ENHANCING COMPETITIVENESS IN THE SOUTH AFRICAN MANUFACTURING INDUSTRY THROUGH HUMAN DEVELOPMENT FOCUS AREAS

A RESEARCH REPORT

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by

K Pattison

(Student number: 70505640)

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Abstract

The South African manufacturing industry faces the dilemma of having to identify policies which will improve SA's competitiveness as well as levels of labour absorption. The research attempts to identify the human development focus areas required to develop a national framework for improved competitiveness in the South African manufacturing industry. Quantitative data analysis compared SA's levels of competitiveness and human development to 72 developing and developed countries. Qualitative personal interviews were conducted in the automotive, chemical and metal and steel industries to answer the research objectives. Research findings include that developed and developing countries respectively had average HDI scores of 0.9118 and 0.7783 compared to SA's 0.658. Human and knowledge resources such as quality of mathematics and science education, availability of scientists and engineers, quality of public schools were examples of factor conditions which created competitive disadvantages for SA. The lack of engineers, artisans as well as IP in all three industries, were found to be limiting factor conditions. Labour legislation is affected by the chosen industrial policy; SA has to focus on flexible labour policies. HIV/AIDS negatively impacts on human development; policies need to address both awareness and changing attitudes towards the pandemic. A framework for enhancing competitiveness was developed by linking the stages of competitiveness to human development and related factor conditions, as well as depicting the impact of strategy, structure and rivalry. This study creates awareness of the link between competitiveness and human development as well as the important role of the South African manufacturing industry.

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Kenneth Pattison

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Statement own work

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I certify that the report is my own work and all references used are accurately reported.

Kenneth Pattison

Signed

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Acronyms, abbreviations and definitions

Automotive industry: Includes motor vehicle manufacturers as well as motor vehicle parts and accessories.

A sub-Saharan African country: is any country in Africa that falls south of the Sahara desert excluding South Africa

Chemical industry: Liquid Fuels, basic organic chemical, basic polymers and rubbers, basic inorganic, fine chemicals, pharmaceuticals, bulk formulated, consumer formulated, plastics and Rubber.

Developing countries: Countries that often have abundant natural resources but lack the capital and entrepreneurial and technical skills required to develop them. The average income per head and the standard of living in these countries is therefore far below that of the industrial nations (Oxford Reference online, 2006)

Group of eight countries (G8): Canada, France, Germany, Italy, Japan, the United Kingdom of Great Britain and Northern Ireland, the United States of America (USA), and Russian Federation, the Russian Federation is however not a developed country.

Metal & Steel industry: Basic iron & steel, ferrous & non-ferrous metal products

Acronym	Description
AIDC	Automotive Industry Development Centre
AMTS	Advanced Manufacturing-Technology Strategy
BER	Bureau for Economic Research
CHIETA	Chemical Industry Education and Training Authority
CI	Competitive Intelligence
DEA	Data Envelopment Analysis
DTI	Department of Trade and Industry
EIA	Energy Information Administration
EIU	Economist Intelligence Unit
FDI	Foreign Direct Investment
FET	Future Education and Training
Gautrain	Gautrain Rapid Rail Link
GCI	Global Competitiveness Index
GCR	Global Competitiveness Report

GDP	Gross Domestic Product
GDP / Capita	Gross Domestic Product per Capita
GNP	Gross National Product
G8	Group of eight countries
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
IISI	International Iron and Steel Institute
IP	Intellectual Property
JSE	JSE Securities Exchange
LRA	Labour Relations Act
MERSETA	Manufacturing Engineering and Related Services Sector Education and Training Authority
MIDP	Motor Industry Development Programme
MNC's	Multi National Corporations
NAAMSA	National Association of Automobile Manufacturers of South Africa
NEDLAC	National Economic Development and Labour Council
NQF	National Qualifications Framework
Porter's Diamond	Michael Porter's Model of National Competitiveness
R&D	Research and Development
SAISC	Southern African Institute of Steel Construction
SAISI	South African Iron and Steel Institute
SA	South Africa
SETA	Sector Education and Training Authority
TEIs	Tertiary Education Institutions
$	United States Dollar
UNDP	United Nations Development Programme
USA	United States of America
WEF	World Economic Forum

1 ORIENTATION

1.1 Chapter Introduction

This chapter highlights the three interest groups who will benefit from the research as well as the contextual setting of human development and competitiveness as measured at national level as well as industry level. The chapter describes the management dilemma and the resulting research question as well as the research objectives. The chosen research objectives are influenced by certain expected limitations as well as possible constraints.

1.2 Audience

The research report will be of interest to three groups of readers:

I. Academics, scholars or students who are interested in, or wish to conduct research on, national competitiveness, factor conditions with particular emphasis on human development focus areas in South Africa's manufacturing industry,
II. Companies in the manufacturing industry, who are considering doing research to help improve industry competitiveness, by focusing on human development,
III. Managers in the manufacturing industry, who wish to understand human development, focus area that will lead to improved levels of industry competitiveness.

1.3 Contextual Setting

South Africa (SA) has the most advanced economy on the African continent, and is seen as the gateway to sub-Saharan Africa (MBendi Information Services, 2005). As the most advanced economy SA's national competitiveness is of vital importance to the African continent. SA's competitiveness is influenced by the ability to attract Foreign Direct Investment (FDI), being able to compete in the global market as well as the general levels of human development. To assist with the identification of focus areas for improved competitiveness, an analysis of current trends in competitiveness and human development in SA is required.

1.3.1 Human Development

The literature review provides a detailed overview of human development. In this section human development as measured by the Human Development Index (HDI) is reviewed. The HDI consists of three basic dimensions and a composite of four statistics, namely:

I. Life expectancy at birth;
II. Adult literacy rate;
III. Combined school enrollment ratio; and
IV. Gross Domestic Product per capita (GDP / Capita) in Purchasing Power Parity (PPP) terms (Cahill, 2005).

SA's HDI statistics is as follows:

I. Life expectancy at birth:	48,4 years
II. Adult literacy rate:	82 %
III. Combined school enrollment ratio:	78%
IV. GDP / Capita in PPP terms:	$10,346

(United Nations Development Programme, 2005)

The above statistics places SA in the 120th position out of 177 countries, with only life expectancy being significantly below the average of other developing and developed countries. The average South African has a life expectancy of 48 years of age compared to the top 50 countries in the world, that all have a life expectancy of above 70 years of age (United Nations Development Programme, 2005). The commitment to health resources and services is improving through out the world and accordingly the life expectancy is increasing as well as the retirement age. The increasing life expectancy is causing populations to increase. The United States is expected to increase their population by more than 100 million people between 1975 and 2015. India is expected to double their population between 1975 and 2015 (United Nations Development Programme, 2005). In light of the above the rest of world faces the prospect of larger populations due to increased life expectancy and improved quality of health care, compared to countries such as SA who face the prospect of a declining population.

SA's population is expected to increase from 25,9 million in 1975 to 46,9 million in 2015, however the population in 2003 was 47,9 million (United Nations Development

Programme, 2005). The HDI indicates that SA's population is expected to decrease by 1 million between 2003 and 2015. SA faces the challenge of remaining competitive with an HDI which was the same in 2003 as it was in 1975 (United Nations Development Programme, 2005). In 1975, SA's HDI was measured at 0.655 compared to 0.658 in 2003 (United Nations Development Programme, 2005). **Table 1.1** below compares SA's life expectancy in years, adult literacy rate, gross enrolment as well as GDP / Capita to other developing countries with an income of between $3,000 and $9,000. SA's HDI ranking is adversely affected by the low life expectancy.

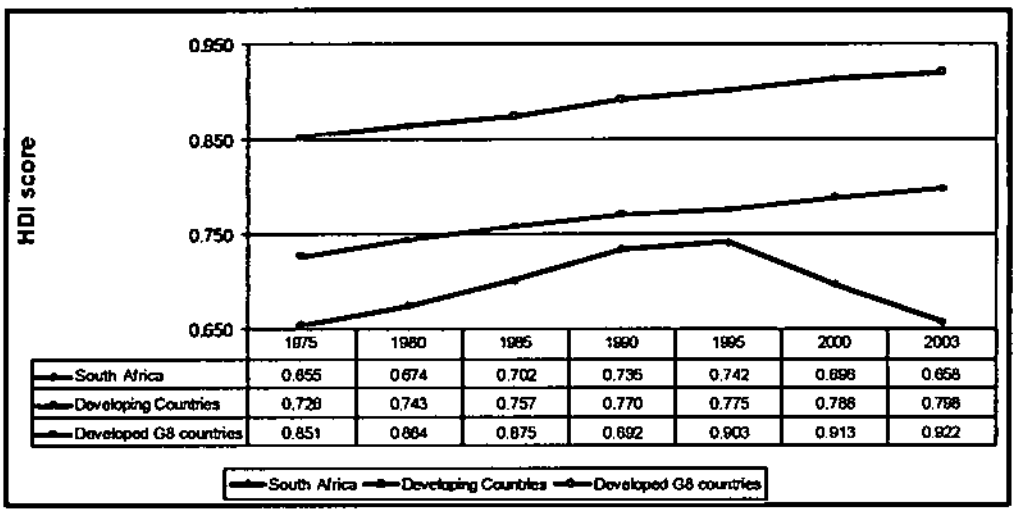
Table 1.1: HDI of SA vs. Developing & G8 Countries (2005)

Human Devlopment Index	Life expectancy at birth(Years)	Adult literacy rate %	Combined gross enrolement for primary, secondary and tertiary schools %	GDP per Capita US$
South Africa	48.4	82.4	78.0	10,346.0
Developing countries	70.3	93.5	80.0	9,358.9
Group of eight countries	77.7	99.0	94.0	26,891.9

Source: United Nations Development Programme, 2005

Figure 1.1 below shows how SA's HDI score decreased between 1995 and 2003, compared to a gradual increase by most developing and developed countries between 1975 and 2003.

Figure 1.1: HDI of SA, Developing & G8 Countries (1975-2003)



Source: United Nations Development Programme, 2005

The above HDI information confirms that developed countries have a higher HDI than developing countries, which raises the question regarding the correlation between per capita income and human development levels.

Table 1.2: SA's HDI vs. Developing Countries (similar GDP/ Capita 2005)

Countries	HDI	Life expectancy at birth	Adult literacy rate	Combined gross enrolement for primary, secondary and tertiary schools	GDP per Capita	HDI Ranking
Chile	0.854	77.9	95.7%	81%	10,274.00	37
Costa Rica	0.838	78.2	95.8%	68%	9,606.00	47
Croatia	0.841	75.0	98.1%	75%	11,080.00	45
Latvia	0.836	71.6	99.7%	90%	10,270.00	48
Mexico	0.814	75.1	90.3%	75%	9,168.00	53
South Africa	0.658	48.4	82.4%	78%	10,346.00	120

Source: United Nations Development Programme, 2005

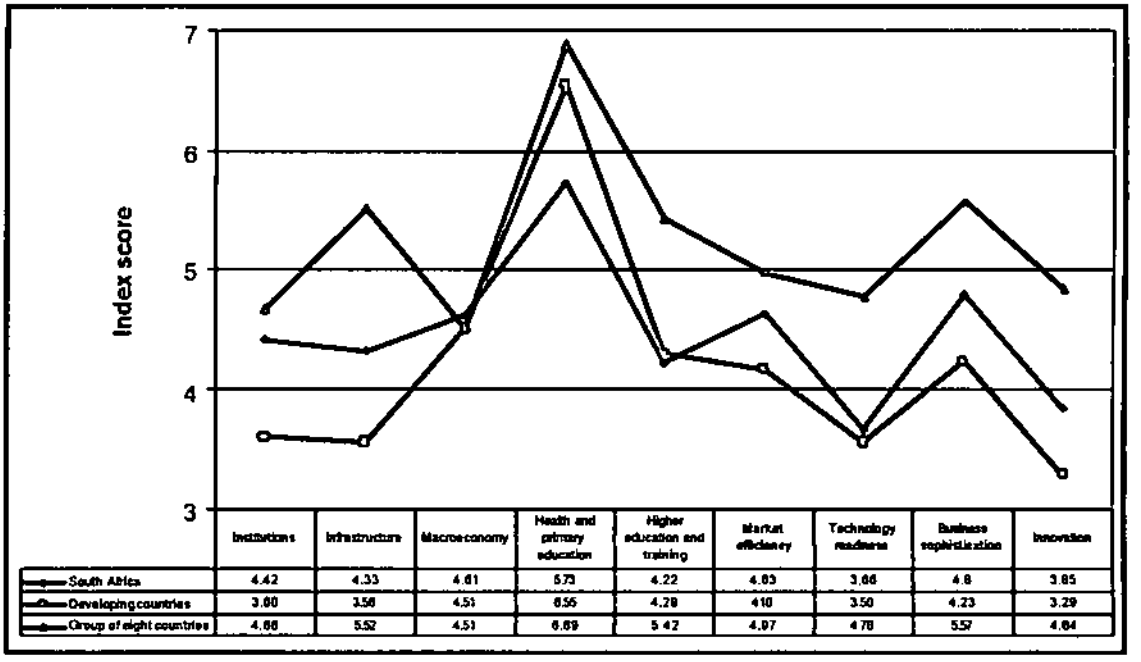
Table 1.2 above provides evidence that countries with similar GDP / Capita have similar levels of levels of human development. In the case of SA there is however a growing gap between the HDI ranking and the per capita income ranking , the gap has growth from -10 in 1994 to -64 in 2001 (United Nations Development Programme, 2003).

1.3.2 Competitiveness

SA has an estimated 45,2 million people (24th most populated country in the world), with an estimated Gross Domestic Product (GDP) of $212, 9 billion (27th in the world) and a GDP / Capita of $10,603 (48th in the world) (World Economic Forum, 2005). According to the Global Competitiveness Report (GCR) for 2005-2006, SA obtained the 40th position on the Global Competitiveness Index (GCI) out of 117 countries, during 2005 (World Economic Forum, 2005).

Figure 1.2 below compares SA's, GCI for 2005 to the average CGI of developing as well as developed Group of eight countries (G8 countries). The graph indicates that only health and primary education lags behind the average of other developing countries. SA however lags behind all nine categories of developed G8 countries. The most relevant categories of competitiveness which are dependent on human development, include, health and primary education, higher education and training, technology readiness and innovation.

Figure 1.2: CGI of SA vs. Developing & G8 Countries (2005)



	Institutions	Infrastructure	Macroeconomy	Health and primary education	Higher education and training	Market efficiency	Technology readiness	Business sophistication	Innovation
South Africa	4.42	4.33	4.61	5.73	4.22	4.63	3.66	4.8	3.85
Developing countries	3.80	3.58	4.51	6.55	4.28	4.10	3.50	4.23	3.29
Group of eight countries	4.66	5.52	4.51	6.69	5.42	4.97	4.78	5.57	4.64

Source: World Economic Forum, 2005

The competitiveness of the African continent compares poorly to the rest of the world. Only SA (40th), Botswana (72nd), and Mauritius (55th) are considered relatively competitive. Zimbabwe has descended rapidly down the rankings, moving from 99th

to 110th between 2004 and 2005, having the world's worst ranking (117th) for the quality of the macro environment (World Economic Forum, 2005). Sub-Saharan Africa as a region has a population of 689 million people, but the region exports less than Belgium, a country with a population of 10 million people (United Nations Development Programme, 2005). The fact that the entire sub-Saharan region exports less than Belgium is cause for great concern in terms of the competitiveness of the region.

President Thabo Mbeki's vision for Africa was stated in September 1998 at the Africa Renaissance Conference as: "Our vision of an African renaissance must have as one of its central aims the provision of a better life for these masses of people whom we say must enjoy and exercise the right to determine their future. That renaissance must therefore address the critical question of sustainable development which impacts positively on the standard of living and the quality of life of the masses of our people" (Jackson, 2004: 51). President Mbeki's vision for Africa which includes a better live for the masses of people is in line with Amartya Sen's definition of human development (Hill, 2003). Sen's definition of human development focuses on the expansion of human capabilities as well as living a long and healthy life (Hill, 2003).

The above review of human development and competitiveness as measured by the HDI and GCI provides an overview of how SA as a nation compares to other countries. However this research document focuses on the manufacturing industry specifically. Competitiveness and human development are defined mostly at national level and not at industry level. The section below provides an overview of the manufacturing industry as well as the three sub sectors which were chosen for the research.

1.3.3 The Manufacturing Industry

The section that follows provides reasons for the choice of the manufacturing industry in general as well as the automotive, chemical and metal and steel sub sectors specifically. **Table 1.3** below provides and overview of the per Industry GDP contribution as measured during the fourth quarters between 2000 and 2005.

Table 1.3: GDP per Industry (4th Quarter: 2000-2005)

Industry	Q4 2000	Q4 2001	Q4 2002	Q4 2003	Q4 2004	Q4 2005
Argiculture, forestry and fishing	4.0%	3.8%	4.0%	3.5%	2.6%	2.6%
Mining and quarrying	5.4%	5.2%	5.0%	5.1%	6.7%	6.3%
Manufacturing	18.2%	18.4%	18.6%	18.1%	16.4%	16.4%
Electricity, gas and water	3.3%	3.1%	3.2%	3.3%	2.1%	2.1%
Construction	2.6%	2.8%	2.8%	2.9%	2.5%	2.8%
Wholesale and retail trade, hotels and restaurants	12.8%	12.6%	12.4%	12.6%	13.9%	13.8%
Transport, storage and communication	10.2%	10.0%	10.7%	11.3%	9.9%	9.9%
Finance, real estate and business services	17.4%	18.0%	17.9%	18.0%	18.5%	19.5%
General government services	12.9%	12.6%	12.3%	12.1%	12.9%	12.4%
Personal services	2.3%	2.4%	2.4%	2.5%	5.6%	5.2%
Other Products	2.5%	2.5%	2.4%	2.4%		
Total Value Added	91.6%	91.4%	91.7%	91.8%	91.1%	91.0%
Taxes less subsidies products	8.5%	8.6%	8.4%	8.4%	8.8%	8.9%
GDP at Market prices	100%	100%	100%	100%	100%	100%

Source: Statistics South Africa, 2005

The contribution per industry as shown in **Table 1.3** above indicates that Finance, Real estate and Business services had a 19,5% share of the GDP (at market price) in 2005. Manufacturing had a 16,4% and the Wholesale, Retail trade, Hotel and Restaurants Industry with a combined 13,8% share (Statistics South Africa, 2005). Although Finance, Real estate and Business services industry is the largest industry, the industry supports other South African industries and is mostly dependent on growth of the various other industries. The manufacturing industry is the second largest contributor to the GDP of SA, and deserves further consideration. John Chiahemen, the Bureau Chief of Reuters SA, said recently that "Manufacturing is key to taking pressure off social problems, due to the industry's capacity for job creation" (World Economic Forum, 2005: no page). Not only should the contribution of industries to GDP be used to determine the value of each industry but also the levels of employment per industry.

Employment figures per industry as shown in **Table 1.4** below shows how employment figures in SA have changed between September 2001 and September

2005. Trade employed 24.58%, with trade including both wholesales and retail trade; services employed 17.82% followed by manufacturing which employed 13.87% of workers. Construction, trade and finance grew by more than 20% between 2001 and 2005, with manufacturing only growing by 5,3% in the same period (Statistics South Africa, 2005).

Table 1.4: Employment Figures per Industry (2001-2005)

Industry	01-Sep '000	02-Sep '000	03-Sep '000	04-Sep '000	05-Sep '000	% Change	Share of employment :Sep 2005
Agriculture	1,178	1,420	1,212	1,063	925	-21.50%	7.52%
Mining	554	559	552	405	411	-25.80%	3.34%
Manufacturing	1,620	1,633	1,550	1,714	1,706	5.30%	13.87%
Utilities	94	84	91	99	100	6.40%	0.81%
Construction	634	605	664	824	935	47.50%	7.60%
Trade	2,454	2,194	2,429	2,542	3,024	23.20%	24.58%
Transport	546	574	537	563	616	12.80%	5.01%
Finance	1,035	1,084	1,098	1,147	1,296	25.20%	10.54%
Services	1,989	2,043	2,180	2,185	2,192	10.20%	17.82%
Private households	1,034	1,029	1,075	1,075	1,067	3.20%	8.67%
Unspecific	42	72	34	26	29	-31.00%	0.24%
Total	**11,180**	**11,297**	**11,422**	**11,643**	**12,301**	**10.00%**	**100.00%**

Source: Statistics South Africa, 2005

Further to the manufacturing industry's contribution to the GDP as well as the levels of employment, the level of sales of manufactured products per sub sector was used to determine the top three sub sectors. An analysis of **Table 1.5** below, which lists the sales of manufactured products per manufacturing sub industry during 2005, indicates the top four sub industries as:

I. Metal and Steel industry: 20,32%
II. Petroleum, chemical products, rubber and plastic products: 20,08%
III. Food and beverages: 18.12%
IV. Automotive industry: 16,28%

Table 1.5: Manufacturing Industry: Sales of Manufactured Products (2005)

Manufacturing: Sub Industries	% Contribution of Total production, survey average 2001-2006	Sales of Manufactured products(R'000) 2005	% Contribution of Total 2005 Sales
Food and beverages	16.40%	153,498,313	18.12%
Textiles, clothing, leather and footwear	5.40%	38,738,665	4.57%
Wood, paper, publish and printing	11.00%	76,805,213	9.07%
Petroleum, chemical products, rubber and plastic products	22.50%	170,118,397	20.08%
Glass and non-metallic mineral products	3.90%	25,708,507	3.04%
Basic iron and steel, non-ferrous metal products, metal products and machinery	22.40%	172,109,761	20.32%
Electrical machinery	2.70%	20,183,146	2.38%
Radio, television and communication apparatus and professional equipment	1.30%	11,542,033	1.36%
Motor vehicles, parts and accessories and other transport equipment	8.60%	137,870,382	16.28%
Furniture and other manufacturing division	5.80%	40,430,591	4.77%
Total	100.00%	847,005,008	100.00%

Source: Statistics South Africa, 2006

The sales figures in **Table 1.5** justify the decision to analyse human development focus areas in the automotive, chemical and metal and steel industries of SA, with a combined contribution of almost 56,68% towards the total sales of South African manufactured goods. The need for human development in the automotive, chemical and metal and steel industries of SA is measured from a factor condition perspective, according to Michael Porter's Model of National Competitiveness (Porter's Diamond).

The above contextual setting provides insight into Altman's comment that the economy of SA is faced with a difficult set of contradictions, being a middle-income

country with a large labour surplus, with a human development profile that closely resembles a low-income country. Altman argues further that SA faces the challenge of having to identify policies that balance the trade off between putting SA on a development path and introducing higher levels of labour absorption. The comments by Altman confirm that SA faces the dilemma of improving competitiveness as well as following a development path that is conducive to labour absorption (Altman, 2006).

1.4 Statement of Management Dilemma

SA faces the challenge of having to improve levels of national competitiveness as well as levels of human development. Improved competitiveness is often achieved by introducing new technologies or production processes, which are capital intensive, but less labour intensive. The challenge is to identify policies that balance the trade off between putting SA on a development path with the need to promote higher labour absorption.

Background to the Management Dilemma

The challenge for the manufacturing industry is to balance the need to automate and introduce new technology into the manufacturing processes with the need to create more employment and higher labour absorption. Efficiency is most often achieved by capital intensive ways. Capital intensive attempts to improve competitiveness are often at the expense of labour. As long as capital absorption receives more consideration than labour absorption one could argue that the need to improved human development might also remain low on the "competitiveness agenda".

Consequences

According to Altman (2006) SA is a middle-income country with a large labour surplus, but with a level of human development which closely resembles low-income countries.

Management Question

How can the competitiveness of the South African manufacturing industry be improved by focusing on human development focus areas?

1.5 Research Question

What human development dynamics would underpin the development of a "National framework for improved competitiveness in the South African manufacturing industry"?

1.6 Research Objectives

Research objective one: Benchmarking SA's HDI and GCI compared to other developed and developing countries.

Research objective two: Establish the relevance of Factor conditions (part of Porter's Diamond) such as human resources and knowledge resources in determining the competitiveness of SA.

Research objective three: Establish the most important factor conditions in the automotive, chemical and metal and steel industries, with specific reference to human and knowledge resources.

Research objective four: Establish how South Africa's labour legislation affects the collective human development focus areas in the automotive, chemical and metal and steel industries.

Research objective five: Establish how HIV/AIDS impacts on the collective human development in the manufacturing industry.

Research objective six: Establish a human development and National competitiveness framework for SA's manufacturing industry.

The source of the research objective, the source of the data as well as the method of analysis is summarised in **Appendix A: Consistency Matrix**.

1.7 Delimitation of the Study

The study was limited to manufacturing industry of SA, and only focused on the automotive, chemical and metal and steel industries. The sample size included 30 companies. The chosen companies are medium to large size companies, and are

listed as well as privately owned companies. Due to the fact that the automotive and chemical industries are dominated by many foreign companies, many of the companies are not listed on the JSE Securities Exchange (JSE). The 30 chosen companies were chosen based on their geographic location within the Gauteng Province, within a 150km radius from Midrand (the researcher's place of residence). Geographic location was an important consideration for the researcher who had to conduct personal interviews. The attached **Appendix D** provides information such as the name of the company, the industry, the physical address as well as contact details.

1.8 Importance of the Study

The importance of the study should be considered with the audience of stakeholders in mind and is as follows:

I. This study provides South African managers in the manufacturing industry with a framework of human development focus areas which will be required to improve the competitiveness of the industry;
II. The research findings of the study will provide academics with insight into future empirical research requirements with regards to human development focus areas;
III. The study will provide South African manufacturing companies with insight regarding development needs as well as highlighting training needs; and
IV. The study will lead to higher levels of human development awareness and improved well-being of the population.

1.9 Possible Constraints to the Research

The potential does exist that representatives from the automotive, chemical and metal and steel industries have not focused their strategic views towards the enhancement of competitiveness by way of focusing on collective factor conditions, and more specifically human development focus areas. This constraint could lead to the fact that the intended outcome of the research is biased by the preconceived, human development focus areas as identified by the researcher.

The main theoretical model used in this study is known as Porter's Diamond, with specific reference to factor conditions which is one of the four determinants of the

diamond. Porter's Diamond is criticized, by authors such as O'Donnell who question the effectiveness of the model in small open economies (Clancy, O'Malley, O'Connell & Egeraat, 2001). Porter's Diamond is also criticized based on the fact that Multi National Corporations (MNC's) are excluded from the model as well as cross border co-operation, and the study is limited by such exclusions. The use of the HDI is limited by the fact that index excludes social, cultural and political dimensions (Waheeduzzaman, 2002). The study is further limited by the exclusion of cultural and political dimensions; social dimensions will however be included, by way of the inclusion of the impact of Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome (HIV/AIDS) on human development and competitiveness.

1.10 Key Assumptions

The research is based on the following assumptions:

I. The HDI is accepted as a global benchmark to measure a country's level of human development;
II. The GCI is accepted as a global benchmark to measure a country's level of competitiveness;
III. The manufacturing industry of SA is one of the main industries which can drive the national competitiveness of the country;
IV. The automotive, chemical and metal and steel industries are seen as the most important manufacturing sub industries in terms of driving the competitiveness of the manufacturing industry; and
V. That company representatives would be willing to agree to personal interviews to gain a deeper understanding into the main human development focus areas in their respective industries.

2 THEORETICAL FOUNDATION

2.1 Introduction

The theories which make up the body of knowledge of the research are discussed in this chapter. A brief overview of some of the main indexes and theories which are included in the literature review is provided in this chapter. The resulting inferential statistical testing of hypothesis which relate to the first research objective is also included in this chapter.

2.2 Scope of the Body of Knowledge

The body of knowledge which is relevant to this study includes some of the following main elements, namely:

I. Human development theories.
II. Competitiveness related theories
III. Porter's Diamond with specific reference to factor conditions

One of the theories used to define human development includes Amartya Sen's argument that development should be assessed less by material output measures such as Gross National Product per capita (GNP / Capita) and more by capabilities and opportunities that people enjoy (Hill, 2003). The theory and measurement of the HDI is also included under the theory overview.

The GCR which reports on the nine pillars of the GCI is explained with particular reference to SA, as well as highlighting the impact on human development levels (World Economic Forum, 2005).

Porter's Diamond deals with the four determinants that contribute towards the joint constitute of a firm's global competitiveness in a given industry, with particular emphasis on factor conditions (Sledge, 2005).

2.3 Theories and Models

The main theories included in this study are:

I. The HDI as developed by UNDP, which measures the overall achievement of a country in three basic dimensions of human development, namely longevity, knowledge and decent standard of living. This index is used to measure how SA's level of human development compares to other developed and developing countries (Waheeduzzaman, 2003).

II. The GCI as developed by the WEF, measures competitiveness of most countries in the world using nine pillars of measurement, namely: Institutions, Infrastructure, Macro economy, Health and primary education, Higher education and training, Market efficiency, Technological readiness, Business sophistication and Innovation (World Economic Forum, 2005).

III. Porter's Diamond consists of four determinants, namely:

   a. **Demand conditions**: The level of domestic demand for a firms products and services, which depends both on the quantity of demand as well as the sophistication level of consumers in a home market;
   b. **Factor conditions**: Consists of five categories: human resources, physical resources, knowledge resources, capital resources and infrastructure;
   c. **Related and supporting industries**: This element includes the importance of enterprises that indirectly or directly affect a given industry, and is described as related and supporting industries;
   d. **Firm strategy, structure and rivalry**: Refers to many key strategic factors that characterize a firm.

The above four determinants or forces of Porter's Diamond jointly constitute a firm's global competitiveness in a given industry, with particular emphasis on factor conditions and how they contribute towards improved levels of human development (Sledge, 2005).

IV. Numerous related models and theories which relate to human development and competitiveness are includes in the literature review.

2.4 Proposition and Hypothesis Statements

Proposition Statement

There is a difference between SA's HDI and GCI compared to other developed and developing countries.

Hypothesis Statement 1

Nul (Ho): SA's HDI compares well to other developing countries.

Alternative (Ha): SA's HDI does not compare well to other developing countries.

Hypothesis Statement 2

Ho: SA's HDI does not compare well to other developed countries.

Ha: SA's HDI does not compare well to other developed countries.

Hypothesis Statement 3

Ho: SA's GCI does not compare well to other developing countries.

Ha: SA's GCI does compare well to other developing countries.

Hypothesis Statement 4

Ho: SA's GCI does compare well to other developed countries.

Ha: SA's GCI does not compare well to other developed countries.

2.5 Conclusion

The chapter highlighted the fact that theories related to human development, competitiveness and Porter's Diamond are included in the research as also indexes such as the HDI and GCI. The four hypotheses are related to human development and competitiveness for developing and developed countries. The literature review in chapter three below provides a brief introduction to the manufacturing industry, which is followed by an overview of the three chosen sub industries. The overview of the manufacturing industry is followed by a literature review of accredited academic journals which define development and competitiveness. The section is concluded by a review of industry related publications which focus on factor conditions within the manufacturing industry as well as industrial policies.

3 LITERATURE REVIEW

3.1 Introduction

The literature review consists of three parts, namely:

I. A brief introduction to the manufacturing industry followed by an overview of the three sub industries specifically. The section is concluded by an overview of how HIV/AIDS and labour legislation impacts on the manufacturing industry in general.
II. Literature review of accredited academic journals and other related information with regards to models and definitions which define human development and competitiveness.
III. A review of industry related publications which focus on factor conditions within the manufacturing industry as well as industrial policies.

3.2 Review of the Manufacturing Industry

An overview of the manufacturing industry's contribution to the GDP of SA, as well as an overview of contribution of the various sub industries towards the overall performance of the manufacturing industry follows below.

3.2.1 Manufacturing Industry

During the first quarter of 2006, the manufacturing industry's share of the seasonally adjusted real value added GDP was 16,4%, the second largest industry behind the finance, real estate and business services which had a 19,5% share (Statistics South Africa, 2006).

The top five sub industries in the manufacturing industry were:

1. Petroleum, chemical products, rubber and plastic products. 22,5%
2. Basic iron & steel, non-ferrous, metal products & machinery. 22,4%
3. Food and Beverages. 16,4%
4. Wood, paper, publish and printing. 11,0%
5. Motor vehicles, parts & accessories & other transport equipment 8,6%

The automotive, chemical and metal and steel sub industries were chosen based on their respective contribution towards the sales of manufactured products during 2005 (Statistics South Africa, 2006).

3.2.2 Automotive Industry

The automotive industry is one of SA's most important industries, many major MNC's source components from SA as well as using SA as an assembly location for local and international markets (International Marketing Council of South Africa, 2003). Vehicle production is the second largest industry in manufacturing industry, with vehicle exports accounting for almost 7% of the country's exports. The automotive industry, including manufacturing, distributing and servicing of vehicles and components contributes about 7% towards the GDP of SA (International Marketing Council of South Africa, 2004).

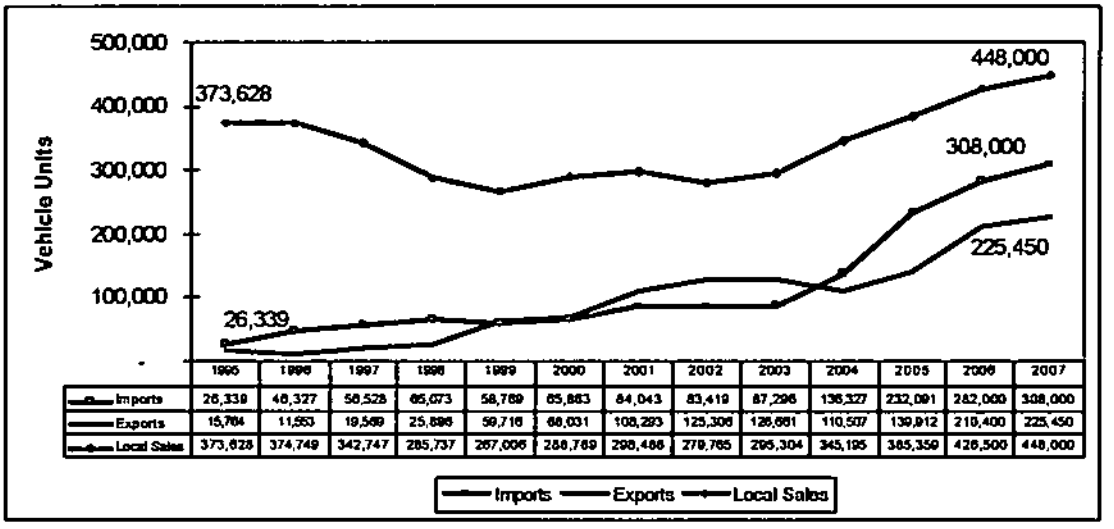
3.2.2.1 Market and Demand Trends

Vehicle manufacturers such as BMW, Ford, Volkswagen, Daimler-Chrysler and Toyota have production plants in SA, while component manufactures such as Arvin Exhust, Bloxwitch, Corning, and Senior Flexonics have established production plants in the country (International Marketing Council of South Africa, 2003). The industry is located in two provinces, the Eastern Cape as well as Gauteng. The industry has the advantage of low production costs as well as access to new markets as a result of trade agreements with the European Union and the Southern African Development Community free trade area (International Marketing Council of South Africa, 2003).

The Motor Industry Development Programme (MIDP) was launched in 1995 as an import / export complementation agreement, whereby local value-add of components or built-up vehicles which are exported earns credits which can be used to rebate import duties on components and vehicles (Trade Law Centre of Southern Africa, 2006). The MIDP however has lead to expanded volumes of limited ranges of component exports. The reason for the limited ranges stems from the MIDP's strategy of forcing rationalisation to achieve greater unit volumes from a smaller number of products. This strategy will result in the share of imported vehicles to increase from 50% presently to 75% by 2012 (Trade Law Centre of Southern Africa, 2006).

Figure 3.1 below shows how actual units sold have increased between 1995 and 2005 as well as projected figures for 2006 and 2007. In 1995 the combined domestic production (Exports and Local Sales) was 389,392 units compared to 673,450 units expected by 2007. Imports increased from 26,339 units in 1995 to 308,000 projected by 2007 (National Association of Automobile Manufacturers of South Africa, 2006).

Figure 3.1: Vehicle Units (Imports, Exports & Local Production 1995-2007)



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Imports	26,339	46,327	56,528	65,073	58,789	65,883	84,043	83,419	87,296	136,327	232,091	282,000	308,000
Exports	15,764	11,553	19,569	25,896	59,716	68,031	108,293	125,306	126,661	110,507	139,912	210,400	225,450
Local Sales	373,628	374,749	342,747	285,737	267,006	256,769	298,466	279,765	295,304	345,195	385,350	426,500	448,000

Source: National Association of Automobile Manufacturers of South Africa, 2006

3.2.2.2 Competitiveness of the Automotive Industry

Figure 3.1 above indicates that the SA automotive industry has grown substantially over the last 10 years. The SA automotive industry recorded sales growth in excess of 20% between 2004 and 2005, making it one of the best performing markets internationally in terms of growth achieved (International Marketing Council of South Africa, 2006).

SA is ranked 19th in the world for vehicle production, accounting for a share of about 0,7% of the world's vehicle output. Although SA's automotive industry is relatively small, it does offer a number of competitive advantages, such as:

I. World beating cost ability on short or low volume runs;
II. Competitive tooling costs; and
III. High degree of manufacturing flexibility (International Marketing Council of South Africa, 2006).

The local industry has good access to the southern hemisphere and African markets and offers right-hand drive vehicles to numerous markets. However the industry is at a disadvantage in terms of geographical location relative to major markets such as the USA, China and India. The industry has first-world production facilities as well as access to raw materials and cheap electricity as well as stable transport and telecommunications infrastructure.

The competitiveness of the industry is however affected by the lack of world-class services due to significant model proliferation; parts supply challenges, high activity levels and lack of physical and human capacity (International Marketing Council of South Africa, 2006). According to the Chief Executive of McCarthy the industry will have to make disproportionate investments in systems, processes, logistics and facilities as well as recruiting new talent, developing and training staff (Ramsay, Son & Parker, 2006).

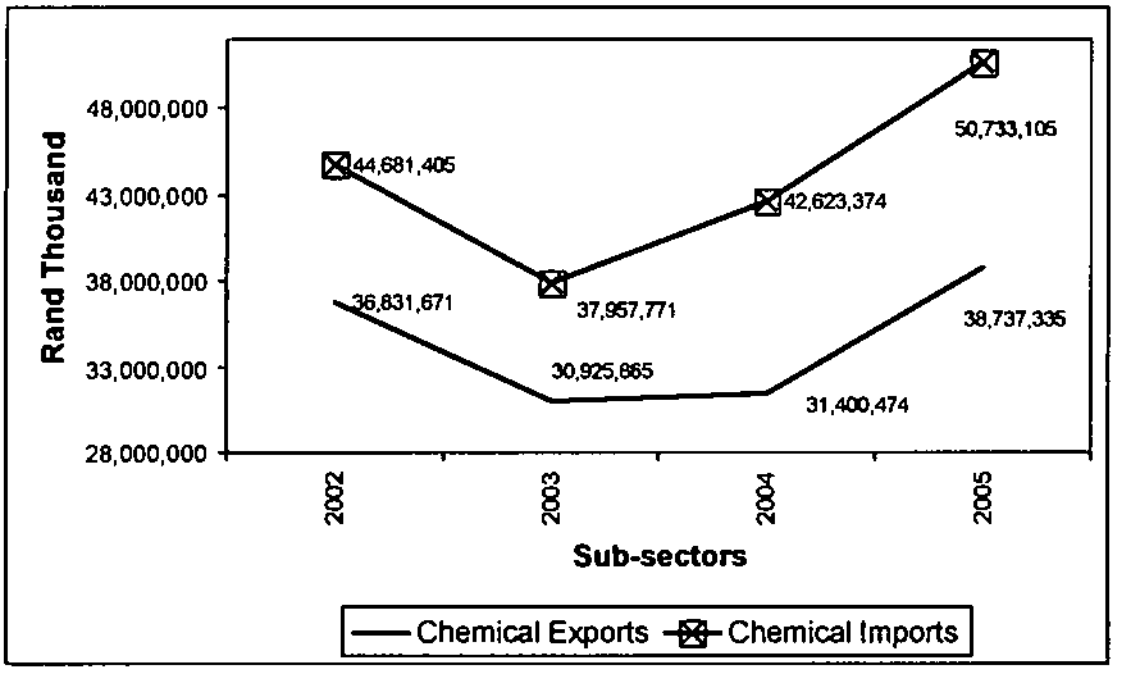
3.2.3 Chemical Industry

The chemical sub industry is one of the most complicated manufacturing industries due to the fact that thousands of different chemical reactions, processes and products impact on the industry. Due to competitive pressures the industry has followed divergent factor demand paths. Basic chemicals in upstream manufacturing have constantly replaced labour with capital intensive methods of production, which has contributed towards higher unemployment but has increased international integration and restructuring and technological capabilities. Chemical manufacturers in downstream production have become more labour-intensive (Trade and Industrial Policy Strategies, 2004).

3.2.3.1 Market and Demand Trends

The chemical industry is a net importer of chemicals; other chemicals have an 11% export-output ratio compared to basic chemicals with a 45% ratio (Trade and Industrial Policy Strategies, 2004). **Figure 3.2** below shows how imports and exports have increased between 2002 and 2005, indicating that the chemical industry's ability to export is dependent on import volumes.

Figure 3.2: Chemical Industry Imports and Exports (2002-2005)



Source: Statistics South Africa, 2006

3.2.3.2 Competitiveness of the Chemical Industry

Basic chemicals are capital intensive commodity type products, requiring large economies of scale. The production of basic chemical is dependent on availability of input materials and cheap electricity which forms part of the costs. Suppliers in the upstream, such as Sasol, Engen and Suprachem use import-parity pricing rather than global free on board pricing. Import-parity pricing causes feedstock's to be 10 to 20% more expensive in SA, which makes it difficult for users of the feedstock to be competitive internationally (Trade and Industrial Policy Strategies, 2004). Import-parity pricing pushes up input costs of firms that are not vertically integrated and affects competitiveness adversely.

Historically chemical production plants were located at inland locations close to coal-based synthetic fuels plants; these plants provide feed stocks to the chemical industry (Trade and Industrial Policy Strategies, 2004). The advantage of the geographic location of chemical production plants relates to the exporting of products to neighbouring countries. The locations create disadvantages for transportation of low value products but not so much for high value products. Exchange rate fluctuations do affect the pricing of down stream chemicals; however there are indications that price flexibility is only upwards (Trade and Industrial Policy

Strategies, 2004). Tariff protection has also been reduced in the chemical industry, which has lead to increased competitive pressures. Competitiveness of a dynamic sense is focussed more towards changing capabilities, rather than cost considerations.

The local demand for chemical also impacts on changing capabilities and supply patterns. Fertilizers and explosives capabilities were developed to meet the needs of the local farming and mining industries. Mining companies are expanding internationally and hence the increase in demand for chemical products. The demand supply dynamics create a dependency path between the growth of mining companies and the growth of chemical products (Trade and Industrial Policy Strategies, 2004).

3.2.4 Metal and Steel Industry

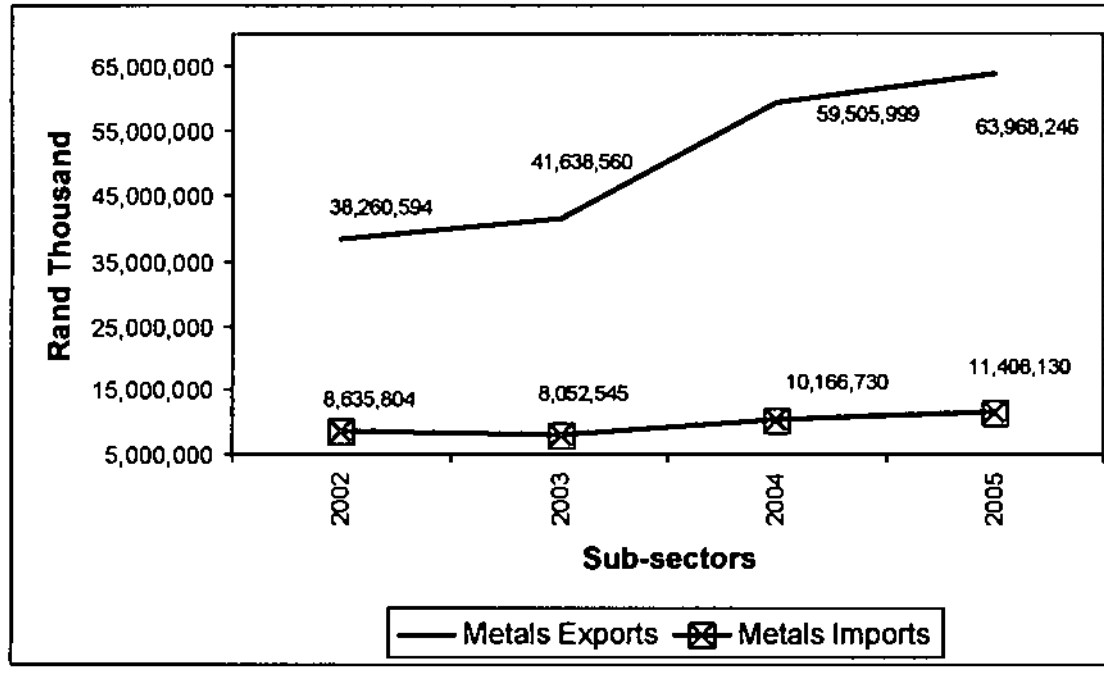
SA has a well developed metal and steel industry. The iron and steel basic industry involves the manufacturing of many primary iron and steel products which range from smelting to semi-finished stages (Southern African Iron and Steel Institute, 2006). SA's non-ferrous metal industry produces aluminium and other metals such as copper, brass, zinc and tin. Aluminium is the largest industry, however SA has no commercially exploitable deposits, hence feedstock is imported. Other non-ferrous metals are small in relation, but are still deemed important for exports and foreign exchange earnings (Southern African Iron and Steel Institute, 2006).

The range of primary carbon steel products and semi-finished products manufactured in SA includes billets, blooms, slabs, forgings, light-medium and heavy sections and bars, reinforcing bar, railway track material, wire rod, seamless tubes, plates, hot and cold rolled coils and sheets, electrolytic galvanised coils and sheets, tinplate and pre-painted coils and sheets (Southern African Iron and Steel Institute, 2006).The range of primary stainless steel products and semi-finished products manufactured in SA includes slabs, plates and hot and cold rolled coils and sheets (Southern African Iron and Steel Institute, 2006).

3.2.4.1 Market and Demand Trends

SA is the largest steel producer in Africa, producing 53% of the total crude steel production on the continent during 2005. **Figure 3.3** below indicates that iron and steel exports have increased by 67% between 2002 and 2005, with imports increasing by 32% (Southern African Iron and Steel Institute, 2006).

Figure 3.3: Metal and Steel Industry Imports & Exports (2002-2005)



Source: Statistics South Africa, 2006

During 2005, SA produced 9,493 tonnes of crude steel, down by 0,1% compared to 2004. The crude steel production only represented 0.8% of world production which reached 1129,4 million tonnes in 2005 (Southern African Iron and Steel Institute, 2006). Carbon steel deliveries by the primary steel industry amounted to 7,628 million tonnes in 2005, a decrease of 1,3% compared to 2004. During 2005, 55% of the carbon steel was sold to the local market and 45% was exported (Southern African Iron and Steel Institute, 2006). During 2005 imports of carbon and alloy primary steel products increased by 8,9% and accounted for 7,4% of apparent domestic carbon steel consumption. During 2005 an estimated 40 million tonnes of iron ore was mined in SA, contributing about 3% towards world production. Of the 40 million tonnes mined, 15 million tonnes was consumed locally and 25 million tonnes

was exported, accounting for approximately 4% of global trade (Southern African Iron and Steel Institute, 2006).

3.2.4.2 Competitiveness of the Basic Iron and Steel, Ferrous and Non-ferrous Metal Products Industry

SA was ranked as the 19th largest crude steel producing country as well as 9th in terms of exporting of primary steel. Iron ore mined in SA also represents 3% of world production compared to SA's share of only 0,7% of world production of crude steel. The competitiveness of the industry is however impacted largely by the relative competitiveness of the other steel producing countries of the world. The figure for January 2006 as produced by the International Iron and Steel Institute (IISI) indicated a rise of 4, 6% in tonnes of production world wide, if China is excluded the remaining 60 countries showed a 1,6% drop in steelmaking volume. US steel imports fell by 8% but exports increased by 20%, mostly due to higher demand from Canada and Mexico (Steelonthenet.com, 2006). China's steel output rose by 20, 7% compared to SA's output which rose by 9% (Steelonthenet.com, 2006). The reason for pointing out the volume increases in steel production relates to the fact that competitive forces are expected to be stronger in countries which are experiencing higher growth. SA produced 873 thousand tonnes of steel during 2005, compared to China's 30,3 million tonnes of steel (Steelonthenet.com, 2006). Many other countries produce millions of tonnes of steel and they have the advantage of economies of scale. SA will find it difficult to increase their share of the world production levels based on the fact that they have a competitive disadvantage in terms of location relative to key markets such as China, Europe and the US.

3.2.5 Social: HIV/AIDS

The World Bank predicts that SA could lose half its per capita income within the next 90 years as a result of HIV/AIDS (Bureau for Economic Research, 2004). The HIV/AIDS pandemic causes a ripple effect through out the economy of SA, impacting households, businesses, communities and the welfare systems of the country. The projections for HIV/AIDS infections in 2004 varied between 3,8 million and 5,6 million people in SA (Journ-AIDS, 2005). **Table 3.1** below shows how the prevalence rates differed between provinces and age groups as well as the impact on life expectancy during 2003. According to the research by the Actuarial Society of

SA (ASSA) the life expectancy for SA was 51 years of age during 2003 with the GCR predicting a life expectancy of 48 years of age.

Table 3.1: HIV Prevalence per Province (2003)

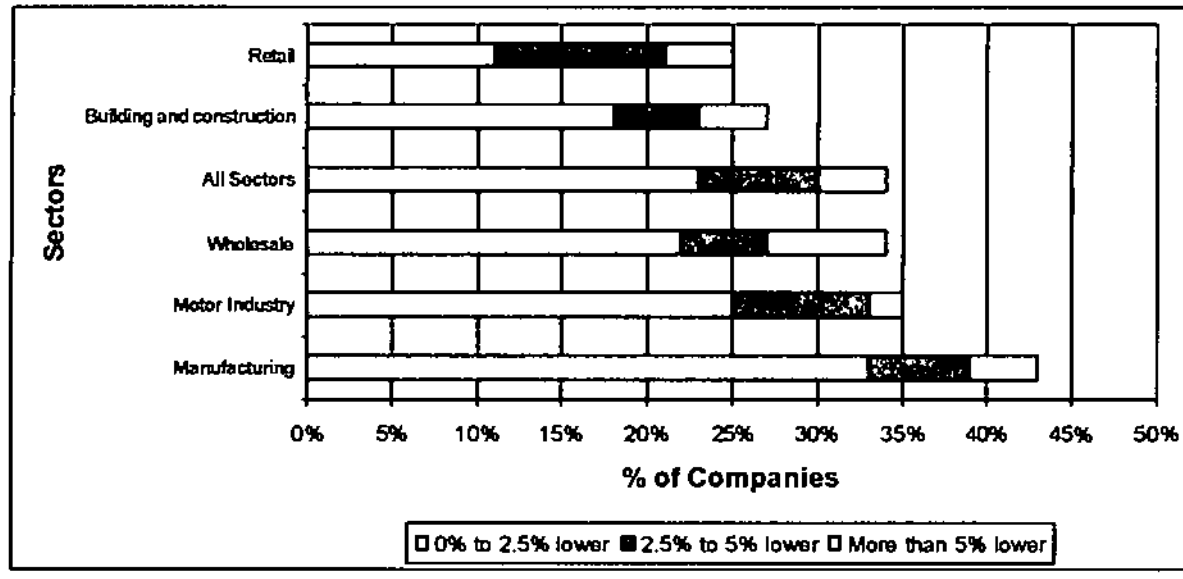
Provinces	Total HIV (thousands)	Total HIV prevalence	15-49 HIV prevalence	Life expectancy
KwaZulu-Natal	1 520 000	16%	26%	43.3
Gauteng	1 370 000	14%	22%	52.4
Free State	380 000	14%	22%	47.2
Mpumalanga	440 000	13%	22%	46.5
North West	470 000	12%	20%	50.7
Eastern Cape	630 000	9%	17%	49.4
Limpopo	380 000	7%	12%	56.4
Northern Cape	60 000	7%	11%	57.8
Western Cape	250 000	5%	8%	61.8
South Africa	**5 200 000**	**11%**	**18%**	**51**

Source: Actuarial Society of South Africa, 2005

Many studies focus on the demographics of the infection among males and females, adults and children as well as between provinces. There are very few studies which focus on infection rates for specific industries as well as distinguishing between employed and unemployed individuals. The importance for having statistics at sector level as well as having statistics which distinguishes between employed and unemployed individuals relates to the treatment strategy that needs to be devised.

During 2004 a study conducted by SA Business Coalition on HIV/AIDS predicted that almost 20% of employees in the manufacturing sector are Human Immunodeficiency Virus (HIV) positive (Business Report, 2004). During the last quarter of 2003 The Bureau for Economic Research (BER) conducted a survey among respondents in the manufacturing, retail, wholesale, motor trade and building and construction industries (Bureau for Economic Research, 2004). The survey was one of the largest surveys to date, with 1,006 companies participating in the survey. Two of the main findings related to the impact of HIV/AIDS on profitability as well as the implementation of company HIV/AIDS policies. **Figure 3.4** below shows that more than 40% of manufacturing companies reported that HIV/AIDS had impacted profits negatively; the graph also shows that 25% of all the companies participating in the survey reported lower profit levels (Bureau for Economic Research, 2004).

Figure 3.4: Percentage of Companies (Negative Impact of HIV/AIDS on Profits)



Source: Bureau for Economic Research, 2004.

Another important finding relates to the level of responsiveness to the HIV/AIDS epidemic, with only 25% of companies having implemented a formal HIV/AIDS policy, with even less having voluntary counseling and testing programmes, or providing care, treatment and support for infected workers (Bureau for Economic Research, 2004). The Automotive Industry Development Centre (AIDC) has formulated a 50/50 match funding policy of which 50 percent of the costs relating to the implementation of HIV/AIDS workplace programmes will be paid for by the AIDC (Automotive Industry Development Centre, 2004).

3.2.6 Legal: Labour Legislation

SA's labour market has undergone a transformation since 1994, the main emphasis being on the elimination of labour inequalities and improved general working conditions. The new labour legislation which has been introduced since 1994 includes the Labour Relations Act (LRA), the Basic Conditions of Employment Act (BCEA), the Employment Equity Act (EEA) and the Skills Development Act (SDA) to name but a few (International Marketing Council of South Africa, 2003).

The 2006 World Competitiveness Report ranks SA 44th out of 61 countries, one of the cited reasons for this relative low position relates to labour regulations. The Economist Intelligence Unit (EIU) makes use of an offshore investment ranking

model to rank various countries. The ranking model consists of nine categories, which include three labour related categories

Table 3.2 below compares SA to other developing countries as well as developed G8 countries, SA was ranked 34th out of 60 countries (Economist Intelligence Unit, 2005). The combined labour score of SA was 66% which compared favourably with the developed G8 countries but poorly compared to other developing countries. Although the comparison seems favourable for SA, SA is grouped with developing countries in terms of offshore investment destinations based on relative low labour costs and complexity. SA was positioned last in the labour regulation category which compared the restrictiveness of labour laws with regards to hiring and firing, the extent of wage regulations as well as minimum wages (Economist Intelligence Unit, 2005).

Table 3.2: EIU Labour Ranking (SA, Developing & G8 Countries)

Countries	Labour Costs	Labour skills and availability	Labour Regulation	Combied Labour Score:Weight of 70%	Labour % score achieved	Other	Total Score	Rank: 60 Countries
Developing countries								
Argentina	9.38	5.01	6.67	4.98	71%	1.65	6.63	28
Brazil	9.52	5.34	7.33	5.19	74%	1.66	6.85	21
Bulgaria	9.61	4.96	7.33	5.10	73%	1.99	7.09	13
Chile	9.14	4.64	7.33	4.87	70%	2.21	7.08	15
Malaysia	8.52	5.65	7.33	4.98	71%	2.15	7.13	11
Mexico	9.45	4.79	7.33	5.01	72%	1.97	6.97	18
Poland	8.81	5.69	6.00	4.95	71%	2.29	7.24	5
Romania	9.49	5.55	6.00	5.11	73%	1.97	7.08	14
Russia	9.51	6.05	6.67	5.34	76%	1.72	7.05	17
South Africa	**8.19**	**5.59**	**4.67**	**4.60**	**66%**	**1.91**	**6.51**	**34**
Turkey	9.02	4.69	6.00	4.71	67%	1.86	6.57	31
Venezuela	9.60	4.01	5.33	4.62	66%	1.75	6.37	41
Developed Countries: G8								
Canda	5.08	7.60	7.33	4.54	65%	2.69	7.23	6
France	1.99	6.73	7.33	3.35	48%	2.50	5.85	55
Germany	3.00	6.61	6.67	3.55	51%	2.68	6.23	47
Italy	4.56	6.07	6.00	3.79	54%	2.32	6.11	49
Japan	2.12	6.38	7.33	3.28	47%	2.36	5.64	58
Russia	9.51	6.05	6.67	5.34	76%	1.72	7.05	17
United Kingdom	3.28	7.03	8.67	3.96	57%	2.64	6.60	29
United States	3.59	8.40	8.67	4.46	64%	2.45	6.91	20
Average	7.17	5.84	6.83	4.59	66%	2.12	6.71	
Weight	30%	30%	10%		0%	30%		

Source: Economist Intelligence Unit, 2005

3.2.7 Conclusion

A review of the manufacturing industry revealed that the industry contributed 16,4% to the GDP of SA during the first quarter of 2006. The automotive industry is one of the most important manufacturing industries, contributing 7% towards the exports of the country. During 2004 and 2005 the industry grew in excess of 20%, which resulted in the need to disproportionately large investments in systems, processes, logistics and facilities as well as recruiting new talent and developing and training staff. The chemical industry is a net importer of chemicals and import parity pricing makes it difficult for users of feedstock to be globally competitive. The local chemical industry is impacted by changing capabilities and supply patterns. The metal and steel industry is the largest steel producer in Africa with 53% of the total crude steel production. SA is the 19th largest crude steel producing country in the world; iron ore mined represents 3% of world production and 0,7% of world crude steel production. The World Bank predicts that HIV/AIDS could halve the per capita income of SA within the next 90 years. SA life expectancy of only 48 years of age as well as that fact that only 25% of companies have formal HIV/AIDS policies does not bode well for SA. The poor global investment ranking of SA in terms of restrictiveness of labour laws with regards to hiring and firing as well as wage regulations and minimum wages also impacts on SA's competitiveness.

The next section provides a detailed overview of literature and accredited academic research with regards to human development and competitiveness.

3.3 Literature Review of Accredited Academic Research

The literature review provides an overview of accredited academic journals as well as related information pertaining to human development and competitiveness. The section is concluded with, an overviews of related research papers, which share some of the research objectives of this study.

3.3.1 Human Development

3.3.1.1 Introduction

Development is seen as an expansion of people's capabilities that is, what they can and cannot do, such as living a long and healthy life, being well nourished, and taking part in society by being able to read and write (Sen, 1989). An important feature of the human development approach is that it has an explicit basis in philosophical reasoning. Amartya Sen has written extensively about the conceptual roots of capabilities in the longstanding intellectual traditions of philosophy, political economy, and economics dating back to Aristotle and including works of Adam Smith and Immanuel Kant (Fukuda-Parr, 2003).

3.3.1.2 Human Development, Neoliberalism and Basic Needs Approaches

A comparison of human development, the neoliberal and the basic needs approach provides insight into the philosophical underpinnings of human development. **Table 3.3** provides a comparison of the key features of each of the approaches.

Table 3.3: The Human Development, Neoliberal & Basic Needs Approaches

	Human Development	Neoliberalism	Basic needs
Philosophical underpinnings			
Normative assumptions	Explicit	Implicit	Not fully specified
Concept of well-being	Functioning's and capabilities	Utility	Meeting basic needs
Evaluative aspect			
Leading criterion for evaluating development progress	Human capabilities, equality of outcomes, fairness and justice in institutional arrangements	Economic well-being, economic growth, efficiency	Poverty reduction in terms of income, access to basic social services
Measurement tools favoured	Human outcomes, deprivational and distributional measures	Economic activity and condition, averages and aggregate measures	Access to material means, derivational measures
Agency aspect			
People in development as end and/ or means	Ends: beneficiaries; means: agents	Means: human resources for economic activity	Ends: beneficiaries
Mobilizing agency	Individual action and collective action	Individual action	Concern with political will and political base
"Development strategy"			
Key operational goals	Expanding on equality and on the human rights of all individuals	Economic growth	Expanding basic social services
Distribution of benefits and costs	Emphasis on equality and on the human rights of all individuals	Concern for poverty	Concern for poverty
Links between development and human rights and freedoms	Human rights and freedoms have intrinsic value and are development objectives. Current research on their instrumental role through links to economic and social progress	No explicit connection. Current search for a link between political and civil freedoms and economic growth	No explicit connection

Source: Fukuda-Parr, 2003

Table 3.3 above indicates that human development has explicit philosophical underpinnings. Human development focuses on equality, fairness and justice and less on economic and material focus areas. The goal of human development is to expand the choices of individuals as well as providing the benefit of equality, human rights and freedom. Economic growth and a general concern for poverty are the

main development strategies of the neoliberalism and the basic needs approaches (Fukuda-Parr, 2003). The issue of inequality is raised by Chatterjee (2005) who argues that a population can have a high degree of human development only when the general level of quality of life is high and inequality among members is low.

The human development approach contains two central theses about people and development. Amartya Sen calls the two theses, the "evaluative aspect" and the "agency aspect" (Fukuda-Parr, 2003). The evaluative aspect is concerned with evaluating improvements in human lives as an explicit development objective as well as using human achievements as key indicators of progress. The agency aspect is concerned with what human beings can do to achieve improvement in human lives. The agency aspect places particular emphasis on achieving the improvements through policy and political changes (Fukuda-Parr, 2003).

The neoliberal approach defines well-being as utility maximisation, which ignores the impact of rights, freedoms and human agency (Fukuda-Parr, 2003). The basic needs approach in turn places people at the centre of development.

The basic needs approach places specific emphasis on specifying "basic needs" in terms of supplying services and commodities to a commodities basis rather than a capabilities basis in defining human well-being (Fukuda-Parr, 2003). The basic needs approach accordingly focuses on material needs of people rather than human rights, freedoms, and agency as emphasised in the human development approach (Fukuda-Parr, 2003). The paradigms of neoliberalism and basic needs provide insight into the evolution of the human development approach. The human development approach deliberately attempts to overcome the short comings of the neoliberalism and basic needs approach.

Amartya Sen argues that "development should be assessed less by material output measures such as GNP per capita and more by capabilities and opportunities that people enjoy" (Hill, 2003: 59). According to Sen, development is a process of expanding the real freedoms that people experience, and for development to take place major impediments to freedom need to be removed. In Sen's view these impediments to freedom include: poverty, tyranny, poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance of repressive states (Hill, 2003). In Sen's view, development is not just

about an economic process but also a political process, and hence to succeed requires "democratisation" of political communities to give citizens a voice in important decisions that need to be made for the community (Hill, 2003). The implication of Sen's discussion is that, to be able to objectively evaluate the quality of life, you have to be able to assess the capability set of individuals.

3.3.1.3 Human Development Index (HDI)

Sen's human development thesis formed the basis for the development of the HDI which was first proposed by the United Nations as a measure of the quality of human life in different nations (Hill, 2003). The HDI was developed during the early 1990's by the United Nations Development Program (UNDP) to measure the effect of economic development on the well being of people (Waheeduzzaman, 2003). The HDI measures the overall achievement of a country in three basic dimensions of human development, namely: longevity, knowledge and decent standard of living. Longevity is measured by life expectancy at birth; knowledge (or educational attainment) is measured by a combination of adult literacy and the combined primary, secondary and tertiary enrollment. Standard of living is measured by real GDP/ Capita ($PPP). The HDI moves the focus from on economic development (per capita income) to a much broader achievement in human life (Waheeduzzaman, 2003).

Although three basic dimensions of human development are measured, the HDI is a composite index of four statistics:

I. Life expectancy at birth;
II. Adult literacy rate;
III. Combined school enrollment ratio; and
IV. GDP per capita in purchasing power parity terms (Cahill, 2005).

The HDI methodology creates intermediate component statistics which rates each country's relative performance in each category. Each country is rated from zero to one, zero and one being the theoretical lower and upper limits of society's capability. Each component index carries an equal weight of one-third, enrollment and literacy statistics are combined to form the education index, in which literacy is given a weight of two-thirds and enrollment one-third (Cahill, 2005) "GDP is transformed by taking the natural logarithm to give it diminishing returns"(Cahill, 2005:2).

The HDI is not the only official index which is used to measure human development at national level, it is thus important to determine the contribution of related literature to the understanding to human development.

3.3.1.4 Data Envelopment Analysis (DEA)

An alternative approach to measuring human development is proposed by Despotis (2005), the approved is known as the Data Envelopment Analysis (DEA). The approach is based on two basic arguments: human development of a country should be benchmarked against best practice countries and that the weights of the components indices should be directly derived by the data. The benchmarking is determined by techniques for measuring the relative efficiency of decision-making units on the basis of multiple inputs and outputs. The efficiency of a unit is defined as the weighted sum of outputs divided by the weighted sum of the inputs and then measured on a ratio scale. The weights for the inputs and outputs are estimated by a linear program. The DEA provides a categorical classification of the units into efficient and inefficient categories. The DEA is a relative measure which compares each country with 'best practices' countries. The approach is meaningful in identifying 'inefficient countries', but can not be used to rank countries in terms of human development due to the fact that scores are not based on common weights (Despotis, 2005).

3.3.1.5 Transformation Approach

The link between economic prosperity and human development is neither automatic nor obvious, which suggests that countries convert income to levels of human development less or more efficiently. The transformation approach to human development places income on the input side and educational attainment and life expectancy on the output side of the equation. The transformation approach differs from the HDI approach in that GDP / Capita is used to reflect the development of peoples' abilities to access resources needed to acquire knowledge as well as to develop life opportunities through access to enhanced health services. The HDI approach discounts income to reflect only the 'basic-commodities' dimension (Despotis, 2005). The transformation approach does offer a relevant view of human development as it equates educational attainment and life expectancy as outcomes of income to access the efficiency of development. This approach however ignores

the impact of other external influences which impact on educational attainment and life expectancy, such social, political and cultural influences.

3.3.1.6 Index of Uptilt

Another alternative to the HDI is proposed by Chatterjee (2005); the index of uptilt considers the impact of inequality among members of society. The proposed index of uptilt is defined by the following equation:

$$U^{\alpha} = \frac{1}{c-1} \sum_{i=1}^{c-1} (Si)^{\alpha}$$

1. U^{α} is the index of uptilt and has the following desirable properties.

a. $0 = U^{\alpha} = 1$

b. U^{α} is monotonic, in the sense that U^{α} increases more when an individual is moved from a lower category i to i+1 than when an individual is moved form a higher category j to j+1

c. U^{α} is subgroup-decomposable, in the sense that if the population is divided into several disjoint subpopulations, each subpopulation is classified similarly according to the same character. The overall U^{α} would be a size-weighted average of the subpopulation U^{α} values minus a non-negative 'between subpopulation' diversity component, which would vanish when subpopulations are homogeneous (i.e. for every category I, pi is same for all the subpopulations).

d. c represents categories in increasing order of intensity of the character.

e. For any category of *i* let Si denote the proportion of individuals belonging to all higher categories (Chatterjee, 2005).

The index of uptilt also includes the three basic constituents of the quality of life of a person: state of health, state of knowledge and standard of living. State of health is represented in terms of a person's prospective longevity; however the measurement is not for individuals but requires probability distribution of the prospective longevity of all persons in the population under study. The state of knowledge takes into account the number of years of schooling undergone or the certificates and degrees received by individuals. The relevant population is then classified into categories corresponding to the different grades. Per-capita real income is considered the best determinant of the standard of living of a person in the case of a more of less market orientated economy. However a welfare state offers services such as health care, education, old age support, Chatterjee argues that income may not be the sole

determinant of standard of living. The uptlit index includes data on per-capita incomes of members of a population which is divided into grouped frequencies (Chatterjee, 2005).

The above uptilt index offers more flexibility than the HDI as measure by the United Nations. The three characters are considered to be of unequal importance, unlike the weighted average equal importance of the HDI. Each of the three characters can also be adjusted by adding more categories. However the index has only recently been published by Calcutta University and is based mainly on Indian states and can be criticised for having limited international application. The fact that categories can randomly be added to the index also could result in inconsistent application between various countries.

3.3.1.7 The Concept of Human Development

Further to Sen's views of human development which focus on "human choice" or the capability of human beings to choose the lives they want, (Welzel, Inglehart & Klingemann, 2002) include political culture in their conception of human development.

Table 3.4: Concept of Human Development

Concept of Human Development:			
	Economic Dimension	Cultural Dimension	Institutional Dimension
Components	Individual Resources	Self-Expression Values	Effective Rights
Generating Processes	Socioeconomic Development	Cultural Change	Democratization
Societal Spheres	Sphere of Means(social structure)	Sphere of Motives (political culture)	Sphere of Rules (regime institutions)
Prevailing Causal Direction	Means-Motive Linkage	Motives-Rules Linkage	
Underlying Theme		Human Choice on a Mass-Level	

Source: Welzel et al, 2002

The conception human development in **Table 3.4** above includes socioeconomic development, changing values and democracy which all work together in promoting human choice. Socioeconomic development includes processes, such as urbanisation, social mobilisation and occupational differentiation. Socioeconomic development accordingly diminishes the most concrete and pressing restrictions on

human choice by increasing individual resources, contributing to the means-component of human choice (Welzel et al, 2002). Cultural change is the second sub process relevant to human choice. Self-expression finds greater leverage once individual resources have widened the scope of human activities and level of achievements. The increased leverage of self-expression or cultural change contributes to the motives-component of human choice. Democracy represents the institutional component of human choice, which provides a legal structure that establishes a set of fundamental citizen rights. Democracy contributes effectively to the rights to human choice in the citizens' private and public activity (Welzel et al, 2002). Human development is further deemed as a means by which societies can grow human choice on a mass level. However it is also argued that human development is not a teleological concept, "It does not imply that the three sub processes necessarily proceed in a linear upward direction" (Welzel et al, 2002: 19).

Collectively individual resources, self-expression values and effective rights are the three components of human development and represent its means-, motives and rules-components. It is believed that progress in any of these components improves a society's "condition humana" giving people larger means, stronger motivations and wider guarantees to make use of their personal potential and to unfold individual creativity (Welzel et al, 2002).

The above conception of human development is comprehensive as it integrates major changes in socioeconomic structure, political structure as well as regime institutions. But on the other hand is sharply focused on a single theme: the growth (or decline) of human choice (Welzel et al, 2002). The conception further alludes to the need to develop theory which emphasises the importance of development beyond short term material gains. The concept of human development by Welzel (2002) offers further insight into the true meaning of development, but does not offer a measurable indexas provided by the HDI

3.3.1.8 Limitations of HDI

Amartya Sen's was concerned that the HDI would not capture the full complexity of human capabilities in a single index. Sen was persuaded by Haq (the fellow developer of the HDI) that policy makers would only pay attention to a single number which measures progress. The agency aspect places particular emphasis on achieving the improvements through policy and political changes, hence the

argument by Haq. The objective was achieved, to the extent that the HDI estimates a country's level of human development as well as focusing on greater basic human capabilities to survive, being healthy, being knowledgeable, and to enjoy a decent standard of living (Fukuda-Parr, 2003). For purposes of this research Sen's HDI has achieved importance by offering a measurable index. The HDI is criticised for trying to capture the broad meaning of human development in an index or a set of indicators (Streeten, 1994). Other grounds for criticism include, the construction of the scale and measurement (Streeten, 1994), methodology (Srinivasan 1994), and data quality / limitations issues (Mc Gillivray & White, 1993). The fact that equal weights are assigned to component indices is also criticised as the three component indices are not perfectly correlated to each other (Chatterjee, 2005). Chatterjee suggests that the index accounts for general level of quality of life but ignores the extent of inequality in quality of life. A quote by Anand and Sen (1992) summarise their thoughts as follows: "Income commodities ("basic" or otherwise), and wealth do of course have instrumental importance but they do not constitute a direct measure of the living standard itself" (Cahill, 2005).

3.3.1.9 Summary: Human Development

The human development approach has evolved over a period of time, and has become more pronounced as globalisation has become the reality of the day. The Neoliberalism paradigm, defines human well being as utility maximisation which ignores the impact of human rights, freedoms and human agency. The basic needs approach is seen as the predecessor of the human development approach emphasising "basic needs" in terms of supplying services and commodities. The approach places less emphasis on human capabilities. The conception of human development includes socioeconomic development, changing values and democracy which all work together in promoting human choice. The conception specifically includes political culture, which adds to the knowledge of human development theory. The conception, although comprehensive, in the sense that it integrates major changes in socioeconomic structure, is sharply focused on growth or decline of human choice only. The human development approach as summarised by the HDI which consists of four statistics, namely: life expectancy at birth, adult literacy rate, combined school enrollment ratio and GDP per capita in purchasing power parity terms. The advantage of the HDI is that it creates components statistics which provides an easy to measure index. The index makes it easy to compare one country to another. The HDI is challenged by theories such as the DEA which

proposes as an alternative approach for computing the HDI, based on two basic arguments: human development of a country should be benchmarked against best practice countries and that the weights of the components indices should be directly derived by the data. The transformation approach to human development places income on the input side and educational attainment and life expectancy on the output side of the equation. Another alternative to the HDI is the index of uptilt which considers the impact of inequality among members of society. The concept of human development is concluded by the conception of human development which focus on "human choice" or the capability of human beings to choose the lives they want which includes political culture.

3.3.2 Competitiveness

3.3.2.1 Introduction

The competitiveness of a nation is the concern of most citizens of a country. Competitiveness is seen as the cause, outcome and a means to achieving a given standard of living (Waheeduzzaman, 2002). "From a macro policy perspective, the primary goal of competitiveness is the well being of the citizens of a country, be it through individual income, standard of living, human development, or social justice" (Waheeduzzaman, 2002: 13). Waheeduzzaman (2002) indicates that the influence of competitiveness on income or standard of living makes intuitive sense and mentions that much effort has been devoted to its influence in literature. However the influence of competitiveness on human development and inequality has not been addressed adequately in literature. The main objective of this literature review on competitiveness is to not only review the concept of competitiveness but also to establish the influence of human development on competitiveness.

3.3.2.2 Competitiveness Indices by the WEF

The WEF's definition of competitiveness goes beyond the notions of exchange rate competitiveness and links the concept of productivity. Competitiveness is defined as that collection of factors, policies and institutions which determine the level of productivity of a country and that, therefore, determine the level of prosperity that can be attained by an economy (World Economic Forum, 2005). The Forum produces three indices:

1. The **Growth Competitiveness Index**: provides a framework for measuring competitiveness, it identifies "three pillars" the quality of macroeconomic

environment, the state of the country's public institutions, and, the level of technological readiness.

2. The **Business Competitiveness Index** (BCI): focuses on the underlying microeconomic factors which determine an economy's current sustainable levels of productivity. The BCI specifically measures two areas that are critical to the microeconomic business environment in an economy: the sophistication of company operations and strategy, as well as the quality of overarching national business environment in which they operate.
3. The **Global Competitiveness Index** (GCI): Replaces the Growth Competitiveness Index and aims to measure the "set of institutions, policies, and factors that set the sustainable current and medium-term levels of economic prosperity". (World Economic Forum, 2005: no page)

The GCI separates countries into three specific stages, adding degrees of complexity at each stage, called factor-driven, efficiency-driven and innovation-driven stages. **Factor driven** countries compete based on low prices, selling commodities or simple products and taking advantage of low-cost labour and readily available natural resources. The basic ingredients of competitiveness include strong public and private institutions, adequate infrastructure, a healthy macroeconomic environment, and a healthy workforce and at least a basic level of education.

The second **efficiency-driven** stage requires more efficient production practices. Product quality, rather than low prices, drives competitiveness and a greater dependency on higher education and training programs to prepare the workforce for more advanced production processes. Increased levels of efficiency are required from labour and financial markets as well as access to latest technologies.

The third **innovation-driven** stage requires of companies to compete through innovation, producing new and different products and using the most sophisticated production processes (World Economic Forum, 2005).
The three sub indexes are composed as follows:

Stage 1: **Factor-driven**: Basic requirements sub index.

Pillar 1: Institutions
Pillar 2: Infrastructure
Pillar 3: Macro economy

Pillar 4: Health and basic education

Stage 2: **Efficiency-driven**: Efficiency Enhancer's sub index.

Pillar 5: Higher education and training

Pillar 6: Market efficiency

Pillar 7: Technology readiness

Stage 3: **Innovation-driven**: Innovation and sophistication factor sub index.

Pillar 8: Business sophistication

Pillar 9: Innovation

Each of the above Pillars in turn consists of many sub categories (World Economic Forum, 2005).

The growth competitiveness index is presented below in **Table 3.5** and compares SA to both the best performing and the worst performing countries.

Table 3.5: The Growth Competitiveness Index

Growth Competitiveness Index	South Africa		Best performer Ranked First		Worst performer Ranked 117th	
	Score	Rank	Country	Score	Country	Score
Overall Index	4.31	42	Finland	5.94	Chad	2.37
1. Technology Index	3.62	46	United States	6.19	Chad	1.80
a. Innovation subIndex	2.27	66	United States	6.66	Chad	1.30
b. Information communication technology subindex	2.63	55	Denmark	5.90	Chad	1.39
c. Technology transfer subindex	5.39	4	Malaysia	5.57	Chad	2.52
2. Public institutions index	4.63	47	New Zealand	6.35	Bangladesh	2.55
a. Contracts and law subindex	4.31	46	Denmark	6.17	Paraguay	2.17
b. Corruption subindex	4.96	56	Iceland	6.78	Bangladesh	2.22
3. Macroeconomic environment index	4.68	31	Singapore	5.82	Zimbabwe	2.25
a. Macroeconomic stability index	4.90	30	Kuwait	5.72	Malawi	2.83
b. Government waste sub index	4.41	14	Singapore	5.90	Paraguay	1.62
c. Country credit rating sub index	4.53	49	Switzerland	7.00	Zimbabwe	1.00

Source: World Economic Forum, 2005

Table 3.5 above indicates that SA was ranked 42nd out of 117 countries in 2005, with Finland being the best performing country and Chad being the worst performing country. SA performed well in the technology transfer sub index (4th), macroeconomic stability (30th) and government waste (14th). SA's innovation sub index (66th) and corruption sub index (56th) performed poorly.

Table 3.6: The Business Competitiveness Index

Business Competitiveness Index	BCI Ranking	Company operations and strategy ranking	Quality of the national business environment ranking
South Africa	28	26	30
United States	1	1	2
Chad	116	116	116

Source: World Economic Forum, 2005

Table 3.6 above indicates that SA's businesses are more competitive than the nation as a whole, the United States being the best performing country and Chad the worst performing country. The fact that company operations and strategy ranking is 26th is also confirmed by SA's relative high score in the GCI for business sophistication.

Table 3.7: The Global Competitiveness Index

Global Competitiveness Index	South Africa		Best performer Ranked First		Worst performer Ranked 117th	
	Score	Rank	Country	Score	Country	Score
Overall Index	4.43	40	United States	5.85	Chad	2.65
1. Basic Requirements	4.77	46	Denmark	6.15	Chad	3.03
a. Institutions	4.42	36	Singapore	5.92	Paraguay	2.37
b. Infrastructure	4.33	35	Denmark	6.48	Chad	1.55
c. Macroeconomy	4.61	48	Chile	5.78	Malawi	2.39
d. Health and primary education	5.73	101	Japan	6.98	Mali	2.72
2. Efficiency enhancers	4.17	43	United States	5.85	Chad	2.22
e. Higher education and training	4.22	47	Finland	6.13	Chad	1.94
f. Market efficiency	4.63	33	United States	5.91	Chad	2.92
g. Technological readiness	3.66	44	Singapore	5.82	Chad	1.79
3. Innovation factors	4.32	29	United States	6.07	East Timor	2.39
h. Business sophistication	4.80	30	Japan	6.28	East Timor	2.61
i. Innovation	3.85	28	United States	5.98	Paraguay	2.02

Source: World Economic Forum, 2005

Table 3.7 above indicates that SA was ranked 40th 2005, with the United States being the best performing country and Chad being the worst performing country. SA performed relatively well in innovation (28th), business sophistication (30th), market efficiency (33rd). It is interesting to note that SA achieved 29th position in innovation factors in the GCI but 66th in the Growth Competitiveness Index. The reason for this variance in ranking refers to the variables listed in **Table 3.8** below. In the opinion of the researcher, the variables used in the GCI are more realistic and applicable to SA.

Table 3.8: Innovation Sub Index Growth Competitiveness Index vs. GCI

Growth Competitiveness Index: Innovation sub index	The Global Competitiveness Index Innovation sub index
1. What is your country's position in technology relative to world leaders?	1. Quality of science research institutions
2. Are companies in your country unable/aggressive in absorbing new technology?	2. Company spending on Research and Development (R&D)
3. How much do companies in your country spend on R&D relative to other countries?	3. University/industry research collaboration
4. What is the extent of business collaboration in R&D with local universities?	4. Government procurement of advanced technology products
5. US utility patents granted per million population	5. Availability of scientists and engineers
6. Gross tertiary enrolment rate	6. Utility patents (hard data)
	7. Intellectual property (IP) protection
	8. Capacity for innovation

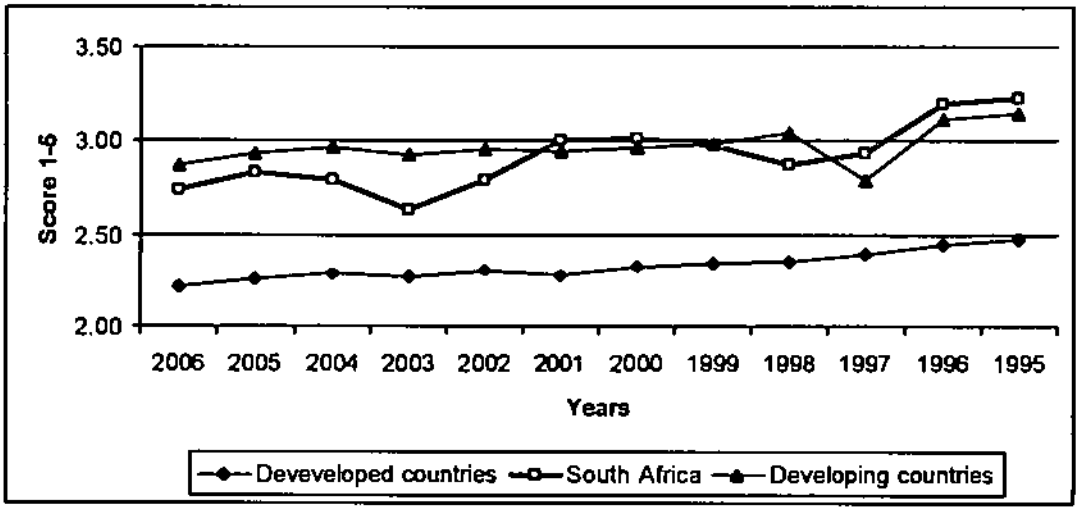
Source: World Economic Forum, 2005

3.3.2.3 The Index of Economic Freedom

The Heritage Foundation produces an annual index known as the Index of Economic Freedom, which measures 161 countries using 50 dependent variables. The 50 variables are grouped into the following categories: trade policy, fiscal burden of government, government intervention in the economy, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation and informal market activity (Heritage Foundation, 2005). Each variable is scored between one and five, with five being the lowest score and the one the highest, in other words a country which scores a one has a higher degree of economic freedom than a country that scores five.

Figure 3.5 below compares SA's aggregate score between 1995 and 2006 to the scores of 35 developed countries and 36 developing countries. On average the countries all achieved improved levels of economic freedom. Developed countries have improved their levels of economic freedom from 2.47 in 1995 to 2.22 in 2006. Developing countries have improved their levels of economic freedom from 3.14 in 1995 to 2.88 in 2006. SA has improved levels of economic freedom from 3.23 in 1995 to 2.74 in 2006 and is performing better than other developing countries with similar levels of GDP / Capita (Heritage Foundation, 2006).

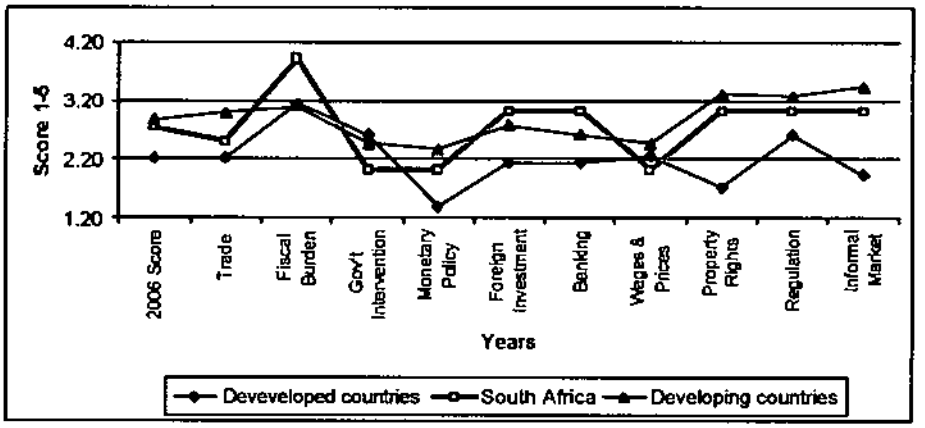
Figure 3.5: Index of Economic Freedom (1995-2006)



Source: Heritage Foundation, 2006

Figure 3.6 below compares the above mentioned 10 categories for SA to the 35 developed countries and 36 developing countries. SA performed better in government intervention, wages and prices compared to both developing and developed countries. SA achieved a lower score than the average developing and developed country in fiscal burden, banking and foreign investment. The researcher however questions the score achieved for banking as SA does have an efficient banking system.

Figure 3.6: Index of Economic Freedom (10 categories:2006)



Source: Heritage Foundation, 2006

The above indexes have provided examples of how competitiveness is benchmarked between nations. The WEF's growth, business and global competitiveness indices focus on factors, policies and institutions which determine the level of productivity of a country and that, therefore, determine the level of prosperity that can be attained by an economy. The Index of Economic Freedom focuses on similar factors but includes categories such as fiscal burden of government banking and finance and informal market activity. The various indexes offer good predications of the competitiveness of nations in the researcher's opinion. However the various indexes do not offer a realistic prediction of competitiveness at industry level within a country. The various theories which are discussed below will attempt to offer further insight into competitiveness at industry level.

3.3.2.4 National, Industry and Firm Competitiveness

Existing studies on competitiveness are divided into three categories according to differences in unity entity: firm competitiveness, industry competitiveness and competitiveness of nations (Cho, 1998).

The most representative research on competitiveness of nations or countries is trade-related theories (Ohlin, 1952; Leontief, 1953). The trade-related theories have their roots in classical Richardian theory of comparative advantage. The theory of comparative advantage argues that a nation's factor endowments determine

competitiveness vis-à-vis other nations. The theory leads to the belief that nations with abundant labour will specialise in labour-intensive industries, and conversely so for countries who posses abundant capital. The resulting conclusion is that a nation's competitiveness is high if it possesses an abundance of labour, capital and/ or natural resources at low prices (Cho, 1998). The report of the President's commission on Industrial Competitiveness (1985) defines competitiveness as "Competitiveness is the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expanding the real incomes of its citizens" (Waheeduzzaman, 2003: 14). The "ultimate goal of competitiveness is to improve the standard of living or real income of citizens of a country; and, a nation can achieve that by offering goods and services at internationally competitive prices" (Waheeduzzaman,2003: 14).

The WEF's definition of competitiveness is defined as "the collection of factors, policies and institutions which determine the level of productivity of a country and that, therefore, determine the level of prosperity that can be attained by an economy" (WEF, 2005: xiii). The above conceptualisations are macro based and have their origins in Richardo's (1817) comparative advantage theory and Heckscher-Ohlin's (1933) factor propositions theory (Waheeduzzaman, 2003).

The basic argument of competitiveness at firm level is that competitiveness of a nation stems from companies within that nation, accordingly firm-specific factors that lead to competitiveness should be identified (Cho, 1998). Current conceptualisations are vague and inadequate with regards to firm level of competitiveness. Porter (1990) views competitiveness as productivity growth. Hamel and Prahalad (1994) define competitiveness in terms of "core competencies" or a bundle of skills and technologies that a company has. Ali (2000) suggests that a workable definition of competitiveness should include the reality of globalisation. Competitiveness is defined as "the ability of the firm to be imaginative and agile, either in defining competition or in shaping the existing competitive game of the firm's advantage" (Ali, 2000: 2)

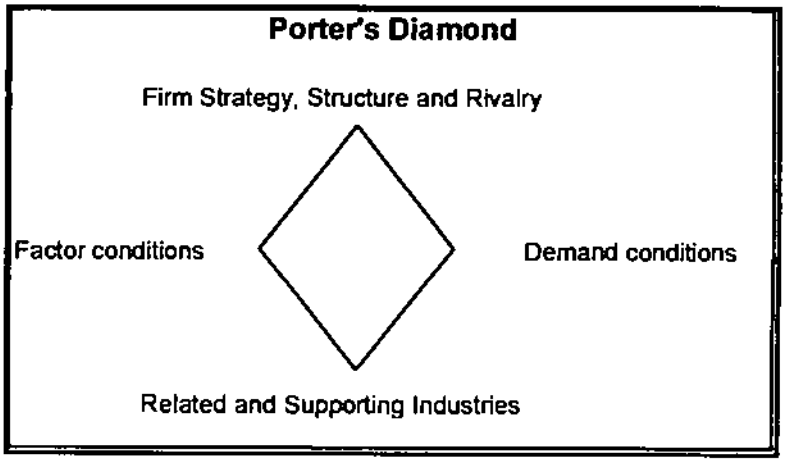
3.3.2.5 Porter's Diamond

Competitiveness with the industry as the unit of analysis was first researched by Porter (1990). The research was based on the in-depth study of 100 industries in 10

nations which were thought to be internationally competitive. Porter found that competitiveness of a certain industry in a certain nation is determined by specific factors that a nation possesses and offers to firms. The research findings resulted in the formulation of a model known as Porter's Model of National Competitiveness or Porter's Diamond. The model is composed of determinants of national advantages which include: factor conditions; firm strategy, structure and rivalry; related and supporting industries; and demand conditions (Cho, 1998). Porter also added government and chance events as external factors.

Porter's model is depicted as a diamond, where the four forces jointly constitute a firm's global competitiveness in a given industry, as seen in **Figure 3.7** below. Porter also acknowledges the role that government forces and luck can play in national competitive advantage, although this link is not depicted in **Figure 3.7** below (Sledge, 2005).

Figure 3.7: Porter's Diamond



Source: Porter, 1990

This model is seen as a broad theory to explain why, in many instances, the most competitive companies in one industry come from the same country (Grein & Craig, 1996).

The first of the four elements is known as **demand conditions**. Demand conditions describe the level of domestic demand that a firm faces, which depends both on the quantity of demand as well as the sophistication level of consumers in a home market. Porter's model indicates that the primary source of competition for firms in a given industry comes from domestic demand. The reasoning behind this observation

is based on the assumption that demanding consumers create an awareness in firms that causes them to focus on the needs and preferences of the local consumer base. Porter contends further that high levels of demand in a nation drive firms in that industry to become globally competitive (Sledge, 2005). Porter contends further that sophisticated and demanding local customers press firms to improve, as they offer insights into existing and future customer needs that are hard to gain in foreign markets (Porter, 1998)."Local demand also reveals segments of the market where firms can differentiate themselves" (Porter, 1998: 9)

The second element of the model is known as **factor conditions**, this element is the most important focus area of the research. Porter classifies the factor conditions into five categories:

I. Human resources;
II. Physical resources;
III. Knowledge resources;
IV. Capital resources; and
V. Infrastructure (Sledge, 2005).

Examples of factor conditions includes any factors that a firm uses in it business, such as land, labour, capital and also naturally occurring raw materials. Other factors of production include manmade structures that facilitate commerce, which includes basic infrastructure systems such as roads, water systems and telecommunications. Other more firm specific factors of production include entrepreneurship and innovation, educational and legal systems (Sledge, 2005). Porter's reasoning is that the more advanced these factors are, the more they will enhance the success of the businesses located in a country (Sledge, 2005).

Porter has reviewed some of his earlier observations relating to factor conditions or factor endowments; he writes that they continue to play a role in location based competition, but are less valuable due to globalisations of economies (Porter, 1998). Porter further argues that "factor endowments continue to influence the location of resource extraction and labor-intensive activities but they play a diminishing role in determining wages and standard of living" (Porter, 1998: 8). Factor conditions refer to basic inputs that allow competition to take place basic inputs are often generic across many industries, which could be a cause of competitive disadvantage and conversely a diminishing source of competitive advantage (Porter, 1998). Further to the above mentioned, Porter writes that to increase productivity, factor inputs must

improve in efficiency, quality and ultimately, specialisation to particular cluster areas (Porter, 1998).

The importance of factor conditions, and more specifically human resources and knowledge resources is based on the fact that it can be linked to the human development school of thought as discussed earlier. The adult literacy rate and combined school enrollment ratio which forms part of the HDI provides a good measurement of human development and also human resource management as well as knowledge management focus areas.

The third element of the model is known as **related and supporting industries**. This element includes the importance of enterprises that indirectly or directly affect a given industry, and is described as related and supporting industries. Examples of such industries include suppliers and distributors but also consulting companies, contractors or even outsourcing ventures. Porter's underlying assumption is that highly competitive supporting industries will drive the focal industry to be more competitive (Sledge, 2005).

The fourth element of the model is known as **firm strategy, structure and rivalry**. This refers to many key strategic factors that characterise a firm. Strategy describes the types of actions firms utilise to achieve both long term and short term goals such as low-cost, differentiation, focus strategies or a combination thereof (Sledge, 2005). Structure refers to the industry composition which describes the degree to which an industry is concentrated or dispersed, competitive or monopolistic, global or domestic (Sledge, 2005). The more "crowded", a structure the higher the level of competition and competitiveness (Ghemawat, Collis & Pisano, 1999). Rivalry refers to both the number of players and the level of competition among firms in the industry; rivalry is seen as the most comprehensive of the three factors based on the observation that it often indicates the underlying strategy and structure of the competitors (Sledge, 2005).

Limitations of Porter's Diamond

Porter's Diamond has attracted much criticism over the years, and it is worth referring to some of the observations to help understand the limitations of the diamond and focus areas for this research. The first area of criticism relates to MNC, Dunning (1993) believed that Porter underestimated the changes in trans-border

activities and believed that Porter should include the role of MNC's as an integrating force in the global economy (Dunning, 1993). Porter has since acknowledged the importance of cross border trade, but not specifically referring to MNC's. More recently Porter's model has also been criticized for excluding foreign-owned MNC's as contributors to the competitive advantage of advanced economies (Clancy, O'Malley, O'Connell & Egeraat, 2001).

Another area of criticism relates to the so called ethnocentric US way of looking at the world, the critique is focused more at the national perspective that is taken by Porter, almost creating a xenophobic national economic welfare view (Dunning, 1993). According to O'Donnell (1998) it seems possible that some economies, and societies, are so open that local processes of innovation are limited and any external economies do, in fact cross national boundaries easily. It has also been argued that Porter's model does not work very well for smaller open economies such as Canada, Finland, Austria, New Zealand and Ireland (Dunning, 1993). A further criticism against Porter's model is that it is case specific because all countries studied were among the most important trading nations in the world, and ignores less successful trade performances as well as excluding developing countries (Grein et al, 1996). Another observation highlights the fact that Porter discusses industry competitiveness, but that he does not make clear what the relationship is with national competitiveness, or even if one exists (Grein et al, 1996). It is further observed that Porter discusses a mixture of industry, company and strategic business units' competitiveness, without explaining how one might lead to another (Grein et al, 1996).

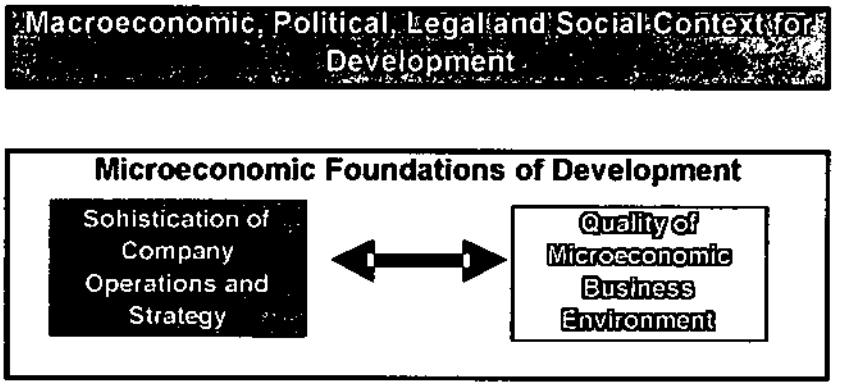
3.3.2.6 Porter's Competitive Strategy for SA

Competitiveness is determined by productivity with which a nation uses its human, capital, and natural resources. Productivity sets a nation's standard of living (wages, returns on capital, and returns on natural resource endowments).

I. Productivity depends on both the value of products and services as well as the efficiency with which they are produced.
II. Prosperity does not depend on what industries a nation competes in but rather how firms compete in the industries.
III. Productivity of a nation is a reflection of what both domestic and foreign firms choose to do in a location.
IV. Productivity of local industries is of fundamental importance to competitiveness.

Porter further contends that nations compete in offering the most productive environment for business. The public and private sectors play different but interrelated roles in creating a productive economy (Porter, 2003).

Figure 3.8: Determinants of Productivity and Productivity Growth



Source: Porter, 2003

Figure 3.8 above indicates that a sound macroeconomic, political, legal and social context creates the potential for competitiveness, but is not sufficient. Competitiveness also depends on improving the microeconomic capability of the economy and the sophistication of local companies and local competition (Porter, 2003).

Competitiveness can be divided into different stages as depicted in **Figure 3.9** below. When policy makers are required to develop industrial policies to enhance the competitiveness of a particular industry of the nation as a whole, it is important to understand in which stage of competitive development a country finds itself.

Figure 3.9: Stages of Competitive Development

Source: Porter, 2003

Porter presented a competitiveness agenda for SA, in Johannesburg on the 9th of June 2003; the following six agenda points were identified:

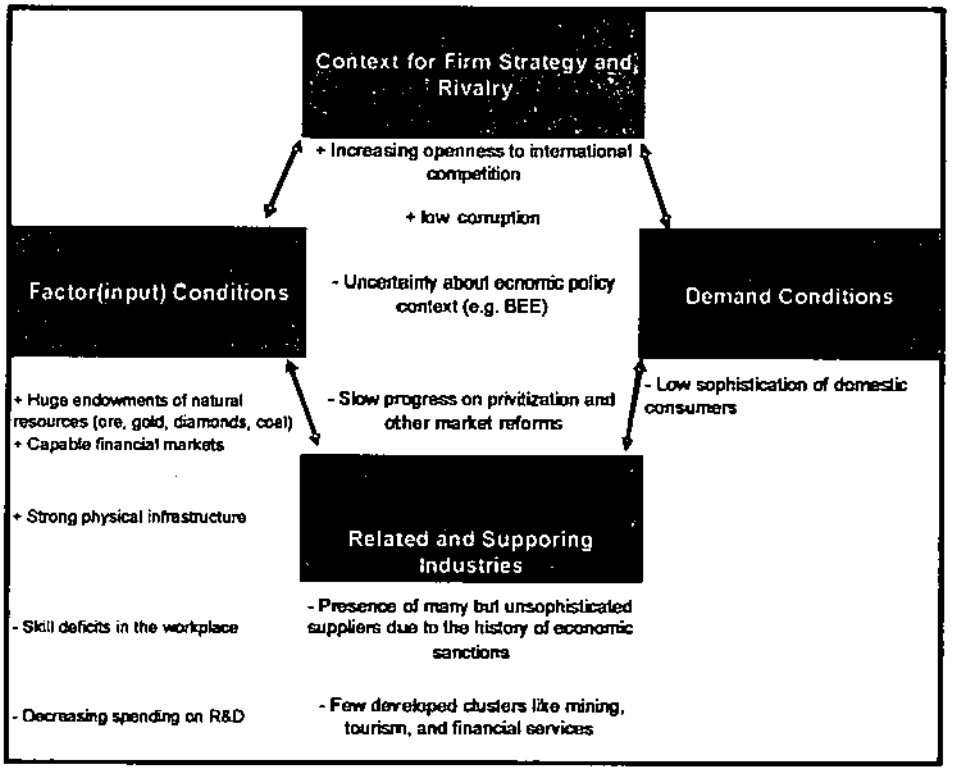
1. Upgrade the business environment;
2. Foster cluster development;
3. Shift roles of government and business in economic development;
4. Integrate social and economic policies;
5. Create economic strategies at provincial level; and
6. Lead a cross-national economic strategy for Southern Africa (Porter, 2003).

The researcher is of the opinion that not all of the listed points on the agenda are relevant to this specific study; however the researcher agrees that all of the points are relevant to the competitiveness agenda of SA. Some of the points are discussed below in more detail

Agenda point one: upgrade the business environment

The South African Business Environment upgrade according to Porter's Diamond is depicted in **Figure 3.10** below, with positive (+) influences as well as negative (-) influences being identified.

Figure 3.10: Porter's Diamond: SA Business Environment Upgrade



Source: Porter, 2003

Porter's analysis of the business environment also identified the competitive advantage and disadvantage of SA's relative position in terms of factor conditions, context of firm strategy and rivalry, demand conditions, related and supporting industries as well as company operations and strategy. These competitive advantages and disadvantages are listed below in **Table 3.9** below.

Table 3.9: SA Factor Conditions: Competitive Advantages & Disadvantages

Factor (Input) Conditions			
Competitive Advantage Relative to GDP per Capita	Ranking	Competitive Disadvantage Relative to GDP per Capita	Ranking
Financial Market Sophistication	13	Quality of Math and Science Education	71
Local Equity Market Access	16	Availability of Scientists and Engineers	65
Adequacy of Public Sector Legal Resources	17	Police Protection of Businesses	59
University/Industry Research Collaboration	18	Telephone/ Fax Infrastructure Quality	58
Intellectual Property Protection	19	Extent of Bureaucratic Red Tape	53
Judicial Independence	20	Quality of Public Schools	50
Quality of Management Schools	20	Cell phones per 100 people (2001)	44
Air Transport Infrastructure Quality	21	Internet users per 100 people (2001)	44
Quality of Scientific Research Institutions	21	Ease of Access to Loans	34
Overall Infrastructure Quality	24	Port Infrastructure Quality	31
Railroad Infrastructure Quality	25		

Context for Firm Strategy and Rivalry			
Competitive Advantage Relative to GDP per Capita	Ranking	Competitive Disadvantage Relative to GDP per Capita	Ranking
Extent of Distortive Government Subsidies	9	Cooperation in Labour-Employer Relations	70
Efficacy of Corporate Boards	12	Decentralization of Corporate Activity	47
Effectiveness of Ant-Trust Policy	22	Favoritism in Decisions of Government Officials	39
Extent of Locally Based Competitors	23	Tariff Liberalization	35
Costs of Other Firms' illegal/ unfair activities	25		
Intensity of Local Competition	25		

Demand Conditions			
Competitive Advantage Relative to GDP per Capita	Ranking	Competitive Disadvantage Relative to GDP per Capita	Ranking
		Consumer Adoption of Latest Products	48
		Government Procurement of Advanced Technology Products	41
		Laws Relating to Information Technology	39
		Buyer Sohistication	38
		Stringency of Environmental Regulations	37
		Presence of Demanding Regulatory Standards	34

Related and Supporting Industries			
Competitive Advantage Relative to GDP per Capita	Ranking	Competitive Disadvantage Relative to GDP per Capita	Ranking
Local Availability of Components and Parts	13	Local Availability of Specialized Research and Training Services	44
Extent of Product and Process Collaboration	27	State fo Cluster Development	35
Local Supplier Quantity	28	Local Availability of Process Machinery	33
		Local Supplier Quality	30

Company operations and strategy			
Competitive Advantage Relative to GDP per Capita	Ranking	Competitive Disadvantage Relative to GDP per Capita	Ranking
Prevalence of Foreign Technology Licensing	6	Nature of Competitive Advantage	68
Reliance on Professional Management	13	Value Chain Presence	65
Extent of Incentive Compensation	15	Degree of Customer Orientation	61
Extent of Marketing	18	Extent of Branding	51
Willingness to Delegate Authority	23	Capacity for Innovation	43
Company Spending on R&D	27	Production Process Sophistication	38
Extent of Regional Sales	28	Control on International Distribution	36
Extent of Staff Training	28	Breadth of International Markets	31

Source: Porter, 2003

The factor input conditions as listed in **Table 3.9** above are considered important for this study and provide support for the link between human development and competitiveness.

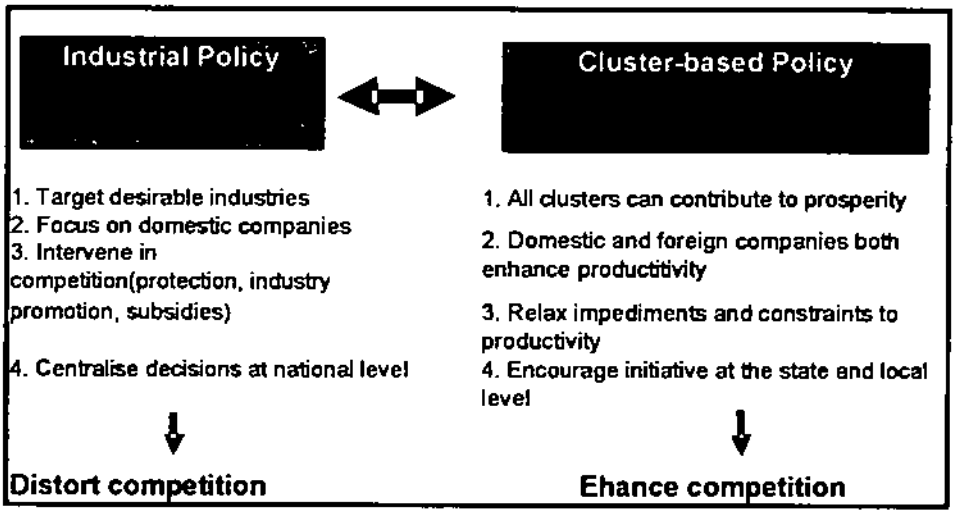
Agenda point two: foster cluster development

Industry clusters increase productivity and efficiency, stimulates and enables innovation and facilitates commercialisation. Porter specifies the following roles for government in cluster development

I. Government in cooperation with the private sector, must identify all existing and emerging clusters;
II. To qualify as an emerging cluster there must be some viable companies present as well as a core of cluster-specific advantages in the diamond;
III. Government policy should reinforce established and emerging clusters rather than attempt to create entirely new ones.
IV. Government should support the development of all clusters, not choose among them, and
V. Government's role in cluster initiatives should be as facilitator and participant. With the most successful cluster initiatives being public-private partnerships (Porter, 2003).

Industrial policy is discussed in more detail as part of the industry analysis; Porter makes a comparison between Industrial policy and a cluster-based policy in **Table 3.10** below.

Table 3.10: Cluster Policy vs. Industrial Policy



Source: Porter, 2003

Table 3.10 above substantiates the relevance of a cluster based policy to enhance the competitiveness of not only a nation but also industries within a nation.

Agenda point three: shift the roles of government and business in economic development

Table 3.11: Old vs. New Model: Roles of Government

Old Model	New Model
Government drives economic development through policy decisions and incentives	Economic development is a collaborative process involving government at mutiple levels, companies, teaching ad research institutions, institutions for collaboration

Source: Porter, 2003

Table 3.11 above indicates that government can no longer drive economic development through policy decisions and incentives but requires collaboration at multiple levels. In other words whether an industrial policy or a cluster-based policy is followed, government can no longer simply draft decisions without collaboration at multiple levels (Porter, 2003).

Agenda point four: integrate social and economic policies

The new thinking with regards to competition is that there is not an inherent conflict between economic and social objectives, but long term synergy. The competitiveness of companies depends heavily on, rising skill levels, safe working conditions, and a sense of equal opportunity and low levels of pollution. Efforts to meet "social" objectives must be aligned with productivity and prepare and motivate individuals to succeed in market systems. Efforts to meet 'economic", objectives must include explicit programs to raise human capability, improve lives and sense of opportunity for individuals and enhance the broader business environment (Porter, 2003).

Agenda point five although relevant for enhancing competitiveness of provinces, is not elaborated upon further as it is not a key focus area of this study.

Agenda point six: lead a cross-national economic strategy for SA

Traditional views include regions as free trade zones as well as economic unions. New views focus on regional strategy as a tool to enhance competitiveness in autonomous countries which include the following elements:

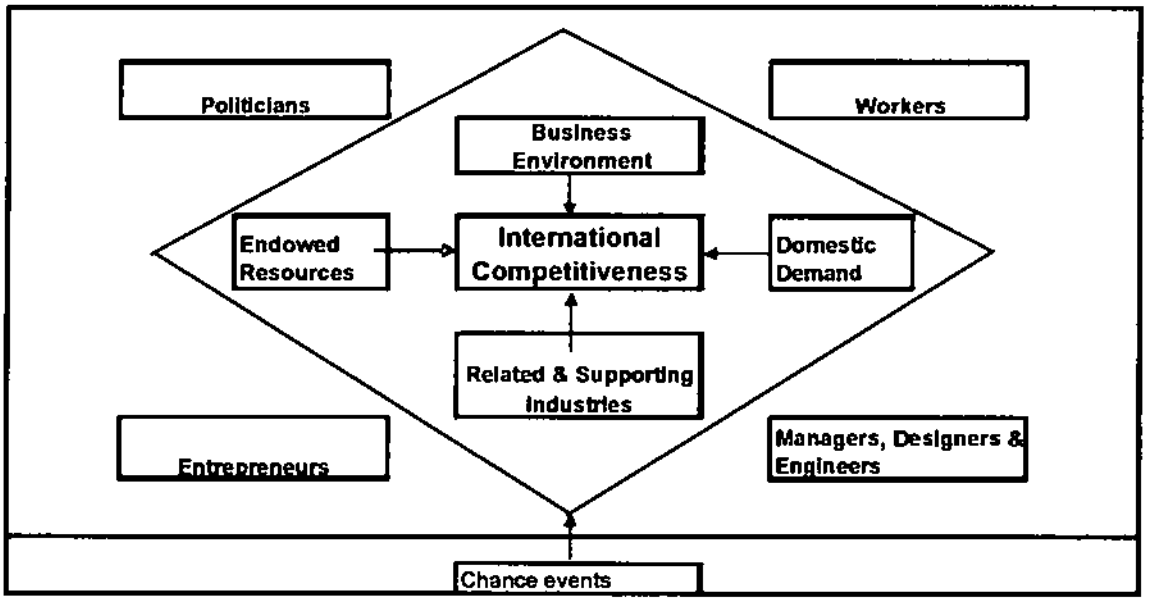
I. **Internal trade and investment**: gains from internal trade and investment.
II. **Company operations and strategy**: enhancing the competitive capability of firms and expanding trade in non-traditional export industries.
III. **Business environment**: mutual benefits to the productivity of the business environment through policy coordination that captures external economies and the benefits of specialisation in institutions and infrastructure across borders.
IV. **Cluster development**: cross-border cluster specialisation and integration.
V. **Foreign investment**: enhancing interest and investment in the region by the international community.
VI. **Economic policy process**: improving economic formulation and implementation at the national level (Porter, 2003).

The above agenda points provide a meaningful insight into the competitiveness agenda of SA and will be used in the drafting of a human development framework. Further to the competitiveness indexes of the WEF, as well as Porter's Diamond, more models and theories which relate to competitiveness are reviewed.

3.3.2.7 The Nine-Factor Model

The model evaluates competitiveness of a nation, using three aspects. The first aspect comprises four physical factors: endowed resources, business environment, related and supporting industries and domestic demand. The second aspect relates to developing countries, with the abundant and diverse group of people being seen as the key engine for economic growth. These people are grouped into four categories: workers who carry out basic economic activities, politicians and bureaucrats who formulate and implement economic plans, entrepreneurs, and professional managers. The third aspect is chance as an external factor. **Figure 3.11** below shows how the various categories fit together.

Figure 3.11: The Nine-Factor Model of International Competitiveness



Source: Cho, 1998

The physical factors: endowed resources, business environment, domestic demand and related and supporting industries are identical of Porter's Diamond. The model however includes human factors by separating workers from endowed resources. Politicians and bureaucrats are specifically referred to instead of government as included by Porter. Entrepreneurs and professional managers and engineers are included as uniquely independent components. Chance events, is also reflected as an external element.

The physical factors include:

1. **Endowed Resources**: Resources can be divided into: mineral resources, agricultural, forestry and fishery resources as well as environmental resources. All of the above mentioned resources are used as input materials for economic activities. It is argued that nations that possess these resources take a lead in competitiveness in proportion to the amount they possess.

2. **Business Environment**: The environment is divided into three domains: nation, industries and company. Nation is divided into visible components such as roads, ports, telecommunication facilities and other social infrastructure needed for economic activities. Invisible components include capitalistic values possessed by people, rules and orders observed in the market. Industry includes the number and size of competitors, the type and height of entry barriers and the degree of product

differentiation. Company includes strategy and the organisation of businesses and the attitudes and behaviours of the constituents in the organisation.

3. **Related and Supporting Industries**: A division is made between vertically related industries which consist of upstream and downstream areas as well as horizontally related industries that use the same technology, raw materials, distribution networks, or marketing activities.

4. **Domestic Demand**: Includes quantitative as well as qualitative aspects of the market. The size of the domestic market determines the minimum economy of scale of domestic companies' activities. The domestic market is also used as the test market for products shipped to overseas markets (Cho, 1998).

The human factors are the subjects that mobilise the physical factors, thereby creating competitiveness. Human factors drive the national economy by combining and arranging physical factors to maximise competitiveness. The grouping of people is included in the model as follows:

1. **Workers**: Factors such as wage level, level of education, sense of belonging to the organisation, obedience to superiors and passion for work, and the size of the labour pool.

2. **Politicians and Bureaucrats**: These individuals are constantly trying to create and maintain political power. Economic development is one of the alternatives which are used to achieve such objectives. It is generally accepted that politicians who attempt to create power by selecting economic development as a means of creating such power, tend to build up higher levels of competitiveness.

3. **Entrepreneurs**: Such individuals create new businesses at the early stage of a nation's economic development. A Nation's competitiveness is strengthened in the course of struggles to overcome high risks and maximising returns.

4. **Professional Manager and Engineers**: Once risks have been taken and production costs need to be reduced and improved efficiencies are required, professional managers and engineers are required (Cho, 1998).

External Factors

Chance events include changes in the environment that can not be predicted, and include an unexpected breakthrough of new technologies or products, oil supply and demand shocks, fluctuations in world capital markets, changes in foreign government policies to name but a few. Chance events strengthen a nation's

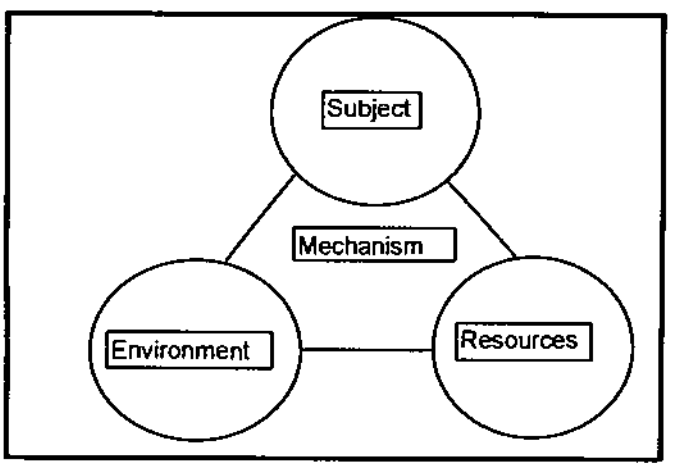
competitiveness only when human factors are ready to take advantage of such changes (Cho, 1998).

The above nine-factor model of International competitiveness does provide a meaningful measure of competitiveness as it includes human development components which complement the research topic. The nine factors each play a different role in determining competitiveness, and has further lead to the development of the "Ser-M" paradigm.

3.3.2.8 "Ser-M" Paradigm

The "Ser-M" paradigm is categorised into four groups, namely: subject(s), environment (e), resource(r) and mechanism (M) as the deciding factors in the performance of business (Cho & Lee, 1995).

Figure 3.12: The Nine-Factor Model of International Competitiveness



Source: Cho & Lee, 1995

The first factor, the subjects are those, who establish policy and business strategy and play a role in generating competitiveness by realigning and recombining available resources in a given environment. The second factor, the environment is exogenous in nature, and can not be changed at free will. The third factor, resources, differs between companies and industries and leads to different responses to a change in the environment. Mechanism, the fourth factor is the principle by which a subject utilises or creates its resources. For example, business

strategy is a part of the mechanism by which entrepreneurs and managers make use of their resources (Cho, 1998).

3.3.2.9 Traditional Paradigms in Manufacturing Industry

Davies (2001) attempted to compare traditional paradigms used in manufacturing to Porter's approach. **Table 3.12** below provides the resulting comparison.

Table 3.12: Manufacturing Industry: Traditional vs. New Strategies

Traditional Strategies	New Strategies
Fragmented: focus on industries and individual companies	Comprehensive: use cluster perspective to build a competitive region
Supply-side driven: reliant on public sector action	Market driven: built on understanding local and global business trends
Static: attention on reducing direct business costs	Dynamic: based on continuous change and improvement
Unfocused: non targeted job creation, traditional economic development programmes	Strategic: based on understanding key competitive factors
Competitive: fosters inter-firm competition	Collaborative: fosters inter-firm and public and private sector collaboration

Source: Davies, 2001

The new strategies information in the **Table 3.12** above provides an overview of the strategies which are inferred from Porter's Diamond. The model has been applied as a tool for sustaining competitive advantage, and provides the theoretical context in which the clustering concept has emerged (Davies, 2001). Davies (2001) refers to four major strategies which are typically employed to enhance manufacturing competitiveness. The four strategies are: industrial specialisation and movement up the value chain, beneficiation of natural resources, targeting of key capabilities and clustering.

The first strategy of **specialisation and movement up the value chain** consists of a chain of products which are produced in two ways. The low end of the chain involves the manufacturing of highly undifferentiated and low quality commodity products. At the other end lies the production of highly differentiated quality products. For a company to change their position in the value chain, a move is required to another sector or by specialising into a related sector by focusing on different market niches (Davies, 2001).

The second strategy of **beneficiation of natural resources**, relates to the benefits obtained from natural resources. Natural resources are often concentrated upstream; with a wide spread presumption that more domestic downstream processing should be the major objective. The domestic downstream processing is known as beneficiation (Joffee, Kaplan, Kaplinsky & Lewis, 1995). Beneficiation should lead to the more efficient use of resources progressively up the value chain, but requires effective implementation to avoid the effects of lower productivity. The strategy is worth following as long as the inefficiencies of the market are considered (Joffee et al, 1995).

The third strategy relates to **targeting key capabilities**, an awareness of competitive gaps between the domestic economy and other countries is required. In SA, Joffee et al (1995) has identified various competitive gaps between South African manufacturers and foreign counterparts, between leading firms and domestic competitors and between "national best practice firms" and the rest.

The fourth strategy relates to **clustering** which is a strategy that favours linkages between businesses which should result in collective efficiency and enhanced competitiveness (Joffee et al, 1995). The above four strategies provide guidelines to enhance both manufacturing industry and firm competitiveness.

3.3.2.10 "Bloc Competitiveness"

As mentioned previously existing studies on competitiveness focus on firm, industry and nation, however "bloc competitiveness" is also receiving more attention. The emergence of economic unions or nations such as European Union (EU), North American Free Trade Agreement (NAFTA), Association of South East Asian Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC) has contributed towards the importance of bloc competitiveness. The concept of "bloc competitiveness can further be expanded to include the concept of "Global competitiveness". Global competitiveness measures wealth and income of the people on earth and by the fairness of wealth and income distribution among people dispersed in different parts of the world (Cho, 1998).

Table 3.13: Bloc Competitiveness: Integrated Model of Competitiveness

Entity Role	Firm	Industry	Nation	Bloc	Global
Subject	-entrepreneurs -professional managers& engineers -labor unions	- business leaders - politicians & bureaucrats	-politicians & bureaucrats	- bloc leaders	- global leaders
Environment	- endowed resources - business environment - relates & supporting industries -domestic demand -politicians & bureaucrats -chance events	- endowed resources - business environment - relates & supporting industries -domestic demand -chance events	- endowed resources -chance events	- endowed resources - bloc-level demand -chance events	-chance events
Resource	- created resources - workers	- createsd resources -proffesional managers & engineers -workers -corporate strategy	- createsd resources - business environment -related and supporting industries - domestic demand - entrepreneurs - professional managers -workers	- endowed resources -created resources - business environment -related and supporting industries -bloc-level demand -politicians & bureaucrats, entrepreneurs - professional managers -workers -macro-economic policy	- endowed resources -created resources - business environment -related and supporting industries -global demand -politicians & bureaucrats, entrepreneurs - professional managers -workers -bloc policy
Mechanism	- corporate strategy	-Industrial policy	-macro-economic policy -industrial policy	-bloc policy	-global policy

Source: Cho, 1998

The Integrated Model of Competitiveness in **Table 3.13** above asserts that the nine factors play different roles in determining the level of competitiveness according to the entity of analysis. The model has two basic criteria: the domain of entities: firm, industry, nation, bloc and the globe, and the category of the roles: subject, environment, resource and mechanism. The model shows that as the domain of entities increases, the scope of resources which can be utilised increases and the scope of the uncontrollable environment shrink (Cho, 1998).

3.3.2.11 Analytical Framework for Examining Competitiveness

Competitiveness can be studied at nation-state, firm and individual levels; Veliyath and Zahra (2000) identified these levels and further examine the benefits and drawbacks of competitiveness at each level and developed the Analytical Framework for Examining Competitiveness.

Table 3.14: Analytical Framework for Examining Competitiveness

Unit of Analysis	Defining Concepts	Dimensions of Competitiveness	Factors influencing Competitiveness	Benefits	Downsides
Nation state	• Sovereignty	• Balance of Trade	• Size	• Greater investment inflows	• Greater economic/ political & security concerns
	• Culture	• GNP/ Capita	• Extent of state intervention	• Greater employment	• Geographic advantages neutralised
	• Social Value	• Income/ Capita	• Pace of change	• Increased reserves.	• Labour market dislocation & unemployment
	• Human Development	• Foreign exchange reserves	• Starting state	• Higher economic growth rates	• Cultural/ social value erosion
	• Living standards	• Employment (%)	• Nature of developmental process	• Stronger currency	• Cyber crime
		• Inflation (%)	• Location	• More value-added economic activity	• Political / institutional erosion
		• Savings Rate (%)	• Labour market flexibility		
		• Investment Inflows	• Market openness		
		• Value added Economic Industries			

Source: Veliyath & Zahra, 2000

The Analytical Framework for Examining Competitiveness as depicted in **Table 3.14** above is only an extract and excludes firm and individual units of analysis, as these units of analysis are not relevant to study of competitiveness at industry level. Defining concepts of competitiveness of a nation includes sovereignty, the societal culture and values, the state of human development and living standards. Dimensions of competitiveness include the balance of trade, GNP / Capita, per-capita income, the nation's foreign exchange reserves, employment levels, inflation, savings rate, investment inflows and the presence of value-added economic sectors.

3.3.2.12 Competitive Intelligence

Competitive Intelligence (CI) is defined by the Society of Competitive Intelligence Professionals (SCIP) as a means to create actionable knowledge for companies and institutions to create competitive knowledge about their business environment, build and sustain a competitive advantage and enhance global competitiveness (Viviers, Muller & du Toit, 2005). Calof defines CI as "actionable recommendations" arising from a systematic process involving planning, gathering information, analysing and disseminating information on the external environment for opportunities or developments that have the potential to affect a company's competitive situation. (Calof, 1998)

By analysing and interpreting the macro environment, CI enables companies to anticipate and plan to exploit market developments rather than merely reacting to them (Viviers et al, 2005). It is an important tool for creating competitive advantage and enhancing competitiveness and is decisive in determining whether an entity (company, country organisation, and region) will be a market leader or a follower (Viviers et al, 2005). The relevance of CI to competitiveness is based on the fact that CI creates a greater understanding of a company's competitors and the competitive environment. Essential ingredients of CI capability include monitoring industry and market trends, assessing the impact of political and economic changes, collecting information on competitors and knowing a company's strengths and weaknesses.

Research conducted by Viviers in 2001, aimed to study CI practices in SA companies. The research was built around the six key areas which collectively form the intelligence model identified by Calof and Breakspear i.e. planning and focus, collection, analysis, communication, process and structure and organisational awareness and culture (Calof & Breakspear, 1999). The research found that South African companies showed a general lack of appropriate processes or structures for CI. Companies were rated poorly in formal organisation and processes for intelligence and there was little evidence that current systems support CI activities. The research also found that there was lack of knowledge management and little knowledge sharing took place. Few companies had dedicated CI units as well as central coordinating points for receiving competitive information. Some positive findings included the fact that companies in SA acknowledged that CI can enhance competitiveness and regarded it as a legitimate business activity. It was also found

that CI activities extended beyond analysis of competitors to include regulatory matters and customers and suppliers (Viviers et al, 2005).

3.3.2.13 Summary: Competitiveness

The above overview of competitiveness highlights the importance of the level of analysis at national, industry and firm level. Some of the competitiveness indexes which were discussed include the WEF's growth, business and global competitiveness indices focus on factors, policies and institutions which determine the level of productivity of a country and that, therefore, determine the level of prosperity that can be attained by an economy. The Index of Economic Freedom focuses on similar factors but includes categories such as fiscal burden of government banking and finance and informal market activity. Porter's Diamond is included as if offers a broad theory to explain why, in many instances, the most competitive companies in one industry come from the same country. The competitiveness agenda for SA as identified by Porter is included, as it emphasizes the importance of human development and knowledge development for improved levels of competitiveness. The nine-factor model of International competitiveness which is an extension of Porter's Diamond is included as it provides a meaningful measure of competitiveness as it includes human development components which complement the research topic. The four strategies which are most often used within the manufacturing industry, namely: industrial specialisation and movement up the value chain, beneficiation of natural resources, targeting of key capabilities and clustering are included. These four strategies offer strategic guidelines for both industries and firms within the manufacturing industry. The Integrated Model of Competitiveness is included as it asserts that how nine factors play different roles in determining the level of competitiveness according to the entity of analysis. Competitive htelligence as a discipline is included as it serves as an important tool for creating competitive advantage and enhancing competitiveness and is decisive in determining whether an entity (company, country organisation, and region) will be a market leader or a follower.

3.3.3 Competitiveness: Related Research Articles

Further to the above literature review of theories and models which relate to human development and competitiveness, this section includes an overview of journal articles which complement some of the research objectives.

3.3.3.1 Competitiveness, Human Development and Inequality: A Cross National Comparative Inquiry

The article was published by A.N.M Waheeduzzaman, in 2002 in the Competitiveness review (Waheeduzzaman, 2003). There are three main research hypotheses, of which two are relevant to this study:
Hypothesis one: International competitiveness will positively influence the per capita income of a country.
Hypothesis two: International competitiveness will positively contribute to the human development of a country.

The methodology used for this research included the use of a database of 45 countries, which included Organisation for Economic Co-operation and Development (OECD) countries and a few medium to low income developing countries. The relationships between these countries, was measured with correlation and appropriate bivariate regression analysis. The data was collected from various secondary sources; the competitiveness information was collected from the GCR of 1998 and the World Competitiveness Yearbook of 1998. The HDI provided the actual country scores for 1998.

The key results of this study were as follows:

Hypothesis one: Countries which had a high score on competitiveness also had a high score on per capita income. The relationship between per capita income and competitiveness was found to be positive and strong. The bivariate relationships between competitiveness and per capita income were also found to be positive, strong and significant, which according to Waheeduzzaman was very similar to what Porter found in 2000 (Waheeduzzaman, 2002).

Hypothesis two: Countries which had a high score on competitiveness also had a high score on human development. It was found that emerging economies had a

poorer rating than richer economies. The regression relationships between HDI and competitiveness were also found to be significant. Competitiveness explained over 50 percent variability in HDI. Hence it was found that competitiveness positively contributes to the human development in a country.

The limitation of the study

The study was cross-sectional and did not show any longitudinal trends. Secondly, the sample was small and excluded low income economies. The study also did not address social, cultural or political dimensions of competitiveness

Suggestion for future research

It was suggested that from a welfare perspective, policy studies need to address the influence of international competitiveness on socio-economic variables like income, human development, and inequality. The author mentioned that such a perspective would place people in the forefront of the competitiveness equation which will help us to think beyond trade and commerce.

Relevance to the study

The relevance of this study to the research topic, relates to the positive correlation between competitiveness and human development, it confirms the validity of Porter's Diamond, with specific reference to factor endowments. The author also suggested that people should be placed at the forefront of the competitiveness equation; this reinforces the link between competitiveness, human development and factor endowments.

3.3.3.2 Industry Clusters in Ireland: An Application of Porter's Model of National Competitive Advantage to Three Industries.

This study was done by Clancy, O'Malley, O'Connell and Egeraat (2001), and was published in the European Planning Studies in 2001.

The study's main hypothesis

To examine to what extent the presence of clusters of related or connected industries have accounted for the degree of competitive success attained in each case.

The study focused on indigenous Irish industries, of which one was in manufacturing, one in internationally traded services and third industry was chosen based on an influence to an appreciable degree by interactions with foreign-owned companies in Ireland. These industries were chosen from industries that could be regarded as relatively competitive and successful. The study followed a similar approach to Porter (1990) by looking at international trade performance of each industry and identified those which had a relatively large share of world exports in their category, compared to Ireland's overall share of the total world exports.

The limitation of the study

The study is limited to only three industries within Ireland were used for the study; the industries were further not related to each other. It was also found that the majority of competitive industries in Ireland were foreign owned and hence dispelled Porter's Diamond theory which excludes MNC's.

Suggestion for future research

The author's suggestions for further research pointed out that the Irish industrial policy on development of clusters or related industries should not be developed based on Porter's model. One of the main findings of the study relates to efforts to attract foreign MNC's with specific emphasis on a significant proportion of highly skilled labour, particularly employees engaged in R & D.

Relevance to the study

The relevance of this study to the research topic, mainly relates to the concept of measuring three competitive industries according to Porter's Diamond. It offers insight into possible areas of debate that question the validity of the application of Porter's Diamond. The study also emphasizes the importance of attracting foreign

factor endowments, to help improve specific industries, competitive advantage and overall national competitiveness. The findings of this study complement the view that the impact of labour legislation on human development in SA is of strategic importance.

3.3.3.3 Does Porter's Diamond hold in the Global Automotive Industry?

This study was done by Sally Sledge, and was published in the Advances in Competitiveness Research journal in 2005 (Sledge, 2005).

The study includes four hypotheses

Hypothesis one: More demanding consumers in the home market will positively impact a firm's global competitiveness.
Hypothesis two: More advanced factor conditions in the home market will positively impact a firm's global competitiveness.
Hypothesis three: Strong and dynamic related and supporting industries in a firm's home market will positively impact the firm's global competitiveness.
Hypothesis four: Greater rivalry within a firm's home market will positively impact the firm's global competitiveness.

The methodology

The data for the study came from several sources. The 2002 Fortune Global 500 and 2002 Fortune 500 were used to obtain a list of the 50 most successful companies in the automotive industry in the world based on 2001 revenues. The home countries represented in this study included Canada, Germany, Italy, France, Sweden, Japan, South Korea and the United States. The goal of the study was to evaluate a multinational sample across a single industry. The research focused on using a large sample of objective data, previous research in the area of national competitiveness has often been based on surveys. The reason for not wanting to use surveys is based on the fact that the methodology includes small sample sizes, subjectivity and self-reporting bias. The data on country conditions came from the 2002 Economist Pocket World in Figures, and other economic data and industrial indicators came from the CIA World Fact book 2002.

The dependent variable was firm performance, which was measured using data from Fortune listings, 2001 profits as a percentage of revenues, or Return on Sales and 2001 profits as a percentage of assets or Return on Assets was used to operationalise performance. The four independent variables each represented one tip of Porter's Diamond, for purposes of this research only the variable that relates to factor conditions will be discussed.

Independent variable: Factor conditions

The variable was chosen based on Porter's understanding of factor conditions which includes naturally occurring factor endowments as well as man-made ones. Porter states that advanced factors are more significant than basic ones and specialised factors are more relevant than general ones. To capture both the advanced and specialised factors, the number of internet hosts per 1000 people in the headquarters location of focal firms was used as a proxy for communications infrastructure. The second factor that was used was U.S. patent filings, which have previously been used to assess technological innovation in the international business literature research. The two factors were given equal weights to create a composite score for factor conditions.

Key results

The key results of Hypothesis two is that factor conditions do positively influence national competitiveness in the automotive industry. One of the interesting findings was that the estimator had the smallest impact on the performance for both revenues and assets model, which seems to indicate that factor conditions are indirectly related to firm success. The implication of this finding was that governments can and do play a large role in industrial global competitiveness. This supports the historical result that developed nations who are committed to advances in business infrastructure and emphasis innovation through the development of proprietary IP have been leaders in the automotive industry. This finding is confirmed by the qualitative research which was conducted by the researcher in the South Africa manufacturing industry.

The limitations of this study

The study focuses only one industry, namely the automotive industry and only on firms that are leaders in the world market, regardless of their origin.

Suggestions for the future

The author indicated that further evidence from other industries will lend additional verification of Porter's model. The author suggested further that global winners in the future will be those that learn from those that have come before them and that such models will help to facilitate the process.

The relevance of the study

The relevance of this study to the research topic is based on the fact that the automotive industry is seen as a leading indicator of the competitiveness of developed countries. The automotive industry as covered in this research can be used to draw parallels to the SA automotive industry, and it is hoped that global learning's can be identified to help with the improvement of human development.

3.3.4 Summary of related research

The related research articles which have been used in literature review have assisted in being able to find a "research gap" on which the research question can be based.

The research by Waheeduzzaman (2001) found that competitiveness and human development are positively related to each other. His suggestion that people should be placed at the forefront of the competitiveness equation creates a valid justification for proposed research topic, as it will help us to think beyond trade and commerce.

The research which was conducted in Ireland further emphasis the relevance of factor endowments and proves that they positively contribute to competitiveness of particular industries. The research however also provided evidence that Porter's Diamond did not offer a conclusive contribution to national competitiveness, two of the three industries could not be regarded as clearly competitive. The study also

looked at three unrelated industries. The proposed research topic will accordingly specifically focus on three manufacturing industries within SA.

The research which was conducted on the global automotive industry, also found that factor conditions do positively influence national competitiveness in the automotive industry. However the link between being a developing country and being a leader in the automotive industry has been neglected in previous studies, hence the need to focus on the automotive industry in a developing nation.

3.4 Literature review of Industry publications

3.4.1 Introduction

The literature review below focuses on publications with regards to mainly the manufacturing industry and sub sectors. Literature which relates to competitiveness and human development is mostly published at national level, publications by the manufacturing industry are limited and even more so by the relevant sub sectors.

The literature review that follows focuses on industry publications which relate to the five factor conditions of Porter's Diamond. The second force of the model is known as factor conditions, which will be linked to human development challenges that the automotive, chemical and metal and steel industries of SA face. Porter classifies the factor conditions into five categories: human resources, physical resources, knowledge resources, capital resources and Infrastructure (Sledge, 2005).

3.4.2 Human Resources

Automotive Industry

The Automotive Industry Development Centre (AIDC) has a human resource development department which was established with the mandate to assist in building human capacity specifically aimed at addressing the needs of the automotive industry. Human resource development is achieved through a strategy of developing relevant technical training capacity and programmes in formal Tertiary Education Institutions (TEIs) as well as a strategy to further develop the technology base of TEIs. The AIDC has partnered with four Gauteng educational institutions to

develop and nature skilled human resources needed to support the Gauteng automotive industry. The objectives of the programmes are:

I. To build the human capacity and capabilities required to increase the global competitiveness of the South African automotive industry to world-class levels.
II. To establish appropriate international, industrial and academic networks to be used to ensure effective transfer of knowledge to the local industry.
III. To improve skills in the automotive industry across all of the National Qualifications Framework (NQF) skills levels.
IV. To undertake research to address the needs of the automotive industry (Automotive Industry Development Centre, 2006).

The key training areas identified include, development / basic training, shop-floor training, technical training, managerial skills training and automotive engineering. The programme to date has collectively succeeded in improving the skills training and the technology base. Learners are considered more employable as a result of skills which meet the needs of the industry. The programme as also facilitated closer cooperation between TEI's and the automotive industry, which as lead to a mutually beneficial relationship (Automotive Industry Development Centre, 2006).

Development programmes and initiatives which have resulted from the above include a Chair in Life Cycle Engineering as well as a chair in Automotive Manufacturing which is a discipline within the Department of Industrial Engineering at the University of Pretoria. The Automotive Technology Centre at the Technikon of Pretoria which offers learning programmes at undergraduate level in the fields of manufacturing and mechatronical engineering. The Automotive Training College is a project at the Soshanguve Campus and delivers customised education and skills development solution at a shop-floor level (Automotive Industry Development Centre, 2006).

Chemical Industry

The chemical industry has poor access to a skilled labour pool, the Chemical Industry Education and Training Authority (CHIETA) has identified priority scare skills for development, such as:

I. Artisans (master artisans, rotation equipment artisans, block artisans, pipe fabrication) ;

II. R&D scientists in specific areas;
III. Metrology; and
IV. Operational supervision.

The above listed scientific and technological skills are seen as crucial limiting factors for future technological growth, the country can however draw on current technological resources although they are not widespread in the industry (Department of Trade and Industry, 2006).

The Metal and Steel Industry

The SA metal industry requires increased levels of quality education due to the industrial development boom which includes the infrastructure required for the 2010 Soccer World Cup, Gautrain Rapid Rail Link (Gautrain) project, shopping malls in previously disadvantages areas as well as infrastructure required for additional power stations. The Southern African Institute of Steel Construction (SAISC) has launched a national diploma in structural steel drafting. The main reason for this diploma is to address the lack of apprenticeships which where previously provided by technical colleges. Technical colleges where replaced by universities of technology, these universities offer standard civil engineering curriculum's which do not focus on structural steel subjects (Engineering News, 2005). Research by Lawless (2006) indicates that the number of civil engineering professionals (engineers, technologists and technicians) have declined since the infrastructure developments during the 1960's and 1970's. The main reasons for the decline include, reduced industry demand, fewer graduates, emigration as well as low remuneration. The research further indicated that fundamental activities relating to the attraction, education and training of professionals are no longer in place or are inadequate. According to Lawless the aspects that require attention vary from English and mathematics in schools, tertiary education, graduate training, working conditions and continuing professional development. The research indicated that between 3,000 and 6,000 additional civil engineering professionals will be required over and above the existing 15,000 civil engineering professionals currently practising in SA to meet the growing demand for infrastructure (Lawless, 2006)

Mittal Steel, SA largest integrated steel producer on the African continent (South African Iron and Steel institute, 2004) is expected to spend about R9 billion over the

next few years on capital expenditure according to the Chief executive, Davinder Chugh (Salgado, 2006). The increased capital expenditure will result in increased demand for training and skills. The General Manager for procurement and logistics at Mittal, Jake Oliver comments that SA will have to increase artisan training by tenfold to meet the requirements set by the Accelerated Shared and growth Initiative (ASGISA). The GM goes on to say that 70% of the current 51,000 artisans are expected to leave the manufacturing industry during the next five to six years. He also commented that about 10,000 to 12,000 artisans need to be trained to feed the manufacturing industry, however SA is experiencing a shortage of skilled artisans, with new apprentices decreasing from 33,000 in 1975 to 1,440 in 2005 (Salgado, 2006).

3.4.3 Physical Resources

SA is the 24th largest country in the world, measuring 1,219,090 square kilometres, arable hectares of land per 1,000 people measures 338.5 hectares or 38th in the world (Microsoft Encarta, 2006). SA's coal reserves are the 7th highest in the world, measuring 49,520 million metric tons of coal, the highly developed synthetic fuels industry is supported by high coal reserves. The local chemical industry has benefited from the well developed synthetic fuels industry, Sasol has managed to become the largest manufacturer of oil from coal in the world (Energy Information Administration, 2005). The local metals industry also has an abundant feedstock of gold, PGM, manganese, chromium, copper, antimony, phosphate rock, uranium, fluorspar and titanium containing heavy minerals. These minerals are however mostly exported in un-beneficiated form (Department of Trade and Industry, 2006).

3.4.4 Knowledge Resources

The importance of knowledge resources raises the issue of the availability of knowledge resources as well as the development of knowledge resources.

Automotive Industry

The Automotive industry's answer to the challenge of knowledge resources is known as the Automotive Focus Group (AFG) which attempts to respond to the needs of the automotive industry for knowledge and technology transfer. The AFG consists of members from the CSIR, the University of Pretoria and the AIDC (The innovation hub, 2002). During 2000 an initiative called initially the Strategic Economic

Infrastructure Investment Programme (SEIIP) was conceived, which was later branded as Blue IQ, the plan for a smart province (the province being Gauteng Province) (Gauteng Provincial Government, 2004). One of the projects included as part of the Blue IQ plan, is the Gauteng Automotive Cluster including the AIDC and Supplier Park in Pretoria. The AIDC was designed to offer world-class services for automotive design testing, R & D, and the development of human resources. The initiative has spurred skills development in the industry and involves four TEI's who developed specific courses to improve capacity in technical skills training, automotive engineering and managerial skills in the automotive industry (Gauteng Provincial Government, 2004). The above initiatives provide insight into the efforts by the Automotive Industry of SA to increase knowledge resources to help improve competitiveness and achieve technological leadership. (The innovation hub, 2002)

Chemical Industry

The link between R&D in the chemical industry is seen as a weakness, as resources are positioned in the public industry. A repositioning towards a more commercial approach is required to be spearheaded by non-commercial orientated resources It is suggested that unless a national technology strategy which is based on sound principles of rationalisation and focus is established, the base will remain weak (Department of Trade and Industry, 2006).

Globally important emerging technologies in the chemical industry include material technology, biotechnology and nano-technology. A study conducted by the DTI found the key interventions with major potential benefit for the local industry includes:

I. The development of a new industry based on the extraction of minerals fom coal ash and low-value slag;
II. The development of a new range of performance chemicals that will improve the recovery of minerals in the mining industry;
III. The establishment of a new technology platform that will develop technologies to decrease economies of scale for chemical plants and hence enable smaller production facilities to compete;
IV. A major initiative to build SA's first generic pharmaceutical actives plant in order to meet future demand for antibiotics and/or anti-retrovirals; and

V. A highly integrated strategy to fully develop SA's ability to add maximum value to its natural products and unique biodiversity (International Marketing Council of SA, 2004).

The Metal and Steel Industry

The metal and steel industry is assumed to have reached maturity world wide. However the importance of incremental improvements in various value chain processes can not be overlooked. Emphasis is placed on aspects such as improved use of gravel as a form of ore, improved extraction of lower grade ore by developing improved reduction and extraction techniques and the more efficient use of energy (International Marketing Council of SA, 2004). More innovative work is however being done in the light metals industry, specifically aluminium, magnesium, titanium and development of alloys. The downstream possibilities of these metals are large enough to warrant significant levels of R&D (International Marketing Council of SA, 2004).

3.4.5 Capital Resources

Between the years 2000 and 2005, the real output growth in SA's economy has exceeded the pace of expansion in the real fixed capital stock; this trend has lead to a declining capital-output ratio. The declining capital-output ratio has lead to the prompting of higher fixed capital formation in order to improve capital stock levels and accommodate sustained acceleration in output growth (SA Reserve Bank, 2006)

As a result of the above indicated trend, the fixed investment in SA has been growing for 22 consecutive quarters, with growth rates of 8,3% in 2003, and 8.8% in 2004 and is expected to grow by over 10% a year over the next five years (International Marketing Council of SA, 2006). The fixed investment as a percentage of GDP in SA reached 16,5% in 2004, up from 15,1% in 2000, however the percentage still lags behind a proposed benchmark of 20% which can be found in some high-growing developing countries (International Marketing Council of SA, 2006). The manufacturing industry's gross fixed capital formation followed an erratic pattern between the 1970s and 1980s. The ratio increased in the 1970s due to the expansion of Sasol and again in the 1980s due to the expansion of Mossgas and Iscor. The ratio has settled at a level of 23% of total capital formation.

Automotive Industry

Not withstanding the key training areas which where identified in **section 3.3.1** above human resource requirements remain challenging, for example the President of NAAMSA indicated at the Durban Motor show during March 2006, that the automotive industry is highly automated and hence employment can not be expected to increase significantly (Competition Commission SA, 2004). The president also commented that the vehicle manufacturing industry expected to increase capital investment by 135% compared to 2005, by the same token he commented that employment had increased from 280,870 employees in 1999 to 306,300 in 2004 or 9% (Competition Commission SA, 2004)

During 2005 the manufacturing industry was expected to complete projects worth R68, 2 billion, the steel industry announced five large projects during 2005:

- Mittal Steel's R8-billion expansion and upgrade of its Vanderbijlpark, Newcastle and Saldanha steel plants.
- The IDC's R3.3-billion titanium project.
- Highveld Steel and Vanadium's R1.6-billion upgrade of its Witbank plant.
- International Ferro Metals' R1.4-billion plan to construct a ferrochrome smelter near Buffelsfontein in North West province.
- Tata Steel's R650-million plan to construct a high-carbon ferrochrome smelter in Richards Bay (International Marketing Council of SA, 2006).

The automotive industry is highly automated and hence extremely capital intensive, the industry requires constant capital investment in plant and machinery to help ensure competitive unit output costs. The vehicle manufacturers in SA announced projects worth R7 billion in 2005, with DaimlerChrysler, General Motors, Toyota and Volkswagen either improving flexibility of operations or expanding capacity to produce new models for domestic and export markets (International Marketing Council of SA, 2006).

Chemical Industry

SA's chemical industry is structured around capital-intensive up-stream operations which use new technology, the downstream companies however in particular plastic conversion, but also formulation and synthesis rely on old technology (Department

of Trade and Industry, 2006). The chemical industry spends about R2 billion rand on capital upgrades per annum (DTI, 2006).

3.4.6 Infrastructure

The country's transport infrastructure is highly developed with extensive network of roads, measuring 275,971 km's, with a total land area of 1,219,090 square kilometers, that translates to 0,22 kilometers of road per every square kilometer of land. SA is the 24th largest country in the world in terms of land area (measured in square kilometers), however the network of roads is the 17th longest in the world, indicating that SA has a well established network of roads (Microsoft Encarta, 2006). The rail system which measures 20,041 kilometers in length is the 14th longest in the world (Microsoft Encarta, 2006). The rail system is used extensively by the automotive industry to transport vehicles from the production plants to the ports for export as well as other domestic distribution points.

SA has seven commercial ports namely Cape Town, Durban, East London Mossel Bay, Port Elizabeth, Richards Bay and Saldanha Bay (International Marketing Council of SA, 2006). These commercial ports function as hubs for traffic emanating from, and destined for, Europe, Asia, the Americas and the East and West coasts of Africa

SA consumes about 189.4 billion kilowatt-hours of electricity per annum, which translates to the 16th highest consumption in the world, however SA's consumption per capita is 4,158 kilowatt-hours(42nd in the world) (Microsoft Encarta, 2006). SA consumers 169,479,000 barrels of oil per annum, which is the 28th highest in the world, however the consumption of only 3,9 barrels per capita is only 85th in world (Microsoft Encarta, 2006). SA does export about 1,344,000 barrels of oil per annum, but imports 133,282,000 barrels of oil per annum (Microsoft Encarta, 2006). SA has four refineries that are involved in both refining and down stream oil activities. These refineries collectively have the second largest refining capacity in Africa, approximately 519,547 barrels of oil per day (Energy Information Administration, 2005).

The physical environment is well suited to the needs of the manufacturing industry, with a well developed road and rail system which allows for a cost effective way to transport low weight to value goods. The seven commercial ports are considered as

a hub for traffic from most parts of the world, and offer more than adequate support to the manufacturing industry. The power supply of SA is mostly reliable and affordable, during 2006 however it became apparent that the Koeberg nuclear power station was performing above capacity and hence requires an immediate upgrade. The petrochemical industry is well established in SA; however the global increase in demand for crude oil products as well as the lower crude oil reserves does not bode well for the South African economy in general. SA has a well developed metals industry, with a large iron ore production capability.

3.4.7 Competitiveness

A thorough literature review of manufacturing industry competitiveness related research has revealed that competitiveness is not researched periodically at industry level. A local publication, known as the Engineering News, recently published an article entitled "Manufacturing competitiveness strategy imminent" (le Roux, 2005). The articles, refers to fact that the so called National initiative to improve the competitiveness of the local manufacturing industry is gaining momentum. The article writes about the Advanced Manufacturing Technology Strategy (AMTS), which aims to strengthen the competitiveness of the manufacturing industry through the implementation of high-impact projects in areas such as industry development, innovation, R & D as well as human development (le Roux, 2005). The AMTS is a Cabinet-approved programme and is hosted by the Council of Scientific and Industrial Research (CSIR's) manufacturing and materials division (le Roux, 2005). Dr Hoffie Maree the CSIR's manufacturing and materials division executive director commented that the local manufacturing industry is declining due to not only the strong rand, but also due to structural issues (le Roux, 2005). Maree commented that in parts of the world where the manufacturing industry is clustered, the industry has managed to remain competitive regardless of fluctuations in the exchange rate (le Roux, 2005). Maree further commented that the South African manufacturing industry can greatly benefit by organising towards specialised niche markets. The comment is substantiated by the trend in the developed world to reallocate manufacturing work (le Roux, 2005).

The South African Competition Commission contends that economic growth is required from labour intensive sectors, to help ensure that growth is matched with job creation. The statement implies that South African labour must be cost effective

against machine equipment locally and abroad, as well as labour in other countries (Competition Commission SA, 2004).

3.4.8 Industrial Policy

The ability of firms to compete depends on their capacity to adapt and to take advantage of the new manufacturing environment. To understand what is meant with a new manufacturing environment an overview of previous modes of securing competitive advantaged is required.
Previous modes of securing competitive advantage included:

I. **Raw material**: which used to offer countries comparative advantages due to import tariffs and high transport costs, raw materials no longer offer a competitive advantage. Duties and trade barriers have been reduced substantially as well as transport costs, manufacturers face similar prices and delivery conditions for most raw material inputs.
II. **Cheap labour**: was previously used by the South African manufacturing industry as a result of the availability of unskilled and semi skilled labour. As a result of higher levels of consumerism, consumers have become more selective and demanding. The higher level of consumerism has lead to more emphasis being placed on technology which requires more skilled and adaptive labour and effective management capacity.
III. **Production knowledge**: access to technology use to offer superior proprietary production technology for extended periods. This has changed in the sense that knowledge is diffused much quicker and technology is rapidly changing.
IV. **Privileged access to markets**: access to markets is diminishing, as a result of liberalisation of trade and investment markets have opened up as well as stronger legal prohibitions on monopoly power and market restrictive practices (National Advisory Council on Innovation, 2006).

A firm's ability to compete depends on the capacity to adapt and take advantage of the new manufacturing environment, which requires:

I. The development of Information and Communication Technologies (ICT), which is required to automate manufacturing and related processes. Although development in ICT has lead to changing structures in the labour market as

well as structuring of work and organisations. In a traditional capital intensive manufacturing industry ICT development has been vital.

II. The role of technology in integral to competitiveness. The APTS is proof of the fact that technology is vital for overcoming barriers and constraints to entry. New technology such as biotechnology and nanotechnology are expected to have a fundamental impact on production.

III. The importance of time and efficiency to costs of production has increased significantly. This had implications for how business needs to operate and for the efficiency with which government needs to interact with the economy (National Advisory Council on Innovation, 2006).

The above mentioned new manufacturing environment favours developed geographic areas with a high potential to entrench and heighten existing spatial inequalities and underdevelopment. The changing basis of competitiveness poses a huge threat to SA as it moves away from SA's traditional competitive advantage. Both national and industry competitiveness is impacted by industrial policies which focus on growth rate, employment creation, small business development, income distribution and equity.

There are numerous types of industrial policies which have been considered in SA in the past few years. The **World Bank's approach** assumes that the weakness in the South African, manufacturing industry is the result of "protection from international competition". Also real wages and capital costs are too high which leads to a high rate of unemployment. This approach follows the orthodox neoliberal approach where the market should determine the cost of labour and capital. The strategy is focussed on "getting the prices of capital and labour right" (National Economic Development and Labour Council, 2006). The focus of the strategy is on developing a more skilled workforce while maintaining prudent fiscal and monetary policies. The approach is criticised for its assumption that economic restructuring, when left to markets, will lead to economic equilibrium. It does not take into account that the South African economy "has been built upon state intervention on behalf of, and in co-ordination with, large-scale corporate capital." A commitment to "undistorted prices" can therefore "not wish away" the economic power wielded by powerful vested interests in SA (National Economic Development and Labour Council, 2006).

The **post-Fordist approach** followed after the Fordist stage which was based on mass production which was coupled with mass consumption. Post-Fordist stage followed after the realisation that mass markets were breaking down into niche (or specialised) markets, which required a move away from rigid assembly-line based approaches to production. Post-Fordists argued that new production techniques based on flexible specialisation could foster an industrial relations dispensation based on trust between management and unskilled workers. The approach emphasised trade liberalisation, support for an export-oriented manufacturing industry through supply-side measures, human resource development, and technological policy (National Economic Development and Labour Council, 2006).

The **Porterist approach** assumes that competitiveness is driven by firms and not by nations, but that government plays and important role. The role of government policy is best understood by looking at how it influences the platform from which firms compete. It is argued that the most productive role of government is to improve the quality of inputs (factors) which firms can draw upon as well as defining the competitive environment and rules of the game which promote innovation and upgrading. The role of the state is seen as the creator of an enabling environment, with limited intervention through strengthening factor markets. This approach emphasises that competitive advantage does not relate to individual firms but to co-operation between different firms in so-called "clusters". With regards to the so called "platforms" on which firms compete, the approach is criticized for underestimating the embeddedness of production in specific labour regimes. The approach provides a useful framework to analyse certain sectors of an economy, however the concept of "clusters" does not provide a broad picture of how different sectors relate to each other (National Economic Development and Labour Council, 2006, 2006).

The **political economy approach** argues that the state and the market are not two separate social entities, but that interaction between state and market is a complex product of the forces that are exerted upon them. Fine and Rustomjee (1996) question the extent to which the manufacturing industry is central to the South African economy. They argue that if SA wants to build an economy of scope and scale based on manufacturing, industrial policy considerations will have to take into account the influence of powerful corporate interests in the economy as well as how these interests shape the role of the state. **Table 3.14** below provides a comparison

of the four industrial policies. The importance of industrial policies can not be underestimated as they focus on key areas such as growth rate, employment creation, small business development, income distribution and equity (National Economic Development and Labour Council, 2006).

Table 3.15: SA Industrial Policy: Different Perspectives

	World Bank	Post-Fordism (Industrial Strategy Project)	Porterism(Monitor Company)	Political Economy Approach (Fine & Rustomjee)
Industrial Structural Deficiencies	Labour and capital costs to high Manufacturing not competitive because of protection	1.Legacy of import substitution industrialisation, 2. Racial Fordism, 3. Decline in productivity in manufacturing sector	1. A lack of co-ordination of firms in economic "clusters", 2. Firms focus on production for government, rather than on customers and competitors, 3. Exports focus on commodities, rather than adding value, 4. Lack of skills integrated with technology capacity, 5. Lack of competition in local market, 6. Lack of government bureaucratic capability	1. Economy still based on a dominant minerals-energy complex, 2. The influence of class interests linked to the minerals energy complex limited the ability of this complex integrating forward into a strong manufacturing industry
Proposed Industrial Strategy	Main focus should be on improving investor confidence to stimulate growth	Main focus should be to improve productivity and exports in manufacturing industry	Main focus on improving competitiveness through providing a market-based enabling environment for firms to operate	State-led investment in the development of infrastructure Selective intervention to integrate minerals energy complex into a manufacturing industry of scope and scale
Role of the State	1. State intervention should be reduced, 2. Creation of investor confidence through 'sound' economic policies	1. Intervene only in case of serious market failure, 2. Build institutional capacity	1. The state should only create a market-driven enabling environment for firms to compete, 2. Best form of intervention is to strengthen factor markets on which firms draw	The false dichotomy between state and market should be rejectedRole of state is central
Proposed Industrial Policy Measures	1. State's role limited to modest redistribution of land and improving skills base, 2. Trade and monetary liberalisation and adherence to fiscal discipline in order to improve investor confidence	1. Strengthening of markets through trade liberalisation competition policy and enhancing role of SMs 2. Improving institutional capacity to enhance human resources development- i.e. training, 3. Enhancing technological capabilities through supporting research & development	The creation of an enabling business environment through increased local and international competition, the development of "clusters", moving up the value chain and the development of related and supporting industries	No specific proposals on industrial policy, but would include measures such as public works programmes and the targeting of industries

Source: National Economic Development and Labour Council, 2006

Industrial strategy followed by an industry or country also has a significant impact on labour absorption capacity. In the recent past South African manufacturing was dominated by high capital intensity, the country was orientated towards the most

capital-intensive end of the spectrum of activities. As a result there was a low level of commitment to labour-intensive sub-sectors with significant levels of employment for each unit of capital. A strategy directed at encouraging labour absorbing investment effectively seeks to promote economic growth by deploying more labour and raising the productivity of capital. The overriding concern of industrial strategy is with enhancing productivity, firstly being concerned with the overall deployment of society's productive inputs and with enhancing the capabilities, the efficiencies of the various productive factors (Policy and Law Online News, 2006).

The high capital-absorbing nature of the economy is as a result of strategic choices which were made by policymakers of the previous government. Previous choices emphasised national self-sufficiency in key products and access to secure foreign exchange sources. These strategic choices effectively rewarded investment in high capital-intensity sectors (Policy and Law Online News, 2006).

Currently SA's industrial policymakers are actively perusing labour-intensive investments, which require a re-orientation in order to achieve more labour-intensive outcomes. However wages are a significant component of overall cost structures, with the current trade reform and increased domestic competition there is however constant pressure to limit rising wage costs. As the South African economy becomes more open to international competition, local firms will only be able to survive if costs and productivity are comparable to major international competitors. A recent report indicated that South African wages (especially unskilled wages) were high relative to production, which accounts for the high unit labour costs by international standards. Increased productivity will be dependent on more training programmes, work-place changes and industrial relations reform. Industrial relations reform will include Human resource development (HRD), however it is acknowledged that education and training on the one hand and economic prosperity on the other, tend to occupy different worlds, despite the unanimous acceptance of the interconnectedness of the two (Policy and Law Online News, 2006).

The task of educating and training is enormous as it has to deal with high levels of illiteracy, unemployment as well as securing employment opportunities for unskilled and semi-skilled workers. However labour intensive manufacturing and services as a result of more integrated technologies will require individuals with multi-tasking capabilities, other than the traditional old-style artisans. In an attempt to promote

dynamic efficiency, skills formation, work security and economic democracy within companies, a suggestion has been made that a Human Development Enterprise (HDE) Index should be negotiated nationally (Policy and Law Online News, 2006).

3.4.9 Summary of Related Research

The review above has revealed that there is a lack of quality research which relates to human development as well as competitiveness at industry level in South Africa. The lack of research further substantiates the need for ongoing publications in the area of competitiveness and human development. An overview of the Porter's factor conditions revealed that human resources are critical to the manufacturing industry and that there are initiatives in place to try and address the skills shortage. SA has a has an abundance of arable land, which rich coal reserves as well as an abundant feedstock of gold, PGM, manganese, chromium, copper, antimony, phosphate rock, uranium, fluorspar and titanium containing heavy minerals. The importance of knowledge resources is most pronounced in the automotive industry with the establishment of focus groups as well as the auto cluster in city of Tshwane. The fixed investment as a percentage of GDP in SA reached 16,5% in 2004 and provides evidence of the importance of capital investment to accommodate sustained acceleration in output growth. SA has a well established transport network of roads, rail system as well as seven commercial ports which are required to transport manufactured products. The AMTS aims to strengthen the competitiveness of the manufacturing industry through the implementation of high-impact projects in areas such as industry development, innovation, R&D as well as human development. There are numerous types of industrial policies which have been considered in SA in the past few years. Previous industrial policies emphasised national self-sufficiency in key products and access to secure foreign exchange sources. These strategic choices effectively rewarded investment in high capital-intensity sectors. Current industrial policymakers are actively perusing labour-intensive investments, which require a re-orientation in order to achieve more labour-intensive outcomes.

4 RESEARCH METHODOLOGY

4.1 Research Design

The research objectives were answered by making use of both qualitative interviewing and quantitative data analysis.

The study was an exploratory study; the quantitative analysis was based on secondary data published by the GCR 2005-2006 and the Human Development Report of 2005. The quantitative data analysis was used to produce descriptive statistics to solve the four hypotheses which relate to how SA's HDI and GCI compared to other developed and developing countries. The previously mentioned hypothesis, were used to solve the first research objective.

The qualitative technique was an in-depth personal interview. The personal interview was structured in an attempt to answer all remaining research objectives. The method of data collection for the qualitative information was a combination of interrogation and communication techniques, the researcher questioned subjects and collected responses by personal means, the chosen method was personal interviews.

The study was an ex post facto design which took place under field study conditions; the researcher had no control over the variables and did not attempt to manipulate the setting as this could have biased the outcome of the study.

The purpose of the quantitative study was descriptive and aimed to show how human development can enhance competitiveness. The research design was cross-sectional and presented a snapshot in time.

4.2 Sample Design

The sample was stratified between the automotive, chemical and metal and steel industry, the constraining of data to the three industries was based on the information provided in the literature review which substantiated the inclusion. However the sampling was disproportionate, the chosen disproportionate sampling frame was based on the fact that a review of the number of chemical companies compared to the number of metal and steel companies revealed that there are more

chemical companies. Based on this finding 14 of the 30 chosen companies were in the chemical industry or 46,66% of the sample. The automotive industry had a 33% proportionate representation and the metal and steel industry a 20% proportionate representation. Area clustering was chosen, to limit the sample within the Gauteng geographical area. The reason for the area clustering was due to the fact that the researcher conducted personal interviews and limited all elements in the sample to a 150km radius from the researcher's place of residence.

The target population was mostly medium to large size companies who operate in the SA automotive, chemical and metal and steel industries. The sample consisted of 30 companies, which were represented as follows:

I. **Automotive Industry**: National Association of Automobile Manufacturers of SA (NAAMSA), AIDC and nine members (BMW, Daimler Chrysler, Fiat, Ford, Honda, Nissan, Renault, Toyota and Volvo.
II. **Chemical Industry**: The major players in the industry were included in the sample, but excluded pharmaceutical companies and amounted to 14 companies/organisations.
III. **Metal and Steel Industry**: South African Iron and Steel institute (SAISI) and three of its members namely Columbus Steel, Highveld Steel & Vanadium corporation as well as Mittal Steel as well as two other companies who are not part of SAISI and amounted to six companies/organisations.

Within the above listed companies the human resource managers or operational manager and directors were targeted. The researcher contacted NAAMSA and SAISI to ensure that access could be obtained from the members. With regards to the Chemical industry fellow Master of Business Leadership (MBL) students were contacted to obtain access to companies. All remaining companies, not included in the above intervention were contacted via telephone.

The main parameters of interest were included in the research objectives as they apply to the automotive, chemical and metal and steel industries respectively. The sampling frame as indicated above is included in **Appendix D**.

4.3 Measurement Instruments

The measurement instrument was a personal interview; the interviews were structured interviews which consisted of open ended questions. Due to the nature of the research, it was envisaged that interviewees would not be experts in the areas of human development and competitiveness. To ensure that the structured interview achieved maximum success, background information was provided to relevant questions. The intention of the background information was not to manipulate the intended outcome, but rather to include information which is not commonly known by individuals. To ensure professionalism, the structured interview was sent by way of electronic mail at least 48 hours in advance of the scheduled interview. Each interview schedule was accompanied by a covering letter as well as a one page executive summary which provided an overview of the research.

The researcher acknowledges that the desired response rates are often different to the actual response rates which are achieve. The researcher hoped to achieve a response rate of 20% which would include six of the companies as included in the sampling frame as per **Appendix D**. As mentioned previously, although the sampling frame was disproportionate per industry the researcher hoped to interview a proportionate number of interviewees per industry. The reason for the proportionate interviewing was to prevent a bias towards a specific industry, unless the research, provided evidence which substantiated the identified bias. The researcher was the interviewer and administered the personal interviews; a voice recorder was used to record the interview. After the completion of the interview all responses were documented and used for qualitative analysis of the research objectives.

5 RESEARCH FINDINGS

5.1 Introduction

The research findings below firstly focus on the quantitative data analysis of the secondary data which was extracted from the HDI and GCI descriptive statistics and hypothesis testing was used to test the validity of the data. The answers to the structured questions which were asked during personal interviews were recorded per question and included in **Appendix C**. The recorded answers are summarised per relevant research objective, in **section 5.3** below.

5.2 Research Findings: Quantitative Data

In an attempt to address the research objective of benchmarking SA's HDI and CGI to other developing and developed countries secondary data published by the GCR 2005-2006 and the Human Development Report of 2005 was used. The findings of the descriptive statistics and well as hypothesis testing are recorded below. The quantitative data analysis was used generate descriptive statistics which was used to solve the four hypotheses which relate to how SA's HDI and GCI compared to both developing and developed countries. The data for developing countries HDI is summarised in Appendix E and the GCI in Appendix G. The data for developed countries HDI is summarised in Appendix F and the GCI in Appendix H.

5.2.1 Human Development Index

The HDI is a composite of three indices:

I. **Life expectancy index** = $\frac{\text{Actual age - 25 years}}{\text{85 years - 25 years}}$

The minimum life expectancy, being 25 years of age and 85 years being the maximum life expectancy.

II. **Education index**, consists of (2/3 the adult literacy index) + (1/3 gross enrolment index) with both indices being expressed out of a 100.

Enrolment is defined by the oxford dictionary as enlist (Thompson, 1992) in the context of the HDI gross enrolment refers to the index which measures the number of students who are enrolled at secondary and tertiary educational institutions.

III. **GDP index** is calculated by dividing the actual GDP per capita of a country by the maximum GDP of a country, expressed as a logarithm.

$$\frac{\log (GDP/\ Capita) - \log (100)}{\log (40{,}000) - \log (100)}$$

The lowest GDP / Capita, being $100 per capita and $40,000 being the highest.

The HDI is the composite of the above indices, with each index carrying an equal one third weight. SA's index is shown below in **Table 5.1**.

Table 5.1: SA's HDI 2003

1. Life expectancy index	$\frac{48.4 - 25}{85 - 25}$	0.3900
2.1. Adult Literacy	$\frac{82.4 - 0}{100 - 0}$	0.8240
2.2. Gross enrolment	$\frac{78 - 0}{100 - 0}$	0.7800
3. GDP index	$\frac{\log (10{,}346) - \log (100)}{\log (40{,}000) - \log (100)}$	0.7700
4. HDI $0.39(1/3) + (0.824(2/3) + .78(1/3)) + 0.77(1/3)$		0.6580

Source: United Nations Development Programme, 2003

5.2.1.1 Descriptive Statistics: SA's HDI vs. Developed Countries

The descriptive statistics in **Table 5.2** below provides a comparison of SA's HDI compared to countries with a GDP / Capita of $9,000 and above. The data used to generate the descriptive statistics is included in **Appendix F**

Descriptive Statistics: Measures of Location

Mean: HDI value: 0.9118 (The arithmetic average of 37 countries) compared to SA's HDI of 0.658 which is lower than the minimum value achieved by Russia. The main reason for SA's low HDI score was the low life expectancy which equates to an index score of 0.3900 compared to the mean for the 37 countries of 0.8792. Although SA's Education Index was measured at 0.8093 it still compared poorly to the 37 countries score of 0.9345. The GDP index of 0.7700 was only marginally higher than the GDP of Russia.

Mode: The most frequent occurring HDI value of the 37 countries was 0.9490, with a life expectancy index at 0.8900, education index at 0.9900 and the GDP index at 0.9400 which again substantiates the superiority of the 37 countries compared to SA

Descriptive Statistics: Measures of Spread

The **sample variance** of 0.02 indicates that the data was very closely dispersed around the mean of 0.9118 for the HDI the other indexes showed a similar dispersion around the mean.

The **standard deviation** of 0.0448 for the HDI showed that on average the data values for the 37 countries, was only 0.045 away from the mean. The data accordingly had low variability as there were no extreme values in the data set.

The **range** of 0.168 compared to a standard deviation of 0.0448 for the HDI indicated that the data had a homogeneous distribution with a ratio of 3.7500 (a range of between 2 and 6 is required for a homogeneous distribution). Life expectancy had the highest range due to Russia's life expectancy of 65 years, but still had a low ratio of only 5.19 which still represented a homogeneous distribution.

Table 5.2: Descriptive Statistics: Developed Countries HDI 2003

HDI value 2003- Developed countries				
Developed Countries	*HDI Value*	*Life expectancy index*	*Education index*	*GDP index*
Mean	0.9118	0.8792	0.9435	0.9132
Standard Error	0.0074	0.0089	0.0093	0.0092
Median	0.9330	0.8900	0.9700	0.9400
Mode	0.9490	0.8900	0.9900	0.9400
Standard Deviation	0.0448	0.0540	0.0569	0.0561
Sample Variance	0.0020	0.0029	0.0032	0.0031
Kurtosis	0.4276	5.8351	2.4126	0.5627
Skewness	-1.1458	-2.1167	-1.6748	-0.8011
Range	0.1680	0.2800	0.2300	0.2400
Minimum	0.7950	0.6700	0.7600	0.7600
Maximum	0.9630	0.9500	0.9900	1.0000
Sum	33.7370	32.5300	34.9100	33.7900
Count	37	37	37	37
Confidence Level(95.0%)	0.0149	0.0180	0.0190	0.0187

Source: United Nations Development Programme, 2003

5.2.1.2 Descriptive Statistics: SA's HDI vs. Developing Countries

The descriptive statistics in **Table 5.3** below provides a comparison of SA's HDI compared to countries with a GDP / Capita of less than $9,000 but above $2,000 The data used is included in **Appendix E**, which produced the descriptive statistics is summarised in **Table 5.3** below.

Table 5.3: Descriptive Statistics: Developing Countries HDI 2003

HDI value 2003- Developing countries				
Developing Countries	*HDI Value*	*Life expectancy index*	*Education index*	*GDP index*
Mean	0.7783	0.7456	0.8644	0.7242
Standard Error	0.0113	0.0236	0.0126	0.0097
Median	0.7915	0.7900	0.8700	0.7250
Mode	0.7920	0.8200	0.9600	0.7000
Standard Deviation	0.0680	0.1417	0.0755	0.0581
Sample Variance	0.0046	0.0201	0.0057	0.0034
Kurtosis	1.9245	7.5389	0.3790	-0.5981
Skewness	-1.2727	-2.6783	-0.7180	-0.3394
Range	0.2980	0.7000	0.3100	0.2200
Minimum	0.5650	0.1900	0.6600	0.6000
Maximum	0.8630	0.8900	0.9700	0.8200
Sum	28.0170	26.8400	31.1200	26.0700
Count	36	36	36	36
Confidence Level(95.0%)	0.0230	0.0479	0.0256	0.0197

Source: United Nations Development Programme, 2003

Descriptive Statistics: Measures of Location

Mean: HDI value: 0.7783 (The arithmetic average of 36 countries) compared to SA's HDI of 0.658 which was slightly higher than the minimum value achieved by Botswana. The main reason for SA's HDI as mentioned before is the low life expectancy which equated to 0.3900 compared to the mean for the 36 countries of 0.7456. Although SA's Education Index was measured at 0.8093 it was still below the mean of 0.8633 of the 36 countries. The GDP index of 0.7700 was higher than the mean GDP of 0.7242 for the 36 developing countries.

Mode: The most frequent occurring HDI value of the 36 countries was 0.7920, with life expectancy index at 0.8200, education index at 0.9600 and the GDP index at 0.7000 which compared favourably to SA.

Descriptive Statistics: Measures of Spread

The **sample variance** of 0.046 indicated that the data was very closely dispersed around the mean of 0.7782 for the HDI the other indexes showed a similar dispersion around the mean.

The **standard deviation** of 0.0680 for the HDI showed that on average the data values for the 36 countries were only 0.0680 away from the mean. The data accordingly had a low variability as there were no extreme values in the data set.

The **range** of 0.2980 compared to a standard deviation of 0.0680 for the HDI indicated that the data had a homogeneous distribution with a ratio of 4.3823 (a range of between 2 and 6 is required for a homogeneous distribution). Life expectancy had the highest range of 0.7000 but still had a low ratio of only 4.94 which represented a homogeneous distribution. However the low life expectancy of both SA and Botswana was the main reason for the wide range.

The above two sets of descriptive statistics provided evidence that the data for both developing and developed countries provided low variances which indicates that the dispersion of the data is suitable for comparison to SA.

5.2.1.3 Inferential Statistics: Hypothesis Testing: HDI

The Hypothesis which relates to the HDI is as follows:

Hypothesis statement 1

Ho: SA's HDI compares well to other developing countries.

Ha: SA's HDI does not compare well to other developing countries.

Hypothesis statement 2

Ho: SA's HDI does not compare well to other developed countries.

Ha: SA's HDI does not compare well to other developed countries

Hypothesis statement 1 and 2 were combined to test how developing countries compare to developed countries and as a result how SA compares to both.

Table 5.4: Hypothesis Testing: Developing vs. Developed Countries HDI 2003

t-Test: Two-Sample Assuming Equal Variances		
	HDI Value	*HDI Value*
	Developed Countries	*Developing Countries*
Mean	0.911810811	0.77825
Variance	0.002003769	0.004618193
Observations	37	36
Pooled Variance	0.003292569	
Hypothesized Mean Difference	0	
df	71	
t Stat	9.942652525	
P(T<=t) one-tail	2.182145919	
t Critical one-tail	1.666599659	
P(T<=t) two-tail	4.364291839	
t Critical two-tail	1.993943341	

Source: United Nations Development Programme, 2003

In information from **Table 5.4** above was used to generate the hypothesis testing as summarised in **Table 5.5** below.

Table 5.5: Hypothesis Testing: HDI Developed Countries vs. SA

The null hypothesis	SA's HDI compares well to other developed countries.
The alternative hypothesis	SA's HDI does not compare well to other developed countries.
Statistical Test	Independent sample T-test
Desired level of significance	0.05
Calculated value	9.9426
T critical two-tail	1.9939
Interpretation	The calculated value is larger than the critical value, thus the null hypothesis is rejected, and the alternative hypothesis is supported. Hence developed countries have higher levels of human development than developing countries. SA's HDI is 0.658 which is lower than the arithmetic mean of developing countries, which supports the alternative hypothesis that SA's human development does not compare well to other developing countries. Hence both Alternative Hypothesis 1 and 2 are supported.

Source: United Nations Development Programme, 2003

5.2.2 Global Competitiveness Index

As previously indicated in the literature review, the GCR measures competitiveness and summarises the information in the GCI which consists of nine pillars. The nine pillars were used to generate descriptive statistics. The nine pillars include the following:

Basic requirements sub index:

1. Institutions;
2. Infrastructure;
3. Macro economy; and
4. Health and primary education.

Efficiency enhancers sub index:

5. Higher education and training;
6. Market efficiency; and
7. Technological readiness;

Innovation and sophistication factor sub index:

8. Business sophistication; and
9. Innovation.

Each of the above nine pillar consist of many different data inputs, with some information being hard data and other being survey data.

5.2.2.1 Descriptive Statistics: SA's GCI vs. Developing Countries

The descriptive statistics in **Table 5.6** below provides a comparison of SA's GCI compared to countries with a GDP / Capita of less than $9,000 but more than $2,000. The data used is included in **Appendix G**, which produced the descriptive statistics as summarised in **Table 5.6** below.

Table 5.6: Descriptive Statistics: Developing Countries GCI 2005

Competitiveness index of developing countries										
Descriptive statistics	*GCI Index*	*Institutions*	*Infrastructure*	*Macroeconomy*	*Health and primary education*	*Higher education and training*	*Market efficiency*	*Technology readiness*	*Business sophistication*	*Innovation*
Mean	4.1081	3.6436	3.5606	4.5078	6.5539	4.0150	4.0433	3.3064	4.0906	3.1228
Standard Error	0.0650	0.1097	0.1124	0.1065	0.0673	0.1033	0.0776	0.0966	0.0777	0.0717
Median	4.0600	3.6000	3.5900	4.5750	6.6650	4.1000	4.0700	3.2250	4.1450	3.1500
Mode	4.0800	3.7600	#N/A	4.1000	6.8300	4.4500	4.0400	2.9200	3.7600	3.1500
Standard Deviation	0.3899	0.6580	0.6745	0.6391	0.4035	0.6200	0.4654	0.5794	0.4665	0.4301
Sample Variance	0.1520	0.4329	0.4550	0.4085	0.1628	0.3843	0.2166	0.3357	0.2176	0.1850
Kurtosis	0.3886	-0.1846	0.7519	0.1004	4.0679	-0.7793	-0.0196	1.3809	-0.7792	1.2218
Skewness	0.6406	0.4155	-0.1571	-0.2786	-2.0596	-0.1312	0.3018	0.8888	-0.1686	0.2840
Range	1.6300	2.7500	3.4700	2.8000	1.6700	2.3900	1.9900	2.7500	1.8400	2.2300
Minimum	3.4000	2.4700	1.7700	2.9800	5.2400	2.7900	3.2300	2.2900	3.1400	2.1400
Maximum	5.0300	5.2200	5.2400	5.7800	6.9100	5.1800	5.2200	5.0400	4.9800	4.3700
Sum	147.8900	131.1700	128.1800	162.2800	235.9400	144.5400	145.5600	119.0300	147.2600	112.4200
Count	36	36	36	36	36	36	36	36	36	36
Confidence Level(95.0%)	0.1319	0.2226	0.2282	0.2162	0.1365	0.2098	0.1575	0.1960	0.1578	0.1455
South Africa	4.4300	4.4200	4.3300	4.6100	5.7300	4.2200	4.6300	3.6800	4.8000	3.8500

Source: World Economic Forum, 2005

Descriptive Statistics: Measures of Location

Mean: The above table provides evidence that SA's, GCI of 4.4300 was above the average arithmetic mean 4.1081 for the 36 developing countries. SA's health and education index of 5.7300 was the only index which lagged behind the average of 6.5539 for developing countries; all other indexes were above the average of the 36 developing countries.

Mode: The most frequent occurring GCI value for the 36 countries was 4.0800. The infrastructure mode is shown as not applicable (N/A) as a result of the fact that there were no frequently occurring values for the 36 developing countries.

Descriptive Statistics: Measures of Spread

The **sample variance** of 0.152 indicated that the data was very closely dispersed around the mean of 4.1081 for the GCI the other indexes showed a similar dispersion around the mean.

The **standard deviation** of 0.3899 for the GCI showed that on average the data values for the 36 countries were only 0.3899 away from the mean. The data

accordingly had a relatively low variability as there were limited numbers of extreme values in the data set.

The **range** of 1.6300 compared to a standard deviation of 0.3899 for the HDI indicated that the data had a homogeneous distribution with a ratio of 4.1806 (a range of between 2 and 6 is required for a homogeneous distribution). Even though some of the other indices had higher ranges the ratio compared to the standard deviation remained within the requirement for a homogeneous distribution.

5.2.2.2 Descriptive Statistics: SA's GCI vs. Developed

The descriptive statistics in **Table 5.7** below provides a comparison of SA's GCI compared to countries with a GDP / Capita of more than $9,000. The data used is included in **Appendix H**, which produced the descriptive statistics as summarised in **Table 5.7** below.

Table 5.7: Descriptive Statistics: Developing Countries GCI 2005

Competitiveness index of developed countries										
Descriptive statistics	*GCI Index*	*Institutions*	*Infrastructure*	*Macroeconomy*	*Health and primary education*	*Higher education and training*	*Market efficiency*	*Technology readiness*	*Business sophistication*	*Innovation*
Mean	5.0208	4.8541	5.1941	4.9046	6.8549	5.0876	4.8311	4.7716	5.1292	4.2659
Standard Error	0.0908	0.1157	0.1444	0.0919	0.0304	0.1130	0.0797	0.1219	0.1175	0.1514
Median	5.2300	4.9600	5.3900	4.9700	6.9300	5.4000	4.9000	5.0400	5.2900	4.3100
Mode	5.3900	4.9600	6.0200	#N/A	6.9400	5.4600	5.0000	5.6100	#N/A	5.6600
Standard Deviation	0.5523	0.7037	0.8781	0.5590	0.1848	0.6872	0.4847	0.7413	0.7146	0.9210
Sample Variance	0.3051	0.4952	0.7711	0.3124	0.0342	0.4722	0.2349	0.5495	0.5106	0.8482
Kurtosis	-1.2930	0.2461	-0.8654	-0.4363	12.9269	-0.7830	-0.4735	-0.0445	-0.9712	-1.0180
Skewness	-0.3654	-0.7329	-0.3910	-0.4406	-3.1954	-0.6101	0.0744	-0.7501	-0.3538	0.0090
Range	1.8600	2.9800	3.2900	2.1300	0.9900	2.4200	1.8700	2.9500	2.5000	3.4100
Minimum	3.9900	2.9400	3.1900	3.6400	5.9900	3.7100	4.0400	2.8700	3.7800	2.5700
Maximum	5.8500	5.9200	6.4800	5.7700	6.9800	6.1300	5.9100	5.8200	6.2800	5.9800
Sum	185.7700	179.6000	192.1800	181.4700	253.6300	188.2400	178.7500	176.5500	189.7800	157.8400
Count	37	37	37	37	37	37	37	37	37	37
Confidence Level(95.0%)	0.1842	0.2346	0.2928	0.1864	0.0616	0.2291	0.1616	0.2472	0.2382	0.3071
South Africa	**4.4300**	**4.4200**	**4.3300**	**4.6100**	**5.7300**	**4.2200**	**4.6300**	**3.6600**	**4.8000**	**3.8500**

Source: World Economic Forum, 2005

Descriptive Statistics: Measures of Location

Mean: The above table provides evidence that SA'S, GCI of 4.43 lagged behind the average arithmetic mean of 5.02208 for the chosen 37 developed countries. SA's macro economy, market efficiency and business sophistication indexes were the only indexes which were relatively close to the average mean for the 37 countries.

Mode: The most frequent occurring GCI value for the 37 countries was 5.3900. The macro economy and business sophistication modes are shown as not applicable (N/A) as a result of the fact that there were no frequently occurring values for the 36 developing countries.

Descriptive Statistics: Measures of Spread

The **sample variance** of 0.3051 indicated that the data was closely dispersed around the mean of 5.0208 for the GCI the other indexes showed a similar dispersion.

The **standard deviation** of 0.5523 for the GCI showed that on average the data values for the 37 countries were only 0.5523 away from the mean. The data accordingly had a relatively low variability as there were limited numbers of extreme values in the data set.

The **range** of 1.8600 compared to a standard deviation of 0.5523 for the HDI indicated that the data had a homogeneous distribution with a ratio of 3.3677 (a range of between 2 and 6 is required for a homogeneous distribution). Even though some of the other indexes had higher ranges the ratio compared to the standard deviation remained within the requirement for a homogeneous distribution.

The above two sets of descriptive statistics provided evidence that the data for both developing and developed countries in terms of the GCI are meaningful for comparison purposes.

5.2.2.3 Inferential Statistics: Hypothesis Testing GCI

The Hypothesis which relates to the GCI is as follows:

Hypothesis statement 3

Ho: SA's GCI does not compare well to other developing countries.

Ha: SA's GCI does compare well to other developing countries.

Hypothesis statement 4

Ho: SA's GCI does compare well to other developed countries.

Ha: SA's GCI does not compare well to other developed countries.

Hypothesis statement 3 and 4 were combined to test how developing countries compare to developed countries and as a result how SA compares to both.

Table 5.8: Hypothesis Testing: Developing vs. Developed Countries GCI 2005

t-Test: Two-Sample Assuming Equal Variances		
	CGI Index	*CGI Index*
	Developed Countries	*Developing Countries*
Mean	5.020810811	4.108055556
Variance	0.305085435	0.15202754
Observations	37	36
Pooled Variance	0.22963436	
Hypothesized Mean Difference	0	
df	71	
t Stat	8.136293164	
P(T<=t) one-tail	4.672140824	
t Critical one-tail	1.666599659	
P(T<=t) two-tail	9.344281648	
t Critical two-tail	1.993943341	

Source: World Economic Forum, 2005

In information from **Table 5.8** above was used to generate the information in **Table 5.9** below.

Table 5.9: Hypothesis Testing: GCI Developing Countries vs. SA

The null hypothesis	SA's GCI does not compare well to other developing countries.
The alternative hypothesis	SA's GCI does compare well to other developing countries.
Statistical Test	Independent sample T-test
Desired level of significance	a 0.05
Calculated value	8.1363
T critical two-tail	1.9939
Interpretation	The calculated value is larger than the critical value, thus the null hypothesis is rejected, and the alternative hypothesis is supported. Hence developing countries have lower level of competitiveness than developed countries. SA's GCI is 4.43 which is higher than the arithmetic mean of developing countries, which supports the alternative hypothesis that SA's competitiveness is higher than other developing countries. Hence Hypothesis 3 is supported. SA's GCI is lower than developed countries with an arithmetic mean of 5.02; hence alternative hypothesis 4 is supported.

Source: World Economic Forum, 2005

5.3 Research Findings: Qualitative Data

5.3.1 Background Information

As indicated in the Research methodology section the measurement instrument was a structured questionnaire which was used to conduct personal interviews. Personal interviews were arranged after initial telephonic conversations as well as electronic mail correspondence. The structured questions as well as a one page executive summary and covering letter were sent via electronic mail to individuals. The questionnaire, executive summary and covering letter in all instances assisted greatly in securing commitment from contacted individuals. As mentioned previously a disproportionate number of chemical companies were included in the sampling frame, with chemical companies representing 46,66%, automotive 33,3% and the steel industry 20% of the sample frame.

The researcher however found it difficult to secure interviews in the chemical industry and was able to secure two interviews from the same company. The Group Human Resource Manager was interviewed as well as the Group Research and Development Manager. In the automotive industry the National Association of Automobile Manufacturers of SA (NAAMSA) was contacted first, however they were not willing to commit to an interview due to a lack of human resources. The NAAMSA indicated that they would be able to provide hard data relating to units of production by the industry, but that they would not be able to contribute towards the research topic and referred the researcher to the AIDC. The AIDC was specifically established with the mandate to assist in building human capacity aimed at addressing the needs of the automotive industry in response to global challenges. Contact was made with the Manager: Human Resources Development Department. An interview was also secured at Nissan which is located close to AIDC in Rosslyn, Pretoria. In the metal and steel industry the SAISI was contacted who referred the researcher to the SAISC. An interview with the Education Director was secured. The SAISC referred the researcher to another company in the steel construction industry namely Cosira International (SA) (Pty) Ltd, an interview was secured with the General Manager Commercial.

The researcher was able to secure a proportionate response from the three industries and was able to secure a 20% response rate from the initial sample

frame. The researcher is of the opinion that meaningful information was obtained from the automotive industry by way of the AIDC as well as the metal and steel industry through the SAISC, however the Chemical Industries information was biased towards one company within the industry.

5.3.2 Summary of the Interview Answers

The interview questions, covering letter and letter of consent are included in **Appendix B**, the answers to the research questions are summarised in **Appendix C**. The personal interview included four sections namely: skills shortages, labour legislation, human development and competitiveness. The section below summarises the recorded answers and offers mostly the interpretations. Some of the abbreviations in this section relate to abbreviations in **Appendix C**, and hence **Appendix C** needs to be read prior to this section.

Questions one to three dealt with skills shortages, in the three chosen manufacturing industries, which relates to research objective three. The following skills shortages were identified:

1. Artisans such as toolmakers, welders and boilermakers;
2. Draughtsmen;
3. First line management such as supervisors and foreman; and
4. Engineers: mechanical, mechatronical, chemical with experience, civil and structural

The following reasons for the skills shortages were identified:

Artisans in the automotive industry are either in short supply or the quality of available skills is poor as a result of declining numbers of trainees as well as grade 12 entrants who battle with entry level mathematics and science. The current artisans are ageing and are not being retested as frequently as in the past which leads to poor quality artisans.

Artisans such as welders and boilermakers are in short supply. The quality of welders has deteriorated over the last few years as a result of the closing of the welding institute who use to not only train new welders but also test existing welders on an ongoing basis. The boilermaker profession is also perceived as a low quality

position with low remuneration and hence does not attract sufficient numbers of artisans. In SA draughtsmen are often used on projects but not employed on a permanent basis, where as foreign companies are willing to offer full time employment. As a result of the lack of permanent employment and more attractive foreign options, draughtsmen are in short supply in SA in the metal and steel construction industry. There is a greater need for draughtsmen who can do detailed design drawing not just general arrangement drawings.

First level management such a foremen and supervisors are in short supply as the best artisans are often promoted to first level management without having managerial training, hence artisans and technicians with managerial training are difficult to find.

New disciplines in mechanical engineering such as mechatronics and robotics require retraining of existing mechanical engineers as well as training of new engineers. And although the Nelson Mandela Metropolitan University for example have started recently with such training the current shortage will persist until trained engineers start entering the industry.

Chemical engineers with experience in process engineering and project management are in short supply as a result of further training in project management being required after graduation.

Civil engineers with a structural background are in short supply as a result of both the brain drain but also the ageing profile of civil engineers indicates that fewer young engineers are entering the industry on an annual basis. Engineers are often remunerated less than professional managers, and hence engineers stop practising as engineers and become technical managers.

The following development programmes were identified:

In the automotive industry the Employment and Skills Development Lead Employer (ESDLE) project which focuses on training learners in manufacturing, engineering and Related Activities Learnership Programme at NQF level one. The automotive industry also envisaged the Institute of Sectoral Occupational Excellence (ISOE) which will soon be establishing five Centres of Excellence (COE).

Due to the diverse nature of the chemical industry, the identified development programmes in the chemical industry was limited to company specific development programmes such as the SDP and MDP programme at Chemserve as well as the Executive Management Programme.

Cosira Caplan School for draughtsmen in the metal and steel construction industry as well as the in-house accredited boilermaker training at Cosira International are examples of development programmes in the metal and steel industry.

Questions 4 to 6 dealt with the research objective of establishing how South Africa's labour legislation affects human development in the three chosen manufacturing industries.

The labour law contributes positively towards relationship between employers and employees, with specific reference to collective bargaining, negotiation, training and development as well as the equal distribution of resources. However voluntary collective bargaining was seen as detrimental to cost competitiveness by larger companies, as smaller companies who do not subscribe to voluntary collective bargaining are able to compete with larger companies due to having lower labour input costs.

Restrictiveness of hiring and firing in some instances was seen as a positive as it helped to ensure that managers appointed and dismissed employees only after careful consideration of the labour law. The restrictiveness of firing however was seen as negative in-terms of dismissing poor performers. The restrictiveness of hiring was seen as negative during periods or recession and reduced production output. The extent of wage regulation was also seen as a positive in the chemical industry as it contributed towards less labour unrest as a result of wage increase disputes.

From an international competitive perspective wage regulations was seen as a negative as it leads to higher labour input costs which means that foreign expatriate labour is sometimes chosen for some projects within Africa. Wage regulations were also seen as a negative as a result of the inability of employers to reward good performers significantly above the regulated wage increase.

Minimum wage laws were seen as a positive as it enables employees to maintain a standard of living which is in line with consumer inflation. However the argument was also made that minimum wages lead to inflationary cost pressures. It was suggested that minimum wages contribute toward unemployment, as more people could be employed at wages below minimum wages. It was further suggested that abolishment of minimum wages could lead to higher rates of employment at a slightly lower wage than current minimum wage levels.

The issue of training unemployed people was raised as a concern as the training was often done at the expense of employed individuals. In the chemical industry the amended legislation which relates to not being able to restructure the labour force prior to sales, merger and acquisitions was seen as a barrier of entry or exit from a particular company. The SDL levy was seen as a positive with regards to the increased training activities as well as being able to claim back training expenses.

The effectiveness of the SETA's depends on the industry; the automotive industry as well as the chemical industry provided positive feedback with regards to the efficiency of the SETA. In the metal and steel construction industry the SETA was not seen as efficient as the number of apprenticeships, trades and learnerships were not addressing the needs of the industry. The fact that the automotive industry and the metal and steel industries are both members of the MERSETA was considered interesting as a result of the fact that the automotive industry had a constructive relationship with the SETA but not the metal and steel industry.

The issue to employment equity targets was raised, with regards to demographics of female production workers. The automotive industry commented on the negative impact of having female workers in areas of production which require hard labour and also have pre-planned production volumes. The maternity leave policy impacted negatively on production as a result of the fact that extended absences by female production workers.

Questions 7 to 8 dealt with the research objective of establishing how HIV/AIDS impacts on the competitiveness of the industry.

The reported prevalence of HIV/AIDS in the South African manufacturing industry was estimated to be 20%. The industry overview section provides research by BER

which confirms that out of 1006 respondents, 40% of manufacturing companies profits were negatively impacted by HIV/AIDS. The research also confirmed that only 25% of companies had implemented an HIV/AIDS awareness programme. The CHIETA confirmed that a study specifically within the Chemical industry had not been conducted and that it relied on information received from the SA Business Coalition on HIV/AIDS.

During the interviews examples of the impact of HIV/AIDS were provided. A company in the North West province was reported to have a prevalence rate of 28%. At Chemserve examples of employees were mentioned who had been nominated for development programmes but had passed away as a result of HIV/AIDS. In the metal and steel construction industry examples of high prevalence under contract workers were mentioned.

With regards to the impact on competitiveness no conclusive evidence was provided. The automotive industry commented that due to SA's large population vacancies created by HIV/AIDS could easily be filled, and as a result of SETA providing trained unemployed individuals. The automotive industry had an infection rate of about 6%; however scepticism existed around the statistics being reported. The chemical industry as mentioned previously did not have sector wide research information. But Chemserve reported a prevalence rate of less than 10% and considered HIV/AIDS awareness programmes to be effective. The metal and steel construction industry also reported low prevalence rates, with only contract workers having high rates of infection.

The question was raised about how to establish a post HIV/AIDS era. The automotive industry suggested that treatment as well as research with regards to curing the pandemic were equally important. The suggestion was made that HIV/AIDS should be treated as a chronic disease along side other chronic diseases. The chemical industry also advocated higher levels of awareness but that the focus would have to be changed towards changing long term attitudes. It was suggested that awareness was only one way of communicating the dangers of the pandemic as low levels of illiteracy had a negative impact on the chosen forms of media. It was also mentioned that if AIDS lead to a significantly lower population, industries would consider more mechanisation which could be detrimental for SA's labour competitiveness.

The issue of sexual education within the Africa culture was raised and the comment was made that although the topic had been a taboo in the past education programmes at school and the television has exposed children to sexual education.

Questions 9-13 dealt with issues of education in terms of quality, mathematics and science, levels of tertiary enrolment, brain drain as well as competitive intelligence education. These questions attempted to establish the most important factor conditions within the automotive; chemical and metal and steel industries, with specific reference to human and knowledge resources.

The automotive industry had different views. One view was that the quality of education was of a high standard but that high levels of education did not translate in to high levels of skills. The issue was also raised that due to high unemployment, many grade 12 pupils were often only employed five years after leaving school, during this time acquired knowledge would have diminished substantially contributing towards the perception of poor quality education. However an example was cited where the HR Director of the TATA motor group found the current education system lacking in terms of providing suitable skills to work in the soon to be built assembly plant in SA. The quality of FET's was also affected by recent transformation and recapitalisation after 150 dispersed technical colleagues had to be transformed into 50 larger colleges. Traditionally FET's were considered less "glamorous" than higher education institutions such as universities and technikons.

Outcome Based Education (OBE) was seen as one of the reasons for the poor level of education as it supports the poor performers until they are able b receive a General Education Certificate after nine years. The quality of both private schools and model C schools were seen as adequate, however the quality of township schools education was considered to be poor. The comment was also made that the poor quality of township schools was as a result of the lack of human and capital resources.

In general the comment was made that the level of understanding of English language as well as proficiency was low. The metal and steel construction industry commented that grade 12 pupils from technical schools did not have a basic understanding of functional business areas. Due to the deteriorating quality of maths and science education the entry requirements for chemistry and chemical

engineering students have been raised at WITS during the last few years as a result of the poor quality of maths and science education.

The impact of the **brain drain** on the manufacturing industry was not considered significant. In the automotive industry MNC's bring in their own skilled workers if the skills can not be found locally. Mention was made of the fact that toolmakers are in short supply as a result of artisans immigrating to foreign countries. The impact of the brain drain on the chemical industry was considered insignificant. The metal and steel construction industry reported a loss of draughtsmen, artisans in general as well as civil engineers as a direct result of the brain drain, but once again confirmed that the impact of the brain drain was low on the industry.

The level of **tertiary enrolment** was the topic of much debate. The automotive industry made a strong argument for increased enrolment at FET level and not so much at university and technikon level. In some instances companies did not want to train employees to much as highly qualified individuals were prone to "job hopping". It was also argued that SA was considered a desirable foreign destination due to labour intensive operations. Excessive tertiary enrolment might act as a barrier to entry for MNC's who are looking for labour intensive destinations for their production. The chemical industry suggested a much higher level of tertiary enrolment to help ensure adequate levels of graduates. In the metal and steel construction industry the level of tertiary enrolment of engineers was considered to be far to low and it was suggested that 15% of all tertiary students should be engineers.

Competitive Intelligence education was also discussed extensively. Previous research conducted in SA suggested that companies show a general lack of appropriate processes or structures for CI. This finding was confirmed by the researcher; however the automotive industry highlighted the fact that higher levels of CI education would not assist the industries current business model which entails manufacturing and assembly under license agreement. As a result of the fact that SA does not design vehicles as well as the lack of IP contributes to the low level or CI awareness and education. Opportunities were identified which will be referred to under the recommendations section. The company in the chemical industry which was interviewed also did not have a formal CI function, and hence there was a lack of CI education, mention was however made of two executives who do scan the

business environment. CI in the metal and steel industry was considered of less importance as a result of the mature life cycle of steel. Mention was made of the fact that English speaking countries do get together on a biannual basis to share ideas about new technologies in response to developments in Asia and the East.

Questions 14 attempted to determine the priority of human development implementation

The three industries confirmed the importance of improved levels of education as well as the need for skills development.

Questions 15 dealt with the question of how human development can drive competitiveness and not only technology.

SA's automotive industry does not attempt to compete, using technology but rather based on following a strategy of being labour intensive to ensure eligibility for manufacturing motor vehicles under licensing agreement. Hence the focus of the automotive industry of having the various development programmes. The MIDP was however mentioned as a programme which requires capital expenditure to be linked to skills development and training which would be required to operate new production plants and new technology. In the chemical industry principle agreements with foreign companies does lead to loss of labour. Human develop which is required to overcome the loss of labour is expected to be along the lines of multi-skilling the workforce. In the metal and steel construction industry drilling machines are replacing human labour, welders and boilermakers are also affected by new technology. Human development will however be required to plan automated production runs and well as skills to operate and work with new technology. The general point was made that new technology would improve levels of human development but that opportunities to create more labour would become more and more difficult. Technology is expected to drive the need for more skilled labour but will not lead to higher levels of employment.

General Comment

An important comment was made by Jan Grobbelaar (AIDC: Manager: Human Resources Development Department) with regards to the research title in isolation. The question was raised regarding the extent to which one would look at the title in isolation as opposed to an entire system of competitiveness. The systemic approach

which is used to drive competitiveness is in turn driven by an industrial strategy. Examples of industrial strategy include: an advanced or integrated manufacturing strategy which becomes a driver to stimulate the manufacturing industry. An industrial strategy can have an export focus and incentive schemes, but these "levers" have to be in place before you can start to "package" the human development focus areas. Many institutions "jump" in with a very focuses approach but ignore the macro economic impact, without asking what incentive schemes and strategies are available from government, for example is there a drive to adapt FDI The remark was made that if none of the above were in place then all other attempts would simply remain a "pie in the sky".

Grobbelaar also commented that the characteristics of the South African automotive industry's business model need to taken into consideration. The current business model is driven by MNC's with foreign ownership. The MNC's bring in a grade or tier one component manufacturer into the country as well as equipment and they compete with their sister plants in other countries. In SA's case the manufacturing is done under license agreement, which is renegotiated every seven years. The South African automotive industry is constantly trying to increase production and volumes and in an attempt to secure orders every seven years. The aim of the industry is to try and outsmart Brazil and other "sister" companies. All IP and automotive manufacturing equipment is sourced globally and hence SA has no technology or knowledge competitive advantage. In light of this, all that SA automotive manufactures can strive for is to manufacture quality vehicles at affordable prices.

Grobbelaar further commented that the SA government gives one the impression that they want the automotive industry to manufacture a South African vehicle as well as get involved in design and establishing our own manufacturing laboratories. The MIDP is in place to support the specific business model hence the answers are pre-packaged to a certain extent.

The researcher considers the above information as vital for the formulation of a development framework for the manufacturing industry, as well as challenging Porters arguments regarding clusters.

5.4 Conclusion

This chapter provided an overview of the comparison of SA's HDI compared to other developing and developed countries and highlighted the fact that low life expectancy and low levels of education contributed towards SA's low levels of human development. The comparison of SA's competitiveness to developing countries revealed that SA's GCI was above other developing countries, with only health and education lagging behind. The comparison of SA's competitiveness to developed countries revealed that SA's GCI lagged behind other developed countries, with only the macro economy, market efficiency and business sophistication being relatively close to the average for developed countries.

The personal interviews which were conducted revealed that artisans and engineers among other skills were in short supply in the manufacturing industry. The impact of labour legislation was also dealt with and revealed that legislation with regards to appointing and dismissing people is restrictive and the benefits of minimum wages was also debated at length. The impact of HIV/AIDS on levels of human development and competitiveness also appeared to be only moderate in relation to national levels. The poor quality of education, specifically mathematics and science education was found to have a negative impact on levels of human development. The possibility of improving competitiveness by way of human development was debated and examples of initiatives were offered.

The chapter that follows deals with the specific discussion and analysis of each of the research objectives and forms the foundation for the recommendation which follow in chapter seven.

6 DISCUSSION AND ANALYSIS OF RESULTS

6.1 Introduction

The above research findings provide adequate information for the formulation of human development focus areas that can enhance the competitiveness of the manufacturing industry. The analysis below deals with research objectives one to five. Research objective six is dealt with more specifically in chapter seven. Each of the research objectives provides valuable discussions which form the foundation for the recommendations per research objective in chapter seven.

6.2 Research Objective One

Benchmarking SA's HDI and GCI compared to other developed and developing countries.

Human Development

SA's ranking of 120th out of 177 countries as measured by the HDI in isolation does not provide a true indication of human development challenges which SA faces. Amartya Sen suggests that human development should be assessed less by material output and more by capabilities and opportunities. At first Sen was sceptic of the HDI as it did not capture the full complexity of human capabilities. However as discussed under the industrial strategy section, policy makers to a large extent determine industrial strategy which drives human development as a consequence. As a result of the above the HDI was published and offered a single number which measured human development, which appealed to policy makers. The index is criticized for assigning equal weights to life expectancy, levels of education and GDP / Capita which refers to the previous comment of measuring material output. The index also does not account for the levels of inequality in the standard of living. The literature review referred to the transformation approach which makes income or GDP / Capita the dependent variable or output and educational attainment and life expectancy the independent variables or inputs.

Having considered the above components and limitations the HDI, the researcher agrees with the fact that the index offers a meaningful benchmark of human development, in terms of using the index for comparison purposes. To allow for a

more meaningful comparison of SA's HDI to other countries a set of 73 countries were selected and grouped into developing and developed countries. The GCR's GDP / Capita figures were used to select countries with similar GDP figures. For developing countries, 36 countries with a GDP per capita of between US$2,000 and US$ 9,000 (**Appendix E**) were chosen and 37 developed countries with income above US$9,000 (**Appendix F**).

Based on the above classification of countries, the following descriptive statistics assisted with the comparison of SA's human development compared to other developing and developed countries

Developed countries on average had an HDI score of 0.9118 and developing countries 0.7783 compared to SA's 0.658. As previously mentioned SA's life expectancy of 48 years of age equated to an index of 0.39 compared to 37 developed countries average of 0.8792 and 0.7456 for developing countries. As a result of the fact that life expectancy carries an equal weight to educational attainment and GDP / Capita, SA is affected negatively. The education index average achieved by the developed countries was 0.9435 and 0.8644 by developing countries compared to SA's index of 0.809. The main reason for the poor comparison was SA's Adult literacy of 82,4% which carries a 66,66% weight of the total education index with enrolment only contributing 33,33%, towards the index. The 36 developing countries had an average adult literacy of 91% and developing countries an average of 96,3%. SA's gross enrolment was 78% compared well to the average index of 77,6% for developing countries and provided evidence of the impact of the 66,66% weighting of adult literacy. The GDP per capita in US$ measured at PPP, 2004 for SA measured at 0.77 or US$10,603 compared to the average index of 0.9132 or US$25,558 for developed countries and the average index of 0.7242 or US$8,103 for developing countries.

The above analysis of the HDI provides evidence that SA's life expectancy of 48 years as well as a low adult literacy compared to other developing countries with similar GDP / Capita levels are the main contributors to SA's poor HDI score. In terms of enhancing the competitiveness of SA's manufacturing industry, HIV/AIDS education is considered to be one of the most important issues that policy makers who devise industrial strategies must deal with. The issue of adult literacy is also

considered of vital importance. Both the issues of HIV/AIDS and adult literacy are dealt with as separate research objectives.

Competitiveness

SA's ranking of 40th out of 117 countries as established by the GCI requires further analysis to ensure a realistic analysis of competitiveness. The CGI is made up of nine pillars and many different hard data and survey data inputs. The index is seen as the most authoritative index of competitiveness in the opinion of the researcher and offers the same single number as the HDI as mentioned above. The index does however measure national competitiveness and not competitiveness at industry level. The literature review does offer examples of theories which relate to the competitiveness of industries; however none of these theories provides a meaningful index in terms of being able to compare nations or industries.

The CGI consists of three sub indexes namely basic requirements, efficiency enhancers and innovation and sophistication factors indexes. SA's CGI was compared to the same 37 developed countries (**Appendix H**) and 36 developing countries (**Appendix G**) which were used in the HDI comparison. Descriptive statistics were used to for the comparison.

SA's CGI was measured at 4.43 compared to the average index of 5.02 of developed countries and 4.108 for the developing countries. A comparison to developing countries revealed that only health and primary education lagged behind the average 36 developing countries, with institutions, infrastructure and business sophistication being well above the average for the developing countries. In comparison to developed countries SA lagged far behind in terms of health and primary education at 5.73 compared to the average of 6.85, as well as higher education and training at 4.22 compared to 5.0876 and technology readiness at 3.66 compared to the average of 4.77. SA's macro economy at 4.61 was close to the average of 4.90 as well as the market efficiency of 4.63 compared to the average of 4.83.

The above comparison again confirms that SA's competitiveness is hampered by poor levels of health, primary and higher education, training and technology readiness. These finding confirms the importance of human development which is

required to improve health, education and training as well as improved levels of technology adoption and readiness.

6.3 Research Objective Two

Establish the relevance of Factor Conditions (part of Porters Diamond) such as human resources and knowledge resources in determining the competitiveness of SA.

This objective was achieved by looking at current literature and also listening to general comments which were made during the personal interviews which were conducted. The above GCI includes the measurement of health and primary education as part of the basic requirements sub index which relates to the importance of human resources and determining competitiveness. The measurement of higher education and training as part of the efficiency enhancing sub index further provided evidence of the importance of human resources.

Knowledge resources and how they impact on competitiveness are measured by technological readiness, business sophistication and innovation. Further proof of the relevance of factor conditions in determining the competitiveness of SA was found in a presentation by Professor Michael E Porter in June 2003. The presentation entitled "The Competitive Advantage of South Africa" suggested that SA's competitiveness agenda should include:

I. Upgrade the business environment;
II. Foster cluster development;
III. Shift roles of government and business in economic development;
IV. Integrate social and economic policies;
V. Create economic strategies at provincial level; and
VI. Lead a cross-national economic strategy for Southern Africa (Porter, 2003).

As part of the analysis of the business environment some of the following competitive advantages and disadvantages were identified:

Factor input conditions as competitive advantages:

I. University and industry research collaboration;
II. IP protection;
III. Quality of management schools; and
IV. Quality of research Institutions.

Factor input conditions as competitive disadvantages:

I. Quality of mathematics and science education;
II. Availability of scientists and engineers;
III. Quality of public schools; and
IV. Cell phone and internet users per 100 people.

An analysis of demand conditions revealed that government procurement of advanced technology was seen as a competitive disadvantage. The above information is presented in **Table 3.9** with the relative rankings as obtained from the GCR report and summarised in the presentation by Professor Porter. The identified competitive advantages and disadvantages provide proof of the importance of human and knowledge resources in determining the competitiveness of SA.

6.4 Research Objective Three:

Establish the most important factor conditions in the automotive, chemical and metal and steel industries, with specific reference to human and knowledge resources.

The importance of industrial strategy comes to the fore, the current important human and knowledge resources are very much dependent on the industrial strategy which is followed by a particular industry. As mentioned previously under the industrial policy section, in the past South African manufacturing was dominated by high capital intensity which resulted in a low level of commitment to labour-intensive sub-sectors. As a result investments and incentives were focused towards capital expenditure which required more knowledge resources and mostly skilled labour but with less emphasis on high labour absorption.

The importance of industrial strategy was emphasised by Grobbelaar (2006) who commented that the systemic approach which is used to drive competitiveness is in turn driven by an industrial strategy and that such an industrial policy needs to be in place before human development focus areas can be "packaged". It is against this background that the important human and knowledge resources which enhance the competitiveness of the three chosen industries can be analysed and interpreted.

The **automotive industry** has a need for mechanical, mechatronical and autotronical engineers as well as artisan toolmakers. Mechatronics can be defined

as the intersection of mechanics, electronics, computers and controls. Autotronics relates to electronics and automotive engineering (Trade and Industrial Policy Strategies, 2004). But there is also a need to artisans and learnerships at the lower levels of NQF one and two. The business model of the automotive industry promotes high labour absorption, and it is this business model that drives the need for lower level NQF learners and individuals with relevant skills. The fact that the industry manufacturers under a licence agreement further contributes to the lack of urgency towards developing knowledge resources. The requirement for these skills confirms the business model of high employment of labour. The many development programmes which are employed by the industry in terms of training and learnerships provide evidence of the importance of human development. The need for higher level engineers is required for the technology which is used, such as robotics. The current business model hence does have a need for human development but knowledge resources are not needed as much as technological resources.

The automotive business model needs to allow for more emphasis on the development of IP in the automotive technology on the design side as well as securing IP in the area of fuel cells. If the business model is changed knowledge resources would become equally important. Development of knowledge resources will contribute significantly toward the competitiveness of the automotive industry.

The **chemical industrial** is a more complex industry to analyse due to the large number of industry players as well as divergent factor demand paths. Basic chemicals in upstream manufacturing have constantly been replacing labour with capital intensive methods of production, which has contributed towards higher unemployment but has increased international integration and restructuring and technological capabilities. Chemicals in downstream production have become more labour-intensive (Trade and Industrial Policy Strategies, 2004). The chemical industry is highly complex and diversified, with products ranging from low unit value commodity or bulk chemical to high value but small volume, complex and highly specialised compounds. To try and determine the importance of human and knowledge resources and the impact they have on competitiveness was considered to be rather complex in the view of the researcher. Chemserve was the only company which was interviewed in the industry, the company's annual review of March 2006 describes the company as a speciality chemicals organisation

(Chemical Services Limited, 2006). The researcher considers the company to be a high value low volume company which specialises in complex and highly specialised compounds. Thus the company is considered to be capital intensive and not highly labour intensive. The skills which were identified as being in short supply or conversely deemed as important were chemical engineers with experience in processes and project management as well as first line supervisors and foremen. Thus human development in the specialised chemical industry does contribute towards enhancing competitiveness; however knowledge resource development is expected to have more importance.

The **metal construction industry** identified artisan welders and boilermakers at the lower level, draughtsmen of detailed structural drawing as opposed to general arrangement drawings as well as civil and structural engineers at the higher level. The industry is very dependent of a high level of human resource development, as a result of the fact that the industry is in the mature phase of the product life cycle and the importance of knowledge resources is not considered as important by the researcher. Although Erling (2006) did mention that English speaking countries do get together on a biannual basis to share ideas about new technologies in response to developments in Asia and the East.

Research by Lawless (2006) confirms that the almost R200 billion which will be spent on the Soccer World Cup of 2010, the Gautrain mono-rail project as well as Eskom and Transnet expansions requires and additional 3,000 to 6,000 additional civil engineers, technologists and technicians. The research also indicated that 6,000 educated and trained graduates since 1963 have been lost to the industry. In light of these research findings and based on the interviews which were conducted it was found that human resource development is vital for the competitiveness of the manufacturing industry. This is substantiated by de Arruda (2006) who suggested that in the absence of a strong SA currency; only physical location offers a competitive advantage for construction projects through out Africa. Mention was made of the fact that many new projects were receiving tenders from offshore companies from Korea and China. As a result of SA's restrictive labour legislation foreign companies are starting to use expatriates from Pakistan and India. This provides evidence that SA's competitiveness is very much dependent on the availability of labour at affordable costs with limited labour restrictions. The issue of labour regulations will be dealt with in due course.

6.5 Research Objective Four:

Establish how South Africa's labour legislation affects the collective Human Development focus areas in the automotive, chemical and metal and steel industries.

The impact of South African labour legislation on the human development focus areas in the three chosen industries was established by looking at literature as well as asking questions in the personal interviews which were conducted.

As mentioned previously the EIU ranking of SA's three labour related categories, ranked labour costs and availability of labour high but the labour regulations category which consists of labour laws with regards to hiring and firing, extent of wage regulations as well as minimum wages was ranked last out of 60 countries.

The personal interviews offered the following insights:

Two of the respondents disagreed with the statement that the labour laws of hiring and firing are restrictive, they argued that these laws offered the employees job security as well as forcing managers to think carefully before appointing or dismissing employees. However all respondents agreed that the law was restrictive in terms of dismissing poor performers with the burden of proof being seen as excessive. Wage regulations were seen as positive by the same two respondents above, who argued that collective bargaining, negotiations, training and development decisions resulted in equal distribution of resources. Wage regulations in conjunction with minimum wages were seen as restrictive, specifically when trying to reward good performers by an amount higher than the collectively agreed upon amount. Minimum wages were deemed fair by one respondent who suggested that all employees were entitled to a fair standard of living. Other comments suggested that minimum wages lead to higher unemployment as well as the loss of construction contracts to foreign expatriate labour.

The above assessment of SA's labour regulations as determined by the EIU and by the local South African respondents again has to be understood within the context of the chosen industrial policy for an industry or a country as a whole. Currently industrial policymakers are actively perusing labour-intensive investments, which

require a re-orientation in order to achieve more labour-intensive outcomes. Wages are a significant component of overall cost structures, with the current trade reform and increased domestic competition there is however constant pressure to limit rising wage costs. As the South African economy becomes more open to international competition, local firms will only be able to survive if costs and productivity are comparable to major international competitors. A recent report indicated that South African wages (especially unskilled wages) are high relative to production, which accounts for the high unit labour costs by international standards. Increased productivity will be dependent on more training and development of human resources.

The international community views labour regulations with regards to hiring and firing, wage regulations and minimum wages are restrictive for FDI purposes. Within the context of the apartheid the current labour regulations could be considered as being necessary to protect workers from future discrimination. However when a policy promotes high-labour absorption to reduce the high unemployment rate then certain components of the chosen labour legislation requires careful consideration.

6.6 Research Objective Five:

Establish how HIV/AIDS impacts on the collective Human Development focus areas in the Manufacturing industry.

The main research findings in **section 5.3.2** highlighted that estimates for HIV/AIDS in the manufacturing industry varies between 20% and 6% for specific sub sectors. The World Banks predication that SA could lose half of its per capita income within the next 90 years does provide a long term measure of the severity of the pandemic. The transformation theory which equates GDP / Capita, as the output of both educational attainment and life expectancy would be adversely affected. In SA's case the HDI would be affected extremely adversely as long as HIV/AIDS causes the average life expectancy to decline.

The BER research also provided evidence that 75% of the more than 1,000 companies who had participated in the survey did not have HIV/AIDS policies. Part of the reason for the lack of urgency seems to be embedded in the fact there is a perceived abundance of unemployed people with skills as well as the fact that SA is highly populated. The historic reality of high capital-absorption industrial strategy

also promoted knowledge resources more than human resources, and hence the low emphasis on HIV/AIDS awareness programmes. Current policy makers are promoting high labour-absorption, and it is assumed that industries with high labour absorption would much more emphasis on HIV/AIDS awareness. The initiative by the AIDC who have formulated a 50/50 match funding for HIV/AIDS workplace programmes. The initiative by the CHIETA who has set aside R5.5 million rand for 2005 and 2006 to help companies deal with HIV/AIDS provides evidence of the increased levels of emphasis on HIV/AIDS awareness.

The impact of HIV/AIDS is also impacted by the balance between treatment and research to cure the pandemic. It was suggested that if HIV/AIDS is acknowledged as a chronic disease and treated as such, there might be less focus on researching cures for the virus. The balance between awareness and changing attitudes is also requires careful consideration.

If 20% of the manufacturing industry is infected with the HIV/AIDS virus then R1 out of every R5 spent on training employees will be lost to the industry as a result of HIV/AIDS. If the life expectancy is 48 years of age then the average a grade 12 educated person will work for only 30 years of which the last five to ten years would be less productive as a result of HIV/AIDS illnesses. The changing age profile could also lead to the lack of mentors with many years of experience, which would be extremely detrimental for the transfer of knowledge.

6.7 Limitations of the Study

The research findings are limited by the fact that only six representatives were interviewed, with the further limitation that the chemical industry was represented by only one company. The lack of available and reliable research with regards to HIV/AIDS prevalence in the respective sub industries was seen as a limiting factor. The research by SA Business Coalition on HIV/AIDS in 2004 estimated that almost 20% of the employees in the manufacturing industry are HIV positive. The research findings suggest a prevalence rate of less than 10%. In the absence of representative statistics at sub-industry, companies are not able to draft realistic HIV/AIDS strategies. The lack of reliable statistics could lead to an emphasis on awareness only, with higher levels of infections requiring more emphasis on treatment, counseling, testing programmes, and providing care and support for infected workers. The researcher also failed to ask questions which specifically

relate to the importance of industrial policies and strategies. The importance of these strategies and policies was only established during the interviews, prior understanding of the importance would have ensured adequate focus on this important aspect. The researcher accordingly is of the opinion that representatives from the DTI as well as the department of labour could have provided important additional inputs towards the formulation of a framework for improved levels of human development. The role of government in the formulation of industry and country policies was also not measured. The researcher is of the opinion that valuable inputs could have been sourced from government representatives. The recommendations below as well as the suggested framework for enhancing competitiveness with specific reference to human development focus areas need to be considered with the above mentioned limitations in mind.

6.8 Chapter Conclusion

The analysis and discussion of research objective one revealed that the HDI does offer a meaningful benchmark of human development, in terms of using the index for comparison purposes. The descriptive and inferential statistics provided proof that low levels of adult literary and low life expectancy are the direct cause of the low human development ranking of SA. SA's competitiveness is hampered by poor levels of health, primary and higher education, training and technology readiness. This finding confirmed the importance of human development which is required to improve health, education and training as well as improved levels of technology adoption and readiness. Porter's competitiveness agenda for SA provided evidence that competitive advantages, and disadvantages with regards to human and knowledge resources are considered to be of vital importance for the enhancement of SA's competitiveness. The development of human and knowledge resources is very much dependent on the industrial strategy which is followed by a particular industry. The automotive industry follows a business model of manufacturing under licensing agreements as well as following a high labour absorption policy which does impact on development of IP and levels of competitiveness. Enhanced levels of human development, in the specialised chemical industry did not seem to contribute towards increased levels of competitiveness; with knowledge resource development being deemed as more important. The metal and steel industry is very dependent on high levels of human resource development, as a result of the fact that the industry is in the mature phase of the product life cycle.

The impact of South African labour legislation on the human development focus areas in the three chosen industries was established by looking at literature as well as asking questions in the personal interviews which were conducted. Labour regulation with regards to hiring and firing, the extent of wage regulations as well as minimum wages did impact SA's off-shore investment ranking negatively. However labour legislation was viewed both from a domestic and an international perspective to ensure objectivity.

The impact of HIV/AIDS on the manufacturing industry could not accurately be assessed and supported the fact that HIV/AIDS is viewed from many different perspectives. The short term view that HIV/AIDS does not affect competitiveness as a result of the large population and high levels of unemployment was balanced with the long term view of the World Bank which predicts that SA's GDP/ Capita could be halved in 90 years. The above discussions and analysis resulted in specific recommendations per research objective which are summarised in chapter seven below.

7 CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

Chapter seven concludes with recommendations as well as concluding thoughts which aim to close the research loop per research objective and in many instances attempt to provide broad guidelines to academics, the manufacturing industry and business managers and leaders in general.

7.2 Recommendations per Research Objectives

7.2.1 Recommendations: Research Objective One

The recommendation for research objective one will focus on a human development measurement instrument which can be linked to industry or company competitiveness.

Human Development

As suggested by Amartya Sen, human development should be assessed less by material output and more by capabilities and opportunities. The current HDI includes GDP / Capita which carries an equal weight to life expectancy and educational attainment. The transformation approach equates GDP / Capita as the dependent variable. As indicated previously the initial reason for the HDI was to provide policy makers with a single measure of human development. The HDI is expected to remain an authoritative measure of national levels of human development.

The research however attempts to identify human development focus areas in the South African manufacturing industry. Human Development as measured at industry level needs to be defined. As mentioned in **section 3.3.7** the Human Development Enterprise (HDE) Index should be negotiated nationally in an attempt to promote dynamic efficiency, skills formation, work security and economic democracy within companies. The intention of this afore mentioned HDE is to measure capabilities and opportunities at company level. The HDE is an indication of the fact that human development needs to be measured at industry or company level.

A measuring instrument for systemic drivers of human development is suggested for the manufacturing industry specifically but applicable to all other industries in general. The measuring instrument includes:

I. **Work Life Expectancy**: If the assumption is made that 18 years of age is the minimum age at which people start working and 60 is the retirement age. Then the maximum work life expectancy would be 42 years. An individual company or industry would need to determine the average age of the workforce and then convert the average age to a statistical index. The example below indicates how the index for a workforce with an average age of 25 years of age would be calculated:

25-18 60-18	0.167	Index for a 25 year old	1	Index for a 60 year old

The above index could measure the work life expectancy of the work workforce or industry. Although a decline or increase in the index could have many explanations, the intention would be to report on the reasons for the movement in the index as measured every five to ten years. The state of health within the industry can be measured by the number of absent days per annum per employee; an increasing trend over a five year period could be interpreted as being correlated to the impact of HIV/AIDS related illnesses. An analysis and measure of the possible impact of HIV/AIDS on work life expectancy as well as the number of absent days is considered to be of great value. Such an analysis is expected to provide more meaningful information than samples which attempt to provide accurate HIV/AIDS statistics, although statistics will always remain important.

II. **Adult literacy within the manufacturing industry can be measured by:**

Adult literacy index which applies to the HDI would also apply to the manufacturing index; a literacy rate of 80% would translate to an index of 0.80

III. **Combined School enrolment within the manufacturing industry can be measured by:**

The classification of enrolment would exclude primary school enrolment as most workers in the manufacturing industry are assumed to have more than seven years of schooling. The remaining secondary and tertiary enrolment would be measured similar to the HDI. Secondary enrolment would be calculated the same as the adult literacy rate above where the % enrolment is translated into an index score. Secondary enrolment would carry a weight of one third.

Tertiary enrolment would distinguish between apprenticeships, learnerships and university education. In total tertiary enrolment would carry a weight of 2/3. However depending on the educational gap of a particular company or industry the individual weights of apprenticeships, learnerships and university education could be adjusted accordingly. The adjustment of the weights would lead to varying target indexes depending on the need of the company or industry.

IV. **Turnover or profit per employee can be measured by:**

GDP/ Capita is a common measure of human development at country level, but is not a practical measure at industry level. Converting GDP / Capita to Turnover and Net profit per employee and setting benchmarks per company or industry would be required. The ratio of wages and salaries per employee can also be compared to the turnover and net profit per employee.

The aim of the above index would be to measure at industry level pillar four of the factor driven stage of competitiveness (health and basic education) as well as pillar five of efficiency driven stage of competitiveness(higher education and training). The index will thus succeed in linking competitiveness to human development at industry level. Although the analysis of competitiveness identified technology readiness, business sophistication and innovation as further areas of development in both the efficiency and innovation stages of competitiveness, these areas focus more on capital resources and knowledge resources. The importance of knowledge and capital resources has been highlighted through out the research as part of Porter's factor conditions. However the recommendations in this research will ultimately focus on human development focus areas which are mainly part of the efficiency stage of competitiveness. The suggested measurement instrument is elaborated upon further in research objective six. Development of frameworks which focus on knowledge and capital resources is a suggestion for further research.

7.2.2 Recommendations: Research Objective Two

As suggested previously the link between competitiveness and human development is not often made, with both disciplines being dealt with extensively but individually. The factor driven stage of competitiveness as included in the GCI includes four pillars, with pillar four being health and basic education, which links human

resources to competitiveness. The inclusion of pillar five under the efficiency stage of competitiveness relates to higher education and training which again emphasizes the importance of human resource development.

As referred to in **section 6.2** above, Porter's suggested competitiveness agenda for South Africa, includes six agenda points. The first agenda point which relates to the upgrading of the business environment identified competitive advantages and disadvantages per factor condition as listed in **Table 3.9** in **section 3.2.2.6.**

The competitiveness of SA is enhanced by the level of university and industry collaboration in terms of R&D.. IP protection was listed as knowledge resources which enhance SA's competitiveness. The manufacturing industry did not however provide information to suggest that such competitive advantages do exist within the industry, and hence would have to be included as a focus area for enhancing competitiveness. The quality of management schools was seen as a positive contribution towards competitiveness of the business environment. The quality of research institutions were also seen as contributing towards the competitiveness of business environment of SA. The competitive disadvantages which relate to the quality of mathematics and science education was address in research objective three and requires serious consideration in terms of improving the quality as well as the application of mathematics and science within the business environment. The availability of engineers was also raised as a concern and the necessary recommendation were made to address the shortage. The poor quality of public schools, specifically the township schools was also raised as a cause for major concern in term of future competitiveness.

7.2.3 Recommendations: Research Objective Three

The importance of industrial policy or even clusters can not be over emphasized as well as the importance of human and knowledge resources and the impact they have on human development and competitiveness. Recommendations which promote human development and competitiveness without considering an industry's business model as well as the most prominent industrial policy could lead to counter productive outcomes.

Skills Shortages

Recommendations with regards to skills shortages need to consider the wider framework of education within South Africa. The automotive industry does require more focus on education as provided by FET's and technical colleagues. The current business model of manufacturing under license as well as following a labour absorption policy as opposed to a policy of mechanisation is expected to continue into the future. Hence the importance of mechanical, autotronical and mechatronical education needs to be promoted at secondary schools. The emphasise of universities compared to FET's and technical colleagues needs to be clearly communicated to schools and advocated by both industry and educational institutions.

The chemical industry clearly is more complex to attempt to provide generic recommendations on how to address skills shortages. Due consideration is required of the distinction between upstream and down stream manufacturing. The upstream manufacturing processes, promotes capital intensive methods and hence skills shortages would be related to highly specialised individuals. The example of chemical engineers with experience in process engineering and project management would be examples of such skills. In the modern age where project management has become a functional management discipline in its own right, there seems to be a need for training at tertiary level as well as in-house trainee programmes. The emphasis of such programmes would be to focus on project management principles as suggested by the Project Management Body of Knowledge (PMBOK). In-house programmes would have to address process related project management which focus on specific needs of the industry.

The metal and steel industry's need for artisan welders and boilermakers seems to be as a result of the lack of artisan training in all industries. The decline in artisan training as suggested previously is related to the relative decline in infrastructure development. It is recommended that more companies develop in-house learnerships and training programmes to help address the need for artisans, however assistance from the SETA's would be required, especially in the metal and steel industry. The draftsmen school as established by Cosira International is an example of such initiatives as undertaken by industry. The need for development of draftsmen with experience in detailed structural drawing as opposed to general

arrangement drawings also needs to be complemented by creating permanent positions for such individuals. Companies might consider employing draftsmen permanently and then allowing them to contract some of their spare capacity out to our companies. The need for civil and structural engineers at the higher level also needs to be viewed from a long term perspective. The infrastructure developments related to the Soccer World Cup of 2010, the Gautrain mono-rail project as well as Eskom and Transnet expansions does emphasize the need for civil engineers, however long term sustainability of the need for 6,000 additional civil engineers, technologists and technicians will have to be carefully considered. It would not benefit SA if many civil engineers, technologists and technicians are trained in preparation of the required infrastructure only to have an over supply of educated individuals, after the projects have been completed.

Quality of education as well as mathematics and science specifically

The quality of education also requires serious consideration. As a result of the legacy of apartheid, many generations of black South Africans received inferior education. The new ANC government have made many attempts to improve the educational system. One of the instruments which have been used is known as OBE, without discussing the intended outcome of this programme, the perception exists that the standard of education has deteriorated since its inception and also that poor performing individuals are "carried" by the system. The educational method of delivery will have to be reconsidered, with the emphasis being on quality of education, which is in line with other developing countries. The manufacturing industry has expressed its concern with regards to pupils, who have attended township schools, it is clear that the quality of township schools is affected by the lack of both human and capital resources. It is important that government and industry work together in addressing the lack of resources at township schools. A suggestion might include various that industries such as security, maintenance, printing companies could provide resources as and when required by schools, which in turn would lead to taxation deductions to companies in various industries.

The poor quality of English language proficiency also requires urgent attention, against the background of the current drive to promote education in the language of choice. Such policies again focus on achieving higher levels of secondary education, but at the expense of being effective within the business environment. English is the

official business language through out the world and hence should be considered as the main language of education for South Africa, with due consideration of minority language interests.

The quality of mathematics and science education is also cause for great concern as a result of the fact that SA was ranked only 105th out of 117 countries on 2005 (World Economic Forum, 2005). The shortage of engineers is symptomatic of this reality. The fact that the age profile of engineers is increasing indicates that fewer engineers are graduating than required by the various industries. The chemical industry highlighted the fact that WITS had recently introduced higher entry requirements for mathematics and science students, which provided proof of the poor quality of mathematics and science education. It is suggested that the quality of mathematics and science education be increased substantially, even at the expense of lower pass rates. The importance of mathematics and science needs to be emphasized by schools, business and government.

Tertiary Enrolment

The tertiary enrolment of 15% for SA provides the country with a ranking of 87th out of 117 countries. The emphasis however still seems to be on university education, which would be expected for countries who are predominantly engaged in the innovation stage of competitiveness and also possibly focussing on high capital absorption levels. With SA being engaged in the factor and efficiency driven stages of competitiveness the comment by the automotive industry is justified, with regards to increased levels of FET enrolment. As long as SA remains a foreign destination of choice in terms of labour efficiency it does not make sense to focus on higher levels of tertiary enrolment per say. However it is suggested that the different types of tertiary education courses receive more consideration than the level of tertiary enrolment per say. Industry and educational institutions need to develop needs-analysis programmes together, as well as focus on future development needs which will be required to drive competitiveness. Programmes will have to specifically focus on the number of engineering students needed by industry to improve levels of competitiveness.

Competitive Intelligence

The issue of competitive intelligence was discussed at length and it was found that companies who were interviewed did not have significant competitive intelligence processes or structures in place. However as highlighted by the automotive industry competitive intelligence, initiatives are impacted by business models and industry policies. In other words when an industry manufactures under license agreements, IP is retained by the company who sells the licences, which leads to lack of R&D on the side of the manufacturer. The manufacturing industry of SA makes up a small percentage of world production and hence one might argue that competitive intelligence and IP might not add much value to the overall world position of manufacturing.

However CI plays an important role in being able to identify new opportunities and being able to develop IP. The automotive industry suggested the development of fuel cell technology which makes use of catalytically converters, which uses platinum as one of the input materials. Mention was made of the need to develop fuel cell strategies within the automotive industry, this suggestion requires serious consideration. In general it is recommended that companies create CI departments who report directly to the CEO or at least to the Chief Strategy Officer of a company.

7.2.4 Recommendations: Research Objective Four

The manufacturing industry of SA is the third largest employer of formal workers. The current industrial policies which focus on high labour absorption emphasize the importance of labour in SA. The revision of the labour law of SA needs to be understood against the background of apartheid, the protection of workers was certainly high on the agenda during the formulation of the revised labour regulations. The exposure of SA to the rest of the world has exposed certain of the restrictive labour laws in terms of being globally competitive. The various elements of the labour regulation are dealt with below.

Labour Regulations

According to the EIU's offshore investment ranking model SA's availability of labour skills as well as labour costs compared favourably to other offshore destinations. The labour regulation score consisted of labour laws with regards to hiring and firing,

extent of wage regulations as well as minimum wages, in this category SA however obtained the lowest ranking and hence the emphasis on these elements.

With regards to ease of hiring and firing, the responses by the companies interviewed in the manufacturing industry varied. However the general consensus indicated that although restrictions offered employee protection as well as forcing managers to carefully consider their decisions with regards to appointing and dismissing workers, that there were some areas for concern. With regards to the ease of hiring, it was suggested that hiring trends are impacted by workforce needs. The metal and steel industry for example has a large portion of temporary workers as a result of the cyclical nature of the industry but also as a result of restrictions in terms of hiring. The metal and steel industry suggested that SA could improve its offshore ranking by considering the declaration of international building sites as international free trade zone, where SA labour laws would be superseded by international labour law requirements.

The restrictiveness of dismissing individuals also required reconsideration. Specific mention was made of the fact that the burden of proof in terms of dismissing individuals due to poor performance was seen as restrictive. Although laws need to be in place to protect workers from unfair dismissal, revisions do need to be made with regards to poor performance. Once poor performance can no longer be tolerated or managed the burden of proof should be made less administratively intensive.

The issue of minimum wages remains controversial, finding a balance between protecting workers and increasing unemployment is not easy. This statement is substantiated by the fact that some respondents felt that minimum wages protected workers from unscrupulous employers as well as offering a decent standard of living. The argument was however also made that minimum wages lead to unemployment and further to the use of foreign labour at the expense of local labour. Minimum wages might be considered good for industries only competing in the domestic local market, assuming a degree of protection from foreign competition. For those industries or companies which compete in the global market, minimum wage regulations do need to be lifted as suggested during conditions of international free trade areas or zones.

7.2.5 Recommendations: Research Objective Five

Recommendations with regards to treatment of HIV/AIDS need to also consider the fact that awareness programmes seem to be working but that they need to be complemented by initiatives which aim to change attitudes as well. It was suggested by respondents that attitudes had not significantly changed towards the disease. Mention was made of the fact that sexual education within the Africa culture was almost seen as a taboo topic in the past, which complicated the requirement of changed attitudes. HIV/AIDS programmes need to consider the outcome of not only targeting awareness but also being able to change attitudes which have been built up over many years.

The importance of treatment of the disease also needs to be balanced with research with regards to curing the pandemic. There are those who suggest that HIV/AIDS should be acknowledged as a chronic disease and treated similar to any other chronic diseases, there is certainly merit in this suggestion. The suggestion of declaring HIV/AIDS as a chronic disease does however present the problem that the disease could simply be "managed" instead of cured. There is certainly also merit in continuing with R&D into cures for the disease, along side the less scientific approach of advocating abstinence. However changing believes and attitudes, requires long term strategies which target family values and life styles which is far more complex and extremely difficult to manage within the boundaries of a programme. The importance of long term strategies can however not be over emphasized, the suggestion by the World bank that SA's per capita income could be halved within 90 years, proves that the World Bank takes long term views with regards to issues relating to HIV/AIDS.

The observation was also made that the manufacturing industry lacks reliable statistics with regards to HIV/AIDS, the reason for the lack of accurate statistics relates to the geographic dispersion of the population of SA as well as the protection of human rights, such as voluntary testing. The fact that the population is geographically dispersed does present a significant challenge, as one could argue that rural areas would have far higher levels of infection than urban areas. The importance of the difference in infections between rural and urban areas relates to the chosen HIV/AIDS programme, industries which operate in urban areas might advocate awareness more than changing attitudes. Programmes which focus on

rural areas would have to possibly target the changing of attitudes more aggressively. The issue of voluntary testing also creates challenges to policy makers and those who have to formulate programmes. If HIV/AIDS testing was made compulsory for all citizens of the country then treatment programmes would be able to more accurately address the true magnitude of the problem.

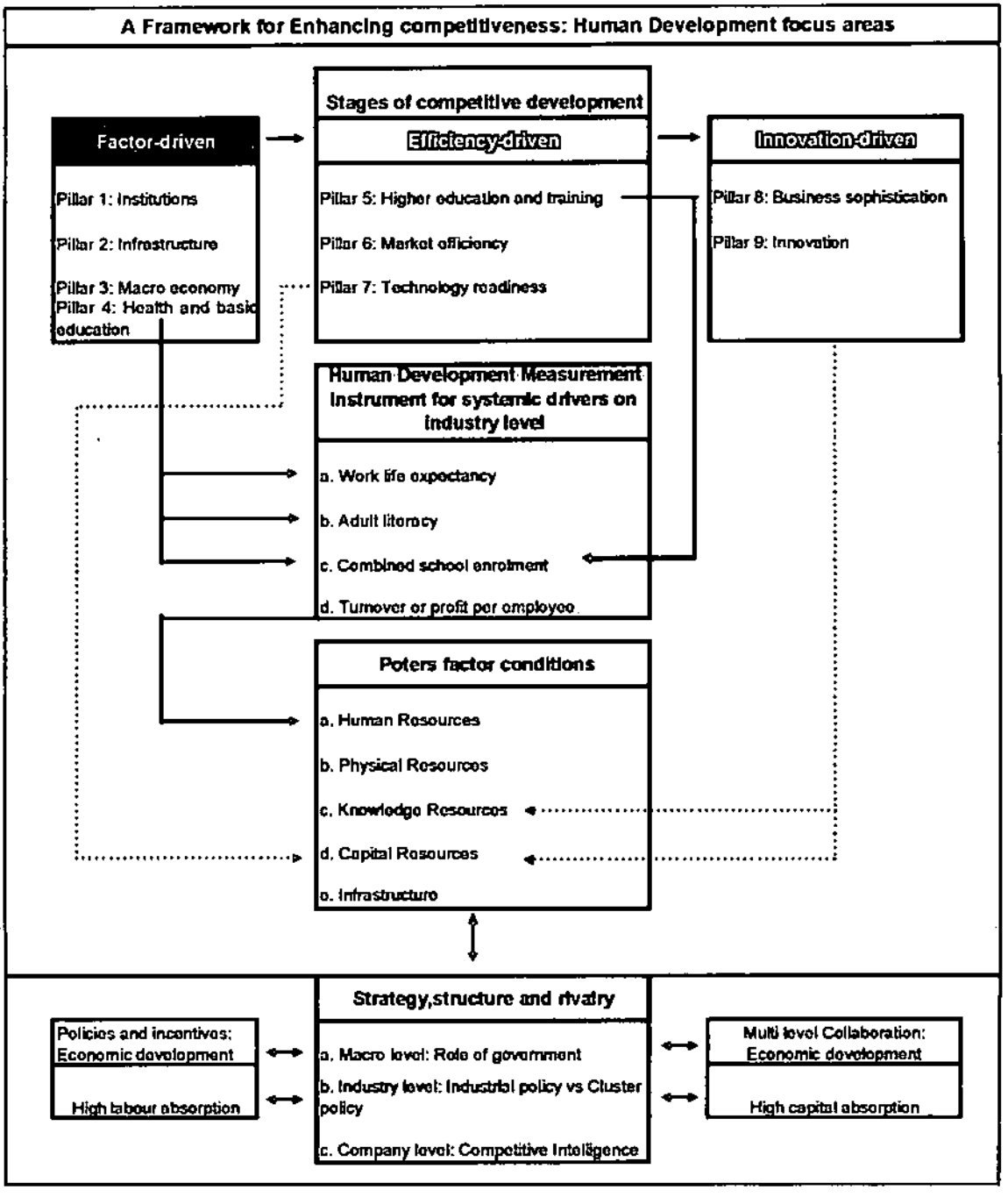
7.2.6 Recommendations: Research Objective Six

Establish a Human Development and National competitiveness framework for SA's manufacturing Industry.

A framework is defined as "A collective agreement that sets out broad principles that apply across enterprises, the detailed application of which is fleshed out in further negotiations at company or workplace levels" (Oxford Reference online, 2006). A collective agreement between or within sub industries of the manufacturing industry is required to establish broad principles which can be used draw up a framework for human development and competitiveness. The emphasis of a framework is that it sets out broad principles, and requires industries and companies to flesh out the detailed application of the framework.

A framework for enhancing competitiveness by focusing on human development focus areas is depicted in **Figure 7.1** below.

Figure 7.1: A Framework for Enhancing Competitiveness: Human Development Focus Areas



The framework consists of four main components:

I. **The stage of competitiveness**: As defined by the GCI which consists of three stages of competitiveness. Each of the three stages consists of pillars which have been explained in detail in the literature review **section 3.2.2.2**.

II. **The human development measurement for systemic drivers on industry level**: The component exists of the same four index components as defined by the HDI, but life expectancy has been replaced with work life expectancy and

GDP / Capita has been replaced with turnover / employee as defined in **section 7.2.1 above**

III. **Porter's factor conditions**: Factor conditions are part of Porter's Diamond and consists, of human resources, physical resources, knowledge resources, capital resources and infrastructure as elaborated in **section 3.3.2.5**.

IV. **Strategy, Structure and rivalry**: Strategy, Structure and Rivalry are a second part of Porter's Diamond; however they have been adapted to distinguish between government, industry and company focus areas as elaborated in **section 3.3.2.5**.

The relevance of the four components and their interrelatedness is explained in more detail below. As suggested above, a framework is a collective agreement which attempts to provide broad principles for enhancing competitiveness. As suggest previously competitiveness and human development are dealt with extensively at National level and also mostly individually.

The Components

The Stage of Competitiveness

The factor driven, efficiency driven and innovation driven stages of competitiveness have been discussed extensively in **section 3.2.2.2** and hence will not be elaborated upon again. The importance of distinguishing between stages of competitiveness is related to the required link between human development and competitiveness. The framework in **Figure 7.1** above links pillars four and five to a human development measurement instrument. As a result of the fact that the manufacturing industry of SA is deemed to be situated mostly within the factor and efficiency driven stages of competitiveness, pillar four and five have been identified as the most prominent human development focus areas. Pillars seven to nine are linked with dotted lines to knowledge resources and Capital resources, and although these are important factor conditions to consider they are deemed less important for industries which have not yet started to consider entering into the innovation driven stage of competitiveness.

The Human Development Measurement for Systemic Drivers on Industry Level:

The inclusion of the human development measurement instrument is related to the fact that human development needs to be expressed in the format of a measurable index to appeal to policy makers. The four components which have been included into the measurement instrument attempt to provide a measurement of human development at industry or even company level. However the four components have been adapted from the HDI to ensure the same level of prominence as achieved by the HDI at National level. The four components have been elaborated upon extensively in **section 7.2.1.**

Work life expectancy measures the age of the average workforce expressed as an index between the age of 18 years and 60 years of age, and is linked to pillar four of the factor driven stage of competitiveness, specifically health. The second part of pillar four which relates to basic education is linked to adult literacy which is the second component of the human development measurement instrument. Combined school enrolment can be adjusted in terms of weights assigned to secondary and tertiary enrolment and is linked to pillar five of the efficiency stage of competitiveness, which relates to higher education and training. The inclusion of turnover or profit per employee as a measure of financial achievement is not linked to a particular stage of competitiveness, but is included to conform to the components of the HDI. The inclusion of turnover is however also justified by the transformation approach towards human development which suggests that income should be deemed as a dependent variable on the output side of the human development equation. Unlike the HDI however the human development measurement instrument does not include equal weights, to help mitigate the criticism against the use of equal weights in the HDI. The framework takes into consideration that the components are not perfectly correlated to each other.

Porter's Factor Conditions

The inclusion of Porter's factor conditions as included in Porter's Diamond relates to the fact that Porter's Diamond measures competitiveness with the industry as the unit of analysis. The importance of Porter's Diamond is also related to the fact the diamond is one of the foundation theories of this research. Porter also used factor conditions to measure the business environment of SA as it relates to the upgrading

of the business environment which is the first agenda point in terms of SA's competitiveness agenda as identified by Porter during 2003 as per **section 3.2.2.6**. The inclusion of the five factor conditions suggests that the industry should do a similar analysis of competitive advantages and disadvantages per factor condition as per **Table 3.9** in **section 3.2.2.6**. In this framework for the manufacturing industry human resources are considered to be the most important factor condition, with competitive advantages and disadvantages being influenced by components of the human development measurement instrument as included in the framework. As suggested under the stages of competitiveness heading, the importance of pillars seven to nine is dependent on the stage of competitiveness of the industry as well as human development levels. Although beyond the scope of this specific framework technology readiness is linked to the availability of capital resources with business sophistication and innovation also being linked to availability of capital and knowledge resources.

Strategy, Structure and Rivalry

The inclusion of strategy, structure and rivalry is again related to the importance of Porter's Diamond as a foundation theory for competitiveness at industry level. The components have however been adjusted to allow for strategy at government, industry and company level. The role of government is specifically included into the framework to highlight the importance of government with regards to policies which affect competitiveness and human development. The fourth component is seen as being both a driver of competitiveness and human development as well as an outcome of competitiveness.

The role of government as suggested by Porter's third agenda point in **section 3.2.2.6** can be based on the old model of driving economic development through policy decisions and incentives or based on the new model which drives economic development through collaborative processes. The importance of the link between government and human development focus areas is based on the fact that competitive advantages and disadvantages as identified within Porter's factor conditions are directly related to government's policies.

The industry industrial policy is linked to Porter's second agenda point in **section 3.2.2.6** and is compared to cluster based policies. In the manufacturing industry the

automotive industry has embraced a cluster based policy for the industry. The inclusion of the industrial policy compared to cluster policy is justified based on the fact that competitive advantages and disadvantages as identified within Porters factor conditions are directly related to and industries chosen policy.

The inclusion of competitive intelligence at company level is based on the findings as included in **section 3.2.2.12**. The relevance of CI to competitiveness is based on the fact that CI creates a greater understanding of a company's competitors and the competitive environment. Essential ingredients of CI capability include monitoring industry and market trends, assessing the impact of political and economic changes, collecting information on competitors and knowing a company's strengths and weaknesses. The importance of internal strengths and weaknesses which are identified within the framework of a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is based on the fact that internal strengths and weaknesses help to identify competitive advantages and disadvantages. Human development focus areas will be influenced by competitive advantages and disadvantages.

The strategy, structure and rivalry component is included in the framework within its own boundary depicted by a block; the reason for this depiction is based on the fact that an analysis of strategy, structure and rivalry is deemed important for the execution of policies which relate to competitiveness and human development. It has to be stated however that the focus of the framework is based on the interaction between components one to three in general and the interaction and interrelatedness between the identified pillars of competitiveness and human development specifically in terms of identifying human development focus areas. Hence the formulation of strategy, industrial policies and competitive intelligence systems are important human development focus, but there inclusion in the framework is for the benefit of future research to ensure that the human development focus areas are used to drive the formulation of government policies for different industries.

The Links between the Components

The link between the pillars of the GCI and the components of the HDI was established by inductive reasoning. Inductive reasoning moves from specific facts to

general but tentative conclusions, with the knowledge that we can never be sure that inductive conclusions are flawless (Cooper & Schindler, 2003). Statistical inference is an application of inductive reasoning; interferential statistics includes the testing of statistical hypotheses (Cooper & Schindler, 2003). Statistical hypothesis are used to measure the competitiveness and human development of developed and developing countries individually, without testing the correlation between competitiveness and human development. It is against this background that inductive reasoning is used to formulate a generalised conclusion from limited observations, that pillars four and five of the GCI are linked to the HDI and to human resources which form part of factor conditions as represented in Porter's Diamond.

7.3 Conclusion

The recommendations per research objective above include many conclusions per objective and hence the purpose of this section will be to focus on the "journey" which was required to close the research loop. A loop is defined by the oxford dictionary as a figure produced by a curve or a doubled thread that crosses itself (Thompson, 1992). This definition highlights the importance of the fact that although a loop can be completed there might be areas which "cross" each, which could lead to confusion or even the existence of "loop holes" where research objective remain unanswered.

The first research objective focused on the benchmarking of SA's competitiveness and levels of human development compared to other developing and developed countries. The intention of this research objective was to build the foundation for the manufacturing industry in terms of benchmarking competitiveness and human development, as a result of the absence of such measures at industry level.

The second research objective focused on the importance of factor conditions such as human resources and knowledge resources in determining the competitiveness of SA. Porter's competitiveness agenda for South Africa provided valuable insights with regards to the important factor conditions at national level. This research objective was used to further help with the identification of competitiveness and human development focus areas at national level but which require inputs at industry level.

The third research objective focused on the most important factor conditions within the chosen three sub-industries of the manufacturing industry. Human resources were considered to be the most important factor conditions with specific reference to skills shortages, quality of education, tertiary enrolment, quality of mathematics and science education and competitive intelligence education.

The fourth research objective focused on how South Africa's labour legislation affects the collective human development focus areas in the automotive, chemical and metal and steel industries. The impact of legislation with regards to appointing and dismissing workers as well as minimum wages and issues of collective bargaining was researched. The need for more flexible labour regulations when working on international projects was identified. This research objective was included to ensure that the impact of labour legislation is considered when trying to identify human development focus areas.

The fifth research objective focused on how HIV/AIDS, impacts on the collective human development focus areas in the Manufacturing industry. The impact of HIV/AIDS was found to less than 10% although this figure did differ substantially from the research by BER during 2003 which reported an infection rate of 20%. The statistical reporting with regards to HIV/AIDS was however not deemed as important as the need for programmes which focus on awareness in the short term as well as changing attitudes over the long term. The fact that 40% of manufacturing companies' profits had been affected by HIV/AIDS was seen as a major challenge for many companies. The fact that only 25% of companies had implemented HIV/AIDS policies was also considered alarming and did not bode well for future levels of human development.

The last research objective focused on creating a human development framework which focuses on human development focus areas and the enhancement of competitiveness. The framework includes the nine pillars of the GCI, the HDI, Porter's factor conditions as well as Strategy, Structure and Rivalry as an additional fourth component as a suggestion for future research. The framework attempts to close the research loop by using inductive reasoning to link the elements of competitiveness and human development and their interrelatedness.

7.4 Recommendations for Further Research

There is a need to conduct quantitative research which measures the correlation between competitiveness and human development at industry level. Further research is required with regards to human development focus areas in all other industries of South Africa. Further research should aim to measure how the human development focus area can be linked to improved levels of competitiveness. The role of industrial policy and cluster policies in enhancing the competitiveness of the various industries in South Africa also requires extensive research as suggested by the fourth component of the framework in **Figure 7.1** above. The role of government in the formulation of industrial policies and how such policies impact on levels of competitiveness at industry level also needs to be researched further. The impact of HIV/AIDS at industry level on competitiveness requires extensive research as such findings would help with the formulation of industrial policies which aim to improve levels of competitiveness with due consideration of the human development challenges which face the industry. The measurement of inequalities within industries and how they impact on level of human development also requires further research based on the fact that the HDI is criticised for not including the influence of inequalities into the index.

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APPENDICES

Appendix A: Consistency Matrix

Research Objective	Proposition number	Proposition	Source of Sub objective	Source of data	Analysis
Research objective one: Benchmarking SA's HDI and GCI compared to other developed and developing countries.	Proposition	There is a difference between SA's HDI and GCI compared to other developed and developing countries.	United Nations Development Programme (2005), World Economic Forum (2005)	Quantitative measurement instrument.	Independent sample T Test
	Hypothesis 1	Ha: SA's HDI does not compare well to other developing countries	United Nations Development Programme (2005)	Quantitative measurement instrument.	Independent sample T Test
	Hypothesis 2	Ha: SA's HDI does not compare well to other developed countries.	United Nations Development Programme (2005)	Quantitative measurement instrument.	Independent sample T Test
	Hypothesis 3	Ha: SA's GCI does compare well to other developing countries.	World Economic Forum (2005)	Quantitative measurement instrument.	Independent sample T Test
	Hypothesis 4	Ha: SA's GCI does not compare well to other developed countries.	World Economic Forum (2005)	Quantitative measurement instrument.	Independent sample T Test
Research objective two: Establish the relevance of factor conditions (part of Porter's Diamond) such as human resources and knowledge resources in determining the competitiveness of SA.			Porter (1990), (2003) and personal interview	Qualitative measurement instrument.	Personal Interview: Structured questionaire
Research objective three: Establish the most important factor conditions of the Automotive, Chemical and Metal and Steel industries are, with specific reference to human and knowledge resources.			Porter (1990) and personal interview	Qualitative measurement instrument.	Personal Interview: Structured questionaire
Research objective four: Establish how South Africa's labour legislation effects the collective Human Development focus areas in the Automotive, Chemical and Metal industries.			Economic Intelligence Unit (2005) and personal interview	Qualitative measurement instrument.	Personal Interview: Structured questionaire
Research objective five: Establish how HIV/AIDS impacts on the collective Human Development focus areas in the Manufacturing Industry.			Bureau for Economic Research (2004) and personal interview	Qualitative measurement instrument.	Personal Interview: Structured questionaire
Research objective six: Establish a Human Development and National competitiveness framework for SA's manufacturing industry.			Porter (1990& 2003), NEDLAC (2006)	Qualitative and Quantitative measurement instrument.	Personal Interview: Structured questionaire, Inductive reasoning

Research Question: What human development dynamics would underpin the development of a "National framework for the South African manufacturing industry"?

Appendix B: Research Questionnaire

Dear industry representative

Research Project on Human Development Focus areas in the South African Manufacturing Industry

I am a final year MBL student at the UNISA Graduate School of Business Leadership (www.sblunisa.ac.za). In order to complete my studies I have to submit a comprehensive research project. The research project I have chosen is entitled:

"Enhancing competitiveness in the South African manufacturing industry through human development focus areas"

One of the dilemmas which the manufacturing industry faces is how to improve competitiveness not only by the use of technology but also by focusing on improved levels of human development. My study will investigate collective human development focus areas within the automotive, chemical and metal and steel industries.

I therefore request that you please assist me with my research by granting me a personal interview, which will be based on the attached prepared questions. The interview should not take more than 1 hour. I would like to make an appointment at a time and venue that suites your time schedule. I would then like to send you the prepared questions in advance of the personal interview to allow for preparation time. Also find enclosed a letter of confidentiality with regards to the information provided.

Thank you sincerely for your kind assistance. Please do not hesitate to contact me at 011 282 6350 or 082 994 474 should you require more clarity or assistance.

Yours faithfully,

Kenneth Pattison Date: 18 June 2006

Tel: + 27 11 6520352
Ref: Mrs Elsabe Broodryk
e-mail: broodje@unisa.ac.za
Web: www.sblunisa.ac.za

2006-07-19

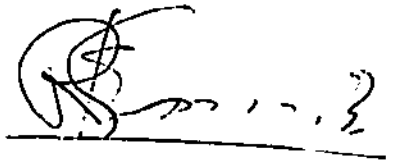
TO WHOM IT MAY CONCERN

This letter serves to confirm that Mr K Pattison, student number 70506590 is a registered final year student at the Graduate School of Business Leadership for 2006. He is doing the MBLREP-P as part of the requirements of obtaining the MBL postgraduate degree.

The Business School will observe any confidentiality requirements as requested by your institution regarding any information made available to the student in assisting with this report. The student must give his agreement as well to the confidentiality requirement.

On behalf of the Business School and Mr Pattison, we thank you for your cooperation.

Yours sincerely



PROF R KHUMALO
MANAGER: RESEARCH
+27 11 6520366
0823352527
RKhumalo@sbleds.ac.za

QUESTIONNAIRE: ENHANCING COMPETITIVENESS IN THE SOUTH AFRICAN MANUFACTURING INDUSTRY THROUGH HUMAN DEVELOPMENT FOCUS AREAS

Required time:	60 to 90 minutes
Number of questions:	15
Background information:	Included for questions 5, 9-12 & 14-15
The interview contains:	Four sections, namely: Skills shortage, Labour legislation, HIV/AIDS, Human Development and competitiveness

Section 1: Skills Shortage

Question 1

Are there any specific skills which are in short supply in your industry? Please name the specific skills.

Question 2

Please provide reasons for the short supply of the above mentioned skills.

Question 3

Are you aware of any development programmes which aim to reduce the skills shortage as identified above?

Section 2: Labour Legislation

Question 4

Please provide examples of how the South African labour legislation positively or negatively affects competitiveness and or human development in your industry?

Background information to question 5

The Economist Intelligence Unit uses labour regulation to rank various countries to determine the offshore attractiveness of a particular country. Labour regulation is measured by formulating a combined index, consisting of:

- Restrictiveness of labour laws on hiring and firing
- Extent of wage regulation

- Minimum wage laws

South Africa achieved a score of 4.67 out of 10, or last position out of 60 developing and developed countries. Many writers on the topic of labour legislation recommend deregulation or the removal of minimum wage legislation as a way of increasing more efficient labour regulation.

The Global competitiveness Report of 2005-2006, ranks South Africa as follows:

Ease of hiring foreign labour 3.4 out of 7 (114th out of 117 countries) compared to the United Kingdom, which achieved 5.5(7 = does not prevent your company from employing)

Question 5

Would you agree with the above assessment of the labour regulation in South Africa?

Please explain why or why not?

Question 6

Which aspects of the labour legislation need to be revised to help to improve levels of competitiveness and or human development?

Section 3: HIV/AIDS

Question 7

Please provide examples of how HIV/AIDS impacts on the competitiveness and or human develop in your industry?

Question 8

Please provide examples of human development initiatives which would lead to a post-HIV/AIDS area.

Background information to questions 9 to 12

The Global competitiveness Report of 2005-2006, ranks South Africa as follows:

1. **Quality of educational system**: 3 out of 7(81st out of 117 countries) compared to Singapore which scored 6.1(7= meeting the needs of a competitive economy).
2. **Quality of math and science education**: 2.7 out of 7(105th out of 117 countries), compared to Singapore which scored 6.5 (7= being among the best in the world).
3. **Brain drain**:, 3.1 out of 7(68th out of 117 countries) compared to the United States which scored 6.4(7 = almost always remain in the country).
4. **Gross Tertiary enrollment**: 15% (87th out of 117 countries), compared to the United States with a 83,2% gross enrollment.

Section 4: Human Development & Competitiveness

Question 9

Does the quality of the educational system negatively impact on the human development levels in your industry? Please explain why or why not.

Question 10

Does the quality of math and science education negatively impact your industry? Please explain why or why not.

Question 11

Does the so-called brain drain affect your industry, if yes, please explain in your opinion, what is required to prevent the brain drain from happening.

Question 12

Does your industry require a higher level of tertiary enrollment and if so what level of enrollment would you recommend compared to the above 15%?

Question 13

Is there a requirement for higher levels of competitive intelligence education in your industry? Please explain why or why not.

Back ground information to questions 14

Elements of human development include

1. **Health**: issues such life expectancy due to the impact of HIV/AIDS
2. **Education**: Gross tertiary enrollment, standard of education, math and science education.
3. **Skills**: Skills inline with future growth areas, knowledge management and competitive intelligence
4. **GDP or GNP / Capita**: The level of GDP/ Capita
5. **Labour legislation**: Revised Labour legislation and impact on Human development

Question 14

If your industry had to implement a human development programme, which of the above elements of human development would you target and in what order of priority?

Back ground information to questions 15

Human Development

South Africa's, Human development Index was measured at 0.655 in 1975 and at 0.658 in 2003, hence almost static after 30 years, mainly due to the impact of HIV/AIDS which has reduced the life expectancy of South Africans to 48 years of age. This gave South Africa a ranking of 120th out of 177 countries

Competitiveness

South Africa's Global competitiveness index was measured at 4.43 (positioning South Africa 40th out of 117 countries)

Question 15

Improved levels of competitiveness are often driven by new technology at the expense of labour; can improved levels of human development positively impact on competitiveness of your industry? Please explain how.

Appendix C: Questionnaire Answers

The answers below are a combination of direct quotations and in some instances rephrased to provide the reader with more clarity. The answers do not include interpretations; as interpretations of the answers are discussed in chapter six of the research.

Question 1: Are there any specific skills which are in short supply in your industry? Please name the specific skills.

Automotive Industry

Artisan engineers at NQF level 2, 3, 4; toolmakers as well as mechanical engineers at the higher NQF levels 6 and 7 are in short supply. The mechanical engineers which are in short supply are those with mechatronics experience which is an engineering discipline which combines mechanical and electrical engineering (Grobbelaar, 2006). Mechatronic engineers with robotics experience are also in short supply and hence the reason that the Nelson Mandela Metropolitan University in Nelson Mandela Bay started training engineers in Robotics recently (Masete, 2006). Masete commented that qualified engineers from universities are in short supply and that the Manufacturing Engineering and Related Services Sector Education and Training Authority (MERSETA) is currently paying for 5 mechanical and industrial engineers for each of the automotive manufacturers in SA.

Chemical Industry

According to Mahlase (2006) there is an abundance of chemistry graduates but the industry is struggling to find chemical and mechanical engineers. Two companies within the Chemical Service group of companies have been looking for project and process chemical engineers and so far have not been able to place any chemical engineers with experience. Mahlase (2006) added that universities are producing chemical engineers but there are few chemical engineers with sufficient experience. Further to the lack of experienced chemical engineers the industry is finding it difficult to recruit first line management such as supervisors and foremen (Mahlase, 2006). According to Dr Nattrass (2006), he receives calls almost on a daily basis from chemical engineers and chemistry graduates who require in-service training. He comments that there is an oversupply of chemical engineers, chemical analytical and plastics qualified individuals. He indicated that technikons and universities are

declining applications, and in his view skills shortage is a perception not a reality. (Nattrass, 2006)

Metal and Steel Industry

The industry has a shortage of draughtsmen, artisans, designers and engineers at all levels in the industry (Erling, 2006). Further to the shortage of artisans, boilermakers and welders are mentioned specifically. Engineers as well as engineering technicians with experience on the design side of the construction process are also in short supply (de Arruda, 2006).

Question 2: Please provide reasons for the short supply of the above mentioned skills.

Automotive Industry

Artisan level engineers are in short supply but also the quality of the supply is poor, with two drivers being responsible, namely the current work force which is ageing as well as new entrants with grade 12 education who are battling to pass entry level NQF level one, mathematics and science. The reason why grade 12 entrants fail mathematics and science is due to the systemic problems which are experienced at the higher level education institutions such as universities and universities of technology. The industry has grown in excess of 30% year on year over the last four years, but the growth was jobless. The workforce has been rejuvenated and new learners have been trained (Grobbelaar, 2006). Grobbelaar mentioned that skills are in short supply as a result of the fact that the industry only started increasing levels of training during the last three to four years as a result of the higher growth levels. He also mentioned that at Auto Africa in October there will be an announcement by NAAMSA, National Association of Automotive Component and Allied Manufacturers (NAACAM) and the Retail Motor Industry (RMI) regarding the future plan to train people in the automotive industry.

Chemical industry

Due to the oversupply of chemical engineers, there is a perceived high occupational unemployment, with many qualified chemical engineers but with insufficient experience. The inability to attract first line management such as supervisors and foreman is due to the fact that good performers in production are often promoted to first line management without having management training (Mahlase, 2006).

Metal and Steel Industry

The Education Director of the SAISC commented that the metal and steel construction industry had experienced an overcapacity in the industry during the last 10 years. This overcapacity resulted in a decline in output which lead to reduced training of mostly artisans and draughtsmen. At the same time both industry and parastatal's stopped training artisans and learnerships. Engineers at technikons and universities were not as adversely affected; however the supply of engineers was limited by the demand for mathematics and science by other professions (Erling, 2006).

The General Manager of Cosira International commented that the quality of welders had significantly deteriorated during the last three to four years. As a result of lower levels of artisan training the number of qualified boilermakers has also declined substantially. To address the shortage of boilermakers Cosira has become an accredited trainer of boilermakers. However the quality and number of welders remains a concern, as practical welding training requires large facilities and welders in the past have had to go for tests at the welding institute. The welding institute no longer exists and hence the poor quality of welders in the industry. Cosira is presently still trying to obtain accreditation for the training of welders. However the company finds that irrespective of the in-house training, current training does not meet demand, due to low perceived profile of welders (de Arruda, 2006).

At the higher level civil engineers with structural back ground are also in short supply. Cosira does not get involved in design, the design part of construction is outsourced to larger companies such as Hatch, DRA and Murray and Roberts, due to the short supply of design engineers and technicians (de Arruda, 2006).

Question 3: Are you aware of any development programmes which aim to reduce the skills shortage as identified above?

Automotive Industry

AIDC as an Employment and Skills Development Leader Employer (ESDLE) is also planning a regional training facility for the city of Tshwane (previously Pretoria) to train learners in the field of manufacturing, automotive and tooling needs. The regional training centre in Rosslyn and Watloo is also in the preferred zone of development for the city of Tshwane. The training centres will collaborate with the

Future Education and Training (FET) colleges and higher education institutions and will provide skills development and learnerships, driven by Ford, AIDC and the City of Tshwane and endorsed by the DTI with funding being secured via the arms deal. During February 2007 the MERSETA will announce the establishment of the Institute of Sectoral Occupational Excellence (ISOE). The MERSETA has to establish five Centres of Excellence (COE).

AIDC offers professional short courses. MERSETA plays a more active role than the AIDC. MERSETA looks more at degrees as opposed to learnerships. The AIDC does provide learnerships but are still reliant on the universities for degrees (Grobbelaar, 2006).

Chemical Industry

The company has bursary schemes for students studying at universities or technikons. Employment is offered to bursary students after the completion of their studies. The Group R&D manager provides the universities and technikons with the three to five year need for chemical specialists, as a result bursary students are selected to meet the demand. In-service training is provided to bursary students to assist with the assessment of students prior to offering employment after the completion of their studies. The above mentioned bursary scheme is seen as extremely successful and results in a retention of 95% of people. Currently an informal Succession Development Programme (SDP) is in place to develop middle to upper management candidates, currently the process is being formalised. Further to the in-house SDP the Management Development Programme (MDP) with the University of Cape Town offers an accredited management programme. After the completion of assignments, presentations are prepared and presented to executive management of the company. At present both programmes do not assist in developing management potential at lower managerial levels, which is the reason for the lack of adequate lower management skills. The company indicated that a formal SDP as well as Executive management programmes would be launched during August and October 2006 respectively (Mahlase, 2006).

Metal and Steel Industry

There is no support from government with regards to development programmes. Government has only recently started to support the industry via the Sector Education and Training Authority (SETA). Current training initiatives will not bear

fruits in time for the infrastructure boom which has to be completed by 2010. In the past government used to rely on industry for development of skills, however during the last few years the industry has not trained sufficient numbers of skilled individuals as a result of the slow growth in the industry prior to the current boom. Cosira recently started the new Cosira Caplan School which specifically trains draughtsmen for the local structural steel industry. There are two types of draughtsmen, one type does general arrangement drawings and the other type does detailed structural drawings. The sector SETA in the recent years has not supported apprentices for welders and boilermakers but they have recently started providing support as a result of the large shortage in the industry (de Arruda, 2006).

Question 4: Please provide examples of how the South African labour legislation positively or negatively affects competitiveness and or human development in your industry.

Automotive Industry

The labour legislation contributes positively towards relationships between employers and employees. Collective bargaining assists with collaboration between employers and employees with regards to issues of negotiation, training, development and wages which assist with the equal distribution of resources (Masete, 2006). However equity targets impact negatively on production due to gender targets which sets targets for all areas of production, Masete (2006) comments that the requirement of maternity leave places a heavy burden on the labour force and argues that targets should be set up selectively. Grobbelaar (2006) further commented that during site visits to manufacturing plants it was found that many factories do not have adequate facilities for female workers. He mentioned that industry had not transformed at the same pace as intended by industry. Labour legislation promotes the training of unemployed people in the automotive industry this has lead to a large number of trained unemployed people at the expense of employed people. From an FDI perspective, the labour law is seen as a negative with industry commenting that foreign contracts with Original Equipment Manufacturer (OEM) are cancelled as a result of bargaining councils and labour unrest due to wage negotiations. The negative impact is as a result of the fact that the South African automotive manufacturing business model is based on high labour employment at acceptable wage levels. (Grobbelaar, 2006)

Chemical industry

Chemserve as a company is constantly growing into new industries by way of acquisitions; the LRA was recently amended to ensure that restructuring may not take place in preparation of a merger or acquisition. The implication of the amendment is that no retrenchments may be made in preparation or prior to an acquisition or merger. The amendment of the act has a limiting impact on the sale and acquisition of companies. Prior to the amendment of the LRA, the seller had to comply with requests of the buyer.

The Skills Development Levy (SDL) is seen as a positive as expenses incurred on training can be claimed back and hence the levy acts as an incentive to train. At present the SETA has been impacted negatively by the many companies who have applied for a discretionary grant, with the SETA not being able to assist with all the requests. The SETA has contributed positively towards training in the chemical industry, but reporting requirements per individual trained is seen as excessive and acts as a detriment as it places a heavy administrative burden on human resource personnel (Mahlase, 2006).

Metal and Steel Industry

The minimum wage regulation does impact negatively on competitiveness, companies work around the regulations by employing fewer permanent employees. As a result of the cyclical nature of the industry variable number of workers is required. The basic conditions of employment have also made it difficult to dismiss poor performing employees and hence there is a reluctance to employ permanent employees (Erling, 2006). Cosira makes use of labour brokers to source the temporary workers, which constitutes 70% of their workforce (de Arruda, 2006).

Question 5: Would you agree with the above assessment of the labour regulation in South Africa?. Please explain why or why not?

Automotive Industry

The extent of wage regulation as dictated by the bargaining councils as well as minimum wages is seen as a positive by Masete (2006) as it is equitable and offers individuals the possibility of a reasonable standard of living. The assessment by the EIU is seen as accurate in terms of the restrictiveness of dismissing poor performers.

Chemical Industry

The legislation with regards to appointing new employees is seen as a positive by Chemserve, as the culture in chemical services has always been that managers must be able to adequately justify employment. The burden of proof which is required to dismiss an individual is also seen as a positive as it again requires management to have justification for the dismissal. Minimum wage legislation is seen as a positive as it is set by collective bargaining, negotiation is done at national level, and hence not much industrial action is seen the chemical industry due to wage increases. It is however still voluntary for employers to take part in national bargaining forum, hence smaller companies are able to compete in terms of labour costs as they are not bound by minimum wage regulation. The members of the national bargaining forum are endeavouring to extend the agreement to all companies in the chemical industry, although it is acknowledged that such an extension might not suite all employers. There is a need for two types of wage determinations, one for smaller companies and one for larger companies based on number of employees as well as the company turnover (Mahlase, 2006).

Metal and Steel Industry

The Education Director of the AIDC was in agreement with the fact that minimum wages does influence competitiveness negatively. Minimum wage regulation leads to higher unemployment (Erling, 2006). SA's competitiveness internationally is dependent on the exchange rate, in times of stable exchange rates only the location serves as a competitive advantage for projects within Sub-Saharan Africa as well as other parts of Africa. Locally steel companies are being challenged more and more by Korean as well as Chinese companies. In many instance various countries bid for the same projects, when foreign companies win the contracts they end up using SA labourers. However due to the restrictive wage legislation foreign companies are starting to bring in expatriates from India and Pakistan. For a recent large project in Madagascar to build a refinery plant, Hatch was contracted as the local designers but a Chinese company was contracted for the labour to complete the first phase. Currently Zambia is mining a zinc belt which requires new smelters, similar opportunities are coming from Botswana. SA can compete on quality but not on labour input costs. Although SA can still compete on quality, countries such as Korea, Eastern Bloc countries, Arabian countries as well as India's quality is starting to improve (de Arruda, 2006).

Question 6: Which aspects of the labour legislation need to be revised to help to improve levels of competitiveness and or human development?

Automotive Industry

The wage regulation in terms of minimum wages and wage regulation should be flexible when foreign contracts are entered into to prevent cancellation of the contract later on, due to high levels of restrictiveness. With regards to collective bargaining for salary increases Masete (2006) commentated that there should be more flexibility to reward good performers. He also added that the burden of proof required in Labour courts and the CCMA needs to revised, to allow for easier dismissal of poor performers. Masete (2006) again indicated that labour law should make provision for additional headcount to compensate for the loss of productivity as a result of maternity leave. This view was shared by Grobbelaar (2006) who commented that companies need to be creative by having training programmes and learnerships for unemployed individuals, which can then be used to compensate for loss in productivity

Chemical Industry

Section 196 of the LRA needs to be reviewed with regards to the restrictiveness of restructuring a company prior to a merger or acquisition. The current legislation makes people "manipulative", as they work around the legislation, as soon as the acquisition or merger has taken place restructuring takes place which defeats the purpose of the amended legislation (Mahlase, 2006).

Metal and Steel Industry

The restrictiveness of hiring and firing needs to be reviewed, to allow for easier dismissal of poor performers. Minimum wage laws impact negatively on the offshore attractiveness of a particular country, as can be seen from the examples where foreign countries prefer to use foreign labour instead of South African labour. The collective bargaining agreements with regards to wage increases place a burden on the inflation of the country. Also more flexibility is required for rewarding good performers above the collective agreement increase percentage (de Arruda, 2006).

Question 7: Please provide examples of how HIV/AIDS impacts on the Competitiveness and or human develop in your industry?

Automotive Industry

Grobbelaar (2006) commented that industry research indicated a 6% level of infection. An example of a company in the North West province was however mentioned where the prevalence rate was about 28% which was is in line with the department of health's statistics for the Region. At Nissan Masete (2006) commented that very few cases of HIV/AIDS had been reported at the company and that the impact on productivity and competitiveness was low.

Chemical Industry

Chemserve started HIV/AIDS awareness programme many years ago which has lead to increased level of awareness, however increased levels of awareness had not changed the behaviour of employees, and this was seen as problematic. The current prevalence in the whole group is considered to be less than 10%. The company has medical aid for all employees and if an employee's monthly salary is less than R9, 000 the company pays the medical aid contributions. The medical aid has a program called aid for AIDS which provides anti-retrovirals. However it was stated that HIV/AIDS does impact on negatively on development based on the fact that talented individuals as well as potential leaders have died of AIDS. The group expects an increase in disabilities and death during 2007 abut expects a stable trend by 2008 (Mahlase, 2006).

Metal and Steel Industry

Many construction projects are geographically dispersed, which requires temporary workers and accordingly 70% of the total workforce being employed in the industry are temporary workers. The fact that most temporary workers work away from home, leads to higher levels of HIV/AIDS infections under contract workers. Artisans are also impacted to some extent by HIV/AIDS with draughtsmen, designers and engineers only being effected marginally (Erling, 2006).

Question 8: Please provide examples of human development initiatives which would lead to a post-HIV/AIDS area.

Automotive Industry

Government needs to make people aware of the seriousness of the disease as well as focusing on both treatment and research to cure the disease (Masete, 2006) Masete commented that not enough emphasis had been placed on research with many programmes focusing on treatment only. HIV/AIDS should be seen as a chronic disease along with many other chronic diseases and accordingly holistic awareness and employee wellbeing programmes are required. The researcher commentated that other interviewees had commented that although awareness had been advocated, attitudes had not yet changed. In reply Masete (2006) commented that research on curing the disease was just as important as trying to change perceptions and attitudes. Development initiatives are hampered by the low level of literacy in the country which makes the education task difficult. In Grobbelaar's view development initiatives are hampered further by the fact that the true magnitude of HIV/AIDS is not known. As a result of the fact that government is not "speaking from the same mouth" there is much scepticism regarding the statistics and research which has previously been conducted. It was argued by Grobbelaar that if development initiatives do not alleviate the impact if HIV/AIDS, companies could industrialise their operations.

The question was raised whether SA will remain competitive if technology becomes the only determinant of competitiveness. The comment was also made that automotive manufacturing orders are secured every seven years and that SA competes with other subsidiaries in developing countries. In the event of technology becoming the only determinant of competitiveness SA could lose its appeal to foreign countries, as foreign countries already have spare capacity and could easily absorb SA's less than 1% of the world's production (Grobbelaar, 2006)

Chemical Industry

Companies have a responsibility as corporate citizens, they have the resources and it is believed that if companies contribute to awareness under employees and immediate families the behaviour will change over time. At Chemserve employees were uneasy at first in terms of attending HIV/AIDS awareness sessions, as they feared being labelled as HIV positive. But workshop attendance increased in the company and people are able to speak freely about HIV/AIDS. The perception has changed in the company due to the fact that HIV positive employees have spoken to company employees at workshops. It also seems that people are taking the

information home to share with their families. Traditionally in African culture, sexual education was seen as a "taboo" topic, parents did not consider it appropriate to discuss sex with their children. The culture of African people is changing in the sense that children hear about sexual education at school and are exposed to sexually explicitly images on television this has allowed parents to talk freely about sex with their children (Mahlase, 2006).

Metal and Steel Industry

The industry will have to take responsibility to increase awareness through out the work force as well as educating young people regarding the danger of unprotected sex (Erling, 2006). The General Manager of Cosira believes that there will not be a post HIV/AIDS era, the disease will simply be known as a chronic disease. The Western influence will affect not only awareness but also attitudes towards the disease, the concern was also expressed that effective treatment could reduce curative initiatives and country might become too relaxed in the fight against the pandemic (de Arruda, 2006).

Question 9: Does the quality of the educational system negatively impact on the human development levels in your industry? Please explain why or why not.

Automotive Industry

The issue of practical skills compared to quality of education was raised by Masete (2006) who indicated that the quality was adequate but that skills were not practical. The issue of high unemployment was also raised; the comment was made that the perceived quality of a grade 12 pupil who had not been employed for four to five years would be low. However the impact of current education on the availability of skills was seen as negative as a result of the misalignment between skills offered by grade 12 pupils and skills required by industry. The comment was made that the education strategy and outcomes need to be looked at to remedy the current misalignment (Masete, 2006).

The quality of education does negatively impact on the level of human development in the auto manufacturing industry (Grobbelaar, 2006). This comment was substantiated by the group HR Director of the TATA group, who plans to build an automotive production facility in SA, making the assessment that the current

education system does not provide adequate skills. This observation was made after the decision was made to draw employment from other OEM plants as well as from SA (Grobbelaar, 2006).

The quality of education as offered by the FET colleges was also considered important to improve levels of human development especially at artisan level. The comment was however made that the FET's are so immersed in transformation and recapitalisation as well as starting a new vocational curriculum, that the quality of training had been impacted negatively. The vocational training, takes in learners from the previously disadvantaged communities, which fills up 80% of capacity, with 20% of capacity being allocated to occupational training such as learnerships. The occupational training component has not been recapitalised, but the vocational component and laboratories have been. This results in occupational training having to compete with the mainstream 80%. The universities of technologies are fairing much better, the Nelson Mandela Metropolitan University has recently introduced a mechatronic / robotics department, which will have a positive impact on quality of engineering education (Grobbelaar, 2006).

Chemical Industry

In the view of Nattrass (2006) the quality of education has deteriorated since the establishment of Outcome Based Education (OBE) in his view poor performing pupils are carried by the system, with very few pupils failing until they reach grade 9. The quality of education is also depended on whether a grade 12 pupil attended either a former model C schools or a private school. Pupils coming from township schools have a poor level of education.

The above view was confirmed by the Group Human Resources Manager who mentioned that grade 12 applicants from former model C as well as private schools had a good level of quality education and that their general levels of confidence were high. Township schools pupils were are not able to express themselves, due to poor language proficiency, specifically English. Feedback from trainers who facilitate training also indicates that employees have a low level of English comprehension. The comment was made that the quality of education will only increase when all township schools have adequate human and capital resources at their disposal (Mahlase, 2006).

Metal and Steel Industry

The quality of education does impact negatively on human development as only private schools and former model C schools are educating quality students, many other institutions are producing poor quality students (Erling, 2006).

Grade 12 pupils with technical education require a high degree of relearning and it is also found that new entrants do not understand the basic functional areas of a business. English grammar and spelling is atrocious and language proficiency is shocking. However it has to be said that the quality of technicians and graduates quality is much higher (de Arruda, 2006).

Question 10: Does the quality of math and science education negatively impact your industry? Please explain why or why not.

Automotive Industry

The quality of Math and science education does negatively impact on the automotive industry. Lower level learners at NQF levels 1 and 2 are mostly individuals with grade 12 mathematics and science, the experience is that they can not even pass learnership levels one of mathematics (Grobbelaar, 2006). The automotive industry recently wanted to place 25 individuals as interns with technikon level grade P1 and P2 qualifications, it was cited that a database of over 1,000 individuals could not provide suitable candidates due to the poor level of mathematics comprehension. The quality of mathematics and science education of engineers coming from universities such as the University of Pretoria was considered high, but it was emphasised that retraining was required prior to entering the industry (Grobbelaar, 2006). Initiatives such as the Chair at University of Pretoria in Automotive Manufacturing are bringing industry and industrial engineers closer together. A Programme at the Nelson Mandela Metropolitan University, known as the Automotive Experiential Career Development Programme (AECDP) goes into the townships and approaches talented pupils from less privileged schools. These pupils are educated further during autumn, winter and summer schools and then exposed to a career in engineering by giving them access to companies, who then offer bursaries for further education. The level of success is high as special attention has been given to such individuals. The current poor quality of education is symptomatic of the fact that additional resources are not available to most pupils at school (Grobbelaar, 2006).

Chemical Industry

As the Group R&D Manager, Dr Nattrass has frequent discussions with university lecturers regarding the issue of quality of mathematics and science education. As a result of the fact that tertiary institutions have a perception that secondary educational standards are dropping minimum entry requirements are being raised. The University of the Witwaters Rand (WITS) is allowing more admissions to chemistry and chemistry analytical students but they are cutting back on practical laboratory work due to the fact that they have insufficient number of laboratories, this is a seen as a major concern (Nattrass, 2006).

Metal and Steel Industry

The quality of math and science education is of vital importance to the industry, the number of students with higher grade science and math is not sufficient to meet the demand of the industry as the industry has to compete with many other industries (Erling, 2006).

Question 11: Does the so-called brain drain affect your industry, if yes, please explain in your opinion, what is required to prevent the brain drain from happening.

Automotive Industry

In general it was stated that the brain drain does not have a meaningful impact on the automotive industry, as most MNC's make use of their, own skilled individuals and are hence not affected by the so called "brain drain". Tool makers were cited as one of the few skills which are in short supply due to the declining number of artisans over the years as well as many toolmakers who have left the country (Grobbelaar, 2006).

Chemical Industry

The chemical industry is not adversely affected by the brain drain, although the highly skilled individuals are leaving the country, there is currently a sufficient supply of people with chemistry and chemical education (Nattrass, 2006). The Group HRM confirmed that the impact of the brain drain was less than 1% on the entire group of companies (Mahlase, 2006).

Metal and Steel Industry

The brain-drain affects mainly draughtsmen and engineers. Research has shown that there is a negative correlation between the number of engineers and than their age, in other words there are more, older engineers than younger ones. With only about 300 engineers entering the industry per annum. In the past a sufficient number of engineers were available to mentor younger engineers. Currently engineers need to find their feet much quicker due to the lack of mentors. Many draughtsmen have left the country and are working in the East and in Asia, where they are paid much better. An example of where brain drain leads to the loss of an opportunity was when Saudi Arabia started a factory which could have made use of South African expertise but only a few experts decided to go and work in Saudi. Currently the SA govemment is bringing in artisans from abroad as a result of the lack of artisans, due to both the impact of the brain drain as well as the low level of training at technical colleges (Erling, 2006).

Question 12: Does your industry require a higher level of tertiary enrollment and if so what level of enrollment would you recommend compared to the above 15%?

Automotive Industry

Yes there are bands such as the FET bands which require much more development which will ripple through to higher education. SA simply needs more skilled people. There is however the school of thought which argues that individuals should only be trained up to a certain level such as short skill training, to prevent highly skilled people from "job hopping". There are even those who argue that if tertiary enrolment becomes to high that SA's labour force could become a barrier of entry as labour costs would be to high. There is however still room for growth as seen from the ASGISA and Joint Initiative for Priority Skills Acquisition (JIPSA) skills development programmes. Part of the low levels of tertiary enrolment has to do with the fact that many parastatal's such as Transnet and Spoornet have stopped training apprenticeships, would lead to a downward spiral in the number of apprenticeships. The MERSETA currently has 3,700 register apprenticeships as well as 3,700 registered learnerships (Grobbelaar, 2006).

Chemical Industry

The level of tertiary enrolment was considered too low at 15% a figure of 40% was deemed to be more realistic as a larger pool of talent is required for selection of suitable candidates (Mahlase, 2006).

Metal and Steel Industry

The GM of Cosira indicated that it would be difficult to quantify a more acceptable level of tertiary education but added that he would want to see at least 15% of university and university of technology graduates being engineers.

Question 13: Is there a requirement for higher levels of competitive intelligence education in your industry? Please explain why or why not.

Automotive Industry

The automotive industries business model does not currently complement CI awareness. SA manufactures automobiles under licensing agreements. SA does not design motor vehicles; hence the low levels of CI. Korean companies also initially manufactured under license agreements and then started imitating projects by going into the value stream, after which they started designing vehicle and developed their own IP, China is following suite.

In light of the above developments increased competitive intelligence and development of IP will lead to increased levels of CI awareness There are needs and opportunities in the country, the future of automotive is hydrogen fuel cells, and the catalytic converter which is a key component of hydrogen fuel cells requires platinum. SA has platinum in abundance; currently SA is not doing much with regards to sourcing IP in the area of fuel cells. The USA is looking for alternative materials to substitute platinum, as they do not want to be dependent on other countries for the sourcing of platinum. British Petroleum (BP) and Shell have research facilities and they are researching fuel cell technology. Some platinum companies are doing research in down stream beneficiation they are naturally doing research in the area of fuel cells. Recently the international community had the 16th bi-annual hydrogen economy conference, which was attended by a delegate from the University of Pretoria. The North West province wants to start with a fuel cell strategy as well. The SA government wants to launch a national fuel cell strategy. SA could manufacture for the world. Currently industry is not concerned with fuel cell

technology as a result of the restrictive licensing agreements. Government should be driving CI and awareness as it should be a country initiative as opposed to an industry initiative. Japan wants to convert a large percentage of their vehicles within the next 5 years to hydrogen, not fuel cells yet. Just as the oil producing countries create a monopoly which is centralised, SA could create the same model for fuel cells dependent on platinum (Grobbelaar, 2006).

Chemical Industry

The company does not have a formal CI function or education per say, but as a result of the fact that the company has a strategy to not only grow organically but also through acquisitions, scanning of the business environment is of vital importance to the company. The company has two executive directors who have to scan the environment and identify potential business opportunities as well as looking at the focus areas of the company and aligning the focus with new opportunities (Mahlase, 2006).

At operational level new technology is imported from the United States all the time. In-house development is also done where sales staff is always on the look out for new competitor products, once such products are identified a sample is obtained for testing. However it has to be said that there is no structured intervention with competitor intelligence being more of a natural occurrence in an attempt to strive to match the competition (Nattrass, 2006).

Metal and Steel Industry

There is not much CI activity in the industry due to the mature nature of the industry. In the past quality was a given and competition has always been "cut throat", the current increased demand for infrastructure has lead to more business for most industry players. There are attempts within the industry to share design information with regards to steel structures. Strategic alliances have been entered into in terms of corrosion protection and painting, these alliances offer first right of refusal options as well as dedicated trucks for transporting materials between operations. At present the competitiveness of the industry is affected by the fact that construction companies do not have direct access to steel mills, as they have to work through the middleman. Steel merchants ensure that there are sufficient stock levels and product ranges, however in some instances six months of forward planning is required from the mills which hampers the flexibility of projects. The only way for the current situation to change would be if Mittal Steel and Highveld had more local

competition. If government abolishes import tariffs on metal and iron ore the competitive environment will change. The issue of import-parity pricing was raised; Mittal Steel SA sells steel domestically based on selected international selling prices which include all freight-handling and tariffs which are charged for exports. The import-parity pricing allows foreign countries with economies of scale to secure projects due to lower raw material input costs. This is detrimental for local employment. The suggestion was made that construction projects should be granted the same rights as an international free-trade zone to ensure more competitive input costs similar to Coega (de Arruda, 2006).

The metal construction industry does get together every two years with other English speaking countries to share ideas about new technologies in response to the developments in Asia as well as the East (Erling, 2006).

Question 14

In your view, which of the above elements of human development would you target and in what order of priority for implementation in your industry?

Automotive Industry

The implementation of education and skills go hand in hand; skills that need to be developed are dependent on educational systems as offered by FET colleges. Improved collaboration between institutions and industry is required in this regard. An example of improved levels of collaboration is the aerospace industry which recently started a centre of excellence funded by DTI and Department of Science and Technology (DST) at Wits University, creating niche products for aeroplanes. This initiative now needs to be followed up by the establishment of IP and research (Grobbelaar, 2006).

Chemical Industry

Education was considered to be the most important focus area in-terms of human development as well as health awareness as a result of the HIV/AIDS pandemic (Mahlase, 2006).

Metal and Steel Industry

Education and relevant skills are considered the most important issue with regards to the improvement of human development (de Arruda, 2006).

Question 15: Improved levels of competitiveness are often driven by new technology at the expense of labour; can improved levels of Human Development positively impact on competitiveness of your industry? Please explain how.

Automotive Industry

The automotive industry does have a strategy of being more labour focused, which is at the expense of mechanisation. The MIDP presently does not incentivise skills development and training. The MIDP currently offers incentives which revolve around receiving debits and credits for imports and exports and also incentives for capital expenditure from the DTI. The capital expenditure as well as import and export activities require new specific skills which need to be developed and training is required for operation of new mechatronic production lines and paint shops. To achieve such skills development, skills development should also receive incentives. A direct link is required between the percentage of capital expenditure and the levels of skills development and training of both employed and unemployed individuals (Grobbelaar, 2006).

Chemical Industry

New technology, especially when principle agreements are entered into with foreign companies does impact on labour negatively (Mahlase, 2006). In many instances parts of the production line do become automated and the labour is impacted negatively, the solution to this problem is to multi-skill individuals to allow for a more flexible workforce (Nattrass, 2006).

Metal and Steel Industry

Yes technology does drive competitiveness, there are examples of drilling machines which can drill much quicker than human beings can, however the industry by in large will remain labour intensive (Erling, 2006). There are certain activities which will be mechanised at the expense of labour, however higher levels of skills are required to operate new technology. New technology could be to the detriment of welders and boilermakers, but administrative requirements on the planning side will increase (de Arruda, 2006).

Appendix D: Sample Frame

	Company	Industry	Address	Contact Number
1. Automotive Industry				
1	TOYOTA SOUTH AFRICA MOTORS (PTY) LTD	Automotive	Old Pretoria Main Road, Wynberg, Sandton	Telephone : +27 (11) 809 9111
2	BMW SOUTH AFRICA (PTY) LTD	Automotive	1 Bavaria Road, Randjespark Ext 17, Midrand	Telephone : +27 (12) 522 3000
3	DAIMLER CHRYSLER SA (PTY) LTD	Automotive	M10, Wierda Road, Zwartkop, Pretoria	Telephone : +27 (12) 677 1500
4	FIAT AUTO SOUTH AFRICA (PTY) LTD	Automotive	Waterfall Park, Howick Close, Bekker Street, Vorna Valley, Midrand	Telephone : +27 (11) 205 3700
5	FORD MOTOR COMPANY	Automotive	Simon Vermooten Road, Silverton, Pretoria	Telephone : +27 (12) 842 2911
6	NISSAN SOUTH AFRICA (PTY) LTD	Automotive	Stand 56, Ernest Oppenheimer Street, Rosslyn	Telephone : +27 (12) 529 6000
7	RENAULT SOUTH AFRICA (PTY) LTD	Automotive	Renault House, 12 Ernest Oppenheimer Drive, Bruma, 2026	Telephone : +27 (11) 607 7300
8	VOLVO (SOUTHERN AFRICA) (PTY) LTD	Automotive	Hughes Business Park, Corner Jet Park Road and Saligna Street	Telephone : +27 (11) 842 5000
9	HONDA SOUTH AFRICA (PTY) LTD	Automotive	111 15th Road, Randjespark, Midrand	Telephone : +27 (11) 847 9400
10	National Association of Automobile Manufacturers of South Africa (NAAMSA)	Automotive	P O Box 40611, Arcadia, 0007	Telephone: +27 (12) 323-2980
2. Chemical Industry				
11	BP Southern Africa Limited	Chemical	Town Square, Cape Town	Telephone: +27 (21) 408 2911
12	Orchem Products (Pty) Ltd	Chemical	Eastgate office park, Bruma	Telephone: +27 (11) 601 1660
13	Bayer (Pty) Ltd	Chemical	Isando	Telephone: +27 (11) 921 5911
14	Caltex South Africa	Chemical	Caltex house DF Malan street Cape Town	Telephone: +27 (21) 403 7911
15	Degussa-cc	Chemical	11 Pullinger Street, Westonaria	Tel : +27 (11) 754 1343
16	AECI	Chemical	Woodlands Drive Sandton	Tel : +27 (11) 806 8700
17	Engen Petroleum Ltd	Chemical	Engen court Thibault square Cape Town	Telephone: +27 (21) 403 4120
18	Sasol	Chemical	1 Sturdee Ave Rosebank	Telephone : +27 (11) 441 3202
19	Omnia	Chemical	13 Sloan Street Epson Downs, Bryanston	Telephone : +27 (11) 709 8888
20	Chemical Services Limited	Chemical	48 Gosvenor Road Bryanston	Telephone : +27 (11) 548 4500
21	Unilever SA	Chemical	15 Nollsworth Crescent, Durban	Telephone : +27 (31) 570 2911
22	Petchem	Chemical	Church Street, Pretoria	Telephone : +27 (12) 305 4550
23	Shell SA	Chemical	Shell House, 9 Riebeek Street, Cape Town	Telephone: +27 (21) 408 4911
24	Total South Africa	Chemical	www.total.co.za	+ 27 (11) 778 2449/000
2. Metal and Steel Industry				
25	South African Iron and Steel Institute	Metal and Steel	SAAU Building, 21 st Floor, c/o Andries and Schoeman streets, Pretoria	Tel +27 12 320 2450
26	Columbus Stainless (Pty) Ltd	Metal and Steel	Hendrina Road Middelburg	Tel +27 13 247 2020
27	Scaw Metals Group	Metal and Steel	MARSHALTOWN	Tel +27 11 842 900
28	Highveld Steel And Vanadium Corporation Ltd (HIVELD)	Metal and Steel	Witbank / Bedfonview	Tel +27 11 454 1583
29	Mittal Steel South Africa (Ispat Iscor Ltd)	Metal and Steel	VANDERBIJLPARK	Tel +27 16 889 9111
30	Samancor Limited	Metal and Steel	6 Holland Street, Johannesburg	Tel + 27 11 376 3370

Appendix E: HDI: Developing Countries

No	Developing countries	HDI Value	Life expectancy index	Education index	GDP index
1	Albania	0.780	0.81	0.89	0.64
2	Algeria	0.722	0.77	0.71	0.69
3	Argentina	0.863	0.82	0.96	0.80
4	Botswana	0.565	0.19	0.76	0.75
5	Brazil	0.792	0.76	0.89	0.73
6	Bulgaria	0.808	0.79	0.91	0.73
7	Chile	0.854	0.88	0.91	0.77
8	Columbia	0.785	0.79	0.86	0.70
9	Costa Rica	0.838	0.89	0.87	0.76
10	Croatia	0.841	0.83	0.90	0.79
11	Dominican Republic	0.749	0.70	0.84	0.70
12	Ecuador	0.759	0.82	0.86	0.60
13	Elsavador	0.722	0.76	0.76	0.65
14	Estonia	0.853	0.77	0.97	0.82
15	Guatemala	0.663	0.70	0.66	0.62
16	Jamaica	0.738	0.76	0.83	0.62
17	Kazakhstan	0.761	0.64	0.94	0.70
18	Latvia	0.836	0.78	0.96	0.77
19	Lithuania	0.852	0.79	0.97	0.79
20	Macedondia, FYR	0.797	0.81	0.87	0.70
21	Malaysia	0.796	0.80	0.83	0.76
22	Mauritius	0.791	0.79	0.80	0.79
23	Mexico	0.814	0.83	0.85	0.75
24	Namibia	0.627	0.39	0.80	0.69
25	Panama	0.804	0.83	0.88	0.71
26	Peru	0.762	0.75	0.88	0.66
27	Poland	0.858	0.82	0.96	0.79
28	Romania	0.792	0.77	0.89	0.72
29	Russia	0.795	0.67	0.96	0.76
30	Slovak Republic	0.849	0.82	0.91	0.82
31	**South Africa**	**0.658**	**0.39**	**0.81**	**0.77**
32	Thailand	0.778	0.75	0.86	0.72
33	Tunisia	0.753	0.80	0.74	0.71
34	Turkey	0.750	0.73	0.82	0.70
35	Uruguay	0.840	0.84	0.94	0.74
36	Venezuela	0.772	0.80	0.87	0.65
	Average	**0.778**	**0.746**	**0.864**	**0.724**

Source: United Nations Development Programme, 2005

Appendix F: HDI: Developed Countries

No	Developed countries	HDI Value	Life expectancy index	Education index	GDP index
1	Australia	0.956	0.92	0.99	0.95
2	Austria	0.936	0.90	0.96	0.95
3	Bahrain	0.846	0.82	0.86	0.86
4	Belgium	0.945	0.90	0.99	0.94
5	Canda	0.949	0.92	0.97	0.96
6	Cyprus	0.891	0.89	0.91	0.87
7	Czech Republic	0.874	0.84	0.93	0.85
8	Denmark	0.941	0.87	0.99	0.96
9	Finland	0.941	0.89	0.99	0.94
10	France	0.938	0.91	0.97	0.94
11	Germany	0.930	0.90	0.96	0.94
12	Greece	0.912	0.89	0.97	0.88
13	Hong Kong SAR	0.916	0.94	0.87	0.94
14	Hungary	0.862	0.80	0.96	0.83
15	Iceland	0.956	0.93	0.98	0.96
16	Ireland	0.946	0.88	0.97	0.99
17	Italy	0.934	0.92	0.95	0.94
18	Japan	0.943	0.95	0.94	0.94
19	Korea	0.901	0.87	0.97	0.87
20	Kuwait	0.844	0.87	0.80	0.87
21	Luxenbourg	0.949	0.89	0.95	1.00
22	Malta	0.867	0.89	0.85	0.86
23	Netherlands	0.943	0.89	0.99	0.95
24	New Zealand	0.933	0.90	0.99	0.90
25	Norway	0.963	0.91	0.99	0.99
26	Portugal	0.904	0.87	0.97	0.87
27	Qatar	0.849	0.80	0.87	0.88
28	Russia	0.795	0.67	0.96	0.76
29	Singapore	0.907	0.89	0.91	0.92
30	Slovenia	0.904	0.86	0.98	0.88
31	Spain	0.928	0.91	0.97	0.90
32	Sweden	0.949	0.92	0.99	0.93
33	Switzerland	0.947	0.93	0.96	0.96
34	Trinidad and Tabago	0.801	0.75	0.88	0.78
35	United Arab Emirates	0.849	0.88	0.76	0.90
36	United Kingdom	0.939	0.89	0.99	0.94
37	United States	0.949	0.87	0.97	0.99
	Average	**0.912**	**0.879**	**0.944**	**0.913**

Source: United Nations Development Programme, 2003

Appendix G: GCI: Developing Countries

Developing countries			Basic Requirements				Efficiency enhancers			Innovation	
No	Countries	CGI Index	Institutions	Infrastructure	Macroeconomy	Health and primary education	Higher education and training	Market efficiency	Technology readiness	Business sophistication	Innovation
1	Albania	3.40	2.94	1.77	4.10	6.83	3.19	3.43	2.44	3.14	2.14
2	Algeria	3.75	3.42	2.88	5.69	6.63	3.35	3.42	2.29	3.24	2.78
3	Argentina	4.09	3.08	3.53	4.67	6.81	4.68	3.65	3.11	4.25	3.18
4	Botswana	3.94	4.59	3.57	4.72	5.24	3.52	4.30	2.92	3.60	3.15
5	Brazil	4.08	3.38	3.20	3.97	6.72	4.19	4.14	3.35	4.63	3.42
6	Bulgaria	4.04	3.12	3.61	4.65	6.80	4.30	3.84	3.18	3.76	3.01
7	Chile	4.84	4.76	4.40	5.78	6.91	4.45	4.86	4.16	4.77	3.41
8	Columbia	4.07	3.57	3.19	4.54	6.76	3.83	4.19	2.86	4.31	3.16
9	Costa Rica	4.08	3.76	3.16	3.51	6.89	4.08	4.04	3.58	4.54	3.49
10	Croatia	4.01	3.44	3.67	4.10	6.62	4.10	3.85	3.31	3.98	3.10
11	Dominican Republic	3.56	2.83	2.58	3.59	6.63	3.18	3.49	3.10	3.74	2.45
12	Ecuador	3.59	2.60	2.74	5.22	6.72	3.04	3.23	2.51	3.41	2.47
13	Elsavador	4.05	3.75	3.72	4.46	6.77	3.38	4.21	2.99	4.21	2.68
14	Estonia	5.03	4.58	4.59	5.24	6.81	5.18	4.78	5.04	4.51	3.59
15	Guatemala	3.50	2.69	2.60	4.36	6.55	2.79	3.36	2.64	3.64	2.52
16	Jamaica	4.03	3.59	3.64	3.25	6.83	3.75	4.15	3.71	3.98	3.20
17	Kazakhstan	4.17	3.65	3.54	5.10	6.37	4.17	4.20	3.12	4.03	3.16
18	Latvia	4.46	3.92	4.19	4.91	6.35	4.87	4.21	3.91	4.16	2.99
19	Lithuania	4.51	3.80	4.09	4.78	6.68	5.02	4.38	3.69	4.55	3.34
20	Macedondia, FYR	3.84	3.06	2.93	5.14	6.56	3.19	3.47	2.58	3.67	2.94
21	Malaysia	5.03	5.22	5.24	4.93	6.29	4.63	5.22	4.51	4.98	4.37
22	Mauritius	4.08	3.83	3.97	4.06	6.18	3.91	3.93	3.52	4.57	3.12
23	Mexico	4.07	3.44	3.32	4.85	6.83	3.79	4.08	3.32	4.13	3.07
24	Namibia	3.80	3.87	4.15	4.46	5.35	3.01	3.83	2.92	3.59	2.71
25	Panama	4.00	3.51	3.55	4.28	6.82	3.75	4.06	3.10	4.21	3.15
26	Peru	3.83	3.06	2.64	4.48	6.60	3.70	3.98	3.03	3.97	2.64
27	Poland	4.38	3.61	3.80	4.14	6.83	4.92	4.33	3.65	4.34	3.40
28	Romania	3.98	3.32	3.43	3.88	6.64	4.33	3.87	3.32	3.76	2.98
29	Russia	4.10	2.94	3.71	4.81	6.65	4.69	4.04	2.87	3.78	3.29
30	Slovak Republic	4.48	3.84	3.91	4.35	6.86	4.47	4.42	4.29	4.35	3.40
31	**South Africa**	**4.43**	**4.42**	**4.33**	**4.61**	**5.73**	**4.22**	**4.63**	**3.66**	**4.80**	**3.85**
32	Thailand	4.59	4.35	4.22	5.45	6.36	4.45	4.72	3.50	4.52	3.49
33	Tunisia	4.48	4.80	4.28	4.78	6.65	4.53	4.27	3.27	4.45	3.72
34	Turkey	3.94	3.76	3.44	2.98	6.03	4.10	4.11	3.38	4.51	3.24
35	Uruguay	3.95	4.20	3.63	3.76	6.84	4.15	3.38	3.07	3.79	2.98
36	Venezuela	3.71	2.47	2.96	4.68	6.80	3.63	3.49	3.13	3.39	2.83
	Average	**4.11**	**3.64**	**3.56**	**4.51**	**6.55**	**4.02**	**4.04**	**3.31**	**4.09**	**3.12**

Source: World Economic Forum, 2003

Appendix H: GCI: Developed Countries

Developed countries			Basic Requirements				Efficiency enhancers			Innovation Factors	
No	Countries	GCI Index	Institutions	Infrastructure	Macroeconomy	Health and primary education	Higher education and training	Market efficiency	Technology readiness	Business sophistication	Innovation
1	Australia	5.31	5.38	5.42	5.08	6.97	5.66	5.21	5.41	5.18	4.31
2	Austria	5.34	5.38	5.47	4.89	6.95	5.46	4.97	5.04	5.85	4.65
3	Bahrain	4.19	4.18	4.10	5.06	6.64	3.74	4.49	4.02	4.03	2.57
4	Belgium	5.23	4.70	5.74	4.74	6.93	5.75	4.70	4.66	5.74	4.64
5	Canda	5.39	4.96	5.91	5.10	6.96	5.65	5.27	5.03	5.35	4.92
6	Cyprus	4.40	4.65	4.59	4.20	6.75	4.53	4.21	4.05	4.58	3.28
7	Czech Republic	4.76	3.83	4.82	4.59	6.90	4.96	4.40	4.56	4.92	3.95
8	Denmark	5.73	5.91	6.48	5.29	6.91	5.82	5.31	5.69	5.88	5.06
9	Finland	5.73	5.77	6.02	5.46	6.95	6.13	5.10	5.40	5.70	5.66
10	France	5.39	4.96	6.28	4.40	6.96	5.75	4.91	4.86	5.83	4.98
11	Germany	5.56	5.33	6.44	4.49	6.91	5.48	4.90	5.11	6.23	5.49
12	Greece	4.28	4.19	4.49	3.74	6.94	4.78	4.21	3.59	4.32	3.36
13	Hong Kong SAR	5.35	5.19	6.17	5.64	6.93	4.78	5.62	5.47	5.40	4.20
14	Hungary	4.50	4.19	4.02	3.64	6.85	4.79	4.54	4.17	4.28	3.69
15	Iceland	5.34	5.70	5.37	4.70	6.95	5.39	5.01	5.61	5.29	4.68
16	Ireland	5.22	5.27	4.58	5.31	6.93	5.40	5.08	5.20	5.39	4.44
17	Italy	4.47	3.77	4.18	4.23	6.97	4.69	4.10	4.26	5.12	3.52
18	Japan	5.50	4.78	6.02	3.93	6.98	5.46	5.00	5.09	6.28	5.68
19	Korea	5.28	4.39	5.39	5.65	6.87	5.44	4.65	5.40	5.31	4.81
20	Kuwait	4.24	4.35	4.09	5.77	5.99	3.93	4.76	3.71	4.19	2.97
21	Luxenbourg	5.04	5.32	5.54	5.33	6.88	4.19	4.92	5.17	5.38	4.00
22	Malta	4.34	4.45	4.10	4.27	6.94	4.19	4.08	4.60	4.09	2.86
23	Netherlands	5.39	5.27	6.12	4.75	6.94	5.55	5.03	5.05	5.71	4.81
24	New Zealand	5.22	5.47	5.07	5.17	6.93	5.46	5.22	5.05	5.24	4.25
25	Norway	5.31	5.54	5.60	5.67	6.96	5.54	5.00	5.12	5.23	4.39
26	Portugal	4.60	4.86	4.88	4.53	6.90	4.61	4.57	4.21	4.33	3.75
27	Qatar	4.31	5.04	3.96	5.58	6.78	3.94	4.54	3.91	3.88	3.15
28	Russia	4.10	2.94	3.71	4.81	6.65	4.69	4.04	2.87	3.78	3.29
29	Singapore	5.67	5.92	6.19	5.48	6.60	5.68	5.59	5.82	5.30	5.18
30	Slovenia	4.62	4.13	4.69	4.84	6.92	5.08	4.11	4.38	4.74	3.65
31	Spain	4.80	4.40	4.95	5.01	6.95	5.00	4.67	4.38	5.11	3.71
32	Sweden	5.55	5.09	5.85	5.28	6.98	5.69	4.85	5.67	5.75	5.25
33	Switzerland	5.67	5.51	6.20	4.97	6.97	5.65	5.23	5.43	5.80	5.66
34	Trinidad and Tabago	3.99	3.39	3.19	5.13	6.69	3.71	4.04	3.14	4.04	2.95
35	United Arab Emirates	4.59	4.83	4.97	5.63	6.59	4.00	4.87	4.39	4.59	3.22
36	United Kingdom	5.51	5.35	5.52	4.72	6.94	5.63	5.64	5.42	5.77	4.88
37	United States	5.85	5.21	6.06	4.39	6.77	6.04	5.91	5.61	6.17	5.98
	Average	**5.02**	**4.85**	**5.19**	**4.90**	**6.85**	**5.09**	**4.83**	**4.77**	**5.13**	**4.27**

Source: World Economic Forum, 2003