

ASOCSA2009-60

# The risks of skills shortage in Construction

Peter Utting  
[uttingpl@yahoo.com](mailto:uttingpl@yahoo.com)

Durban University of Technology  
Work: 031 373 2585  
Cell: 084 549 2772

## **ABSTRACT AND KEYWORDS**

### **Purpose**

This paper looks at the problems and risks associated with the skills shortage in the construction industry. The various threats are identified in an attempt to evaluate and contain the nature and spread of this phenomenon.

### **Approach**

The research investigates through literature and internet study other research on skills shortage and the risks involved in the construction industry to assess qualitatively what action has been shown to alleviate the problem elsewhere.

### **Findings**

The salient findings indicate that the skills shortage is not confined to South Africa, but is exacerbated by some of the recruitment practices in other countries. Solutions proposed elsewhere are not always practical and are yet to be tested and found to work. Unfortunately, no concrete examples of successfully addressing skills shortages in the construction industry could be found.

### **Practical implications**

As an industry we need to take responsibility for the plight of the construction industry and address the education and training imbalance that seem peculiar to this country.

## 1. INTRODUCTION

Skills shortage in construction is an international phenomenon. In South Africa the problems are compounded by the legacy of a government that ensured that more than eighty percent of the population was not educated to manage a construction economy and then handed over a decimated construction industry. Injection of massive amounts of money for reconstruction and development, and the exodus of essential skills exacerbated the situation to the point that construction could not deliver on promises of basic needs for the vast majority of the population.

Management of the construction sector largely remains a 'pale male' domain. The few historically disadvantaged who have managed to break through the concrete ceiling continue to be under-represented through middle and senior management up to board level. The born free generation has been failed by a dysfunctional education system that should have itself been born free but has struggled with academic issues of teaching and transformation.

South Africa is said to have achieved intentional social transformations in 1994 when it embraced democracy. This was not transformation, however, but a transition from the known system of apartheid to a defined democracy. Similarly, there was no transformation to the new Constitution – it happened overnight after a period of definition. What is significant here is that we knew where we were coming from and we defined and achieved our goal.

Construction in South Africa is at risk from lack of transformation and lack of skills. We need to look at the risks involved and identify ways to cope with lack of progress.

### 1.1 What is construction project risk?

Construction projects are characterized as being very complex with uncertainty from various sources. The word 'uncertainty' is often preferred instead of 'risk', to emphasize that a risk has two sides, both negative and positive (Miller and Lessard, 2001). When dealing with risks, the potential for improvement should also be taken into account, for example to undertake a project with fewer resources or to take advantage of an unexpected window or opportunity.

Risks are central to business and linked with opportunities. Since opportunities and threats are seldom independent, there are no opportunities without risks related to them. Understanding each participant's risks gives better risk allocation (Klemetti, 2006). Construction projects gather together a large variety of stakeholders making it difficult to study a network as a whole. As more and more companies concentrate on their core business, the expansion of subcontracting results in more complex networks and greater numbers of project participants. Hence

projects are becoming shared efforts of multiple parties, where the project is delivered in an extremely complex skills network.

Risk management is directly related to successful project completion. Statistically significant relationships have been shown between management support for risk management processes and reported project success (Voetsch, Cioffi and Anbari, 2004). Project risk management has received a lot of attention recently, and is widely seen as one of the most critical procedures and capability areas in the field of project management.

Construction projects are recognized as risky projects associated with inflexible risk management by contracts. There is a gap, however, between risk management techniques and their practical application by construction contractors. The literature on project risk management is extensive, but lacking from the network viewpoint in managing project risk (Baccarini and Archer, 2001).

Losing projects are those that are behind schedule, over budget, where start-up and operational problems are common, and where contractors fail to realize a profit. Based on the assumption that by better understanding both the relationships in a project and risks related to the network structure, project risk management can become more effective (Klemetti, 2006).

## **1.2 What is skills shortage?**

Skills are the necessary competencies that can be expertly applied in a particular context for a particular purpose (NACI 2003), and skills shortage occurs where employers are unable to fill vacancies or have difficulty in filling vacancies for a particular occupation, or specialized skill needs within that occupation, under current levels of remuneration and conditions of employment, and location. Shortages are typically for specialized and experienced workers in an occupation, and also relatively overall unemployment. An occupation may be recognized with shortages even where there is not a shortage in all specializations, and may be in shortage in some geographical areas only (Coulter, 2004).

Technology changes which result in new methods and skills requirements often lag behind retraining. Degree of difficulty may require higher basic education levels, such as Grade 12 mathematics, particularly in the technology trades. The shortage may be identified as resulting from deficiencies in the education system at school levels.

Recruitment difficulties also occur when there may be an adequate supply of skilled workers, but employers are still unable to attract and recruit sufficient suitable employees, due to characteristics of industry, occupation or employer, including relatively low remuneration, poor working conditions, unsatisfactory working hours, poor image of the industry, undesirable location, ineffective recruitment, inappropriate advertising and so on. Skill shortage lists typically exclude skills with only a limited period of training or experience to acquire.

Over the last twenty years or so, the labour market and industry skills needs have undergone significant change. Skill shortage includes managers, professionals and artisans, and the biggest gap in construction appears to be skilled artisans and supervisors (NCE, 2001). This is not peculiar to South Africa but is a worldwide phenomenon. Although it may reflect a buoyant construction economy, it is causing real project delivery challenges for consultants and contractors alike.

### 1.3 What causes skills shortage?

The construction industry boom means worsening skills crisis. Retirement of skilled managers, professionals and artisans coupled with a deficient education and training system means a dwindling pool of human resources (Greenblat, 2008). The attraction of UK, Australasia and the Middle East will be a continuing draw for talent.

Attracting new staff often means we are competing with lifestyle choices – it is a hearts and minds issue. Mobility in career choices means companies face problems recruiting and retaining experienced staff, competing with more attractive packages resulting in higher staff turnover. In civil engineering during the 1990s, for example, the number of graduates declined by over 40% in spite of an overall increase in university graduates. Many of these do not remain in the industry, and many are attracted overseas (NACI 2003).

The poor public image of the construction industry as a career and the ambiguity of functions in construction, coupled with the perception that a career in construction means working 50% more for 50% less, forever being shipped from one site to another, is a major factor. The lowly professional status means that there is an increasing reluctance of younger employees to commit the necessary effort to achieve professional status.

Construction is notorious for its low profit margins, which explains why there is a reluctance to increase salaries (Mylius, 2001). When margins are at historical low levels, we have a skills shortage which could lead to a reversal in roles – employees may be interviewing prospective employers.

Changes in on the job training and the demise of apprenticeships have a long-term impact on the skills base. The low national interest in physical sciences, mathematics and the massive inequality in education reduces the potential pool of required skills. Where the construction industry does not interact with people at school or a university, it results in poor career information and further reduces the choices (Pieterse, 2007).

The skills profile in construction is skewed towards retirement age. As skilled managers and artisans retire and insufficient recruits are capable of replacing them, the skills shortage is set to grow and construction prices will increase, posing an unnecessary burden on the construction economy. We cannot continue to blame the government (or apartheid) for the problem, or even look to the government for a solution. Yet that is precisely what we have been doing.

#### **1.4 How is construction industry affected?**

Skills shortage poses the greatest threat to the future of construction, and will continue as demand for construction work increases. The boom in demand puts pressure on the construction industry which is struggling to meet increasing demand for its services (Creamer, 2007). There will be an increase in construction demand together with a worsening supply of middle and senior management.

The construction sector is struggling to meet the increasing demand for its services because of an increasing industry-wide skill shortage. The skill shortage will continue as the demand for construction work increases, and is most acute in the public sector where the most sought after skills are for engineers, natural scientists and artisans.

The shortage of professionals and managers within the industry is reflected in many parts of the world, and the construction industry is becoming more global. The risks for both contractors and their clients as human, material, logistical and financial resources are being leveraged to unsustainable levels. Companies are expected to develop more of these resources internally as the projects evolve, exacting a toll on the efficiency of the company and the ability to meet deadlines (Essa, 2008). For how much longer can this continue?

#### **1.5 What are the risks of skills shortage?**

The risks that are caused by the skills shortage need to be identified and the ways to manage risks in co-operation with the whole construction industry found. Risks facing construction include (Leitch, 2008):

- the skills shortage in the construction industry;
- the level of health care and education spending by government;
- capacity constraints in the industry; and
- tight delivery deadlines imposed by clients.

The quality of output is at risk with a greater proportion of unskilled workers, and skills shortage is a growth risk making the industry less attractive as a career. Future competitiveness is at risk as we fight for the talent remaining after the brain drain.

Skills shortage will see a decline in SMMs – with more bankruptcies. A greater proportion of unskilled workers restricts innovation and growth, where we have 80% of the workforce without qualifications and only 20% of jobs have no need for qualifications. The education system will be unable to cope with the demand.

Industry will be crippled by skills shortage – globally. Sustainable construction is at risk, and it is hurting the economy. As it becomes more difficult to recruit skills, the smaller firms look within the company while the larger companies look outside. Risk management at project levels is

improving, but skills shortage risk management is absorbed into company culture.

### **1.6 What are risks to construction economy?**

The construction economy is a well defined element of every national economic framework and is identified as a component of gross fixed capital formation within the gross domestic product. It is represented by all expenditure associated with fixed investment into physical infrastructure, production and commercial facilities and accommodation, as performed by general and specialist contractors, engineers, materials suppliers and service providers. It generally excludes the supply of process machinery and equipment.

South Africa's construction boom is expected for at least the next 10 years thanks to government investment in the private sector spend, creating a catalyst for further earnings growth and keeping the industry alive beyond the 2010 World Cup.

Given the definition of skills, skills shortages are likely at all levels of the economy, as a result of relatively low levels of education in the workforce and static growth in higher education outputs (NACI 2003). Skills shortage is one of the greatest risks to economic prosperity. It is inflationary when demand outstrips supply forcing wages higher that are not based on productivity. Higher unemployment results in greater inequality – the rich get richer while poor get poorer. Lack of skills puts market growth at risk, with the further risk of capital flight and the mothballing of future major projects.

### **1.7 What does this mean for projects in SA?**

Skills shortage puts more pressure on existing systems and processes. More projects not completed on time or within budget, some organizations attempt to take short cuts and safety slips. More pressure is placed on existing systems and processes. Skills shortage gets blamed for everything – project delays, power shortage, oil crisis, etc.

Scarce workers have unrealistic salary expectations, resulting in demands for higher salaries, wages and organizational costs. Rapid promotion means some are running before they can walk, and retention issues can affect performance and culture, with more project pressure, and less executive management support.

Initially, the industry has responded by recruiting from overseas, with Australia and New Zealand being the favoured sources as English is the common language. But with the construction boom in those countries, some companies are recruiting from the UK resulting in a two-way flow of skills (Gabriel, 2007). More subcontracting moves the focus onto smaller firms. Many organizations, however, become more focused on skills

development, putting safety down as a real value and not merely paying it lip service.

The South African construction industry recognises the importance of outcomes-based training, overseen by long-term training and skills development plans, and acknowledges that the SETAs are the logical implementation bodies (NACI 2003).

### **1.8 What are organizations doing to cope?**

Many organizations are adopting a new strategy: they accept the new reality that the market, not the company will determine the movement of their employees. Managing retention becomes controlling both the direction and speed of the flow, rather than trying to dam it.

While the increase in skills from abroad helps to ease the pressure, obtaining work permits to bring in skilled foreign nationals is often a lengthy process fraught with unnecessary delays. Migrant workers on temporary work permits are mainly filling manual occupations.

Visible support from the management is crucial, convincing teams that they are serious about career programmes and not just performance management. Graduate programmes and mentoring is becoming more common, and many contractors are providing construction skills training centres. Some contractors, however, are transferring all the risks to project owners, which will ultimately be forced to cancel projects that are no longer feasible on a reassessment of risks, rewards.

### **1.9 What is government doing to cope?**

The South African Government has introduced policy around the Joint Initiative for Priority Skills Acquisition, the Accelerated and Shared Growth Initiative of South Africa, the Construction Transformation Charter Group and the 2014 goal to halve unemployment (Mlambo-Ngcuka, 2006). These are expected to sustain and transform the industry.

Government promises on spending levels are the main driver of growth aimed at propping up the construction industry as the current major projects come to a close and house building is slowing down. Private infrastructure spending, however, is still rising reflecting the important balance between public and private spending.

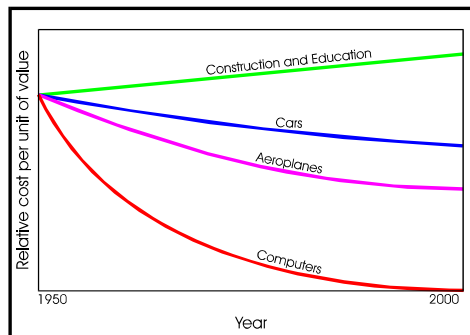
The Department of Higher Education and Training has been separated from the Department of Basic Education to focus on skills training and education. The participation rate in higher education for 18 to 24 year olds has increased from about 14% to 18% since 1994 (HESA, 2008). The Government has, however, set a steady state target of 20% from this year onwards. Alarm bells ring when this is compared with an average percentage for North America, Western Europe and Australasia of about 70%. Some Asian countries have an even higher participation rate.

What may be of even greater concern is where the post-school education and training is positioned. In 2006, the bulk of growth is in the more expensive university system with about 800 000 students. The remainder of about 380 000 students are found in the further education and training system, resulting in an absurd inverted pyramid. This is on top of an under-performing school system. Most developed countries generally accept a ratio of five sub-professionals to support each graduate.

Both the construction sector and the education sector are facing similar problems of transformation and sustainable growth. The two are closely related.

### 1.10 Economic progress over time

Consider the economic implications of the different technologies shown. Relative to a constant rand, the cost per unit of construction – be it a kilometre of highway, a hundred square metres of house, or a megawatt of power plant – has generally gone up since the mid-twentieth century, in spite of more mechanization, prefabrication, and so on. Certainly, in some absolute sense, things have probably improved; but relative to the economy as a whole, which has improved even more rapidly, construction has become more expensive.



Things have been somewhat better for automobiles – today's cars are better engineered and more fuel efficient, yet are still within the purchasing power of most workers in industrialized countries (unlike new homes!) – but the gains have still been modest on a relative scale.

Progress has been greater in commercial aircraft. Around 1950 air travel was mostly for wealthier people, and by today's standards the aircraft were slow and expensive to run. Today's efficient commercial jets fly on less than half the cleaner fuel of earlier models, and international as well as domestic air travel has become accessible to people of average means.

But compared with computers, even these gains have been modest. It has been said that if the economics and productivity of aircraft had evolved as rapidly as those of computers, one could travel from Johannesburg to Cape Town for just a few cents and arrive within seconds of taking off.

What if we extend this analogy to construction? You should then be able to buy a single-family house for under a rand, and have it constructed while reaching for your wallet!

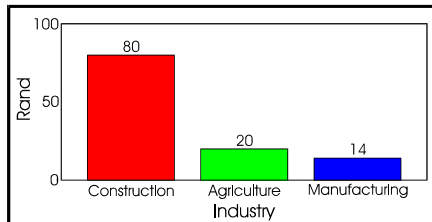
It is pertinent to note that both construction and education exhibit similar characteristics. The cost of education continues to climb with no



significant improvement in the quality of the graduates. If we extend the computer analogy to education, you could educate a learner to graduate level for under a rand!

### 1.11 Incremental earnings per rand invested

An important feature of the construction economy is its multiplier effect. It is estimated that for every rand invested in construction, about 80 cents incremental earnings are generated to the Gross National Product (GNP). The corresponding figures are for agriculture about 20

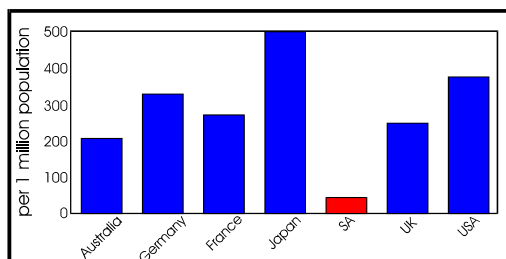


cents and for manufacturing about 14 cents (ISRDS, 2000). From the fiscal point of view, investment in construction is more desirable to boost the economy. In more developed economies, the fiscal policy makers routinely create favourable or unfavourable situations to guide the real estate market which in turn affects the construction and the short term economic environment. Fiscal control of construction is one of the easiest tools to apply, but unfortunately it often takes the construction industry a long time to recover, especially following harsh conditions where firms have sold plant and down-sized skilled labour, such as occurred in South Africa in the dying years of apartheid.

Construction creates large scale employment which by itself is a significant contribution to the national economy. It is also a good vehicle for the distribution of wealth which means that a significant proportion of the money spent in construction moves directly from the rich to poor people, especially in rural areas.

### 1.12 Graduating engineers per million population

We often take comfort in comparing ourselves with the rest of Africa. After all, South Africa has 10 per cent of the total population of Sub-Saharan Africa. Our gross national product is 71 per cent the magnitude, and electricity generation 2.3 times as large as the rest of the sub-continent. Indeed, the South African government actually spends a greater portion of its budget allocation on education than any other country, not only in Africa but in the world. But how do we compare with major industrial nations in technically trained people?



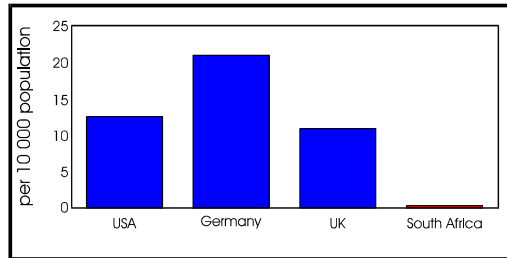
At present only about 35 engineers per 1 million

population graduate annually in South Africa. The sorry state of engineering education in South Africa is shown (Utting, 2008).

### 1.13 Science and engineering doctoral degrees

Other comparisons are equally dismal. For, example:

- South Africa only has twice the number of engineers and technicians as New Zealand to serve a population that is over 10 times as large.
- South Africa has proportionately only 10 per cent of the number of scientists and engineers as North America. The United States has 13 doctoral degrees in science and engineering per 10 000 population, Germany 22 and Britain 11. South Africa has only 0.18 (Utting, 2008).



### 1.14 How do they cope internationally?

In the past, school leavers could be trained to fill the skills shortages. In the UK the government has launched a £200 million training project to try and tackle the skills shortage and lessen the reliance on migrant workers to fill the gaps (Denham, 2008). Eastern European migrants have filled shortages but in the longer term this is not something to be relied upon. Supplementing the shortfalls in local recruitment can only be considered a short-term solution, and as soon as the global demand for these workers increases, then the supply will dry up. There are also questions being asked about whether one country should be taking valuable skilled workers away from their own countries where they are needed.

The civil engineering skill shortage cannot be solved by importing more engineers from Australia, South Africa, New Zealand, Poland, China and India. Importing foreign workers fails to address the widening skills gap that is driving construction inflation, limiting capacity and adversely affecting project time scales and budgets.

The Construction Industry Training Board predicts that Britain needs to attract 370 000 new recruits over a five year period just to keep up with demand. Of these 74 000 each year, 64 000 are required simply to replace existing workers leaving the industry (NCE, 2001). Some of the proposals for solving the problem include:

- Flexible working hours is the key to resolving the skills crisis.
- Training projects provided by specialist training colleges focusing on the construction industry.

- Respect and retain the engineers already on board. Lack of respect is the second biggest reason given by graduates for leaving the industry and for undergraduates not joining.
- Employers should reward good staff properly and provide them with good opportunities to develop and progress.
- Improve the standard of training mentoring and provide training agreements that are not considered incidental in the early years of the professional's career.
- The clients, especially Government, should award more contracts on quality not price.
- Engineers should be used as engineers, not project managers.
- Retain the best staff and help them reach the top of the profession.
- Consider ethical recruitment, especially when bypassing social legislation to recruit abroad. When work can be done for a quarter of the price in India it may make sound business sense, but it maintains the differences between the developed and developing countries and does nothing to resolve the long term problems of the profession.
- Recruit school leavers rather than graduates and help them to gain their technical experience from vocational qualifications.
- Offer golden hellos to graduates.
- Head hunt from rival organizations is an extension of the problems associated with recruiting abroad.
- Treat staff equally. The construction industry's macho, bullish, sexist and racist image is a major deterrent. Redress the gender and racial imbalance in the industry.
- Work with the universities so that they educate and train the right people for the right work.
- Use the over fifties to solve the construction skills shortage.
- Retrain skilled workers at retirement age so that they can impart their skills and knowledge to the younger generation.
- Adapt to new technologies and keep abreast with the latest methods.
- Scream at Government!

### **1.15 How are we coping long term?**

In a recent report (CIDB 2007), the Construction Industries Development Board considered that the construction and engineering industries can overcome the immediate challenges by re-organization and targeted interventions, as well as by importing scarce skills. However, the industry's ability to cope will decline over the next five to ten years unless new capacity skills are developed in the interim.

The construction industry in South Africa has been fortunate to be bolstered by the 2010 FIFA World Cup. We have passed through the worst of the economic downturn and need to assume that the booming infrastructure future will continue. The five-year forecast continues to look healthy thanks to the Government recognition of the value of the industry.

During the next five-year period we must rethink the way we sell the industry to children and make a concerted effort to provide the construction toys that allow children to develop spatial perceptions, building concepts that they can relate to the real world. By the time that they reach high school they should be conversant with the basic technical tools of the industry.

The industry needs to stand up and collectively be counted, starting with the client and then down through the supply chain with consultants, contractors suppliers and institutions. The mystery needs to be taken out of the industry and we need to teach that which is relevant to knowledge and understanding of how construction works and the facilities function.

A radical approach rather than a magic wand is required:

- the post-school pyramid must be inverted to restore proper education balance;
- skills development should be a core business value and not considered a cost to the business;
- skills development must be rationalized and standardized and made easily available;
- training provision must be increased to attract and retain good staff;
- construction professionals must commit to continuing professional development if they want employers to invest in their education and training;
- think about long-term rather than short-term benefits;
- think about the next generation of builders and take on more apprentices;
- invest in education and training.

As an industry we need to take responsibility for our skills problems and collectively develop appropriate solutions. We need to avoid the triple threat of spiraling costs, eroding quality and increased accidents on site. Skills shortage should not be seen as a problem, but in a solution oriented industry we are about finding solutions. We must continue to tackle the challenge and not leave it until it is too late.

## 2. REFERENCES

- Baccarini, D., Archer, R., The risk ranking of projects: a methodology, *International Journal of Project Management*, 2001, Vol. 19, pp.139-145.
- CIDB, Skills for Infrastructure Delivery in South Africa: The Challenge of Restoring the Skills Pipeline, *Construction Industry Development Board*, March 2007
- Coulter, Nerida, National and State Skill Shortage Lists Australia – 2004, *Department of Employment and Workplace Relations*.
- Creamer, Terence, Creating losing projects, *Engineering news online*, 16 Nov 2007.
- Denham, John, *Government launches new skills shortage project*, 20 May 2008, <http://www.ambition.co.uk/news/1553-Government-launches-new-skills-shortage-project>.
- Essa, Ismail, Skills shortage a challenge, *SAPA*, 13/05/2008, [http://www.iol.co.za/index.php?set\\_id=1&click\\_id=3045&art\\_id=nw20080513134018615C270285](http://www.iol.co.za/index.php?set_id=1&click_id=3045&art_id=nw20080513134018615C270285).
- Gabriel, Keith, Keith's point: the skills shortage - can the industry deliver? *NCE online*, 27 November 2007, [http://www.nce.co.uk/opinion/keiths\\_point\\_the\\_skills\\_shortage\\_can\\_the\\_industry\\_deliver.html](http://www.nce.co.uk/opinion/keiths_point_the_skills_shortage_can_the_industry_deliver.html)
- Greenblat, Eli, Skills shortage puts construction in peril, *The Age: Business Day*, April 14 2008, <http://www.theage.com.au/business/skills-shortage-puts-construction-in-peril-20080413-25us.html>
- HESA, *HIGHER EDUCATION SOUTH AFRICA*, Address to the Parliamentary Portfolio Committee on Education, 24 June 2008.
- ISRDS, *The Integrated Sustainable Rural Development Strategy*, 17 November 2000, <http://www.info.gov.za/otherdocs/2000/isrds.pdf>
- Klemetti, Anna, *Risk Management in Construction Project Networks*, Laboratory of Construction Management, Helsinki University of Technology, Report 2006/2.
- Leitch, John, Waco UK reveal a pre-tax loss of £6m, *Contract Journal*, 08 May 2008. Miller, R., Lessard, D., Understanding and managing risks in large engineering projects, *International Journal of Project Management*, 2001, Vol. 19, pp. 437-443.
- Mlambo-Ngcuka, Phumzile, Parliamentary media briefing by Deputy President Mlambo-Ngcuka, 6 February 2006, <http://www.info.gov.za/speeches/2006/06020615151001.htm>
- Mylius, Andrew, Industry boom means worsening skills crisis, *NCE News*, 01 November 2001,

[http://www.nce.co.uk/news/safety/2001/11/industry\\_boom\\_means\\_worsening\\_skills\\_crisis.html](http://www.nce.co.uk/news/safety/2001/11/industry_boom_means_worsening_skills_crisis.html)

- NACI, The potential impact of skills shortages on the innovative capacity of major civil engineering projects, *National Advisory Council on Innovation*, South Africa, October 2003.
- NCE, How to beat the skill shortage, *NCE News*, Feb 2001, [http://www.nce.co.uk/news/2001/02/how\\_to\\_beat\\_the\\_skill\\_shortage.html](http://www.nce.co.uk/news/2001/02/how_to_beat_the_skill_shortage.html)
- Pieterse, Ilva, Skills shortage remains a concern, *ITWEB Contributor*, 12sep07, <http://www.itweb.co.za>
- Utting PL, Is construction future affected by skills shortage, IQPC Conference: *Construction Project Risk Management*, Johannesburg, June 2008.
- Voetsch, R.J., Cioffi, D.F., Anbari, F.T., Project Risk Management Practices and their Association with Reported Project Success, *Proceedings from IRNOP*, 2004