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Senate Education, Employment and Workplace Relations Committees
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Dear Committee Members,

Is it a fact that there is a skills shortage in engineering? Is there a shortage of Engineers? Is there a shortage of Engineers with the appropriate skills? These separate questions need to be asked. Any research and data needs to be analysed carefully for adequate research methodology.

Does the committee really know what is going on? Are there resources available to ensure this or is it based upon the biased opinion, innuendo and fantasy of employers unwilling to train Australian undergraduate (or post-graduate) Engineers?

Are there plenty of graduate Engineers in Australia but a lack of willing employers ready to train them?

It is important to recognise that my comments refer to Professional Engineers and are not necessarily related to Engineering Technicians or Engineering Trades, as referred to in Australia.

It is important to interpret my submission in terms of questions to be asked that perhaps have not been adequately asked before or researched adequately or in a disciplined manner by researchers in Australia.

Ultimately 10-20% of employed Engineers should be undergoing training. That is, at least one in ten Engineers should be undergoing training. How close to reality are we? There is a massive requirement that employers understand that one in ten employees need to be undertaking fundamental training!

My comments are as follows with reference to the Terms of Reference:

The nexus between the demand for infrastructure delivery and the shortage of appropriate engineering and related employment skills in Australia, with particular reference to:

(b) the impact of the long-term outsourcing of engineering activities by government on skills development and retention in both the private and public sectors;

Do private companies train a sufficient number of Engineers or a sufficient number of Engineers to replace the retiring number of Engineers?

(c) options to address the skill shortage for engineers and related trades, and the effectiveness and efficiency of relevant policies, both past and present;

Many graduate Engineers do not work as Engineers. Often this is confused with the idea that many Engineers are promoted to management and hence no longer have roles as Engineers. What evidence is there that many Engineers no longer have employment in the engineering field? Engineers Australia provided a survey that claimed to know (which I do not have a reference to) of how many graduates work outside the field of engineering but it doesn't take much to conclude that they are unable to source this information accurately, yet their research shows there is a significant proportion of people with Engineering degrees working entirely outside the realm of Engineering. How many people in Australia have Engineering Degrees but have nothing to do with Engineering? I work as a High School Teacher and in 2009 we had seven Teachers at the High School I work at who claimed they had Engineering Degrees. As I wrote to Engineers Australia, we had a higher proportion of Engineering degrees to total number of Teachers at our School than any Engineering project in Australia had Engineering Degrees to the number of employed people on any Australian Engineering Project. How many Degree Qualified Engineers did I see go through the High School I am employed at between 2002 and 2006 who were training to be Science Teachers? I did not keep a record.

The Inquiry should determine the number of people with Engineering Degrees not working in any Engineering related field as a proportion of total Engineers!

Perhaps the Senate Committee could develop a strategy to entice graduate Engineers back to Engineering.

What does it take to be an Engineer? Does being an Engineer simply mean getting a degree? How much training do Engineers receive in their initial career? Is it just sink or swim? Are you just expected to know who the suppliers are since you have an Engineering Degree? Are you suppose to know what contractors are capable of since you have an Engineering degree? Are you suppose to know the structure of the industry and the practices of the industry from the theory taught in university? What can you be taught in an

Engineering degree? Why do employers think graduate Engineers are suppose to be job ready?

Reference to Aristotle is a good start to understanding what a degree can offer. Universities provide an education in theoretical knowledge. Theoretical knowledge does not provide an understanding of who can provide goods and services. Theoretical knowledge does not provide knowledge of what contractors can provide. TAFE (Technical and Further Education) can provide technical knowledge that universities cannot provide. The Employer can only provide practical knowledge for Professional Engineers, Engineering Technicians and Engineering Tradespeople by on-the-job training that employers can only be responsible for.

Are Universities and TAFE really two totally incommensurable institutions? Why do people think there is some sort of relationship or overlapping of knowledge?

Perhaps the Committee should determine how much training Engineers receive after completing their degree! Are Engineering Graduates trained in technical knowledge after completing their undergraduate degree? Are Engineering Graduates trained in practical knowledge after they have completed their undergraduate degree? What does an undergraduate Engineering degree consist of? Can a Diploma of Engineering Practice be assessed with reference to a written report? How?

What is practical knowledge? Can a university train an engineer in practical knowledge? Of course not! Universities train students in theoretical knowledge! Does theoretical knowledge train you in where a supplier can be obtained? Does theoretical knowledge teach you how a trades person works? What training do employers offer? Basically none? Sink or swim? It is necessary that an employer train a person in practical knowledge. No one else can do it! Universities specialise in training people in theoretical knowledge. TAFE specialises in training people in technical knowledge. Only businesses can train people in practical knowledge. Too many employers have no idea of this conundrum and think educational institutions have expertise impossible beyond their realm.

How many engineering businesses train their management personnel in Aristotle?

There is a huge movement in the relationship between science, technology, engineering and mathematics (STEM). Can you imagine a business leader, lawyer, economist, or accountant understanding even the vagueness of this? How are Engineers suppose to explain Engineering to business leaders, lawyers, economists, or accountants? Is infrastructure being limited by the poor education of lawyers, economists, accountants and business people? By decision theory, choice theory, utilitarianism, problem solving (Does anyone really know what problem solving really is?). These are specific theories! Utilitarian outcomes, results based philosophies often couched in economic or politically ideological terms.

Please ignore the ridiculous pleas by employers regarding attracting High School students into Engineering. High School students are savvy enough to recognise the delusions of employers and savvy enough to know there just aren't the jobs available that too many private sector employers scream out that are suppose to be available. The reality of available jobs is just not there.

'Once upon a time' in better times there were Government Enterprises. These Government Enterprises are no longer politically correct or economically rational. Government is to be minimised and Government is not to be part of trade or enterprise. Business can apparently do it better 'on their own'. Government Enterprises have been privatised or corporatised. I don't think that I am wrong in saying it was a political agenda for Government Enterprises to train more people than they required and hence the private sector could poach readily trained people. Could this possible political agenda of training more people than required have created a buffer for the private sector? In the highs of the business cycles there was a ready pool of skilled labour and in the lows of the business cycle Government Enterprises could maintain a pool of skilled labour ready for the next business cycle high. Could the private industry create this buffer? I think not! It is now politically correct and economically rational for businesses and corporations to train less people than they need. Are we not seeing the wood for the trees?

This 'market-based' ideology creates a fantasy amongst business people that there is a ready supply of skilled labour 'out there' in the market. This delusional fantasy of business people means they do not have to train people for their own needs. The invisible hand of the market will magically create a ready supply of labour. How this is possible is beyond me! Defies the laws of the conservation of matter. Is it not basic and simple logic that business needs to plan six to ten years ahead to ensure they have sufficient personnel with the required skill set? Unfortunately the use of the word 'plan' is politically incorrect and has connotations of a 'planned economy' – somehow the economic rationalists and right-wing political ideologues can't have that. The economic rationalists and right-wing political ideologues simply believe the invisible hand of the market will instantaneously and automatically adjust the supply and demand curves to immediately provide an equilibrium in the 'market'. Is this just simple and basic logic that business needs to plan ahead? Where is the time lag in supply and demand curves – the competition!

The businesses, recruitment companies, employment agencies and labour hire firms live in a fairyland or wonderland of economic rationalism where the invisible hand of the market will instantaneously and automatically adjust the supply and demand curves to immediately provide an equilibrium in the 'market'. When their fantasy does not become reality they run, scream and cry to the government expecting the government to instantaneously and automatically adjust reality to suit their economic rationalist fantasy. How the government is expected to do this defies basic logic. Does the government have a magic wand?

Why does the solution seem crystal clear? Unfortunately, it just takes time!

(e) effective strategies to develop and retain engineering talent in the private and public sectors through industry training and development, at enterprise, project and whole-of sector levels;

Should businesses be required to train a sufficient number of people commensurate with the number and classification they employ? Should we have legislation that requires a proportion of people be undertaking training dependent upon qualified people employed? If you have 10 people trained as fitters and turners at least two should be apprentices? Why not? How many organisations recognise that 20% of their employees need to be some sort of apprentice, trainee or cadet? Isn't this just simple infant school mathematics? Why not a training tax on organisations who won't train 20% of their employees at a fundamental level? Or does the extremely simplistic notion of "the market" completely dominate? Should government be the ones compensating for the ridiculous irregularities of the 'so-called' market? Why should government be responsible for these irregularities? Why can't businesses take responsibility for something? Where do the employment and recruitment agencies stand regarding training?

20% might seem like a high figure. What about those who find their career not to their talents or liking – in this age of choice and competition? What about the proportion who fail? What about the proportion whose personal circumstances do not coincide with the demands of their employer? Where principles beyond economic rationalism and neo-liberalism and patriotism might not be as valued as we like? Isn't a 50% attrition rate expected amongst apprentices, trainees and cadets?

(f) opportunities to provide incentives to the private sector through the procurement process to undertake skills development;

Whatever happened to government grants, tariffs, subsidies, quotas, R&D Tax Concessions, Anti-dumping laws, and basic government spending? Why do we believe (or should I say, have unmitigated faith) in competition? Why is Ricardo's Theorem relegated to a short paragraph on page 576 of a 600 odd page Economics Textbook? Why did Hilmer write a whole competition policy followed by successive Labour and Liberal government policies that have absolutely no reference to Ricardo's principle? Could there be something wrong with Ricardo's principle??? Hmmm... (Isn't it obvious!?)

(i) other related matters.

This debate is based upon ideology.

We have a market-based system where everyone is responsible for his or her own future. We are told we have "choice" and we should follow our passions. There are some good points about this but these are few. Not everyone can be a computer games creator. Some of us have to be garbage collectors,

teachers, doctors, etc. Even poorly paid Engineers! The economic rationalists and right wing political ideologues think that "the market" just sorts everything out to an "equilibrium" situation - perhaps instantaneously. The economic rationalists and right wing political ideologues refuse to have any "managed economy" as this is akin to fascism and communism and "planned economies" "don't work". I argue that economics is based upon static mechanics and economists do not have the ability to understand dynamic mechanics (or feedback as in control) (or the mathematics so fundamental to an Engineering Degree). Hence economists (and politicians) don't understand that it takes, say, four years for someone to do the education for a career plus another 2-8 years to come up to speed in that career. Business people expect that they can immediately go to "the market place" and pick off the shelf someone already trained with 5-10 years experience that are very specific to the required job details. Just delusions of fantasy! The massive structural changes to the Australian economy in the last 30 years have caught out people who could not foresee the closure of the industries they have trained for (and paid for without employer support). So too have businesses been caught out in this lack of foresight yet cry wolf to the government to fix their lack of foresight. Why can't businesses take responsibility for their selves as individuals are expected to? Why can't government be as tough on businesses as they are ruthless on individuals?

How many businesses train people? Do businesses train sufficient people for their future needs? Or is it a case of poaching off the few who will train people? Or do businesses poach off the developing nations who desperately need trained people? All the government industries that have trained a disproportionate number of people are virtually gone due to privatisation and the private companies have not taken up this tradition.

Business does not seem to understand the idea of "the cleaner, the waiter, the computer operator" point of view. Once upon a time 20% of people were lower class, 60% of people were middle class, and 20% of people were upper class. Now 30% of people are lower class, 40% of people are middle class, and 30% of people are upper class. Why are Ph.D.'s driving taxis? Along with scientists and engineers? As the joke goes, "What is the quickest way to find an Engineer?": "Call a taxi." – once too often a real experience. Why do Hawke, Keating, Howard, Costello, Rudd, Gillard, and Swan promote the 'aspirational class'? As though everyone can attain this 30%? The economy has changed and there are simply not enough jobs for educated people. The "market" just does not "upgrade" itself to cater for this influx of intelligent people. Business proliferates the social Darwinistic myth that intelligence and skills result in success. Not that I don't believe in education – it is much better to have educated people than uneducated people. Educated people are necessary for a liberal democracy.

Do I promote Engineering through teaching "Engineering Studies"? So that the call for the so-called undersupply of Engineers, as in the 1980s, proliferates Engineer graduates that business is unwilling to take up, resulting in a real oversupply and an extreme competition amongst Engineers that

simply reduces the salary and conditions of Engineers as it has done for the past twenty years in Australia?

How many Engineers are prepared to explain to a High School student that an Engineer often sits at a desk all day doing calculations? What do you think the perception of a High School student might be to this? Can you explain the power, significance and responsibility of this to a young person? Most adults in our society cannot comprehend this! When I explain to my Engineering Studies students that during an Engineering degree you spend about 24 hours per week face-to-face doing almost entirely mathematics, they just cannot comprehend this. It is beyond their scope of comprehension when they might be doing, say, six (or four) hours of face-to-face mathematics per week at school. I encourage my students to do Engineering simply because of the high level of intellect required of Engineering compared to say the poor level required of an economics, accounting or business degree. But this is the end of it. There are no other incentives other than Florman's existential experience.

The skills shortage of Engineers in Australia is provided by the few shrill voices screaming about the undersupply of a few niche areas in Engineering in Australia. Overall there is an oversupply of Engineers in Australia. This fantasy in perception of an undersupply is solely due to a lack of willing employers willing to train the graduate Engineers available! Please catch a taxi just to experience the desperation!

This submission is a private submission.

Thank you for the opportunity to submit my submission.

Yours sincerely,

Peter Doherty (BE)
(A High School Teacher)