*

## Dealing with danger

Southland District Council had instigated steps under sections 124–128 of the Building Act 2004 to require Thompson to demolish what was considered to be a dangerous building.

Thompson appealed unsuccessfully from the issue of a warrant under section 129 requiring immediate demolition due to the concern that loose roofing iron would be an immediate danger in a predicted storm. The Council later applied to the District Council for confirmation of the warrant under section 130.

The High Court rejected Thompson's submission that the territorial authority has to have the approval of a District Court Judge before it can urgently enter a site. This upheld the District Court's finding that sections 129 and 130 are standalone sections clearly empowering the chief executive of a territorial authority to issue a warrant where there is a likelihood of immediate danger to public safety. The wording of section 130 clearly envisages the application to the District Court is made after completion of the emergency works ordered under section 129.

*Source: The Capital Letter, 30 October 2007*

*Thompson v Southland District Council HC INV CIV 2007 425 00231, 2 October 2007*