CHAPTER 3 - CHANGES IN THE EXTERNAL BUSINESS ENVIRONMENT AND THEIR IMPACT ON THE STRATEGIC MANAGEMENT OF CONSULTING ENGINEERING FIRMS IN SOUTH AFRICA: THE MACROENVIRONMENT

3.1 Introduction

The previous chapter has provided some background information on the nature of the South African consulting engineering industry. In order to extend the reader's understanding of the business of consulting engineering within the South African context, this chapter discusses the impact of changes in the macro external business environment on the strategic and operational management of local consulting engineering firms.

The essence of strategic management is in adapting strategy, either in reaction to or in anticipation of business environmental changes. This process of adapting or modifying strategy requires an in-depth understanding of the external environment in which a particular business operates [189]. In the increasingly turbulent external business environment that all enterprises currently face, this requirement for continuous and rapid adaptation of strategies presents management with its greatest challenge, as successful adaptation to the environment is the key to the continued growth and even survival of enterprises. The previous chapter has clearly illustrated how important the continued health of the consulting engineering profession, as a key driver of and stakeholder in national economic growth, is to South Africa. Any contribution towards attaining a better understanding of the external environment in

which consulting engineering practices operate will therefore be valuable, both for the consulting engineers themselves and for the country.

In this chapter the macro external environment of enterprises in South Africa at the beginning of the twenty-first century is reviewed, with particular reference to the impact of environmental changes on the strategic management of such enterprises. Although some mention is made of international trends, the primary focus is on those external environmental change factors that are unique to South African enterprises. Similarly, there is some discussion on the external environment of South African enterprises in general, but the emphasis in this chapter is on South African consulting engineering firms. In reading this chapter, it should furthermore be kept in mind that owners and managers of South African consulting engineering firms have to deal with environmental factors that are unique to the transitional nature of South African society, while also being exposed to the "normal" environmental turbulence of the modern business world.

3.2 Terminology

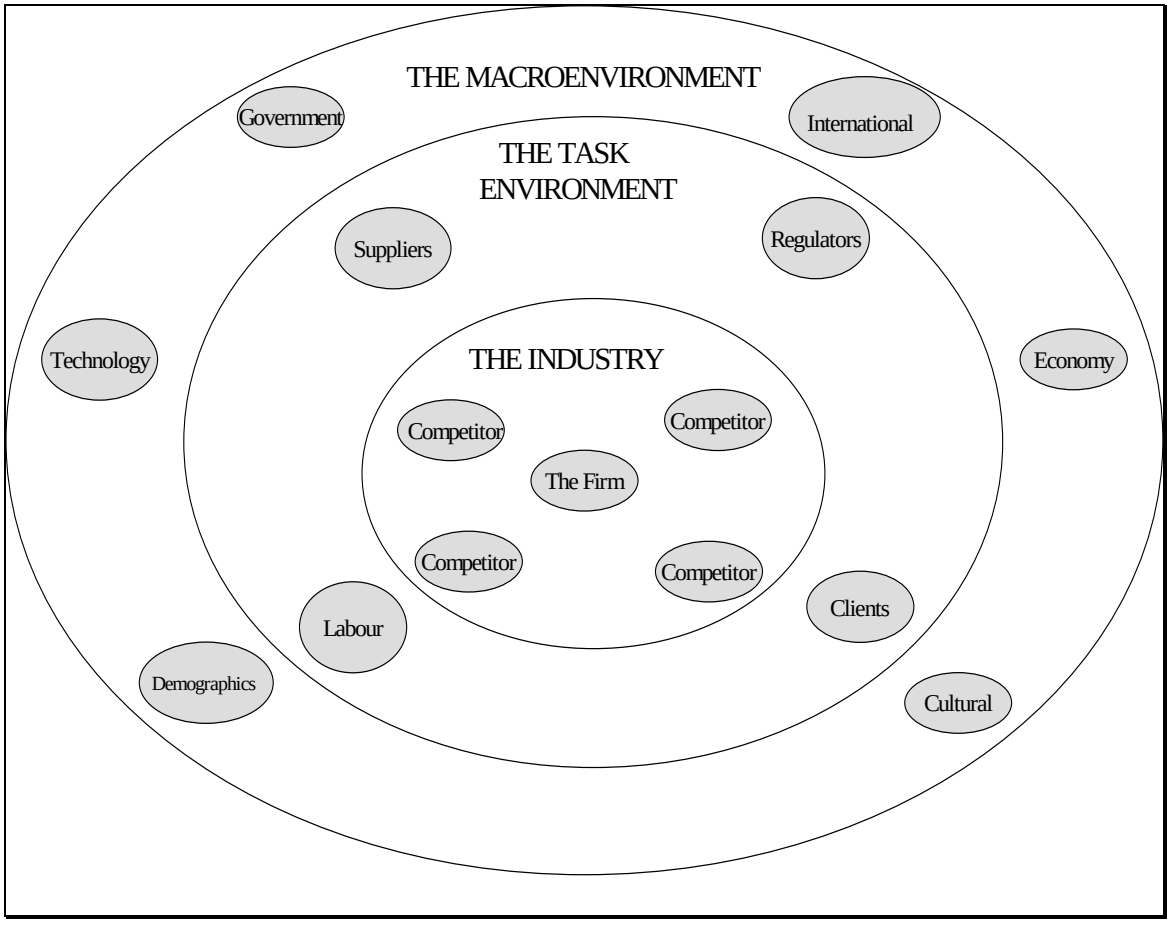
For the purpose of this chapter classical business science definitions and terminology regarding the "external environment" will be used. The external environment is considered to include the (consulting engineering) industry environment, the macro-environment and the task environment [13].

The industry environment of an individual firm is composed of the firm itself and the organisations that compete directly with it. The firm also operates in a more extended task environment, which includes not only competitors, but also clients,

suppliers, regulating authorities and other organisations with which the firm interacts directly. At the most general level of the external environment an individual firm operates in a macroenvironment, which includes the influence of the government, the international environment, the economy, demographics and other fundamental factors that generally affect all organizations. Figure 3.1 [13] is a graphical representation of the external environment of an individual firm.

FIGURE 3.1

The external environment of an individual firm [13]



3.3 The Macroenvironment

The current unpredictability of the international business environment is primarily due to unpredictable and ever accelerating changes in the macroenvironments of businesses. Government policy is a particularly important factor in the macroenvironment of South African businesses. This is mainly due to extensive state intervention in the economy in an attempt to rectify historic structural imbalances in the national economy and society in general.

3.3.1 South African government policy

In any country the policies of the national government present the business sector with both strategic constraints and opportunities. Internationally the importance of government to the consulting engineering industry lies mainly in its roles as

- developer of rules and regulations which must be interpreted and applied by consulting engineers,
- provider of funding for major engineering projects,
- regulator of the private sector,
- owner of certain economic assets such as land, infrastructure and parastatal organisations,
- the authority responsible for setting land development priorities and
- the final arbitrator of disputes, as the custodian of the legal system [117].

The post-apartheid South African government has inherited a country with, amongst other problems,

- a bloated civil service,
- a divided and polarised society,
- substantial government debt,
- strained international relations,
- partial international economic isolation,
- skewed resource ownership / wealth patterns,
- high crime levels and
- substantial government participation and intervention in the South African economy.

Government has consequently embarked on a substantial legislative programme in order to address the above-mentioned and other national issues. Many of the new laws are obviously of an interventionist nature and, as such, will have an impact on the private sector, and more specifically on the consulting engineering industry.

The point was made in the introductory chapter of just how vulnerable consulting engineers are to changes in government policy and it can therefore be appreciated that South African consulting engineers have to be extremely aware of changes in the policy or legislative environment. It should however be stressed that changes always bring both threats and opportunities and that the essence of strategic management is not just to counter threats, but also to proactively exploit opportunities. The following are some examples of government policy changes that are already impacting on South African consulting engineers and will continue doing so into the foreseeable future.

- **The targeted procurement policy**. This policy is aimed at using public sector procurement as an instrument of policy [213]. A 1996 study showed just how powerful a policy instrument public sector procurement can be, with the combined procurement by national and provincial government departments and local authorities amounting to 13 % of the Gross Domestic Product of South Africa [214]. The targeted procurement policy framework was formalised in the Green Paper on Public Sector Procurement Reform in South Africa [148] and was enacted in the Preferential Procurement Policy Framework Act (No. 5 of 2000) [156] with the Preferential procurement regulations pertaining to the Act, as approved April 2001 [157].

  A few examples of how this policy influenced the business of consulting engineering in South Africa are:

  - The preferential treatment of firms owned by individuals from previously disadvantaged backgrounds (PDI's) in the award of public sector appointments has lead to a proliferation of small affirmable professional service providers (APSP's) .

  - A secondary result has been the enticement of inexperienced young professionals and professionals-in-training who come from previously disadvantaged communities away from established firms to form their own small APSP practices. This often implies that, in the absence of experienced mentors, normal professional and career development do not take place and internal transformation in established firms as

well as the eventual normalisation of the industry is delayed. The inexperience and limited capacity of some of these small APSP firms has unfortunately resulted in some negative market perceptions of black professional practices.

- The policy caused increased polarisation between so-called black (APSP) and white (established) practices. The intense competition for the scarce professionals from previously disadvantaged backgrounds has often sabotaged human resource development and succession planning, especially in the established firms.

- The preferential treatment given to some individuals on grounds other than merit demotivates students and young professionals from non-PDI backgrounds from pursuing a career as a consulting engineer in South Africa.

- The targeted procurement policy has largely been responsible for raising the public profile of the South African Black Technical and Allied Careers Organisation (SABTACO), enabling it in turn to raise the profile of successful black professionals as role models in previously disadvantaged communities. It is anticipated that these role models will increasingly draw more students and graduates from previously disadvantaged backgrounds into consulting engineering, eventually contributing to the normalisation of the industry in terms of its demographics.

- **Policy regarding training.** South Africa's shortage of skilled labour and abundance of unskilled labour required drastic intervention. One of the interventionist measures instituted by government was the introduction of a skills development levy on private business and a requirement for obligatory workplace skills plans. This was enacted in the Skills Development Act (Act no. 97 of 1998) [163] and Skills Development Levies Act (Act no. 9 of 1999) [164].

  Substantial investment in education and training has however always been a feature of South African consulting engineering, for example, during the last 6 months of 1998 an amount of R49 million (or 3,6 % of the salary and wage bill) was spent by member firms of the SAACE on study bursaries and training [184]. There is a concern that negative perceptions regarding

  - the introduction of an additional levy to add to the already heavy South African tax burden,
  - delays in instituting the required administrative mechanisms for disbursing training funds and
  - expensive and inefficient administrative structures and procedures that consume a substantial part of the funds collected from the training levy

  may act as disincentives for consulting engineers to maintain their high level of expenditure on education and training.

- **Employment equity and labour relations**

  The purpose of the Employment Equity Act (Act no. 55 of 1998) [146] is to achieve equity in the workplace by promoting equal opportunity, fair

treatment and by implementing affirmative action measures to in order to ensure equitable representation of all population groups at all levels in an enterprise. The aim is therefore for all companies to give preference to the employment of people from previously disadvantaged population groups in order to achieve a situation where their workforce is representative of the composition of South African society. The reality is however that, as illustrated in Table 3.1 [47], the pool of available qualified engineering manpower in the country does not represent the demographics of the broader society. In the short to medium term attempts at improving the demographic representivity of professional staff complements will obviously introduce operational inefficiencies into consulting engineering firms. This will be an added burden for firms in an embattled industry facing increasing international competition in a globalised economy.

The Labour Relations Act (Act no. 66 of 1995) [149] and Labour Relations Amendment Act (Act no. 127 of 1998) [150], both of which are primarily aimed at protecting the rights of workers in a blue-collar labour environment, also apply to the professional consulting engineering environment. Certain of the requirements of these Acts, which may make perfect sense in some blue-collar labour environments, are not practical in a professional services environment and, if strictly applied in future, will add to the staff-related overhead cost of consulting engineering practices.

- **Construction Industry Development Board.**

As a result of Parliamentary approval of the Construction Industry Development Board Bill on 13 October 2000 [119] a new statutory body will be established in terms of the Construction industry development board Act [143] to promote construction industry development. The new Board will be tasked to, inter alia, "direct a strategy for growth, performance improvement and transformation of the construction industry" [122]. As an important section of the construction industry, the future business of consulting engineering will definitely be influenced by actions of the Board. The nature and extent of such impact on South African consulting engineers remains to be seen.

- **New Legislation governing the development professions.**

The following new Acts that govern the so-called development or built environment professions were approved by parliament during November 2000 [118]:

  - the Council for the Built Environment Act [144],
  - the Engineering Profession Act [147],
  - the Quantity Surveying Profession Act [162],
  - the Project and Construction Management Professions Act [158],
  - the Property Valuers Profession Act [159],
  - the Landscape Architectural Profession Act [151], and
  - the Architectural Profession Act [142].

South African consulting engineering firms currently employ professionals from all of the above-mentioned professions and the envisaged changes in the nature of statutory control of these professions will obviously impact in some, yet undetermined, way on these firms.

- **Proposed amendments to Income Tax Legislation.**

The South African parliament has (in November 2000) approved amendments to tax legislation [165], which introduced a change from the source plus basis of taxation to a so-called "residence minus" system of taxation. One of the implications of this amendment is that South African residents are now taxed on their worldwide income. This will imply the taxation in South Africa of both dividends on foreign investments held by South African residents and the foreign earnings of South African residents working overseas for limited periods. The proposed amendments have the potential of greatly curtailing the global competitiveness (and resultant ability to export professional services) of South African consulting engineers [132]. It may furthermore encourage those firms earning a substantial proportion of their fee income outside South Africa to establish offshore companies and / or move their operations to other locations.

- **Changing government expenditure patterns.**

In order to address development imbalances, public sector fixed investment in infrastructure was reduced in favour of expenditure on social services such as health, education and state pensions. As a result consulting engineers

have increasingly expanded their services into the arena of so-called "soft" services such as education and training, social facilitation, programme management of social programmes etc.

Public sector fixed investment expenditure has furthermore shifted geographically in order to develop previously neglected provinces and areas of the country. Consulting engineers need to monitor such expenditure shifts in order to make decisions about existing and future firm and office locations.

- **The changing nature of local authorities.**

Legislation such as the Local Government: Municipal Structures Act (Act no. 117 of 1998) [152], the Local Government: Municipal Structures Amendment Act (Act no. 33 of 2000) [153], Division of Revenue Act (Act no. 1 of 2001) [141] and the Local Government: Municipal Systems Act (Act no. 32 of 2000) [154] have changed many of the long established municipal traditions, structures, sources of revenue and service delivery mechanisms in South Africa. The new acts have inter alia formalised the concept of mega-cities and changed the structure, status, boundaries and authority of many existing South African local authorities. Income from local authorities constituted 23 % of the total income of South African consulting engineering firms as at June 2000 [185] and it is therefore not surprising that such major structural changes had and will continue having a major impact on consulting engineering practices.

Two further factors that will forever change the way in which many South African consulting engineering practices operate, are:

- The implementation of the stated government policy of restructuring municipal service provision and

- the expected transfer of infrastructure provision, maintenance and operation to the private sector, in keeping with international trends.

- **The management of public finances.**

The Public Finance Management Act (Act no. 1 of 1999) [160], Public Finance Management Amendment Act (Act no. 29 of 1999) [161] and Draft Municipal Finance Management Bill [145] will, if properly administered and enforced, contribute greatly towards good governance in central government departments, provincial government departments and local authorities respectively. The legislation defines inter alia financial accountability of officials and the obligations of the state and its officials with regard to the execution of contracts concluded between the state and private sector enterprises.

The non-payment and slow payment of consulting engineers' fee accounts by the public sector has over the past years become a problem with serious implications for all the consulting engineering firms, the majority of which are privately owned. By the end of 1998, the total public sector debt that was outstanding for more than 90 days to consulting engineering firms amounted

to R1 600 million (Figure 12.22). This figure also shows how this problematic situation has already been improved due to the application of the provisions of these Acts, combined with intensive lobbying by the consulting engineering industry and a media campaign.

Consulting engineers are however concerned that the financial accountability requirements of these Acts may scare the new wave of inexperienced officials, who will be given responsibility for managing projects of a capital nature, into a state of inactivity. Such a situation will obviously have a major impact on consulting engineers due to delays in project planning and implementation. It could also have a negative impact on the broader community as the delivery of vital basic services to poor communities may be delayed, potentially resulting in politically volatile situations. This aspect will have to be closely monitored and timeous actions will have to taken by the individual firms or the broader industry as applicable.

- **The Competition Act (Act no. 89 of 1998) [166].**

This anti-monopolistic law has unfortunately impacted negatively on the business of consulting engineering in a number of ways, for example:

  - Commercial property transactions, which normally involve the sale of a property-owning company, are now mostly subject to approval by the Competition Board. The slow processing of these approvals, although often a mere formality, has resulted in a severe backlog in the Competition Board offices. These unforeseen delays often have

cost implications for property owners and developers to the extent that it can have a negative impact on the financial feasibility of a project and even lead to the cancellation and postponement of projects. Such delays and project cancellations impact negatively on the structural and building services disciplines within the consulting engineering industry. This is especially the case since consulting engineers are often working at risk (i.e. without payment, but with a guarantee of payment when the project proceeds to either final design or construction) during early project stages of commercial projects. In such a case a delay in the transfer of a property or properties will inevitably result in an extended so-called at risk period with the resultant financial implications for the consulting engineer.

- Mergers of and acquisitions within the consulting engineering industry now often (depending on prescribed limits for transaction amounts and annual firm turnovers) have to be approved by the Competition Board. Applications for such approvals are costly and long approval cycles often delay transactions.

The aforementioned examples illustrate that, in present day South Africa, government policy is probably the dominant factor in the external business environment of consulting engineering practices.

3.3.2 Technology

Today a company cannot be successful without considering as part of its strategy the astonishing technologies that exist and that continue to evolve [13]. Businesses that develop their strategies around the cutting edge of technological advances can gain competitive advantages. Businesses with strategies that ignore technological advances or lag behind competitors in their consideration of technological change will, on the other hand, become obsolete or extinct.

In the changing world of consulting engineering technological advances create new services, new ways of rendering traditional services, new productivity benchmarks, and new ways of managing and communicating. It also produces new engineering materials, which require new design methods. The following are examples of the impact of technological changes on South African consulting engineers.

- The evolution of computer software and the increased integration of various types of software have created extremely powerful geographic information systems (GIS). The continuous development by innovative engineers of new GIS technology applications have led to many new services and new ways of rendering traditional services. Examples of such services are the development of very user-specific, integrated, intelligent and highly graphical computer-based maintenance, asset and facilities management programmes.

- The continuous development and improvement of specialised design and drafting software continues to raise the productivity levels of design and drafting staff. Design and drafting has in most cases become a single, totally integrated computer-based process.

- Increasingly complex projects are being managed using sophisticated project management software that integrates activity planning, material and equipment requirements, actual costs, budgets, human resources, external influences, forecasts, scenario modelling, etc.

- The animated three-dimensional visualisation of proposed projects, which incorporate walk-through, drive-through or fly-through features, has become a standard for project proposals to sophisticated potential clients.

- Live computer-based management information systems (MIS's) have made management information available faster and to many more people. This led to new levels of transparency and management accountability.

- New technology such as digital photography, aerial-scanned digital terrain models, sophisticated and fast data transfer methods, etc. has in many cases made the application of remote-manufacturing principles possible in the consulting engineering environment. This is now even being used in highly sophisticated and individualised projects such as industrial plants and large bridges and has led inter alia to the practice of producing single complex designs using two design teams working in shifts by utilising time zone

differences and capitalising on lower labour costs on different continents, e.g. in the USA and Ireland or in the UK and India or Pakistan.

- Wide area networks and affordable personal electronic communication devices have accelerated the trend towards outsourcing certain aspects of the design and draughting process to freelancers or independent contractors who work from their own home-offices, thereby reducing overhead costs.

- The availability of information on the internet has, as a single factor, made a huge contribution towards easing the entry of South African consulting engineers into international markets, but has likewise removed many barriers to the entry of foreign competitors into the South African consulting engineering market.

In a technology-based professional service enterprise, such as a consulting engineering practice, the continued viability of an individual enterprise depends largely upon the ability of its management to identify relevant technological advances and to timeously integrate those technologies into their business processes. Of particular importance in this regard is the principal of cost-benefit analyses, i.e. new technology should only be adopted if the financial benefit of the new technology to the enterprise can exceed the cost of introducing and applying the new technology over the expected total lifecycle of the technology. Strategic management should at all times be aware that new technology can at any time sweep away previous competitive advantages [90].

3.3.3 Demographics

Demographics are measures of various characteristics of the people composing groups or other social units. In a business environment companies must consider work force demographics in formulating their human resource strategies. Strategic plans of consulting engineering enterprises must therefore make provision for recruiting, retaining, training, motivating and effectively utilising people with suitable skills to achieve the firm's mission. In a technology-based professional service enterprise, such as a consulting engineering practice, its knowledge workers constitute the only real asset of the firm [77, 84]. It is therefore of cardinal importance to remain mindful of Lester Thurow's statement that "the dominant competitive weapon of the twenty-first century will be the education and skills of the workforce" [208]. This is reflected in the fact that, at a recent international consulting engineering conference [62], problems with the recruitment and retention of human capital were identified as the most important issue in the consulting engineering environment. On a global scale the competition for key human capital has become so intense as to be referred to as the "talent wars" or the "people wars" [84].

The demography of the South African technological skills pool has certain specific characteristics, which are of particular concern to local consulting engineering practices. These include:

- The short supply of engineers, technologists and technicians from previously disadvantaged backgrounds as shown in Table 3.1, combined with the requirements of the Employment Equity Act as discussed in section 3.3.1.

- The loss to the South African economy of many talented young professionals due to the global demand for such human capital as a result of the international “talent famine” [84]. The numbers in Tables 3.2 and 3.3 provide an indication of the extent of this trend. The figures are however considered conservative because many young emigrants do not notify the Engineering Council of South Africa (ECSA) of their departure.

TABLE 3.1

Racial Demographics of the South African Engineering Profession

(Source: ECSA, Statistics for Males, September 2000-[47])

DISCIPLINE	Agric	Chem	Civ	Elec	Mech	Min	Met	Indus	Electro	Elec Electro	Electro Mech	Ind Electro	Trans port	Other	TOTAL
PROF. ENGINEER															
A-Asians	-	9	54	63	31	1	4	1	18	7	-	-	-	1	189
B-Black	-	7	95	74	48	7	2	3	3	12	1	-	-	-	252
C-Coloured	-	5	10	9	8	2	1	-	-	5	-	-	-	-	40
F-Female	1	42	107	24	15	1	15	15	15	9	-	-	-	-	244
W-White	203	702	6309	2643	2922	463	271	157	450	241	3	-	-	53	14417
	204	765	6575	2813	3024	474	293	176	486	274	4	-	-	54	15142
ENGINEER IN TR.															
A-Asians	1	35	38	96	65	3	-	1	20	6	2	1	-	2	270
B-Black	-	17	94	132	67	15	4	1	3	7	12	-	-	-	352
C-Coloured	-	-	2	3	3	1	-	-	-	-	1	-	-	-	10
F-Female	2	55	72	22	17	-	11	17	9	9	1	4	-	1	220
W-White	56	247	527	643	768	97	84	75	201	187	24	7	-	23	2939
	59	354	733	896	920	116	99	94	233	209	40	12	-	26	3791
PROF. TECHNOLOGIST															
A-Asians	-	1	38	4	3	-	-	-	-	1	-	-	-	-	47
B-Black	-	1	8	5	1	-	-	-	-	-	-	-	-	-	15
C-Coloured	-	-	11	3	-	-	-	-	-	-	-	-	-	-	14
F-Female	-	1	10	1	1	-	-	-	-	-	-	-	-	-	13
W-White	-	2	833	760	370	5	6	2	10	11	-	-	17	31	2047
	-	5	900	773	375	5	6	2	10	12	-	-	17	31	2136
PROF. TECHNOL. IN TR															
A-Asians	-	3	28	16	6	-	-	-	-	-	-	-	-	-	53
B-Black	-	4	23	15	6	-	1	2	-	-	-	-	-	-	51
C-Coloured	-	3	4	4	3	-	-	-	-	-	-	-	-	-	14
F-Female	-	3	4	1	1	-	-	-	-	-	-	-	-	-	9
W-White	-	6	155	54	51	-	1	2	-	-	-	-	-	-	269
	-	19	214	90	67	-	2	4	-	-	-	-	-	-	396

Abbreviations used in Table 3.1: Agric- agricultural engineering, Chem- chemical engineering, Civ- civil engineering, Elec- electrical engineering, Mech- mechanical engineering, Min- mining engineering, Met- metallurgical engineering, Indus- industrial engineering, Electro- electronic engineering, Elec/ Electro- electrical/ electronic engineering, Electro/ Mech- Electro/ mechanical engineering, Ind/ Electro- Electro/ industrial engineering, Transport- transportation engineering, IN TR- in training, PROF.- professional, TECHNOL.- technologist.

TABLE 3.2
Persons still registered with ECSA, but staying abroad
(Source: ECSA, Statistics, as at 19 May 2000 [45])

COUNTRY	MEMBER TYPE									
	Pr Eng	EIT	Techno	ETOIT	Techni	ETIT	Cert Eng	CEIT	Lifts	Total
AUSTRALIA	109	4	7		4		8			132
AUSTRIA	2									2
BELGIUM	3		1							4
BOTSWANA	53	9			4		7			73
BRAZIL	1									1
COLUMBIA	1		1							2
BRUNEI SE ASIA			1							1
CANADA	61	1	3		1		2			68
CHILE	3									3
CYPRUS	1									1
KIA	1									1
DATAR	1									1
DENMARK	2									2
EGYPT	2									2
FRANCE	5									5
GERMANY	12	3	1				2			18
GREECE	3		1							4
HONG KONG	4									4
HUNGARY	1									1
IRELAND	6	1	1	1	1					10
ISREAL	7									7
ITALY		1								1
JAKARTA	1									1
KENYA	3		1							4
LESOTHO	6	12		1						19
MALAWI	1									1
MALAYSIA	1									1
MALTA	2									2
BEHRAIN	1									1
MAURITIUS	4	1			1					6
MOZAMBIQUE	3									3
NAMIBIA	64	12	6		10		1			93
NETHERLANDS	12	1					1			14
NEW ZEALAND	50	2	5		3		1			61
NORWAY	1									1
PHILLIPINES	1									1
POLAND	3									3
PORTUGAL	6				1					7
SINGAPORE	1									1
SAUDI ARABIA	3									3
SCOTLAND	5									5
SEYCHELLES	1									1
SINGAPORE	2									2
SPAIN	2									2
SWAZILAND	21	12	2		3	1	4			43
SWITZERLAND	7	1						1		9
TAIWAN			1				1			2
TANZANIA	1						1			2
THAILAND	4									4
UK	153	8	12		5		2		1	181
ARAB EMIRATES	5		1							6
USA	88	5	4		3		1			101
VENEZUELA	1									1
ZAMBIA	4						1			5
ZIMBABWE	25	2	3				1			31
TOTAL	760	75	51	2	36	1	33	1	1	960

Abbreviations used in Table 3.2: Pr Eng- Professional engineer, EIT- Engineer in training, Techno- Technologist, ETOIT- engineering technologist in training, Techni- technician, ETIT – technician in training, Cert Eng- certificated engineer, CEIT- Certificated engineer in training, Lifts- Certificated lift inspection technicians.

TABLE 3.3

Cancelled ECSA registrations due to emigration

(Source: ECSA, Statistics, September 2000 [46])

Type of Registration	Year	**Emigrated**	Type of Registration	Year	**Emigrated**
Professional Engineers	1 Jan - 31 Dec 1998	**46**	Engineers in Training	1 Jan - 31 Dec 1998	**17**
	1 Jan - 31 Dec 1999	**63**		1 Jan - 31 Dec 1999	**31**
	1 Jan - 31 Sep 2000	**43**		1 Jan - 31 Sep 2000	**13**
Professional Technologists	1 Jan - 31 Dec 1998	**-**	Technologists in Training	1 Jan - 31 Dec 1998	**-**
	1 Jan - 31 Dec 1999	**4**		1 Jan - 31 Dec 1999	**-**
	1 Jan - 31 Sep 2000	**3**		1 Jan - 31 Sep 2000	**-**
Engineering Technicians (Masters)	1 Jan - 31 Dec 1998	**1**	Lift Technicians	1 Jan - 31 Dec 1998	**-**
	1 Jan - 31 Dec 1999	**-**		1 Jan - 31 Dec 1999	**-**
	1 Jan - 31 Sep 2000	**1**		1 Jan - 31 Sep 2000	**1**
Engineering Technicians	1 Jan - 31 Dec 1998	**3**	Technicians in Training	1 Jan - 31 Dec 1998	**-**
	1 Jan - 31 Dec 1999	**5**		1 Jan - 31 Dec 1999	**2**
	1 Jan - 31 Sep 2000	**2**		1 Jan - 31 Sep 2000	**-**
Certificated Engineers	1 Jan - 31 Dec 1998	**-**	Certificated Engineers in Training	1 Jan - 31 Dec 1998	**-**
	1 Jan - 31 Dec 1999	**-**		1 Jan - 31 Dec 1999	**-**
	1 Jan - 31 Sep 2000	**-**		1 Jan - 31 Sep 2000	**-**
TOTAL		**171**			**64**

- The lack of growth in the number of civil engineering graduates from South African universities is of great concern, especially in the light of the aforementioned emigration figures and the fact that South Africa, as a developing country, is still in need of significant civil engineering infrastructural development in order to fulfill its economic potential. The annual number of civil engineering graduates produced by South African universities declined from more than 400 in the 1970's to approximately 300 in 1980 to approximately 180 in 1998 [129].

- In a recent survey [88] it was found that the age profile of staff of South African consulting engineering firms show South African consulting engineering to be an "ageing profession". This can largely be ascribed to a combination of the following factors:

    - The aforementioned reducing number of civil engineering graduations per year with civil engineering being the largest consulting engineering discipline category,
    - the emigration statistics for young South African professionals,
    - the attraction of young engineers to professions outside consulting engineering and outside the engineering profession,
    - the reducing profitability experienced by South African consulting engineering practices and their resultant weaker position to compete for young engineering talent and
    - the shrinking turnover of the South African consulting engineering industry, which has led to a corresponding reduction of staff levels and therefore a tendency to retain experienced staff and not employ new and younger staff members [185].

Demographics has, especially over the past 10 years, become a very significant business environmental factor for all South African business enterprises, but particularly so for technology-based professional service enterprises, such as consulting engineering practices.

3.3.4 Cultural and social trends

Cultural and social trends influence how people think and behave and therefore have major implications for the management of enterprises. These trends are of particular relevance in the management of human resources and corporate social actions as well as for strategic management decisions about products and markets [13].

The following are illustrative examples of how cultural and social trends impact on the business of consulting engineering.

- **Women in engineering.**

  In South Africa, as a male-dominated, conservative society, it was for many years unfashionable, but often also culturally unacceptable, for women to pursue careers, except in a few traditionally "feminine" careers such as teaching, nursing, social work etc. This has inter alia resulted in an extremely gender-skewed engineering profession as illustrated in Table 3.1. Although the numbers of women entering the engineering profession have increased in recent years, it is still, as a proportion of the overall intake, much smaller than in most developed western countries due to gender stereotyping and cultural factors.

- **Race profile in the engineering industry.**

A number of political, social and cultural factors resulted in the skewed racial distribution of participants in the engineering industry as illustrated in Table 3.1.

- The racially segregated and differentiated education system was one of the cornerstones of the Apartheid system [21]. The application of the Bantu education Act of 1953 restricted the access of Black people to tertiary education, but especially to technical and scientific tertiary education over a period of about 30 years. As a result the first Black engineers, such as Josua Nkosi and Ebenaezer Moahloli [112], only graduated from South African universities during the late 1970's.

- Those leaders in the (anti Apartheid) liberation movement who stayed in South Africa during the so-called struggle were, in many respects, the definitive role models for a generation of children from disadvantaged groups, especially those from poor urban communities. Many of these community leaders were either qualified in the social sciences or without tertiary education. The lack of engineers or scientists as role models therefore resulted in what can be called a cultural lack of interest in technical or scientific careers among Black children, even once tertiary studies for such careers became accessible to all students. This factor was

even more prevalent in rural Black communities where role models were often either uneducated or from a social sciences background (e.g. religion, education and law) [112].

- The perceived lack of status of such so-called invisible careers, of which very little is often known or understood in many Black communities, still hold very little attraction for children from such previously disadvantaged groups [112].

- The teachers in previously disadvantaged communities have a great influence on their pupils' choice of school subjects. These teachers, who often themselves have no knowledge of or appreciation for technical careers due to their own background, education and qualifications naturally guide pupils towards subjects (and as a result towards careers) with which they (the teachers) are familiar. Recent statistics [110] show that there is still only a very limited number (less than 3200 per year) of Black children who matriculate with high grade science and maths amongst their subjects. This will continue to frustrate attempts to rectify the racially skewed distribution of participants in the engineering industry for many years to come.

Several very ambitious vocational guidance and educational assistance initiatives exist and are largely funded and run by the private sector, aid agencies, foreign donors and NGO's. A number of

universities have instituted educational programmes that are specifically aimed at bridging the gap between a technologically deficient secondary education and a technological tertiary education. Scholars and students from previously disadvantaged communities have in the past showed a bias against scientific and technological subjects and careers in the choices they make and one would hope that these initiatives, as well as Government's current science and technology education initiative [110], would in future reverse this trend. Failure to attract scholars and students from previously disadvantaged backgrounds to technological and scientific subjects and careers will make the vision of a normalised and representative industry [111], as well as the expected contribution from previously disadvantaged communities to the growth of the shrinking technological knowledge/ skilled manpower pool, no more than a dream for many years to come.

- **Social and environmental consciousness.**

Increasing sensitivity towards the impact of man's activities on the ecological and social environments has, especially over the past decade, greatly influenced the business of consulting engineering.

This influence as reflected in the term "sustainable development" will increasingly play a role in consulting engineering, for example by becoming the most important factor in determining project acceptability [89]. The sustainability criteria, which is increasingly

being applied in many developed countries, will in future require proposed projects to satisfy not only minimum technical and economic feasibility criteria, but also minimum environmental and social criteria, before projects will be allowed to proceed or even to qualify for commercial, state or agency project finance [50].

This approach to project development will increasingly require consulting engineers to [50]:

- Be sensitive towards, but also skilled in dealing with environmental and social issues and stakeholders;
- work in a multi-professional integrated team environment and
- amend their personal and professional codes of conduct/ ethics to make provision for sustainability issues.

Examples of the influence that the application of sustainability principles may have on South African consulting engineering practices are:

- Practices will have to increase the efficiency and effectiveness of their networking with other professionals.
- Larger practices will increasingly become multi-professional.
- Increasing involvement in project lifecycle phases other than the traditional design and implementation phases (e.g. the conceptual, management and rehabilitation phases) of projects.

- Pro-active practices will develop a sustainability engineering service, as this is already a growing discipline in the USA, Scandinavia and Western Europe [89].

3.3.5 The economy

National economies have always been interdependent, but technological advances and the driving force of globalisation are resulting in an increasingly integrated global economy [67]. As a developing country with an emerging economy, South Africa has, particularly in the past five years, seen how vulnerable its economy is to international investor perceptions and speculators. The South African market's reaction to various recent emerging markets crises as well as to the recent events in neighbouring Zimbabwe [20] illustrated how events outside one's own country can impact on the local economy. These events caused inter alia interest rate fluctuations and the devaluation of the local currency, which in turn influenced the short to medium term national economic growth prospects of the South African economy.

The economic environment dramatically affects the ability of any business to function effectively and will always influence a firm's strategic choices. Economic conditions furthermore change over time and are difficult to predict. Interest and inflation rates largely determine the availability and cost of capital, the ability to expand and operating costs. The current state and growth prospects of the national economy largely determines the propensity

towards fixed capital formation by both the public and the private sectors and, as such, are major determinants of the demand for consulting engineering services.

3.3.6 The international environment

The globalisation concept will currently dominate any discussion on the international environment as an external business environmental influence on the strategic management of any enterprise. The following statement by John Kotter [90] summarises the current state and influence of globalisation in the business world.

"*We have been in a new economic era for a decade or two, in which the central driving force is the globalisation of markets and competition, and there is no evidence that this era is going to end any time soon. In other words, this is just the beginning of something that could go on for another two, three, four, five, or even six decades.*

Globalisation is nowhere near finished. There may be a billion people who are currently integrated in the global economic system, but that still leaves another 4,7 billion that aren't. And more are coming in literally every day. So this isn't going to play itself out any time in the near future.

The main impact of globalisation is that it's creating both more hazards and more opportunities for everybody. Hazards in terms of a more volatile environment and more competition. And opportunities in terms of more markets and bigger markets. What all of that is doing is speeding up everything and producing more change".

South Africa, due to years of international economic sanctions prior to 1994, has been a relative latecomer to this globalisation of markets and competition. South African business enterprises are currently having varying degrees of success in coming to terms with the threats and capitalising on the opportunities resulting from globalisation.

The following are examples of the impacts of globalisation on South African consulting engineering enterprises:

- Multi-national consulting engineering and other enterprises have purchased varying levels of equity in a number of established South African consulting engineering firms, e.g. HKS, Bergman, African consulting engineers, Ninham Shand, Africon, Stewart Scott, SENA, etc. This has resulted in an influx of foreign capital into an industry, which was traditionally known for its relatively low capitalisation requirements. The new capital and ready access to international technological developments resulted in a number of mergers and acquisitions and increased levels of technological and price competition in a depressed local market.

- The political acceptance of South Africa by the international community has opened up opportunities for South African consulting engineers to export their services. A recent survey [185] has shown that more than 12 % of the total turnover of South African consulting engineers currently originates from outside South Africa. This figure has been showing a steady growth over the past two years, but should be

regarded as a conservative figure as several South African firms work outside the country through foreign-registered business entities. The turnovers of such entities were probably not included in the responses to the survey of South African firms.

- Foreign competitors are often subsidised by their governments when competing against South African firms in the local, wider African and wider international markets. Such subsidies are mostly in the form of tied aid packages or direct government incentives for exporters of services. Comparable incentives and subsidies are not available to South African firms.

- Foreign competitors from countries such as India, China and Pakistan has much lower salary costs than South African firms and can therefore offer comparable technology at very competitive prices.

The international environment, and in particular the impact of globalisation, will continue to be a major external environmental factor in the strategic management of South African consulting engineering firms for the foreseeable future. The ability of South African firms to adapt their strategic choices to the ever changing international environment may be one of the most critical factors in determining their ability to achieve sustainable profitability and future growth.

3.4 Conclusion and recommendations

Awareness, interpretation and anticipation of changes in the external environment are central in the concept of strategic management. This chapter dealt mainly with the macro-environment, which is the most general elements in the external environment that potentially influence strategic decisions. The macro-environment represents environmental factors that are outside an individual company or even an industry's sphere of control. Macro-environmental factors must however be considered by managers in individual companies before they commit themselves to strategic decisions. Failure to take cognisance of changes in the macro-environment before finalising strategic decisions and taking action can have disastrous consequences for any enterprise.

The transitional nature of all aspects of South African society has resulted in an abnormally high incidence of change factors, which are "outside an individual company or even an industry's sphere of control". The macro business environment are therefore more important to South African firms than it is to most of their competitors and counterparts in developed countries.

In the next chapter the task and industry environments as further aspects of the external environment of South African consulting engineering firms will be discussed to illustrate how changes in these environments can influence the strategic management of such firms. The industry environment of an individual firm is composed of the firm itself and the organisations that

compete directly with it. The task environment includes not only competitors, but also clients, suppliers, regulating authorities and other organisations with which the firm interacts directly.