
**THE ROLE OF HUMAN CAPITAL
IN THE
COMPETITIVE PLATFORM OF SOUTH AFRICAN INDUSTRIES**

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ABSTRACT

The role of human capital in the competitive platform of South African industries makes Africa different from other regions. This paper reports on an empirical study conducted among South African manufacturers, which investigated human capital's ability to answer to the challenges of modern technology and globalisation. Attention given is to the competitive strengths and investment opportunities, including the quality and availability of human resources, labour cost, level of education and skills, vocational and industry related training facility, work ethic of labour force, productivity of labour force, workplace regulations, as well as efficiency of the civil service, including productivity and competitiveness indexes. Other aspects like social infrastructure near their premises and health services were also included in the study, as well as the situation in the various provinces, firm-sizes and sub-sectors of manufacturing were compared. The study found that the level of human capital in South African industries much higher than the general perception and not the worst element of South Africa's competitive platform. The findings also indicated challenges, however, like absentees due to AIDS and other specific factors, a shortage of artisans and proficiency towards modern technology and innovation.

1. INTRODUCTION

The role of human capital in the competitive platform of South African manufacturing industries is investigated in this paper. International trade agreements, like GATT, and the effect of modern technology and globalisation intensifies international competition as tariffs and trade restrictions is declining. This exposes companies to international price and cost structures, which can replace local sales and with it local employment that manufacture those commodities. On the other hand productive human capital can also provide a country with a competitive edge that could lead to economic growth and enhance everyone's welfare.

Human resources is an important factor of production and has a direct impact on the competitiveness of firms. Improvement in the quality of human resources can lead to lower unit costs of production and sales and in that way decreases marginal cost structures, enabling firms to trade products at lower prices and better quality. A supply of quality labour in a country can then to competitive markets and growth.

This paper commence with a theoretical discussion on the role of human capital in the competitiveness of firms and the country, followed by a review of the available literature of the subject. Then the empirical results of a survey conducted among South African manufacturers will be described.

2. THEORETICAL BACKGROUND

In Economics, natural resources, capital goods, labour and entrepreneurship are considered to be the four factors utilised as inputs in the production process. Half off these: labour, management and/or entrepreneurship consist of people. Their knowledge, skills and ability to produce present human capital to the production process. The higher the stock of human capital the more output can be delivered per labour unit and the higher its value to the process. Labour is therefore an important factor in a country's industrial competitiveness platform.

Competitiveness relate to a firm's ability to enlarge its market share. A firm can *conquer* a growing *share of market* demand by selling more goods and services. This will be able when the firm can supply at lower prices, or better quality, reliable supply, low risk, providing a superior total sales package and a better image. In all of these aspects human capital has a role to play.

Improving *labour productivity* enhances competitiveness. Although some studies on price competitiveness ignore labour altogether (e.g. Siggle, 2001), others like Mazumdar & Van Seventer (2004) estimate price competitiveness solely considering labour. Productivity is calculated as the total production per production factor input. (TP/Pf_{in}). Labour productivity is then determined as the average product, which is the output per labour unit ($AP_L = TP/L$). The more output per labour unit the more valuable labour becomes.

Optimal resource allocation is found at the point where the marginal productivity delivered by a factor of production per last Rand spent are equal in all factor markets. Thus $MP_L/w = MP_C/i$, where MP are the marginal products of Labour and capital, respectively, w is the wage rate and i the price of capital (usually interest rates). When the additional product (MP_L) yield by labour increases without increase in price, the quality of labour is improving and its worth increases ($MP_L/L \uparrow$). In this way labour makes the production process more competitive. This might shift the total production function up to a higher level, which Sollow saw as a prerequisite for sustainable economic growth and development (Todaro & Smith, 2004:130). This also makes labour more valuable than the other production factors. Capital will be substituted for labour, creating more employment in the economy, enhancing everyone's wealth.

When human capital becomes more valuable per unit of production it implies that a firm's cost functions is depressed. Average and total variable costs shift down and the *marginal cost curve* moves to the right. These down and rightward shifts of the cost functions imply higher productivity and a higher competitive position. As marginal cost curves represents the supply curve of firms, added together to form the market supply

curve, higher labour productivity implies an outward shift of the total market supply, which will usually persist sustainable into the future.

Improved labour productivity, which can be due to better skilled workers or better managerial efficiency, can shift the supply curve permanently to the right, increasing production, while prices decline. This can also lead to a lower price level on macro-level, making the entire country more competitive.

The four corners of the so-called Porter Diamond of Competitiveness (Porter, 1998) emphasis input factors of production, output market conditions, and firm structure, rivalry and management as well as related and supporting firms. Modern profit maximisation also requires production management, innovation and marketing. In all of this human capital is involved. Utilising modern technology with such proficiency that it leads to new innovations, builds competitiveness, while managerial efficiency has to upgrade processes and apply creative entrepreneurial activity.

When legislation and trade union action push the wage rate up the opposite happens and the industry will move towards self-destruction, especially when cost structures of firms are distorted in relation to international price structures.

As human capital is involved in all the aspects of production and trade the quality thereof plays a role in all processes. By improving human capital, profit margins and competitiveness increase, making sustain growth possible. This emphasis the need for education and training, especially industry and vocational related training. A large pool of productive workers enable firms to grow as productive labour is available and this will be an important factor when the location of firms is determined (Krugman, 1998). As agglomeration takes place more firms become available in the industrial districts or computer networks and advantages of knowledge and technological spill-overs occur. These spill-overs effects are mainly conveyed by people between different firms which come in contact with each other. Spill-overs effects, education and training as well as experience and learning by doing all enable human capital to accumulate and become more productive. In this way the production function are pushed up continually and diminishing marginal returns may not occur or occur at much higher production levels as predicted by the endogenous growth theory (Cypher & Dietz, 1997:115). All these aspects of South African industries will be investigated in the empirical section.

3. LITERATURE REVIEW

There exists an extensive volume of studies related to human capital in the available literature. Very few considered the role of it on the competitiveness of firms or nations and none on its role in the South African Competitive Platform. On the other hand productivity received a lot of attention and several authors consider it to be synonymous, although it only entails a single aspect of competitiveness.

To name a few examples: De Jager (2004) studied the productive use of human capital and Yadavalli (2001) the value of human capital in productivity. Van Zyl (2004)

suggested cost-production duality as an instrument to measure labour productivity, while Mazumdar & Van Seventer (2002) described the application of a simple decomposition model to assess the trade off between employment growth and real wage growth, while Wilson (2003) constructed an Input-Output Model of labour productivity equations of the American economy. Several authors estimated whether productivity is improving (like Mantashe, 2004 & Lewis, 2002) and ways to enhance productivity (e.g. Sigonyela, 2004). Schoeman (2002) argues that the answer to higher levels of growth and development lies in a balanced approach between government expenditures aimed at increasing investment in human capital, research and development and productivity.

Much is written on the enhancement of labour productivity and managerial efficiency. Falkenberg (2005:42), for instance, studied companies as learning organisations. Pistorius (2004) studied the link between competitiveness and innovation, stressing that human resources are one of the most important components of a national innovation strategy. The role of management is studied by authors like Brooks (2004), while others discuss specific management challenges, like managing knowledge (De Villiers & Michel, 2004:22, Redelinghuys, 2001).

Cascio (2005:16) considered the economic benefits of effective human capital management. Others in the similar fields are Wright & Breytenbach (2004) and Mayikana (2002) who states that "*the future of competition is human*" and Horwitz (2005) says "*HR can advance competitiveness*". Trostel P.A. (2000) investigated micro evidence on human capital as the engine of growth and its relation to endogenous growth.

In firm-specific studies Grimbeek (2005:39) studied the business philosophy of Nissan (SA), Schoeman & Roode (2004) the importance of leadership for continuous growth of Clover Industries, while Kaplan (2004) investigated comparative industrial performance in the South Africa's motor and textile industries. Aljuhani (2002) studied labour utilisation and labour productivity of a gold mine in Saudi Arabia, while Fedderke & Pirouz (2002) and Radebe (2002) examined the labour cost and labour productivity in South African mining sectors.

The Institute for Management Development's (IMD) studies strengths and weaknesses according to world competitiveness indices, ranking countries, stressing the importance of marketing a country. Beisiegel (2003) emphasises that productivity improvement will ultimately raise the standard of living of all South Africans as did Van den Berg (2003) who found that a country's standard of living depends on its productivity.

Focussing specifically on competitiveness Siggel (2000 & 2001) studied industrial price competitiveness in India and Uganda, while Mbaye & Golub (2002) studied unit labour costs, international competitiveness and exports in Senegal. Mulder & De Groot (2004) made an international comparison of labour-productivity performance. De Jong & Soete (2005) made a comparative description of the productivity in Belgian and Dutch manufacturing, Cörvers (2005) considered the impact of human capital on labour productivity in manufacturing sectors of the European Union and Galdon-Sanchez & Schmitz (2003) studied labour productivity Atlantic iron ore producers; to name a few.

Van Dijk (2003) investigated South African manufacturing performance in international perspective and compared the labour productivity gap with that of the United States. Hooper & Larin (1989) made an international comparison of labour cost in manufacturing and Van Seventer (2002) a decomposition of the source of cost distortion for South African Industry, while Mazumdar & Van Seventer (2004) investigated real wage growth for South African manufacturing, based on price competitiveness.

The above gave a sample of an enormous volume of recent publications on human capital that exists. It also indicated that a study of the role of human capital in the South African industrial competitiveness platform was still not adequately investigated and that is the reason why this study was conducted. The following section gives attention to an empirical study that was conducted among South African manufacturers.

4. THE SURVEY

An empirical investigation of the industrial competitiveness platform was conducted to determine South Africa's ability to address the challenges presented by modern technological development and globalisation. From a database of 14 000 manufacturing firms 450 firms were randomly selected and a questionnaire was posted to them during 2002. The response was 16.7 per cent response, which is regarded as satisfactory for a mail-based survey in Africa. Although the author would prefer to report only on the responding firms of the survey, most findings correlate with earlier studies like those of the South African Netherlands Programme on Alternative approaches to Development (SANPAD, 1999, 2000) and some generalisation might be in order.

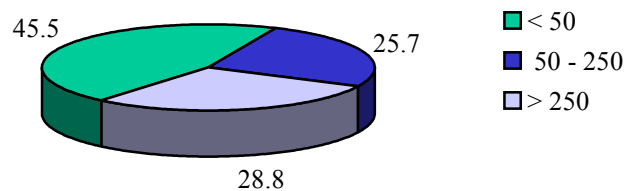
Table 1 Cronbach-Alpha Coefficients	
Question Groups	Coefficients
Human Capital	0.855
Resources	0.892
Demand Conditions	0.815
Related & Supporting Indust. & Instit.	0.878
Firm Strategy, Structure & Rivalry	0.873
Technology & Innovation	0.914
Quality & Environment	0.801
Perspective & Expectations: Current	0.868
Perspective & Expectations: Future	0.789
Shortages: Current Quarter	0.917
Shortages: Future	0.863

In compiling the questionnaire the Porter's Competitiveness Diamond was taken as the basis, taking into consideration input factors, demand conditions, firm strategy, structure

and rivalry, and related and supporting firms, which represents the industrial competitive platform. The questionnaire was extended to include questions measuring specific aspects, like location and expectations. In calculating indices, the methodology was similar in principal to that applied by the IMD in calculating the annual World Competitiveness Indices.

Affirmative factor analysis was done and the significantly high values of Cronbach-Alpha coefficients that were obtained indicated that the questionnaire was a reliable measuring instrument to measure the proposed objectives. Table 1 indicates some of the most important Cronbach-Alpha coefficients of the various groups of questions. To be reliable Cronbach-Alpha coefficients should exceed 0.5 and table 1 indicates that all values were satisfactory, most exceeding 0.8 (Kleynhans, 2003a:242). The high

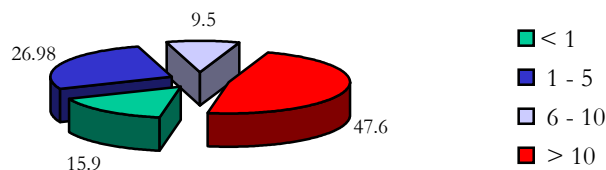
Figure 1: Number of Employees



Cronbach-Alpha values and the consistency of the responses to the items in the survey suggest that respondents completed the questionnaire with great care and a high degree of accuracy.

Figure 2: Annual Turnover of Firms

R million



The response to the questionnaire covered a good spread of firms. Figure 1 indicates that most respondents were from small firms (45.5%) employing less than 50 employees, while 28.8 per cent were from large firms, employing more than 250 workers. The number of employees ranged between one and 8 400 employees. A total of 47.6 per cent of the responding firms have an annual turnover in excess of R10 million, 27 per cent were between one and five million and 15.9 per cent have a turnover of less than a R1 million annually (see figure 2).

Considering the various sub-sectors of manufacturing the largest response of 22.4 per cent was from the sub-sector manufacturing products of basic metals, machinery and office equipment, followed by 20.7 per cent from food processing and beverages, 12.1 per cent by producers of chemicals, chemical products, coke, petroleum products, nuclear fuel, and products from rubber and plastic, 21.1 per cent from textiles, clothing and leather products, and 10.3 per cent came from the sub-sectors of electrical and electronic equipment taken together.

Considering the spatial response from the nine provinces in South Africa; the largest response of 39.6 per cent was from Gauteng, compared to 13.6 from the Eastern Cape, 12.1 from North West and 10.6 per cent from the Free State. From some provinces the response was so small, making generalisation impossible. Information on sub-sector and provincial level should there only be seen as a case study, and the calculation of competitive indexes as an academic exercise in which the instruments were developed for further research. Some firms were visited in person to complete and collect questionnaires making the response from Gauteng disproportionately higher than the other provinces. Gauteng is, however, the most important centre of manufacturing, producing more than half of South Africa's GDP.

5. EMPIRICAL FINDINGS

5.1 General Findings

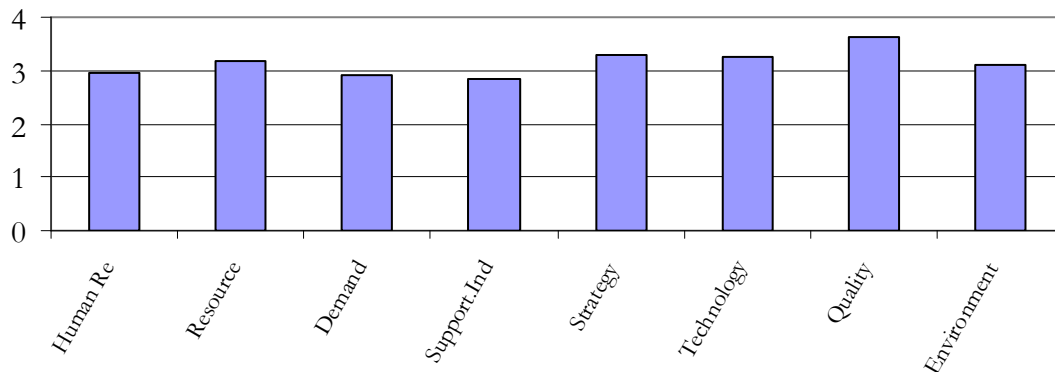
The findings revealed that human capital is not the worst element of South Africa's competitive platform. As illustrated in figure 3 most respondents perceive the human capital base in South Africa to be fair. None of the main constructs were seen as poor but there is much room for improvement, as none were regarded as good or excellent either. Other recourses, technology and quality are stronger elements of the competitiveness platform in South Africa, as is strategy, structure and rivalry, but this includes managerial performance, which is also part of human capital.

The most important findings regarding the competitive platform of South Africa are represented in figure 3. Most questions of the questionnaire expected respondents to rate their response on a five-point scale where 5 is excellent, 4 is good, 3 fair, 2 poor and 1 very bad. Although South Africa is a less developed country, all categories were on average rated about fair, but none of the main constructs of the questionnaire was rated good or excellent. Human resources rated much higher than expected. The survey affirmed the perception that the country's human capital is poor, especially low on productivity, motivation and work ethics. The country's managerial shortage is a stylised fact, but the survey also highlighted a shortage of artisans, which merits attention (Kleynhans, 2003b:16). Vocational and industry related training facilities are also insufficient.

It is further indicated in figure 3 that the country's technological base is rated between "fair" and "good", as is management strategy and quality. In some industries, like

electronics, a poor technological platform is still hampering competitiveness though and the technological base was not rated as good in any industry. The provision of support services, like cold storage and harbour facilities, for example, is inefficient and where they do exist, it is not utilised.

Figure 3: Strengths & Opportunities



All firms have a very poor perception of the government and civil service, rating them between poor and very bad. They are regarded as inefficient and non co-operative. Competitiveness is also retarded due to a lack of government assistance, information, aid and incentives, political and policy instability. This is a matter that merits serious attention from the government. As usual respondents are unhappy about high costs, taxes and interest rates. There are sometimes shortages of raw materials but it is not serious. Finally poor market demand restricts the competitiveness and growth of manufacturers.

Considering the *four corners of the Porter Diamond*, competitiveness of South African manufacturers the quality of human capital and the civil service needs lots of attention. It was found that the availability and quality of most *input factors* were found satisfactory. Some capital goods are imported at very high prices and a shortage of skilled labour and managers are sometimes a problem, though not a serious obstacle and shortages do not hamper production. The all over rating of human resources was, however, poor.

Considering *the measures of globalisation* the availability and quality of *skilled labour* is low and not enough is being done to improve human capital. It does not seem that South African firms are adequately equipped to compete in the *new economy* yet. Although the level of technology is fair, the supporting labour is lacking and unproductive. As most workers lack the necessary skills modern equipment cannot be optimally utilised in many instances.

Manufacturers perceive the quality and availability of human resources to be between poor and fair. The supply of unskilled labour is as can be expected fairly well, and that of technical and managerial staff fair. There is, however, a significant shortage of artisans. Very few responding firms rated the availability of any component of labour as very

poor. The worst rating was that of civil servants that is regarded as poor with a standard deviation of only 0.9 on a five-point scale and none of the respondents viewed them as being very efficient.

Most respondents regard wage rates, unit labour costs and workplace regulations to be fair, while their perception of the work ethics of the labour force, motivation and *productivity* is poor, impeding the competitiveness of firms. Respondents do not expect the average working hours per factory worker, the average total cost per unit of production or the average labour cost per unit of production to change in the near future.

5.2 Government Assistance and Legislative Issues

Some manufacturers suggested that the government should support manufacturing much more, especially through direct measures. There is a need for more incentives to local manufacturing. Some asked for subsidies on transport and wages, like those that existed in the past. More should be done to promote exports, training and manpower development. Attention should also be given to local value added services such as consultants, design, building, education and maintenance. The

Some respondents expressed concern against the growing power of trade unions. Some manufacturers regard the current labour laws as being “draconian”, which together with affirmative equity laws are onerous and hostile towards industrial development and need to be addressed. Black empowerment programs are seen as restricting industrial expansion and investment and some manufacturers suggested that it should be suspended. Labour laws make it difficult for small businesses to control their own businesses and remain competitive. Healthier labour relations with manufacturers and deregulation of employment practices are requested. Current labour legislation is not seen as an incentive to employ more people, but increases unemployment (this perception is also expressed in current literature; see e.g. Maziya, 2001:211).

Trade union demands and other rising costs present other countries like China with opportunities to compete favourable on the South African market, especially with labour intensive business. Local manufacturers therefore plead for a surcharge on import based on the difference in variable costs such as labour energy and transport. A national drive towards awareness of and commitment to productivity to increase international competitiveness was suggested including training courses, advertising, propaganda and a national productivity day.

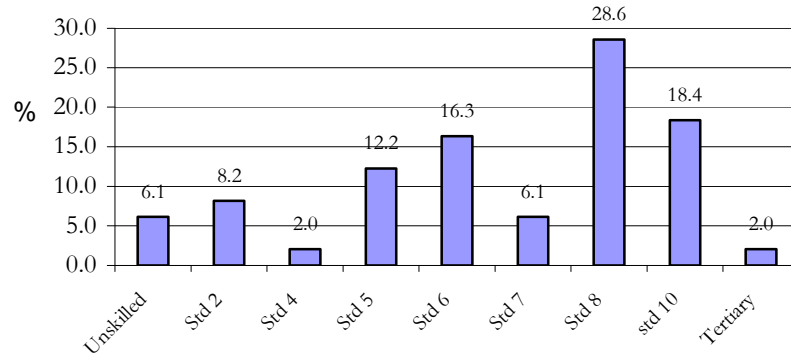
It is suggested that the skills development levy should be cancelled as firms can effectively only claim fifteen per cent of the levy back. Respondents also suggested that annual wage increases should be linked to the geographical area.

5.3 Education and Training

The educational level of labour in general should be improved. The low levels of literacy restrict the trainability of most unskilled workers. People should also be trained to acquire

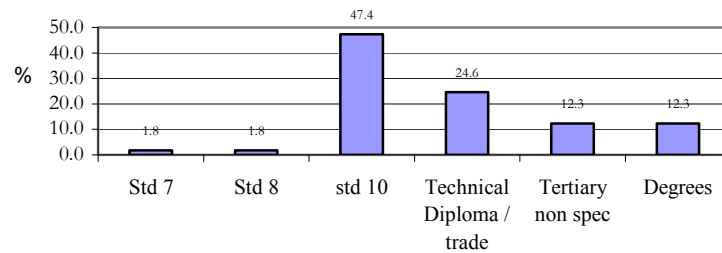
quality skills. Vocational and industry related training facilities are insufficient and there are a serious shortage prospects for artisan training. Development of workers skills should receive more attention and the authorities may consider the sub-contracting of private developers. Continued investment, development and upgrading of *human capital* are crucial to obtain and expand competitiveness. On average, respondents view the vocational and industry related training facilities in South Africa to be poor.

Figure 4: Education of Unskilled labourers



The *educational level* of unskilled labour of the survey is shown in figure 4. The highest level is on average about ten years of school education and only 6.1 per cent of the firms employ mostly workers that are totally illiterate. Nearly half (49%) of the unskilled workers have ten years or more, which are far higher than would have been expected.

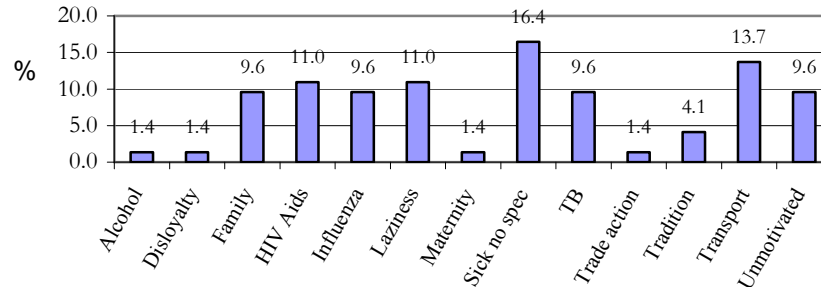
Figure 5: Qualifications of Skilled Personal



On the other hand the average level of education to among skilled personal is not very high. Figure 5 shows the average level of education among skilled labourers in the firms studied. Almost half (47.4%) of the workers in this category have only matric and about a quarter (24.6%) has technical diplomas or are skilled artisans. Twelve per cent have degrees and another 12.3 per cent tertiary training of some sort although those respondents did not specify.

5.4 Reasons for Absentees

Figure 6: Absent from Work



Main reasons why employees are *absent from work* is illness. The kind of illness was unfortunately not specified. Figure 6 shows the main reasons why workers are absent according to respondents. The largest reason following unspecified illness is problems with transport and then HIV/AIDS. Many of the other reported illnesses could also be AIDS related. Influenza and TB respectively were both given by 9.6 per cent of the manufacturers as major reasons for absentees. Respondents viewed low work ethics as an important factor causing absentees, 9.6 per cent saw workers being unmotivated as a major reason for absentees and another eleven per cent explicitly named laziness and 1.4 per cent disloyalty as major reasons. On the specific questions on work ethics and productivity, most employers rated it as being poor, although some manufacturers also have excellent motivated and productive workers. Manufacturing-labour is, however, newer rated as inefficient as civil servants. Although family responsibilities was only seen as a major problem by about ten per cent of the respondents, tradition was only in 4.1 per cent of the cases a major cause of absentees and trade action was only in 1.4 per cent of the firms a major reason for absentees.

5.5 Social Infrastructure

On average, respondents rate the *social infrastructure* near their premises to be fair but rated the availability of health services to be poor. This probably implies that they feel satisfied with their social infrastructure but view the availability of medical assistance to their employees to be insufficient. The availability of schools, colleges, universities and other industrial training facilities near the premises of manufacturers is a problem creating problems to obtain skilled labour. They are satisfied with their managerial skills and practices, but feel that the proximity of professional services is in most cases inadequate.

5.6 Locational Factors

The *New Economic Geography* emphasises a pool of skilled, intermediate inputs, knowledge and technological spill-overs as the most important factors of industrial

location. Regarding *locational aspects of their premises* respondents on average rated both traditional *factors of location* and modern factors are considered to be poor relating to the location of the premises of respondents. Neither factors like proximity of markets, low taxes, the availability of land, financial and trucking services, nor modern factors like the proximity of support services, the availability of skilled labour and industrial training facilities are seen as enhancing their efficiency and competitiveness due to their location.

5.7 Management

Respondents rate the availability of managerial staff as being poor but rate the abilities of management to be on average higher than that of other labour and contributing towards higher competitiveness. Management is competent and has good contacts leading to strategic positioning in the market competing successfully with rivals. The most important aspect hampering their activities is shortages of raw material, followed by shortages of skilled labour, machinery and equipment, maintenance and supporting

Co-operation with competitors was seen to be poor but all other factors relating to firm strategy, structure, and rivalry in the South African economy were perceived by the respondents to be fair to good. As businesses usually try to please their customers, respondents saw co-operation with clients to be the strongest factor. Other factors that were seen to be between fair and good were co-operation with suppliers, managerial practice, and managerial skills in the integration and innovation of business activities, employee performance incentives and business contacts. The ability of firms to enter foreign markets, their growth in exports, and profits were also seen as being satisfactory.

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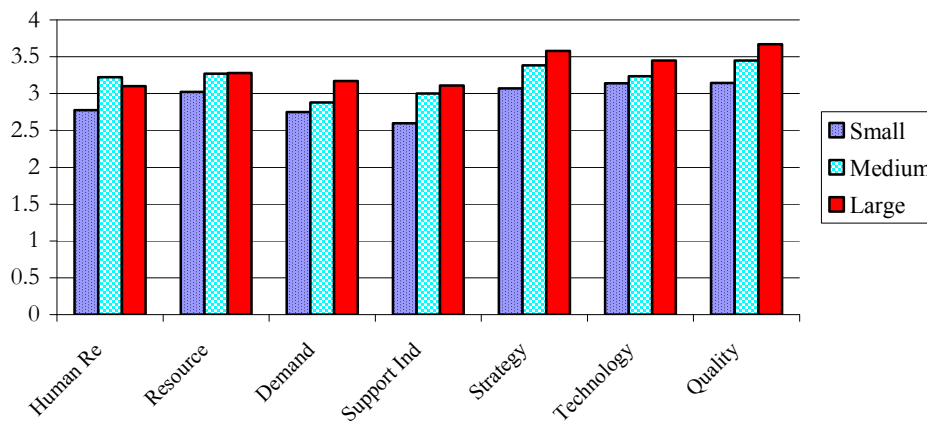
5.8 Competitiveness and the Size of Firms

Figure 7 illustrates that all aspects of competitiveness grew with firm size, except human resources. Smaller firms are more labour intensive and this might be the reason why the largest companies are not so competitive when human capital is considered. Demand for skilled and specialised labour increases as firm size increases and this might also be a reason why respondents of the largest firms rate the quality of their labour input as less efficient. Larger companies can achieve scale economies, as they are more efficient and more competitive.

The factors of which large companies are experiencing a slight shortage of are skilled labour, managerial staff, raw materials, machinery and equipment and technology and knowledge support services. The only factors that large companies expect to decline in future are electricity and the availability of factory workers, including skilled labour, probably due to the effect of HIV/Aids.

Small firms rate all aspects of their *human capital* to be poor. The only aspects that are satisfactory are the availability of unskilled workers and workplace regulations. The worst aspects are the efficiency of civil servants, which none rated as excellent, followed by a shortage of managerial staff and artisans and industry related training facilities. *Medium sized firms* also experienced problems with the inefficient civil service and inadequate training facilities, but also with the work ethics of the workforce that are unmotivated, neglected and not conscientious. The respondents of medium sized firms rated all other factors relating to human capital as fair. *Large companies* also found inefficient civil servants to be their greatest obstacle to competitiveness when considering human capital, followed by high unit costs per worker. Other factors were all satisfactory and the best factor was the availability of unskilled labour.

Figure 7: Competitiveness and Firm Size



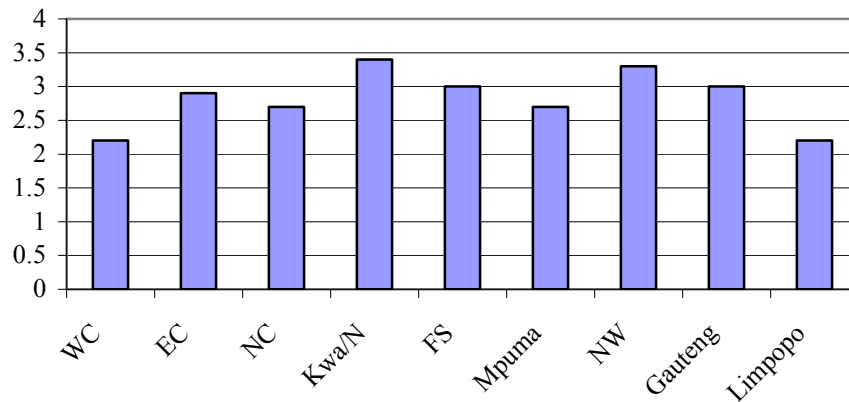
All firms find labour cost to be a fair obstacle, to small firms this is a little bit higher, but there are no significant differences between firms of different sizes. The overhead per worker in smaller firms are higher and declines with firm size. This might be because larger firms have more employees. This might suggest that smaller firms are not so productive; it also correlates with the productivity indices of table 2, which indicates that productivity rises with firm size. It is, however, doubted that the overhead cost per labourer could be interpreted as a measure of productivity as fewer people have to handle more overheads in smaller firms.

Table 2: Overhead Cost per labourer: Firm Size	
Large	37757
Medium	116896
Small	128837
Total Sample:	109316

5.9 Competitiveness of Provinces

There are spatial differences in human capital among the various provinces as illustrated in Figure 8. As the sample sizes were too small generalisation is, however, not possible. Human capital is best developed in KwaZulu, North West and Gauteng, although no province's overall assessment of their labour stock were regarded as poor. The study calculated competitive indices for the nine provinces of South Africa, the ten sub-sectors of manufacturing and the various firm-sizes.

Figure 8: Human Capital of Provinces



The *competitiveness index* calculated for the various *provinces* was similar to the World Competitiveness Index of the International Institute for Management Development (IMD), and tested to determine whether the groups form a reliable instrument and whether it is statistically significant. The values of Cronbach alpha coefficients calculated were again averaging between 0.7 and 0.9 indicating that the groups of questions probably serve as a reliable measuring instrument.

Literature of the IMD on their calculation of the World Competitive Indices is not very clear and it was decided to base the calculations on their methodology (IMD, 2001:516-7) but alter it to suit the need of this study. Basically the method calculates a group average and compares, firms or groups of firms in provinces or industries using their standardised standard deviation from the average. A higher value implies higher competitiveness, while a positive value implies competitiveness above the average and a negative value indicates a level of competitiveness that is below average.

Table 3: Competitive Indices of the Provinces of South Africa										
Sub-Categories	Ranking	Local Economy	International-isation	Government	Finance	Infrastructure	Management	Science & Technology	People	Total
KwaZulu/Natal	1	0.872	0.623	0.893	0.744	1.584	0.921	0.987	1.592	1.032
North West	2	1.301	1.134	1.184	0.64	0.713	1.029	0.759	0.217	0.965
Mpumalanga	3	0.971	1.368	0.484	0.591	0.22	0.674	0.918	-0.567	0.687
Eastern Cape	4	0.306	0.55	0.252	0.653	0.923	0.206	0.041	0.408	0.473
Gauteng	5	0.478	0.085	0.574	0.145	0.347	0.336	0.531	0.867	0.401
Northern Cape	6	-1.031	-0.925	-0.922	-0.572	-1.125	-0.965	-1.434	-0.526	-0.999
Free State	7	-0.673	-0.483	-0.177	0.471	-0.498	-0.017	-0.123	0.572	-0.113
Western Cape	8	-0.727	-0.796	-0.229	-0.308	-0.85	-0.054	-0.319	-0.898	-0.465
Limpopo	9	-1.496	-1.557	-2.059	-2.365	-1.314	-2.133	-1.728	-1.664	-1.971

The Competitiveness Indices calculated for the various provinces of South Africa are given in table 3 and ranked with the most competitive at the top. The competitiveness indices confirm the results already obtained and illustrated in figure 8, especially the indices on people and management. It also suggests an agenda for development. The provinces with the highest overall rankings also correlate with the high rankings on *Science and Technology*, as well as with the sub-category indices of human capital. This correlates with the productivity indices of these provinces given in table 4.

Table 4: Productivity Index					
Provincial Indices		Sub-Sector Indices		Firm Size Indices	
KwaZulu Natal	0.802	Food	-0.199	Large	0.687
North West	0.966	Textiles	-0.563	Medium	0.119
Mpumalanga	0.604	Paper & Wood	-1.378	Small	-1.054
Eastern Cape	-0.208	Chemicals	0.771		
Gauteng	0.383	Non-Metal Mine	1.561		
Northern Cape	-0.434	Basic Metal Prod	0.995		
Free State	0.731	Electrical	-1.897		
Western Cape	-0.681	Electronics	0.178		
Limpopo	-2.164	Transport	0.1778		
		Furniture	0.1778		
Cronbach Alpha Coefficient: 0.741					

5.10 Competitiveness of the Manufacturing Sub-Sectors

When the competitiveness of ten major manufacturing sub-sectors was studied it was found that the competitiveness of the different sub-sectors is about equal. No industry was significantly more competitive than others and no sub-sector much weaker than others. Food processing and transport equipment manufacturers seem most competitive, but the others not much worse. This also applies to the state of human capital, as illustrated in table 5. An alarming aspect was the low level of technological proficiency, expertise and innovation in the science- and technology-based industries like chemicals and electronics. When the competitiveness of ten major manufacturing sub-sectors was If South Africa is to survive in the new economy its level of technological expertise, capabilities and capacity will have to be improved considerably.

6. FURTHER RESEARCH

The topic should be further investigated to enable generalisation of the findings and determine whether trends persist over time. This will, however, require much more funds, to conduct additional research and follow up. Further research, especially with larger samples, can enable comparison of firms in the various sub-sectors of manufacturing, like food processing, basic metal products and textiles, as well as the various provinces and also suggest an agenda for development. Much research is conducted on SMMEs, but larger firms are neglected and deserves further investigated. The synergy between small, medium and large firms also deserves attention.

The significant Cronbach alpha values suggest that the response from firms is significant. When considering the theory of production it was shown that the most important aspect in enhancing industrial competitiveness was in addressing the cost structures of firms. An important extension to this study will be the calculation of cost competitiveness like the studies done by Siggel (2000 & 2001), Van Seventer (2002) and Van Seventer & Molate (2002). These studies could, however, be contradictory and focus only on productivity as comparative unit cost ratios are calculated as the ratio between total costs and the value added (Siggel, 2000:13). A problem when determining cost competitiveness is the availability of detailed data and the estimation of shadow prices.

7. SUMMARY AND CONCLUSION

The role of human capital in the competitive platform of South African manufacturing industries is investigated in this paper. Attention was first give to a theoretical background to the role of human capital in enhancing competitiveness, followed by a review of the current literature. Then attention was given to a survey conducted among South African manufacturing industries.

This paper reported on an empirical study conducted among manufacturers, which investigated human capital's ability to answer to the challenges of modern technology and globalisation. Attention was given to the competitive strengths and investment opportunities, including the quality and availability of human resources, labour cost, level

of education and skills, vocational and industry related training facility, work ethic of labour force, productivity of labour force, workplace regulations, as well as efficiency of the civil service, including productivity and competitiveness indexes. Other aspects like social infrastructure near their premises and health services were also included in the study, as well as the situation in the various provinces, firm-sizes and sub-sectors of manufacturing were compared.

The study found that the level of human capital in South African industries much higher than the general perceived and not the worst element of South Africa's competitive platform. The findings also indicated challenges, however, like absentees due to AIDS and other specific factors, a shortage of artisans and proficiency towards modern technology and innovation.

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