

**ORGANIZATIONAL AND INNOVATION-CENTRED FACTORS THAT
ENCOURAGE THE RETENTION OF SKILLED INFORMATION
TECHNOLOGY PROFESSIONALS IN KWAZULU NATAL**

by

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**A dissertation submitted in partial fulfillment of the requirements for the degree of
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DECLARATION

I hereby certify that this dissertation is the result of my own original investigation and that it is not being submitted concurrently in candidature for any other degree.

Signed: _____ Date: _____

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I certify that the above statement is correct and authorize this dissertation to be submitted for examination.

Signed: _____ Date: _____

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ABSTRACT

This research project incorporates the theory that global integration is shaped by national, regional and local dynamics. South Africa's integration into the global arena is affected by its attempts to enhance empowerment, restructure the labour market, remove discrimination and increase participation. In this case study, the factors that encourage the retention of skilled IT professionals and graduates in KZN were investigated, to explore the reasons why despite opportunities for global advancement in the IT sector, skilled individuals choose to remain in localities that are assumed to be "skill-exporting" areas.

This study has revealed that innovation is the key to a dynamic and successful IT sector in KZN. The formation of technology-intensive organizations is vital in order to develop local capabilities and to compete effectively in the global economy. They are also necessary to reinforce the relationship between academia, industry, and government and to encourage technological innovation. Innovation will not only contribute to the growth and development of the SMME sector, but also attract and retain skilled IT professionals and graduates in KZN. The potential of KZN to develop a successful IT sector can be significantly improved by employing a "cluster based approach" to attend to its development needs. The establishment of the Innovation Support Centre in KZN, therefore, can be regarded as a significant tool to promote regional development, and foster innovation and the development of a successful SMME sector in the province, which will in turn contribute to the retention of the skilled IT workforce in KZN.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The aim of this study is to explore the successful models that have contributed to the retention of the Information Technology (IT) skills pool in KwaZulu Natal (KZN). The structure of the dissertation is as follows: Chapter One is the introduction, which is a discussion of the research aim, and the relevance of the topic for research. Chapter Two is the literature review, which incorporates a discussion of the central theories on which the rationale of the study is founded, as well as a concise synopsis of the relevant literature related to the topic under investigation. The research methodology is highlighted in Chapter Three. This chapter involves a definition and a discussion of the research methods used, including data collection methods and data analysis.

Chapter four presents a discussion of the dilemmas that are faced in the IT sector in KZN as well as a discussion of the conclusions and the related implications for the retention of skilled IT professionals in KZN. A summary of the most significant aspects of the research is recorded in Chapter Five with an emphasis on the policy implications of the research.

1.2 Background to the study

According to Held et al. (1999), globalisation is said to define a new era of human history in which global competition is seen as the forerunner of human progress. This 'phenomenon' has had a significant impact on the local labour market. At the beginning of the twenty first century, the process of globalisation has become the determining feature of political, social and economic discourse (South African Information Technology Industry Strategy [SAITIS], 2000). The concept is firmly linked to developments in the arena of IT, in other words, as the South African Information Technology Industry Strategy Project (2000) insists, technological developments drive globalisation and globalisation stimulates the production and adaptation of new technologies in a competitive global environment.

It has been argued that globalisation has affected patterns of work and employment around the world (Held et al, 1999). In the globalised world, labour is viewed as the key to the migration of people (Held et al, 1999). It is argued that one of the key factors responsible for the mass movement of people around the world is the push and pull of market forces and of supply and demand. People are increasingly being viewed as a scarce resource, and in a competitive global environment one of the key challenges for organizations is to hire and retain a good workforce, extracting value from them (Cairncross, 1997:1). Although globalisation has weakened the local IT labour market, certain IT firms have succeeded in reversing the trend, and have implemented models to

retain their skills pool. The impact of globalisation, therefore, with specific reference to information and communication technology will be explicated in the following chapter.

1.3 Rationale for the study

According to Sitas and Collett (2000: 14), the growth of the IT industry, in numerical terms, has been extensive. As corporations and governments are responding to 'globalisation' so too has the need increased in terms of responding to the global flows of goods, people, telecommunications, and economic transactions. From prior research it is evident that highly skilled information technology graduates are leaving the country in large numbers (ITWEB 2001; Sitas & Collett, 2000). According to Held et al. (1999); Castells (1996) and Martins (1996), skills-based migration, is one of the main features of globalisation in the last decade. According to a worldwide survey conducted by a Swiss company, South Africa has been singled out as the country in which well educated people are least likely to stay, after Russia (Steenkamp, 2000). The study has also found that most people who left were professionals or people with high levels of technical skills. Last year alone, more than 159 engineers and related technologists left the country (Steenkamp, 2000). South Africa is therefore being perceived as a 'local training center for the global market'.

However, in the midst of this exodus, there are those IT professionals that choose to remain. There is a need therefore, to explore the reasons why despite such opportunities skilled individuals remain in localities that are assumed to be "skill-exporting" areas. The

factors that encourage these individuals not to leave are of tremendous importance. As the Science and Technology White Paper (Department of Arts Culture Science and Technology [DACST]: 1997) recognizes, information technology is a key national capacity, which will influence the success of a country in the global marketplace.

According to Castells (1999, 54-56) there are specific social conditions that exist which foster technological innovation. This enabling environment “feeds” into the path of economic development and further innovation. He argues that clusters of, technical knowledge, institutions, firms and, skilled labour are the exemplars of innovation in the Information Age. By focusing on the IT sector, I will investigate whether skilled individuals choose to remain in KwaZulu-Natal, provided that, what Castells (1999) calls, the “milieu of innovation” is in place. Castells (1999) argues that once a ‘milieu’ is consolidated, it gravitates toward generating its own dynamics, and to attract knowledge, capital, and talent from around the world.

1.4 Statement of research

This study involves an investigation into the organizational and innovation-centred factors that encourage the retention of skilled Information Technology graduates and professionals in KZN. Research will be conducted primarily through qualitative methodology. Data will be gathered from individual interviews, as well as discussions with participants.

1.5 Primary and secondary objectives of the study

The primary objective of the study is to examine the organizational and innovation-centred factors that encourage the retention of skilled Information Technology graduates in KZN.

In order to achieve this objective, several secondary objectives need to be investigated:

- To explore the nature of globalisation and its impact on employment trends in the local labour market in the area of Information Technology
- To investigate the reasons behind the lack of requisite skills by focusing on the nature of the South African economy
- To investigate the IT industry in KwaZulu Natal
- To explore the conditions under which skilled IT experts and Engineers will remain in South Africa, by concentrating on environments that stimulate innovation and the production of a solid skills base

1.6 Value of the research

According to Marais (1998), the fact that the world has shifted on its foundations is undeniable. There are far-reaching consequences that have been set in motion by these developments. It has been argued that globalisation creates a new global division of labour and generates new inter-dependent organizational and technological systems (Held et al, 2000; Beck, 2000; Hutton and Giddens, 2000; Roberts, 2000). In order for South Africa to successfully compete in this global economy, retention and growth of skilled individuals needs to be a priority. According to Diana (2001), KwaZulu Natal currently has a low retention rate of skilled labour which is precisely what is required for innovation, economic growth and stability in KZN as the world moves toward more highly skilled-based products. In addition to this, there are insufficient skilled IT professionals to surmount the skills shortage. The ability of this province to attract such skills will have an impact on its ability to achieve its goals. This research is necessary, therefore, to bring to the fore and highlight the factors that contribute to the retention of skilled information technology professionals and graduates in KwaZulu Natal.

1.7 Summary

The background of the study has been detailed in this chapter. The rationale for the study, and the value of the study, in terms of its contribution to the body of existing knowledge in the research field of skills retention in KZN, was also elucidated. The aim of this study is to explore the successful models that have contributed to the retention of the IT skills

pool in KZN. Through the means of individual interviews and discussions, this investigation will attempt to explore the reasons why despite opportunities for global labour mobility, skilled IT professionals choose to remain in KZN.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to explore the literature and the research articles related to the topic, as well as elucidate the theoretical foundation for the study. The nature of globalisation will be explicated, in order to explore the changing configuration of the economy, and the demands being placed on national economies to compete in a competitive global arena. The impact of globalisation on employment trends will also be illustrated, to bring to the fore the global division of labour and the consequences thereof on knowledge-based skills in the Information Technology sector.

The past and current trends in the Information Technology industry in KwaZulu Natal will be depicted to expose the low retention rate of skilled professionals, and the low output rates of IT graduates from tertiary institutions in KwaZulu Natal. A discussion of the milieu of innovation, as theorized by Castells (1999), will illustrate however, how a technological milieu can foster innovation and encourage the retention of skilled professionals in a region.

2.2 The Nature of Globalisation

“ As the process of globalisation accelerates, the more conscious we become of the pull of localism in all its forms” (Barnett et. al, 98: 21).

According to Barnett et al (1994), more people across the globe are presently connected to each other than at any other time period. National plans and processes cannot be put into place without considering the impact of globalisation. According to Held et al (1999:2), globalisation can be conceptualised as the “...widening, deepening and speeding up...” of interconnectedness around the world. The drastic decline in ‘distance’ is of enormous economic and social importance around the world. Cairncross (1997:1) states that the ‘death of distance’ is a powerful force shaping society today. It has revolutionized the way people live and has impacted decisions about where people work and the kind of work that they do. He argues further that globalisation has brought freedom from the shackles of geographical boundaries and borders.

According to Giddens (1990) globalisation refers to the process whereby different social contexts or regions become linked across the entire globe. He argues further that globalisation can be viewed as the intensification of social relations on a global scale, which connects distant regions in such a way that local events are shaped by occurrences happening in remote areas and vice-versa.

2.3 The old economy and the new economy

The South African Information Technology Industry Strategy (SAITIS) Baseline Studies (2000: 3) states that the Industrial Revolution brought to the fore a social arrangement among governments, workers and employers which, while exploiting the ordinary worker, sustained growth in capitalist economies for over a century and generated competing ideologies. This has now been challenged by a shift to new IT-mediated modes of production of goods and services. Barnett et al (1994) argue that the multi-national corporation that existed twenty years ago carried on separate operations in many different countries and tailored its operations to local conditions. Presently however, large business enterprises, and even a few smaller ones, have the technological capabilities and strategic vision to breakthrough the limitations of the past, that is, of time, space, national boundaries, language, custom, and ideology (Barnett et al, 1994). These organizations acquire technologies that stretch across the globe, create products that can be produced anywhere and sold everywhere, spread credit around the world, and connect global channels of communication that can pervade any village or neighbourhood (Barnett et.al, 1994). According to Van Dijk (1999), in the 1980's people spoke about 'automation', however computerization and information technology have now largely replaced this term.

According to Barnett et al (1994), The Ford Motor Company played a pivotal role, in the development of mass production. He argues that "Fordism", which is used to describe modern capitalism, connotes the 'marriage' of mass production based on well-paid jobs

on the assembly line and mass consumption of affordable, standardized products. He states further that as the Global Workplace took shape old jobs were lost in large numbers, but new jobs in substantially lower numbers were created in high-technology industries. Van Dijk (1999) argues that this most recent communication revolution is a structural revolution, which marks an end to the distinction between media that is fixed in space and time and media that connect these dimensions.

Table 1: Changes from the “Fordist” paradigm to the IT era

‘FORDIST’ OLD	‘IT’ NEW
Energy intensive	Information intensive
Standardised	Customised
Dedicated plant & equipment	Flexible production systems
Single firm	Networks
Hierarchical management structures	Flat horizontal management structures
Centralisation	Distributed Intelligence
Specialised skills	Multi-skilling
Government control & planning	Government information, regulation, co-ordination and “Vision”
Minimal training requirements	Continuous training & re-training
Rather stable product mix	Rapid changes in product mix

Source: UNCSTD Report, 1997:2-4

According to Reis (2001), as table 1 indicates, the new economy differs from the old economy in several distinct ways. He argues that the old economy was static, where established organizations dominated vertical markets, and specialisation was the key to success. For most 'players', competition was limited by geographical boundaries and new candidates into the market were hindered by high barriers to entry. Because alternatives were limited, the company was able to maintain total command over its customer relationships. It decided what to offer and how to offer it and customers had little choice but to accept the company's terms. (Reis, 2001)

It has been argued that the Second World War propelled modern technology, and after the war technology increased at an ever increasing rate (Freeney, 2000; Isaacs, 1997; Barnett et al, 1994). The cold war and the 'race to the moon' launched technology into the seventies where microelectronics and telecommunications developed at a frantic pace. It was these developments that allowed the transformation and development from a global industrial economy to the informational economy that exists today (Freeney, 2000). A new way of producing was brought to the fore where information technology stimulates production rather than machines and physical labour.

According to Freeney (2000), after the informational technologies breakthrough in the 1970's, the conditions for the economy changed drastically. The impact of information technology can now be seen in every facet of human life, from business to education. In addition to this, Reis (2001) postulates that the new economy is fundamentally different and dynamic. He regards it as an arena where traditional rules have been discarded. In the

new economy, competition is global, and barriers to entry are low. This means that the economy as we have known it, with capitalism and statism, as Castells (1999) describes it, and “Fordism and Post-Fordism” are witnessing its last days. According to Castells (1999), the collapse of the Soviet Union occurred as a result of its inability to shift to this informational model. It has been argued that for the first time in history the human mind has become a tradable commodity (Freeney, 2000).

Castells (1999:2) states that the new economy that has emerged is a new trademark of capitalism, characterized by three central features: productivity and competitiveness are in the main a function of knowledge generation and information processing; firms and territories are organized in networks of production, management and distribution; and the core economic activities are global thus enabling them to work in real time as well as on a global scale (Mowlana, 1997). He argues further that new information and communication technologies have provided the infrastructure for this economy to operate and while the internationalisation of economic activities is not new, this technological infrastructure is. Castells (1991) states therefore, that the central process in the shift to a post-industrial society is not a transition from goods to services, but rather to information technology as the core, fundamental activity. (Castells, 1991; Dicken, 1998)

According to Castells (1999), the main challenge at the start of the revolution in the seventies was to discover new markets to absorb the growth in the production of goods and services. The solution to this came with direct foreign investment. The amalgamation of international financial markets in the 1980’s encouraged the separation of capital flows

from national economies toward international capital flows. The construction of the global economy makes the concept of an economy defined by “national” borders inappropriate. De-regulation and privatisation have made international trade and investment the rule instead of the exception (Cash, 2001). This means that there is a long-term trend towards a single, borderless economy, which is being rooted by the trade liberalisation and the dismantling of tariff and non-tariff trade barriers (Standing, 1999). According to Castells (1998), contemporary society is organized around telecommunicated networks of computers. Human activity is reliant on technological innovation, which facilitates global communication.

2.4 The impact of globalisation on employment trends

According to Mowlana (1997), this worldwide eruption of communication and transportation technologies in the past three decades has led to a corresponding increase in the contact between people of different cultures and nations. In short, technology has made possible the global exchange of information without requiring the people involved to leave the base of their operations. He states further that many activities, however, now include a second type of information flow, which is, human movement. He cites the movement of labour and professional personnel across borders as one of the broad channels of human movement. According to Barnett et al (1994), in this era of globalisation, millions of employees are coming to the realization that they have to compete for their jobs with individuals who reside on the other side of the world.

It has been argued therefore, that globalisation has affected patterns of work and employment around the globe (Held et al, 1999). In this age, the global division of labour is markedly different from what it was forty years ago (Barnet et al, 1994). In the globalised world, labour is viewed as the key to the migration of people (Held et al, 1999). It is argued that one of the key factors responsible for the mass movement of people around the world is the push and pull of market forces and of supply and demand. People are increasingly being viewed as a scarce resource, and in a competitive global environment one of the key challenges for organizations is to hire and retain a good workforce, extracting value from them (Cairncross, 1997). According to Cairncross (1997), technological advance in computing and communication has important repercussions for jobs, income distribution and productivity. The barriers to the global dissemination of knowledge are being stripped away.

Barnett et al (1994) argues further that the failure of national economies to provide enough jobs for the increasing number of job seekers has coincided with labour shortages in a few countries and in specific job categories. These great disparities in employment possibilities have aided in the stimulation of mass migrations on a worldwide scale. According to Barnett et al (1994), a vast majority of people leave 'home' in search of jobs. They argue further that in the world we live in today, the importation of labour is often an important indicator of a rising standard of living and changing cultural attitudes about work.

This global passage of human labour has become critical to the economies of countries that lose the workers and the countries that receive them (Barnett et al, 1994). They argue that the increasing mobility of labour is a largely unanticipated response to the extraordinary global mobility of capital in recent years. According to Barnett et al (1994), it is not poverty, overpopulation, nor economic stagnation in themselves that trigger mass migration, although they obviously do play a role. The people who are excited by the prospect of jobs abroad are likely to be the more intelligent and the most self-confident, entrepreneurial, and adventurous amongst the working population. These are the exact characteristics, however, that are most needed by developing countries. Losing skilled workers and professionals, therefore, has an obvious negative impact on the country as a whole.

According to Standing (1999), globalisation and the global phase of flexible labour markets cannot be adequately assessed without taking the ramifications of technological change into account. Firstly, technological innovation have given managements more choices in their organization of production, for example by making it easier to shift production from one site to another or to combine different parts of production in different localities. It has also facilitated managerial flexibility. Technological change has made easy the increased growth in capital mobility and has enabled large firms to not only decentralise production and advance the detailed division of labour but also have greater cost control. The globalisation of the world economy, therefore, is stimulating massive investments by transnational corporations, which are acting as a dynamo to produce more jobs and higher profits worldwide. (Global Policy, 2001)

It has been argued that in an arena as competitive as IT, the rapid depletion of critical skills is not a unique problem. The lure of careers and higher packages with large organizations abroad is systematically stripping the ranks of employees. Staff retention has therefore become a key issue for IT companies and particularly those, which cannot convince employees to remain with the company through lucrative share options.

2.5 The history of the South African labour economy

The legacy of apartheid in South Africa has dramatically increased the challenge for human resource development and its restitution. According to the DACST (1997), the most pervasive effect of this system of discrimination is the inequalities that have been created by decades of laws aimed specifically at excluding the majority of South Africans from participation in social, political and economic spheres of life. Currently race and gender disparities in the IT profession are unacceptably high (DACST: 1997).

As with any other profession in South Africa, there is a racially distorted labour market in the IT profession. Although there is slightly less gender inequality in IT compared to other professions, there is greater racial inequality in favour of whites and asians. This inequality is particularly true of IT managers where the racial and gender makeup reflect the usual white male dominance, where 90.4% of IT managers are white male, 0.6% are black, 3.9 are asian and 5.1 are coloured (Hodge et al, 1997). With regard to IT professionals 83.0 % are white, 3.4% are black, 7.4% are asian and 6.2% are coloured (Hodge et al, 1997).

History continues to shape employment patterns today and will continue to shape our workplaces and our society. The major challenge that South Africa faces is to integrate successfully into the global arena while simultaneously addressing the local needs such as equity in labour for South Africans (DACST: 1997).

According to the RDP White Paper, 23 November 1994, South Africa has started to undertake the task of the equitable development of the life opportunities for all its citizens. With the demand of global economic competitiveness, sustainable development and equity considerations, the development of innovative ideas, products and institutional arrangements and processes will allow the country to effectively address the needs and aspirations of its citizens. Government needs to work hard at creating an environment that is supportive of innovation. According to the DACST (1997), in an innovative society, individuals, groups, organizations and institutions recognize that they are partners, rather than opponents. It argues further that for a society to prosper, it must first construct and maintain social, legal and economic structures and processes that support innovation. It must also ensure that its members develop and continually update the knowledge, competencies, abilities and skills that are required to produce innovative products and services. A society also needs to nurture and support the effective potential of its members. It has been argued that government cannot force innovation to occur, however it can ensure that a competent pool of expertise, from which innovation can be brought about, is grown and maintained (DACST: 1997).

2.6 The Information Technology industry in South Africa and in KwaZulu Natal

According to the DACST (1997), some of the most consequential, ubiquitous and intellectual technological reorganization occurring around the globe presently, are those, which arise from the rapid development of information technologies. From a technological perspective, economic growth has proved to be interconnected to the process of technological change in individual firms and in the economy as a whole. According to Sitas and Collett (2000), IT graduates leave the local IT companies and enter with ease into the global labour market. They argue further that there is a critical shortage of skilled IT professionals in KwaZulu Natal, which IT companies have singled out as the most problematic area stifling the growth of their company. Research undertaken by Sitas and Collett (2000) reveal that 81% of IT graduates have left KwaZulu Natal. A further 13% plan on leaving soon. That equates to a loss of 94% of the top KZN IT graduates. Of these 94%, 13% have left South Africa, with the remaining 81% moving to Gauteng. Head offices of IT companies have moved to Johannesburg. Currently there are only seven companies listed on the Johannesburg Securities Exchange, who have their headquarters in Durban. This implies that integral decision-makers have moved away from KZN (Diana, 2001). KwaZulu Natal therefore reveals significant deficiencies in terms of human resources for Science and Technology.

According to Hodge et al (1997), it is estimated that there were approximately 25 000 IT professionals working in South Africa in 1995, which can be interpreted as 4.9 professionals per 1000 of the workforce. However, in spite of this modest figure, growth

in the number of IT professionals has been impressive. The labour market has responded well to this demand for IT skills because of:

- The good employment opportunities and salary premiums compared to other professions
- The low barriers to entry, that is, no specific degree requirements and low initial training requirements
- The relatively short training period (for programmers it may only be a few months).

However, despite the rapid growth in IT professionals, there still exists a shortage of such skills in KZN. This can be seen from the salary premiums paid in relation to other professions, the much more rapid career progression, high vacancy rates and high staff turnover. (Hodge et al, 1997)

As stated earlier, South Africa is weighted down by the reality of having to redress the legacy of apartheid, simultaneously rebuild relations with the international community,¹ and deal with the reality of the emerging global community. The South African government is also presented with the challenge of creating jobs and moving towards stronger economic growth (SAITIS, 2000). The problems of skills flight and the existing¹ social barriers to IT access, particularly the low levels of literacy and education of the

vast majority of the population, present serious obstacles. The SAITIS (2000) baseline studies reveal that the skills shortages experienced by the telecommunications industry pertain not only to the number of people qualified in a specific area, but also to the combination of skills required in one individual. This is because the convergence of technologies brought about the need for the *integration* of engineering skills and information technology skills.

According to Hodge et al (1997), the quality and quantity of IT skills within South Africa's population is a key factor in determining the effective and widespread use of IT in the economy and society. In an examination of IT human resources there are three principal components, which are, the professional skills, the extent of computer literacy and IT education. Hodge et al (1997) argue further that the number and skills of IT professionals determine the ability of a region to be technologically innovative and develop beneficial applications. The level of computer literacy, it is argued, determines the ability of the population to utilise the power of IT in their daily work and during leisure time. Finally, the extent and quality of IT education through formal public and private institutions as well as formal and 'informal' training will determine the country's accumulation of IT skills over time. (Hodge et al, 1997)

According to SAITIS (2000), the South African industry has seen an increased movement towards offshore development in the past few years. In the IT industry, companies such as Comparex, Dimension Data, and Datatec, increased their exposure to foreign markets either through acquisition or through listing on an overseas stock exchange. It increases

their exposure to world markets, provides alternate sources of capital and allows them to exploit a broader market. It has been argued further that offshore movement is also characterised by the movement of capital and/or skilled personnel overseas. (SAITIS, 2000)

2.7 Milieu of Innovation

However, despite the adverse impact of globalisation on employment and skills flight, Castells (1999) brings to the fore a theory that technological discoveries come in clusters. Innovation encourages further innovation. According to Castells (1999, 54-56) there are specific social conditions that exist which foster technological innovation. This enabling environment “feeds” into the path of economic development and further innovation. He argues that clusters of technical knowledge, institutions, firms and, skilled labour are the exemplars of innovation in the Information Age.

He refers to these clusters as ‘milieus of innovation’. Castells (1999) argues that once a ‘milieu’ is consolidated, it gravitates toward generating its own dynamics, and to attract knowledge, capital, and talent from around the world. In the age of globalising economies, the paradox is that proximity still matters, this may explain the re-emergence of industrial districts and the formation of innovation milieu as mechanisms of regional growth.

According to Castells (1996:37),

“...Technological innovation is not an isolated instance. It reflects a given state of knowledge, a particular institutional and industrial environment, a certain availability of skills...and a network of producers and users who can use their experiences cumulatively.”

It has been discovered from previous industrial revolution that the closer the connection between the location of innovation, production and use, the quicker society recreates itself to produce conditions that are favourable to further innovation (Castells, 1999). These conditions are not exclusively economic or technological but also depend on social, cultural and institutional support. Castells (1999) sites the example of Silicon Valley as a ‘milieu of innovation’. It formed the socio-technological context within which the innovative activity was embedded, where innovations could be tested, and where a concentration of centres for both applied and pure research, and a network of suppliers and production facilities for new technology were located. Once this was firmly incorporated, it presented an attraction to the international labour force and sources of foreign capital. Innovation has since been driven by market demands.

Castells (1996) analysis of Silicon Valley reveals the following factors determining its success:

- It hosts the top research oriented University complexes in the US, particularly in electronic engineering and computer sciences
- There exists an active and organized network of financial firms specializing in channelling venture capital toward promising small businesses
- It is located within a national and international network of telecommunication and air transportation
- It has the ability to generate an industrial milieu reaching beyond its own organization (Castells, 1996: 48-52)

According to Sabel (1989), industrial technological districts are not a new concept. Examples of 20th century industrial districts are found in Italy, Japan, the US, Denmark, West Germany, Austria and France. One of the most notable industrial districts is Silicon Valley.

Modern industrial district theory states that a new type of economic growth is occurring in some regions. Its characteristics include geographically concentrated networks that have connections with other firms in the district (Harrison, 1993). Flexible production controls and technology enable them to quickly change to adapt to the market. A key economic characteristic is division of labour with specific emphasis on skilled labour. The proximity of firms in districts and their embeddedness in the local environment

encourages a willingness of small firms to share information, exchange specialized assets, and to co-operate in forming projects and project teams. According to Schmitz (1992) a distinct advantage of districts is that they may not only facilitate regional growth, but also innovation and high employment standards.

According to Warnick (www.pitt.edu) it is crucial for small firms to operate in industrial districts because they have been, in recent times, the main creators of new jobs and they tend to be more technologically innovative.

In South Africa, the small business sector absorbs nearly 44% of the people that are formally employed in the private sector and it contributes to about 37% of the countries gross domestic product. However, the levels of technological capability, in the SMME (Small, Medium and Micro Enterprises) sector needs to be improved due to factors such as lack of information and exposure to advancing technology that impedes innovation. It is for this reason that in 1998, the European Union decided to finance a technology support for SMMEs pilot programme under the EPRD (European Programme for Reconstruction and Development), which is the development co-operation between South Africa and the European Union.

2.8 The Innovation Support Centre

The Innovation Support Centre (ISC), one of the pilot programmes, was designed to focus on encouraging technological innovation within the local economy in order to

increase the capacity of small IT firms to compete successfully in the global economy. It is aimed at optimising and commercialising newly identified technologies developed in accordance with regional and local economic development strategies (South African Mission to the European Union: Science and Technology Bulletin: 1999). The project coordinator Mr Greg Diana, states that the Innovation Support Centre has several projects aimed at encouraging small business to work towards developing new technologies.

Other key issues that this programme aims to address include outdated technology employed by SMMEs; low engagement rates of SMMEs in value-adding activities; the high failure rate of start-up SMMEs; and poor access to facilities for testing and promoting innovative ideas. The Innovation Support Centre will house the new technologies, where technical specialists will package the technology for implementation in the market place. (DACST, 1999)

Gauteng

In Gauteng an Innovation Hub was established in partnership with the Gauteng Provincial Government, the Blue IQ initiative, the South African Education and Research Alliance (SERA), the CSIR and the University of Pretoria (UP), in order to address the above issues. According to the Gauteng Provincial Government, the Innovation Hub is essential to the development of high technology businesses and the growth of high-tech opportunities for SMMEs within the Gauteng economy. It also supports SERA's aim to enhance South Africa's international competitiveness in science and technology, and

strengthen the country's National System of Innovation through creating world-class educational research and technology transfer infrastructure and competence. The Gauteng Provincial Government has allocated approximately \$20 million to the support of the project, while SERA and the CSIR/UP partnership will make land available and support the Hub projects with specialized knowledge on technology incubation and management, and provide the necessary training. (www.innovationhub.co.za/about/partners/gpg2)

Western Cape

A similar venture, the Cape Information Technology Initiative (Citi) has been undertaken in Cape Town. This initiative allows information technology entrepreneurs in the Western Cape to compete in the global market, by providing public-private partnership that gives IT start-ups access to subsidised infrastructure, seed capital and advice on legal, marketing and business matters. Citi is located in a business "incubator" in Cape Town. One of the key objectives is to nurture new IT companies and develop an IT cluster in the province. It has been argued that because of its lifestyle attractions, the region enables employers to attract and retain key staff more easily. Many IT companies choose to locate their intellectual property development units in the Cape, and others have moved entire business units to the region to ensure that staff are retained.

(<http://www.citi.org.za/cgi-bin/read.>)

Citi is supported by R500 000 in grants from the local and provincial government. In addition to this it has received sponsorship from Internet infrastructure company UUNet

and subscriptions from Citi's fifty members, including Sanlam, Naspers, Siemens, Telkom and Wesgro. (<http://www.citi.org.za/cgi-bin/read>).

In the two years since its inception Citi has produced several successes. FuturePerfect Corp, one of the companies linked to Citi, was chosen to manage the Western Cape government's drive to deliver public services on the Internet. Another Citi company, SouthEaster formed by three University of Cape Town information systems graduates, produces high-level software tools that enable a prospective e-commerce trader to create a web-trading site like Amazon.com in a short period of time. The company was borne out of the students' third-year university research project. Citi helped SouthEaster obtain venture capital in one day with a company in London. Citi is also attempting to establish a R20 million seed fund that would be utilized by Citi to loan funds to start-up firms or in exchange for equity in small firms. Ideosphere, another start-up company that has been assisted by Citi, is a stakeholder in TimberAfrica.com, an online timber exchange launched in November that already trades more than R1 million of timber monthly. Prior to their association with Citi, Ideosphere used to pay R1500 per month for internet access, but now the company spends R150 a month for continuous internet use. (<http://www.citi.org.za/cgi-bin/read>)

2.9 Summary

This chapter served to illustrate the impact of globalisation on employment trends, specifically focusing on the migration of skilled IT professionals from KwaZulu Natal. It has been argued that the new global economy, which is based on the advancement of information technology, has contributed to this skills flight, by creating a demand for specialized IT skills that are in short supply. In order to compete effectively in this global economy, regions including KwaZulu Natal, need to produce and retain skilled IT professionals. Compared to other regions such as Gauteng and the Western Cape, KZN is failing in this area.

As stated earlier, however, Castells (1999) argues that the creation of a milieu of innovation will provide infrastructure and support to encourage the retention of skilled IT professionals. A notable example internationally, is Silicon Valley, which is the most advanced information technology-producing region in the world. Examples of developing milieus of innovation, in South Africa include Citi in Cape Town, and the Innovation Hub in Gauteng, which have achieved considerable success in terms of nurturing and encouraging the growth of SMMEs. In KZN, the Innovation Support Centre is in the process of being established. The ISC has been projected as the Information Technology Hub of KZN whose aim is to support SMMEs and encourage the production of skilled professionals.

The output of IT diplomates and graduates from tertiary institutions in Gauteng and the Western Cape also far exceed that of KZN (SAITIS, 2000). The skills shortage, therefore, is another problem that needs to be addressed in KZN. These issues will be discussed in greater detail in the following chapter.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter serves to explain and discuss the research methodology employed in this study. The specific research approach and methodology will be outlined, followed by a discussion of the data collection and analysis procedures.

The aim of the study is to explore the reasons why despite opportunities to enter the global market, skilled IT professionals choose to remain in KZN. Due to the fact that this study is a first of its kind several problems were encountered during the research. Given that there were no complete databases of IT professionals and graduates, I came across difficulties in securing information and locating suitable participants. It is for this reason that I had to rely on the snowball sampling method. Although the qualitative research approach was employed, I also gathered several primary documents to assist with the research. Presently, the IT sector in KZN is in a state of flux and any researcher would require at least a year's engagement with the field to produce a detailed study. However due to the pragmatic constraints of a research dissertation, and the limited time afforded a research student, that is, three months, it was difficult to provide a *comprehensive* case study of the factors that encourage skilled IT graduates and professionals to remain in KZN. The time limitations allowed me to provide a baseline scan of the information

available at that point in time, which I hope will encourage further and more in depth research.

3.2 Research Approaches

In recent years, there have been considerable changes in methodological research practice in the social sciences. Qualitative research methods have become the predominant research approach in comparison to quantitative methods. The quantitative research approach usually focuses on the causal relationships that exist between certain phenomena. These phenomena are examined through statistical aggregation of data collected through clearly prescribed methods (Leedy, 1997). Quantitative research methods were originally developed in the natural sciences to study natural phenomena. Examples of quantitative methods now well accepted in the social sciences include survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modelling. (Babbie and Mouton, 2001)

Qualitative research alternatively is defined as,

“ Inquiry process of understanding a social or human problem, based on building a complex holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting”
(Leedy, 1997: 165)

For the purposes of this research, the qualitative research approach was employed. Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. The reason for choosing qualitative research methods is that it is designed to aid in the understanding of social phenomena. Kaplan and Maxwell (1994) argue that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified. There are several considerations when deciding to adopt a qualitative research methodology. Strauss and Corbin (1990) claim that qualitative methods can be used to better understand any phenomenon about which little is yet known. They can also be used to gain new perspectives on things about which much is already known, or to gain more in-depth information that may be difficult to convey quantitatively. Thus, qualitative methods are appropriate in situations where one needs to first identify the variables that might later be tested quantitatively, or where the researcher has determined that quantitative measures cannot adequately describe or interpret a situation. Research problems tend to be framed as open-ended questions that will support the discovery of new information. The ability of qualitative data to more fully describe a phenomenon is an important consideration not only from the researcher's perspective, but from the reader's perspective as well. (Lincoln and Guba, 1985)

The particular design of a qualitative study depends on the purpose of the inquiry, what information will be most useful, and what information will have the most credibility. There are no strict criteria for sample size (Patton, 1990). Examples of qualitative

methods are action research, case study research and ethnography. The case study method has been adopted for this research.

3.3 The Case Study

A case study can be described as a unit of analysis, for example a case study of a particular organisation, or as a research method. According to Denscombe (1998), Bishop (1994) and Robson (1993), a case study is a research strategy that combines a number of qualitative and quantitative research techniques. This is one of the advantages of the case study method as it allows the context and the needs of the case to determine the methods used.

Whilst the study will inevitably demand an investigation of the institutions and social processes that exist outside the cases, the nature of this research strategy demands that these investigations be focused enough that they remain central to the aims of the research. In other words, although this study focuses on the organisational and innovation-centred factors that encourage the retention of skilled IT professionals in KZN, it nevertheless demands a discussion of the context in which this phenomenon takes place, i.e. globalisation and the effects thereof on the IT sector and employment trends.

The case study strategy also allows particular issues to be brought to the fore, that would have otherwise remained 'hidden', if other research strategies, such as surveys, were used

(Denscombe, 1998). Another reason for choosing the case study approach is its focus on processes and relationships as opposed to neatly defined outcomes or findings. Whilst findings of this case study are of critical importance, the focus is on the complex interplay of processes and relationships that occur amongst the different actors and institutions that are investigated (Bishop, 1994; Robson, 1993). Case studies allow investigations to take place in the 'natural setting' of the case. In other words the case already exists and is not artificially constructed or manipulated for the purpose of the investigations. The case study strategy, therefore, for the purpose of this study, is the most appropriate research strategy.

3.4 Sampling

In this study, the population, which is the larger pool of cases from which a restricted number of cases will then be sampled (Neuman, 1997:203), is made up of graduates, and professionals in the IT sector in KZN. Of this population, a research sample needed to be obtained.

Sampling is a "process of systematically selecting cases for inclusion in a research project" (Neuman, 1997:201). There are a number of probability (where a list of the population of that which is investigated is known), and non-probability (where a list of the population is not known or easily available) sampling methods. The non-probability method of snowball sampling was adopted in this research, due to the difficulty in obtaining population lists. This method of sampling entails identifying subjects suitable

for research and then asking those initial subjects to refer the researcher to additional subjects. (www.statpac.com)

3.4.1 Sampling Frame

Considering the fact that this is the first study of its kind, as mentioned earlier, I encountered several difficulties in securing information, locating suitable participants and persuading them to contribute to the study. In light of this circumstance, I had to utilise data from other primary sources in order to compensate for and add to the interview material. I began the study by concentrating on the proposed establishment of the Innovation Support Centre. The Innovation Support Centre is designed to focus on encouraging technological innovation within the local economy in order to increase the capacity of small IT firms to compete successfully in the global economy. It is faced, however, with the challenges, of skill shortages, skill flight, and the lack of requisite skills in the IT sector. It is for this reason that initial contact was made with the project co-ordinator of the Innovation Support Centre who in turn referred me to SMMEs in the IT sector in KZN. Once the managers or owners of the SMMEs were contacted, snowball sampling was used to obtain further interviews with respondents from these organisations.

While the snowball sampling technique can dramatically lower search costs, it comes at the expense of introducing bias because the technique itself reduces the likelihood that the sample will represent a good cross section from the population. (www.statpac.com). In order to make up for this, other sources were utilised to explicate the relevant themes. Due to racial divisions of labour in the IT sector as discussed in Chapter Two, care was taken to ensure that black IT professionals were also interviewed. In addition to this, alternative sources of information, namely research articles and statistics, were used to extract further data regarding skilled black IT graduates and professionals.

In total there were 12 interviews conducted with respondents from various SMMEs and IT corporates in KZN as well as with the project co-coordinator for the Innovation Support Centre. As stated earlier, it was difficult to obtain interviews with individuals in the IT sector, as many were unable to clear busy schedules. On several occasions interviews had to be cancelled and rescheduled. One potential interviewee, had given many interviews due to his successful black empowerment IT company, and was therefore reluctant to make time to be interviewed.

3.5 Data Collection

Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions. For the purposes of this research, semi-structured interviews were employed.

According to Bailey (1978), Denscombe (1998), Bishop (1994) and Robson (1993), semi-structured interviews allows for flexibility and spontaneity in order to assess the validity of the respondents' answers. An interview guide or "schedule" is a list of questions or general topics that the interviewer wants to explore during each interview. Although it is prepared to ensure that basically the same information is obtained from each person, there are no predetermined responses, and in semi-structured interviews the interviewer is free to probe and explore within these predetermined inquiry areas. Interview guides ensure good use of limited interview time; they make interviewing multiple subjects more systematic and comprehensive; and they help to keep interactions focused. In keeping with the flexible nature of qualitative research designs, interview guides can be modified over time to focus attention on areas of particular importance, or to exclude questions the researcher has found to be unproductive for the goals of the research (Lofland and Lofland, 1984). The interview scheduled utilized in this study was comprised of open-ended questions, and probing questions, which allowed for greater flexibility during the interview process. Semi-structured interviews also provide more opportunity to respond to and supply information that is more accurate quickly. There is also a chance for issues to be clarified between the researcher and the respondent.

Due to the nature of qualitative research as well as the objectives of this research, it was important that the interviews be accurately recorded. This would also guarantee that the data could be verified and certified as reliable. The interviews were therefore recorded by means of an audio tape recorder. Audio recording is a method of keeping interviewer bias in check. It allowed me as the researcher to concentrate on the interviewee and his/her

responses, rather than writing copious amounts of interview notes. This allowed me to probe further into issues that were not forthcoming. Respondents were asked for their permission to record the interviews, and were informed of the nature of the research and its intended use.

In addition to this, the survey conducted by Sitas and Collett (2000), on Information Technology in KZN was also utilised in this study. The survey aimed to explore three areas of information technology activity in the province, namely:

- Manufacturers
- IT Companies and,
- IT graduates from tertiary institutions

3.6 Data Analysis

The data was transcribed from the interviews and a thematic data analysis was employed in order to simplify and organise the data. Listening to the tape recordings several times and reading the transcriptions, provided a context for the emergence of the various themes. This allowed for a thorough exploration of the various issues and debates emerging from the different perspectives whilst also presenting the inter-connectedness of the themes.

3.7 Conclusion

This chapter has outlined the research strategy and process followed in this dissertation. It has also elucidated the methods and techniques used to elicit and analyse data. The results of the research are discussed in the following chapter.

CHAPTER 4

THE IT SECTOR IN KZN – PROBLEMS AND POSSIBILITIES

This chapter presents and discusses the results of the interviews that have been conducted, together with various other research sources used to explicate the themes that were brought to the fore.

4.1 Skills in the Information Technology sector in KZN

4.1.1 Skills Shortage

“ We've got a massive backlog in terms of people, we do have first world type infrastructure but we don't have markets, and in KZN especially in the IT sector everybody's flying out of here. We have companies who are big users of IT but not developers of IT... I attended a forum the other day, the IT executive forum, where are the big users of software attended, they are expressing exactly the same sentiments as I am. They're worried that the corporates aren't locating here, the corporate IT suppliers aren't locating. Durban isn't becoming a destination anymore. When they come to South Africa and visit they go to Gauteng or the Cape, we're being left off the map” (Diana, Interview: 2001)

Human resources development is the most critical area that KZN faces in the development of its IT sector. KZN is not unlike other regions around the world that also

have to deal with the shortage of skilled workers, and in particular, the global migration of skilled workers (South African ICT Sector Development Framework, SAITIS, 2000). The phenomenon of globalization has had a significant impact on the labour market. Globalisation has annihilated geographical boundaries and borders, and have allowed for the extraordinary global mobility of capital and workers (Cairncross, 1997; Giddens, 1990; Held, 1992). The country's critical IT skills shortage is exacerbated within the previously disadvantaged community as a result of historical educational and cultural factors. (McDonogh, 2001). Currently less than one percent of engineers at the enterprise solutions level are black (www.microsoft.com).

According to the International Organization for Migration (IOM), currently more African scientists and engineers work in the US than in the whole of Africa. Approximately 20,000 African scientists and engineers work in Africa compared to the estimated one million that are needed to sustain the continent's development (Herbert, 2001). The IOM estimates that about 23,000 university graduates leave Africa every year.

A study presented at a conference on migration in Africa, revealed that in 1997, the cost of the skills flight to the South African economy was around \$11.6 billion, which is equivalent to an annual drop in GDP growth of 0.37 percent. Another study found that the same skilled workers would probably take from South Africa about \$1.4 billion in capital on their departure, while business that remained would sustain additional costs of \$416 million to deal with the increased staff turnover (Herbert, 2001).

A recent study at the University of Cape Town found that between one-fifth of South Africans with tertiary education were living abroad. From 1989 to 1997, approximately 233,609 South Africans, mostly professionals settled in the US, Britain, Canada, Australia and New Zealand. Of all the countries, however, the US continues to attract skilled professionals from around the world.

According to Castells (1998), Silicon Valley can only maintain its pace of innovation by recruiting thousands of engineers and scientists every year from across the globe, because Americans do not have the suitable skills. In 1998, the White House passed legislation that allows a substantial increase in the number of foreign technical workers that can enter the US (Bretherton, 1998). With measures, such as these therefore, South African IT professionals can enter into the global market with ease.

However, beside the damage to the economy, the loss of skilled professionals constrains new ventures and economic expansion. I will argue therefore, with support from the interviews, and other research sources, that KZN does not only need to implement models to retain the IT skills pool, but also to produce more skills in the province.

According to SAITIS (2000), the inadequate performance of the education system has placed a great constraint on the ability of universities to increase the number of graduates emerging out of the system. The 1998 HSRC Telecommunications Study's detailed analysis of the output from universities and technikons around the country reveals a striking deficiency in KZN with regard to the production of graduates and diplomates, in

comparison to tertiary institutions in Gauteng and the Western Cape. This low supply of graduates contributes negatively to IT sector in KZN, and will hamper innovation initiatives undertaken in the province.

In 1996, only 53 Computer Science and Data Processing graduates emerged from Universities in KZN, in comparison to the 163 graduates that Pretoria University and WITS combined, produced. With regard to First Diplomas awarded in Computer Science by Technikons: Pretoria Technikon, Technikon SA, Vaal Triangle, and Witwatersrand produced 234 diplomates; and KZN produced 109 diplomates. Pretoria Technikon and the Vaal Triangle produced 294 diplomates in electrical engineering in 1996, whereas ML Sultan, Natal Technikon and Mangosuthu combined produced only 122 diplomates.

Table 2: First degree graduates in Computer Science and Data Processing from South African Universities: 1992-1996

University	1992	1993	1994	1995	1996
Fort Hare	3	4	3	3	3
Orange Free State	11	31	11	10	22
Potchefstroom	52	57	49	60	37
RAU	26	40	44	34	35
Cape Town	45	58	63	44	49
Durban-Westville	8	9	10	14	11
Natal	43	45	43	43	43
UNISA	36	33	39	47	34
Pretoria	20	18	90	94	108
Western Cape	17	3	11	15	25
WITS	43	31	40	71	55

Source: 1998 HSRC Telecommunications Study

Table 3: First diplomas awarded in Computer Science by Technikons: 1992-1996

Technikons	1992	1993	1994	1995	1996
Cape	89	71	69	77	104
Gauteng North	16	34	40	35	66
ML Sultan	34	41	55	82	78
Natal	42	28	0	21	31
Pretoria	134	132	117	94	79
Technikon SA	1	8	84	74	51
Vaal Triangle	34	37	34	22	22
Witwatersrand	69	69	69	80	82

Source: 1998 HSRC Telecommunications Study

Table 4: First diplomas awarded in Electrical Engineering by Technikons: 1992-1996

Technikons	1992	1993	1994	1995	1996
Cape	107	127	113	106	125
Gauteng North	1	10	28	50	70
ML Sultan	34	37	35	52	49
Mangosuthu	21	14	0	43	46
Natal	67	82	75	27	27
Pretoria	336	337	275	252	146
Vaal Triangle	135	143	138	78	148
Witwatersrand	104	92	124	116	94

Source: 1998 HSRC Telecommunications Study

According to Greg Diana (Interview, 2001), universities and technikons, in KZN, need to increase their IT skills output if it has any expectations of being competitive and innovative. He argues that IT skills do not only refer to computer scientists and engineers, but also professionals in the commercial sector, finance and law:

“ ...it’s basically putting financial systems in software, so you need programmers, you need computer science...you need people who know how the market works to inform the programmers how to structure a solution... it requires a much more multi-disciplinary and holistic solution” (Diana, Interview: 2001)

He argues further that skilled professionals are leaving to places where there are opportunities to make use of their skills, and to derive the benefits of their skills. If a need were created for these skills, then individuals would remain in KZN. A letter from a skilled IT professional reveals that his motivation to leave KZN is prompted by the fact that there are no opportunities for him in his field:

“Greg I need to make a decision on whether to move my family to Jo’burg [Johannesburg] toward the end of the year, which I do not want to do. By then there should have been some development in your projects retaining IT in Durban. Obviously due to the fact that I cannot get work in IT in my level in South Africa, my mind is also pointing to emigrate, so I can then work again in my field. I sincerely hope that this need not be the case” (Diana, Interview: 2001)

As Hodge et al (1997) have argued, therefore, factors such as crime, and economic stagnation, are not the motives for skill flight. According to Greg Eksteen from Intervid, a successful IT solutions company in KZN (Interview, 2001):

“...no matter where you go there’s always going to be something, if it is not crime then its something else... the grass is never greener on the other side...”

What is needed therefore, for IT graduates and engineers to remain, is a market that utilises their expertise.

The owner of a small IT firm struggling to compete effectively in this sector, argues that Durban is very “cutthroat”, with a number of firms providing the same services in terms of training people to enter into the IT sector. He states that,

“The line for school leavers to enter the IT industry in Durban is limited. And if I train these school leavers I will actually cheat the parents out of their money... (how do you) tell these kids from the outset that there are no jobs for them in Durban.” (Interview, 2001)

Currently, South Africa is experiencing a high unemployment rate, and the labour market is finding it difficult to supply skilled IT workers to meet the increasing demand. The distribution of IT skills on a provincial basis reveals a higher concentration of workers in Gauteng (65%) and the Western Cape (22%). The Western Cape and Gauteng also have the best IT infrastructures in their schools compared to the other provinces (SAITIS, 2000). The overall demand for professional, semi-professional, and technical personnel in South Africa is expected to rise by 15% during the period from 1998 to 2003. Increased shortages are estimated for workers with at least eight years experience.

According to the SAITIS Baseline Studies (2000), the following are reasons they provide for the IT skills shortage:

- There is a lack of co-ordination between the education system and the labour market

- Demand for IT professionals is outstripping supply; and
- Exceptional job offers in other countries

In accordance with these findings, Eksteen (Interview, 2001) states that having a qualification and experience is a necessity in this industry, however, many individuals are leaving tertiary institutions, without adequate preparation for the realities of the IT sector and the responsibilities that go with it. He states further that IT professionals, including himself, would only leave KZN if they were offered more lucrative career prospects elsewhere in the country, or abroad. These factors need to be addressed in order for KZN to effectively deal with the issue of the skills shortage.

It can be argued therefore, that there is a demand for skilled IT professionals, but in areas like Gauteng and the Western Cape. Those involved in IT in KZN are merely 'bit players'. According to the research undertaken by Sitas and Collett (2000), in the manufacturing sector in KZN, a culture of information sharing is absent. Only 38% of the manufacturers stated that they had a department concentrating on Research and Development. Furthermore, most manufacturers have not allocated a specific division in their company for Information Technology despite the fact that all of them are actively using it. Most IT decisions, therefore, are taken away from KZN to the company headquarters in Gauteng and the Cape. Jobbing and vending define the manufacturing sector in KZN whilst the main needs of the organizations in this sector are managed at

their head offices through international vendors in Gauteng and the financial insurance industry in the Cape. (Sitas and Collett, 2000)

Sitas and Collett (2000) have also discovered that the incentive for KZN manufacturers to produce innovative products is missing, as only two manufacturers that participated in the study indicated that product development was a primary area of research and development in their organizations. It can be argued therefore, that innovation is inhibited in KZN, due to an absence of the need for high order design and development skills. Sitas and Collett (2000), argue further, that KZN has the stigma of being non-competitive on a national and global scale:

“ It seems that KwaZulu Natal has sufficient IT breadth, but not enough IT depth to make sufficient consolidated gains that will ensure its growth.” (Sitas and Collett, 2000)

The critical IT skills shortage in KZN has been singled out as the most problematic area stifling the growth of IT companies. In addition to this, the size of the KwaZulu Natal market seems to be of concern in terms of inhibiting the ability of IT companies to grow. IT graduates from KZN who were interviewed by Sitas and Collett (2000), expressed a lack of confidence in the ability of KZN to be innovative.

A skilled IT professional currently working in the IT division of one of KZN's leading tertiary institutions states that:

“ The only comfort that this job provides is security...to know at the end of the month there is a pay cheque waiting for me... the pay on the other hand, is not what I know I could be earning elsewhere ... the reason I stay is my family...I could be earning double even triple in Jo 'burg if I decided to leave ” (Interview, 2001)

4.2 IT Sector

Globalisation has transformed the workforce from “paper and pencil” routine to IT applications and infrastructure. The ubiquitous nature of technology has provided the capability of turning local communities into global villages. In terms of the business arena, production cycles have been condensed to gain competitive advantage of being the first to market a product. Geographic boundaries, also no longer restrict market reach. Globalisation has facilitated the creation of vertically integrated organizations with worldwide distribution networks. (SAITIS, 2000)

Although South Africa’s ‘share’ of the global IT market is small, at approximately \$US 10 billion, the sector holds promise of being a significant and growing contributor to economic growth in domestic and export markets. In addition to this, the sector has the unique opportunity, both directly, and as an enabler for other sectors, to contribute in a substantial manner to sustainable economic development, social upliftment and empowerment (SAITIS, 2000).

In line with this trend, governments around the world are attempting to take an active role in developing policies that promote the development of the IT sector. The most significant policy change has been the liberalisation of the telecommunications market. Sixty-nine countries, including South Africa, signed the World Trade Organization's basic telecommunications agreement to open up the world's telecommunications market to competition. Pervasive utilisation of computer technologies, therefore, has increased the demand for new products and applications, lower prices, ease of access and improved functioning and portability. (SAITIS, 2000)

South Africa, therefore, has to compete on a global scale. In order to do this they will have to invest in Research and Development (R&D) in the IT sector. R&D expenditure in South Africa, however, is approximately 0.8% of GDP, which is below most OECD countries, where IT sectors account for 2.5 to 3 percent. Overall, research on computer sciences represented only about 2.3% of total Research and Development spending in 1993 (SAITIS, 2000). It can be argued, therefore, that KZN needs to invest in Research and Development in the IT sector in order to become innovative and to effectively compete on a global scale.

Leslie Makhetha, Dimension Data SA's group employment equity and skills development manager maintains that the Employment Equity Act, which is aimed at ensuring companies reflect SA's demographics, cannot achieve its goal without a concerted effort at skills development (McDonogh, 2001). The Dimension Data Learnership programme came about therefore, as a result of intensive research and

development. Dimension Data has partnered with leading intellectual capital development consultants, Pi Africa, to assist with the identification and recruitment of suitable candidates for the programme. Makhetha states further that the company does not want to take the “cream” of the IT graduates and diplomates, as it will cost at least R83 000 to skill each learner to a level at which he/she can become a productive member for the Group. It has to be ensured, therefore, that the individuals who are recruited for the programme become not only skilled IT professionals, but also skilled “Dimension Data” people who will remain with the group. (McDonogh, 2001)

In a similar venture, Integrated Technologies Institute (ITI), one of Microsoft’s top Authorised Technical Training Centres (ATECs), has established a bursary programme to help students from disadvantaged communities train as Microsoft certified professionals, in order to ‘salvage’ South Africa’s IT skills shortage. ITI’s recent joint venture with Ndizani, a community-based IT training institution focusing on end-user training in desktop applications, has created a groundbreaking training solution CAST – Computer Accelerated Skills Training. CAST was formed out of the recognition that black professionals at both end-user and engineer level must be skilled in the engineering and management of Local Area Networks (LANS) and Wide Area Networks (WANS). According to the Managing Director of Ndizani, CAST will attempt to address the lack of technology skills through mentor programmes and access programmes designed to bridge the gap between computer literacy and highly skilled IT resources. (www.microsoft.com)

Another successful IT solutions company in KZN, Intervid, have developed and integrated a wide range of products as a result of its Research and Development Division. A number of these products are “world firsts”. Their Research and Development Division consists of twelve permanent members of staff who are responsible for the continuous development of Intervid’s current product set as well as the innovation of new applications in the arena of digital imaging. The Group is continually researching, developing and designing systems for existing and new niche markets both locally and abroad. (www.intervid.co.za)

According to Greg Eksteen who provides network infrastructure at Intervid:

“ ...there are a few internationally based companies that are competition for us, but as far as doing the broad spectrum of stuff that we do there’s no one else really in KZN.” (Interview, 2001)

The reason for the success of Intervid can be attributed to their intensive focus on research and development, and in fostering innovation.

Guinet (2001) argues that the countries that experienced the best economic performance during the 1990’s, i.e. the decade of the accelerating transition toward a knowledge-based economy, have the following characteristics in common:

- Growing levels of business R&D and other innovation-related investment

- An increasingly diversified base of R&D performers. Both the number and variety of R&D performing organizations increased in high-growth countries. In particular, small firms are playing an increasing role in performing R&D, as are firms in the service sector
- Improved linkages between science and industry
- High levels of networking among actors of innovation through both formal and informal relationships

These common characteristics reveal the main factors that determine the efficiency of countries' R&D and innovation systems.

The above illustrations bring to the fore the rising awareness by IT companies of the lack of suitable IT skills in the province, and the emigration of skilled workers, be it from one organization to another, one province to another, or ultimately from one country to another. It also brings to the fore the dire need for research and development in this sector as the shortage of 'talent' and lack of high-level skills training, has severely hampered the ability of IT companies in KZN to effectively compete in the global arena.

Another issue that has been highlighted in KZN is the skewed nature of the IT sector with regard to race and gender divisions, due to the previously discriminatory education system.

4.2.1 Race and gender disparities in IT sector

The stark reality of the current corporate landscape is that it's very white, very clubby and powered – in the main – by testosterone (Maggs, 2001)

Historically, education and training policy and provision has been an area of debate in South Africa, especially during the country's discriminatory apartheid era. Although racial and gender discriminatory policies were central to both education and training systems, another problem was that the two systems themselves grew apart in ways that are problematic. During the apartheid years, the training system was formed around a number of apprenticeship training courses that mainly equipped young white men to work within an industry.

With rapid changes in technology, new methods of work organization and the shift towards the global market, these apprenticeship courses became an insufficient basis for global competition. When black learners entered the system after reforms in 1981, there was a tendency for them to get the theory and not the practice. As a result of this, they were unable to develop 'real' competence in an area. Therefore, while many other developed and developing countries, adapted quickly to the global economy, South Africa followed slowly behind, restricted by the need to first resolve its political dilemmas before concentrating on the skills of its workforce. (Skilling South Africa, February 2001)

4.2.1.1 Racial disparities

The apartheid education system, characterized by racial divides, was aimed at systematically excluding the majority of African students from high-quality academic education and technical training. Many of these effects are still prevalent today and therefore highlight where redress is necessary, both in terms of resources and of the dominant educational ideology. (www.hsrc.ac.za)

According to Education Minister Kader Asmal, the number of black graduates had risen on average by 13.3% from 1994 to 1998. In 1994, 14 439 black University students successfully completed their studies, as compared to 1998 where 23 805 degrees were awarded. For 1998, 14% obtained degrees in Science, Engineering and Technology.

The aim to deracialize the economy has not been achieved as the white minority still holds the economic power of the country. According to a recent survey of black professionals and job seekers by Vertex Commercial Services, a South African recruitment company, racism is rampant in the information technology industry. (www.english.peopledaily.com.cn)

Lee-Anne Thomson, managing director of the company, said that 56 percent of the black participants in the sector felt that their careers were being impeded by some sort of discrimination, and 95 percent complained that physical makeup, namely skin color, usually played a key role in employment. Almost all the participants felt strongly that

even though they were given the same job title as their white colleagues, they were not offered the same depth of job responsibilities, and technical projects allocated to them were rarely of much importance. (www.english.peopledaily.com.cn) These stumbling blocks, therefore, contribute to frustrations in the IT sector by black professionals.

Black IT professionals, who are eager to remain in KZN, however, are those that are making breakthroughs, and don't want to leave. An example of a successful black-owned technology consulting and software development company is Southern Focus Holdings (now IOCORE-Southern Focus), one of the first black empowerment IT companies in South Africa, who have branches in KZN and Gauteng. An information technology portal aimed at servicing 200 ports from Cape to Cairo, was just one of the achievements attributed to Southern Focus before the company entered into a joint venture with IOCORE, one of South Africa's leading suppliers of IT services and solutions. According to Martin Cele, the company's chief executive, the strong port network, which not only allowed African ports to communicate but electronically negotiate with key international players, had launched a host of possibilities that would further enhance the company's income. Southern Focus had also facilitated various proposals from maritime organizations around the world, which expressed a willingness to build African alliances (Jones, 2001).

Southern Focus, which was backed by Trematon, the listed equity capital group, had an intention to ultimately locate itself as a 'vibrant' IT brand within the Southern African Development Community (SADC). It had already installed numerous port administration,

authority and operations systems for local ports and was knowledgeable about the challenges faced by both the SADC's port authorities and their global partners. (Jones, 2001)

With regard to the success of Southern Focus, Cele stated (Jones, 2001): "*We sell brain power*", arguing that Southern Focus was not a hardware merchant but developed technology to support the unique needs of an industry. He stated further that this ability of Southern Focus to leverage technology development off an intimate knowledge of local industries' needs had been the primary reason for the extensive growth of the company. **Innovation**, according to Cele, had been the instrumental factor since he began Southern Focus in 1997. Contributing to the success of the company has also been the fact that:

" Black Ownership and operational management have been our strengths, especially when servicing government and parastatal bodies eager to fulfill black empowerment objectives " (Cele in Jones, 2001)

The main objective of the merger with IOCORE, was to capture a 'bigger' share of the IT services market. IOCORE-Southern Focus has already supplied Petronet with a comprehensive SAP human resources management system. According to Cele, Southern Focus was 'attracted' to IOCORE, because of its complimentary skills set, the large number of skilled IT professionals in its employ, and its ability to transfer skills to Southern Focus. (www.itweb.co.za/office/iocore)

It can be argued, therefore, that innovation and a solid skills base, is required for IT companies to gain success in this sector. These are also the reasons why black IT professionals choose to remain in KZN. Harold Ndlovu (Interview, 2001), Product Systems Director for one of the largest international companies that create and sell commercial IT solutions states that:

“ There is a increasing demand in South Africa, and in KZN for IT skills, but the companies don’t have what it takes to keep the people. You need to start creating...innovation is important...when you make these breakthroughs, you create the solutions for problems, so people don’t go looking elsewhere for IT solutions, and skills remain in the province.”

4.2.1.2 Gender disparities

According to Rathgeber (1995), fewer women than men in Africa, as elsewhere, specialize in the sciences or engineering. Traditionally, the tendency has been to view new technologies introduced into the global marketplace as gender neutral, having equal potential to be used by either men or women. Engineers in technology development gave little thought to the symbolic value of technology or, the symbolic value of the use of technology. Thus, if women have not been active participants in the development and use of new technologies, then it is assumed this has been a result of their own choice or the fact that they have been slow to recognize the importance of a particular new technology (Rathgeber, 2000). This however is not the case, the poor education system and lack of

support for women in IT are powerful factors that contribute to the gender inequalities in the IT sector.

According to Rathgeber (2000), few if any statistics are available on the involvement of women in the IT sector, but preliminary observations indicate that women are greatly underrepresented. For Europe and North America, some subjective evidence indicates that women who do involve themselves in information technologies tend to bring with them interests and expectations different from those of their male colleagues. For example, early research has shown that women and girls in information technology and engineering tend to be more interested in the social applications of technologies (Keller, 1992).

In Africa, too, interest is growing in the potential that IT offers women. In the weeks before the 40th anniversary conference of the United Nations Economic Commission for Africa (ECA) in April 1998, ECA joined the World Bank and the Women's Programme of the Association for Progressive Communications in organizing the Afr-fem Internet working group. The group's mandate was to gather field information on the conference themes, which led to numerous lengthy discussions of the potential of IT to advance African women's interests. More than half of the group came from South Africa, Kenya, and Uganda. The working group focused on the problem of persuading more African women to establish Internet connections. However, most of the women with access to e-

mail and the World Wide Web still tend to be members of the urban elite. (Rathgeber, 2000)

In order decrease the gender inequalities in KZN, therefore, there will have to be a move to increase the impact of women on technology and to increase the positive impact of technology on women. Research and Development in this area, in this regard, will need to focus on working with industry, academia, government and communities to involve women in defining and implementing technology. According to Borg (1999) most organizations that have an impact on information technology remain “culturally narrow” and predominantly male, and often portray the attitude that ‘elite’ technologists are the only individuals who have innovative ideas.

According to an Indian female software developer from a leading tertiary institution in KZN:

“ It’s been a long road to finding equality amongst the genders and the journey is not yet complete. If you look around you...white males dominate management positions, in IT as well as the rest of the corporate world. So we (‘black’ women) face a triple threat especially in KZN, being black and female and pursuing a career in IT, which we have been brought up to believe is a man’s domain... In the 21st century people still maintain that men are more analytical than women, are

more innovative and so on, so it's difficult. Everyone's competing, for the biggest piece of the IT pie...and the way you are viewed in this arena will determine whether you get that piece or not" (Interview, 2001)

As mentioned earlier, statistics measuring the number of women who work in IT are unavailable, but participants in the *Women in ICT Workshop* suggested the following on gender issues in South Africa (SAITIS, 2000):

- Gender issues are obscured by general black affirmative action
- The industry is dominated by white males with women earning less
- There are few women in leadership positions
- There are racial divisions with the emphasis on white women
- There are insufficient women graduates in IT and
- Rural woman have little or no access to IT

Gender analysis has indicated that women systematically face technological barriers that are different and often more severe than those which affect men. Since women are important or potentially important in SMMEs as entrepreneurs, managers, and members of the workforce, and as customers and suppliers, this technological difficulty faced by

the gender has grave consequences in terms of technological performance of SMMEs as well as equity.

Racial disparities in the IT sector along with gender inequalities, therefore, need to be adequately addressed. It can be argued that policies and practices aimed at redressing the issues discussed above will no doubt help reduce the skills shortages faced in KZN.

4.2.2 Lack of support for SMMEs

In the global market, barriers and protectionism have fallen and new competition from abroad as well as on the domestic level comes up every day. For most of the SMMEs this is a critical situation. In order to survive in this evolving business environment, the SMME's have to adapt and transform themselves into becoming much more prepared for competition. (Hinojosa-Barragán, 1999)

According to Hinojosa-Barragán (1999), a strong SMME sector is crucial in terms of the goods and services it provides to large enterprises and to informal, micro-enterprises. In developed countries informal micro-enterprises have been largely displaced, and it is suggested that this pattern will also occur in more advanced developing countries. On the other hand, in the developed countries large-scale enterprises increasingly are downsizing and depending on networks of SMMEs. It is suggested that a technologically strong SMME system in developing countries will also be necessary to develop, attract and

work with large enterprises. An SMME must bring together at each productive point people with the right technological knowledge, equipment with the right technological capabilities, and materials suitable for the purposes and the techniques to be applied. This is a difficult goal to achieve as technological performance must be sustained, and this can only be achieved through innovation. The individuals, equipment, facilities, and processes in the SMME must demonstrate sufficient technological knowledge to adapt technology to meet local circumstances and changes in local circumstances, and also to develop new technology.

In KZN there has been no support for up and coming IT firms. The large IT corporations don't have their head offices in KZN. According to Diana (2001), few companies are leveraging their advantages in competing within South Africa, taking advantage of the positional and logistical advantage of Durban and to be able to grow Durban's share of the South African economy as a whole. Head offices have migrated to Johannesburg. Presently there are only seven companies listed on the Johannesburg Securities Exchange who have their Head offices listed as being in Durban. Staff are 'flown' in for specific assignments, according to Helmut (Interview, 2001), the owner of Computer Magic. He states further that this lack of support for SMMEs has led to the failure of many small IT firms in the province. He cited the example of a black empowerment company that tendered for the International Convention Centre, and was signed up as a sub-contractor for IBM:

"IBM provided all the cabling for him ... the project takes five to six months, but in three months he ran out of money... lost everything ... IBM did not support him, he had to take care of his staff"

Greg Diana (Interview, 2001) states there are many successful IT firms that grew out of KZN but have now relocated, for example Conlog and Prism. He argues that once these firms reach a certain 'size', they relocate to where technology is needed and where there are appropriate skills to accommodate the growth of the firm.

" So they... absorb the capacity here and then they go to where the skills are, in Gauteng, because there are lots of universities and technikons ... there are some studies where our three Technikons together don't produce more graduates than one of the technikons in Jo'burg. So we (KZN) have more or less stagnated because they (IT firms) realize there's not a (skills) pool from our region "

(Diana, Interview: 2001)

According to Helmut (Interview: 2001), in order to remain in 'business', the company has had to start a training 'school' to teach basic computer skills to people, as they could not survive in the IT sector just by developing software. He argues further that marketing is a problem. SMMEs do not have the finances to market the software that they develop. Computer Magic has developed software that aid children in learning, but they do not have the resources to upgrade the product for the international market. Diana (Interview, 2001) argues that this is one of the main problems in the software development field.

“ A good example of the importance of an excellent marketing strategy was the old video recorders, you had VHS and you had Betamax. Betamax was a far superior technology, but it failed why? Because VHS marketing strategy got there first, so in actual fact a less superior technology made it. So it's not always the best idea that wins, it's how that persons idea now translates into the market”

(Diana, Interview: 2001)

According to Hinojosa-Barragán, (1999) Enterprise Incubators (especially for technology-based enterprises) are important in increasing the likelihood that entrepreneurs seeking to establish new technology-based enterprises will be successful. Incubators include training and technical assistance, finance and other inputs, which are coordinated among SMMEs that are geographically located close to each other.

The introduction of technological innovation at the enterprise level and the building of industrial clusters should be one of the main focus for policy-makers in this region by promoting training in the efficient use of technology and information networks. This is a very dynamic sector, and the pace of the technological progress is speeded-up by new information systems, advanced materials, new electronic media and other aspects which might change daily. It is essential to assimilate and manage knowledge that is presently so essential for succeeding if not surviving in international competition. (Hinojosa-Barragán, 1999)

Hinojosa-Barragán (1999), argues that thriving SMMEs in large numbers are a sign of a dynamic economy. Small-scale business is the market's research and development laboratory for new products and new ideas. SMMEs therefore have immense potential in developing countries, but their situation at present remains precarious. Governments must therefore do everything in their power to promote SMMEs in concrete ways. With the dismantling of the large state concerns, SMMEs will have a key role to play in restoring regions to economic health, growth and development at national and international level. (Hinojosa-Barragán, 1999)

In order for SMMEs in KZN to survive and thrive in this era of globalization, a supportive and enabling environment needs to be created. According to Figel (1997), this can be ensured by:

- Fostering innovation (at present there is not enough focus and attention on research and development in KZN which inhibits innovation);
- Promoting technology transfers and exchanges of experience between SMMEs and also between SMMEs and large firms, locally and at the national and international levels (in Hungary, for example, the government's industrial policy is designed to help SMMEs to work with large firms);

- Supporting the development of marketing services and better quality products in SMMEs.
- Setting up the infrastructure needed for SMMEs to grow and develop. This can be achieved by the formation of an IT cluster in KZN.

In accordance with this, Diana (Interview, 2001), argues that KZN does not only have the task of rectifying the skills shortage, but also supporting skilled IT professionals and SMMEs in KZN:

What's the point of producing graduates if you don't have support for them?

4.3 IT Clusters

Firms are attracted to communities and regions that can assist them in providing the key functions needed to bring their products or services to market speedily. This implies that IT firms will flourish in areas that provide the necessary support for growth and innovation. As stated in Chapter two, IT clusters promote and encourage innovation. A “cluster” can be defined as a group of inter-related organizations in a specific area that lend mutual support to each other, for example the Innovation Hub in Gauteng and Citi in Cape Town. (SAITIS News, 2000; Voyer and Roy, 1996)

Pricewaterhouse Coopers (PwC) have identified eight characteristics as being important to successful cluster development. These will be outlined along with a discussion of the potential of KZN to develop an IT cluster. These characteristics were determined through an investigation of the dynamics of more than 60 knowledge-based industrial clusters around the world (SAITIS News, 2000; Voyer and Roy, 1996; Quandt, 1997). The eight key characteristics include:

- Recognition of potential by local leaders – This alludes to the extent of recognition among political and business leaders in the region of the potential of IT sector development. This recognition, however, also has to be supported by concerted effort to realize the development.

In KZN, the Durban Unicity is engaging the help of business in bringing an end to the brain drain of graduates that undermines the economic regeneration programme being driven by the council. Deputy mayor Councillor Logie Naidoo stated that stemming the outflow of skilled people with tertiary qualifications, particularly in the IT field, was paramount to the city's long-term development aim of becoming a "digital region" (Parker, Daily News: 25/06/01). The Durban Unicity has recognised the fact that KZN lags behind Johannesburg and Cape Town in terms of the number of skilled IT professionals currently working in the region. They have also recognised that skilled IT graduates are leaving KZN to work elsewhere (Parker, Daily News: 25/06/01). Local leaders in KZN have therefore, recognised the need to develop the IT sector in this province.

- Support of local strengths and assets – This relates to aspects such as the number, size, and quality of educational and research institutions and major firms in the region, and the extent and quality of infrastructure (e.g. transportation), including IT infrastructure

The lead organization behind the proposed Innovation Support Centre in KZN is the University of Natal while ML Sultan Technikon will also be involved. Local and provincial government structures have also been approached to come on board. The projects to be undertaken are being conceptualised with the business partners of the consortium that plans to establish the technology hub. The consortium partners include UEC Technologies, the Durban-based Altech subsidiary that pioneered the development of digital satellite decoders, Intervid, the JSE listed digital imaging solutions group, and Azisa, the suppliers of internet commerce technology (Salgado, Sunday Tribune Business Report: 18/04/01). Following from the above, it is evident that KZN has the support of educational and research institutions, as well as major companies in the province, to successfully establish an IT support system such as the Innovation Support Centre.

- Influence of Champions – “Champions” are individuals, organizations or institutions that are recognised for their leadership abilities and their ability to mobilise support for the development of the IT sector.

Greg Diana, the project co-ordinator for the ISC, based at the University of Natal, initiated the process for the establishment of the ISC “...it was founded because I

had the interest to put in an application for it...with this IT hub that we're talking about we want to get the city, the tertiary institutions involved, why should the technikons and that increase their output fourfold if there's going to be no commitment to support it?" (Interview, 2001)

Brenda Gourley, former Vice-Chancellor of the University of Natal was also very supportive of the ISC and its links with the university. Greg Diana, therefore was an instrumental figure in mobilizing support for the ISC and the development of the IT sector in KZN.

- Entrepreneurial Drive – This is an innate ability, found in individuals, whether they are in growing firms or are part of the supporting organizations.

As stated earlier, there are many SMMEs in KZN that have the potential to be innovative leaders in IT, but are stifled by lack of support and desperately needed funding. The ISC, therefore, will be a crucial component in the development of the SMME sector in KZN, to promote the innovative and entrepreneurial drive within individuals and SMMEs.

- Various Sources of Financing – This includes a broad range of financing, for example, financing of vehicles for developed and developing companies, angel capital, venture capital and funding at the start-up phase.

The initial capital needed to start up the ISC was made available to Greg Diana and the team responsible for setting up the project. The ISC has been awarded R9 million, from the European Union, over a period of three years to establish the infrastructure for the centre.

- Information Networks – Where the focus is on the transfer of tacit knowledge, in events arranged by associations and so forth.

One of the main objectives of the ISC is to link SMMEs in the region with each other, in order to encourage a culture of information sharing between them.

- Educational and Research Institutions – These are necessary to produce skilled people and technological expertise within the region. There also needs to be strong links with industry in order to achieve success.

Eddie Moss, UEC's general manager for sales into Africa and the Middle East, says that the ISC has the potential to create a draw card for engineering expertise in KZN. *"You find a lot of people on the Reef who are resistant to moving here because they see it as a move out of the technology hub of South Africa. We feel that the innovation support centre will create a blueprint to attract them here"* (Moss in Salgado, Sunday Tribune Business Report, 18/04/01)

- Staying Power – Participants in the cluster must be prepared to remain until the cluster reaches full maturity.

Following from the above discussion of the characteristics of successful IT clusters, it can be argued that KZN has the potential to develop a flourishing IT innovation cluster. According to Grewan (2001), the cluster concept focuses on the linkages and interdependence between the players in the network of production when producing products and services and creating innovation. In other words, the concept of 'clustering' suggests that regional development and innovation potential can be closely linked. He argues further that the cluster concept can propel the central economic goal for a city, or a region, thereby attaining a high and rising standard of living for its citizens, which is reflected in a high per capita income and high paying, satisfying jobs for a large proportion of the labour market (Grewan, 2001).

The cluster concept represents a new way of thinking about the economy and is rapidly beginning to take hold as communities across the globe view the successes of Silicon Valley and Route 128. KZN's ability to produce high-value products and services that support high wage jobs depends on the establishment and strengthening of these regional hubs of innovation.

According to Guinet (2001), innovation is the driving force of economic growth, and the "cluster" is a key concept for understanding innovation processes and determining the best method to optimize them. It can be argued, therefore, that competitiveness and

growth in the knowledge-based economy are directly linked both to the development of local innovation capacity and connectivity to global resources. Clusters therefore are emerging as significant tools to promote regional development and foster the growth of SMMEs. In turn SMMEs, especially technology intensive ones, can activate and sustain economic growth and equitable development, strengthen university-industry-government co-operation, and promote technological innovation and regional competitiveness.

According to Diana (Interview, 2001), a Durban IT corporate can be created if business, government and tertiary institutions came together to cultivate a growing SMME sector and an environment that fosters innovation:

“... that’s exactly what the TATA Infotech group in Bangalore in India did. They got together and they formed a business park, and they had a whole lot of small companies around them, but they took the corporate responsibility. And that’s exactly what our vision is that we are trying to create... we are actually going to have to also as part of our mission get people to invest in new technology that will enable this centre to work, and if we don’t get that type of commitment and support, I may as well just take this money now and give it back to the EU, and so really that’s what the ISC is about... it’s there to support SMMEs to help them commercialize and optimize their technology. The big presumption about that is that you have SMMEs with technology to commercialise and optimize, and we don’t have that, so we need to encourage innovation, and the ISC is the key.”

The cluster will benefit from its complex web of interactions because innovation rarely happens in isolation. The cluster improves innovative capability by reducing uncertainty through information sharing and screening (Camagni, 1995).

An organization's ability to generate knowledge is strongly linked to its interaction with related firms in a process of collective learning. According to Stafford Taylor, a product manager for small IT firm in Durban (Interview, 2001),

“ I think that a company that will be able to generate innovation is one that has a supply of research, and knowledge that can only come from experience, skilled people and infrastructure to support innovation, such as the Innovation Support Centre that you were describing...the links to other small firms are also crucial as they provide a channel for knowledge accumulation that will stimulate innovation... ”

Diana (Interview, 2001) states that the proposed Innovation Support Centre, to be established in KZN, aims to encourage small businesses to work towards developing new technologies in order to stimulate economic growth:

“ ... the only scope for real growth and opportunity is in creating new industries around IT... but before you can support small companies they have to already have something...you can read academically about innovation, knowledge management, all these things, but the people writing these things are in

technological environments which support it (innovation) ... look around the globe and you can see where the growth is, Silicon Valley, Ireland, etc. etc.. They are the areas that are technologically rich. You can't sit back and become an innovator, you got to be involved and understand how things work to come up with solutions. That's what innovation is about, it's not invention, it's innovation. E-commerce can't solve your problems, people solve your problems..."
(Interview, 2001)

Following from the above discussion, it can be argued that once the Innovation Support Centre is established, KZN will exhibit characteristics which resemble that of a modern technological district as explicated in chapter two. One of its characteristics includes geographically concentrated networks that have connections with other firms in the district (Harrison, 1993). The aim of the ISC is to link SMMEs in the region in order to encourage a culture of innovation and information sharing. According to Schmitz (1992), a distinct advantage of technological districts is that they may not only facilitate regional growth, but also innovation and high employment standards. This is in keeping with the central objectives of the ISC.

4.4 Conclusion

This chapter has discussed the findings of the interviews that have been conducted, together with various other research sources, used to explicate the themes that were brought to the fore. Following from the above discussion of the results, it is evident, that

the critical IT skills shortage in KZN not only contributes to the deterioration of the economy, but also constrains new ventures and economic expansion. KZN therefore, is unable to compete effectively in the global economy as the labour market is finding it difficult to supply skilled IT workers to meet the increasing demand. In addition to this tertiary institutions in KZN are producing a low supply of IT graduates in comparison to tertiary institutions in Gauteng and the Western Cape, this hampers innovation initiatives in the province. It has been discovered that in order for KZN to be competitive and innovative, it has to increase its IT skills output.

It has also been revealed that *innovation* is the key to a dynamic and successful IT sector in KZN. Innovation will not only contribute to the success of SMMEs, but also attract and retain skilled IT professionals and graduates in KZN. The examples of CITI in the Western Cape, and the Innovation Hub in Gauteng, serve to substantiate Castells (1999), theory that a technological milieu of innovation will attract and retain skilled workers. In Gauteng and the Western Cape, it is this combination of academia, labour, industry, and the corporate sector, that is offering support and fostering innovation and the development of the IT sector. This has resulted in the skilled IT workforce from around the country migrating to these regions, where a culture of support and innovation has been established.

The various examples of the successful IT firms presented in this chapter, such as Intervid and IOCORE-Southern Focus have revealed that Research and Development and Innovation, are the key factors determining whether or not skilled professionals will

remain in KZN. Intervid has become a leading digital imaging company both locally and internationally, due to its commitment to R&D and the creation of innovative products. Those IT professionals that have chosen to remain in KZN, therefore, are in areas of IT and in organizations that support innovation and the growth and development of the IT sector.

It has been argued that the establishment of an *innovation cluster* can achieve an environment that nurtures innovation in the province. The establishment of the Innovation Support Centre in KZN, therefore, can be regarded as a significant tool to promote regional development, and foster innovation and the growth and development of a successful SMME sector in the province, which will in turn contribute to the retention of the skilled IT workforce in KZN.

CHAPTER 5

CONCLUSION

The purpose of this research is to explore the dynamics of global pressures, links and opportunities, flowing from a democratic South Africa's integration into a world community. In this case study, the factors that encourage the retention of skilled IT professionals and graduates in KZN were investigated, to explore the reasons why despite opportunities for global advancement in the IT sector, skilled individuals choose to remain in localities that are assumed to be "skill-exporting" areas. As stated in Chapter Three, the limited time that I was afforded to engage with the field, allowed me to provide a baseline scan of the information available at that point in time, nevertheless, I would be remiss if I failed to mention certain policy implications that have arisen as a result of this research. These implications together with a summary of the research findings will be discussed below.

The scope of digital technology, and the transformation to a knowledge-based economy have created an increasing demand for workers highly skilled in IT. The demand for workers who can create, apply and use IT goes beyond computer and software industries, cutting across the manufacturing services, transport, health care, education and government. South African employers face tough competition from around the world in a tight global IT labour pool. SA must rely on retaining and updating skills of IT workers as well as educating and training new workers. (www.ta.doc.gov/report).

To participate effectively in the IT sector, KZN must ensure the development of skills that are equivalent to or exceed world standards. This will mean improvement to existing educational and training capabilities as well as preparing its population to participate broadly in the Information Society and to be productive member of the IT sector. There is also a dire need to counter the outflow of skilled IT workers from KZN. Emigration now accounts for 13% of executive turnover with half of the professionals leaving for more lucrative employment opportunities. Most South Africans appear to be heading for the United Kingdom, approximately 30%, with 23% opting for the USA (Maggs, 2001). It is evident that South Africa needs to awaken to the harsh reality of the emigration crises and its consequences.

It has been discovered that KZN must make a firm commitment to developing its skilled IT workforce and begin the process of human resources development. This can be achieved by (SAITIS Studies, 2000):

- Building on the existing education and training system to rapidly develop the required skilled IT workforce
- Work with the education and training institutions to more closely link outputs of these institutions to the IT needs on the province, particularly the needs of business and government
- Engage the labour movement in proactive development of the IT sector in a broad and substantive manner.

In a knowledge-based economy, it is imperative to focus not only on the “learning market” and learning systems, but also on the business sector and labour market, because the right skills are needed to continuously drive companies and help develop the economy. The needs to be a collective responsibility among government, business, labour, education and training providers for delivering education and training at all levels i.e. formal, informal, and on-the-job (SAITIS, 2000).

According to the SAITIS Studies (2000), during the industrial era, educators collectively tried to meet the needs of children and young adults, and paid inadequate attention to disadvantaged groups and the workforce of that time. In South Africa, and KZN, the educational system was further stunted by the vast inconsistency in the availability of teaching skills and job opportunities for women and the black, coloured and asian communities.

This research has revealed that if women are to participate completely in the IT revolution, then greater efforts must be made to ensure that females become involved in Science and Technology (S&T) at an early age. Moreover, although male scientists still dominate, a few women are starting to be visible in S&T in KZN. However, they are more common in the biological and biophysical sciences, such as medicine and food technology, than in engineering, electronics, or information science.

This situation is not unique to South Africa and KZN. United Kingdom statistics show that the number of women entering university computer-science courses fell from 24% in 1979 to less than 10% in 1989 (Kirkup 1992). However, with the

recognition of the growing importance of information technology during the 1980s, secondary and even primary schools in the industrialized countries have increasingly exposed students to computers, and information technology has become part of the curriculum. KZN educational systems will have to change at all levels to ensure the needed skills base for a broader use of computers and information technologies in all aspects of life. Both men and women will need to acquire various new skills in participatory networking, information sharing, and facilitating the design, implementation, and maintenance of new communication networks. (Crede and Mansell, 1998)

This research has discovered that if KZN is to compete effectively in the global arena and be economically stable, then a learning environment that nurtures development and the acquisition of relevant skills required to succeed in the knowledge-based economy, needs to be created.

This study has also revealed that a strong culture of innovation is imperative in order to retain skilled IT professionals, and to encourage the growth and development of the SMME sector in this province. The Innovation Hub in Gauteng and CITI in the Western Cape, have shown that offering support and fostering innovation in the region has resulted in the skilled IT workforce from around the country migrating to these regions, where a culture of innovation and support for SMMEs has been established. This has substantiated Castells (1999) theory that a milieu of innovation attracts and retains skilled workers. The various examples of the successful IT firms presented in the Chapter Four, such as Intervid and IOCORE-Southern Focus have

revealed that Research and Development and Innovation, are the key factors that encourage skilled IT workers to remain in KZN.

It has also been discovered that:

- SMME's can play a pivotal role in initiating and sustaining economic growth and equitable development in KZN
- The formation of technology-intensive organizations is vital in order to develop local capabilities and to compete effectively in the global economy. They are also necessary to reinforce the relationship between academia, industry, and government and to encourage technological innovation.
- The potential of KZN to develop a successful IT sector can be significantly improved by employing a "cluster based approach" to attend to its development needs. As has been argued, one of the main features of the 'Information Age' is global competition. Seemingly well-established local markets have had their foundations shaken by global competitors. The research has shown that in order to develop a strong IT sector, therefore, innovation and cooperation between government, business, academia, and labour are greatly required.

This is what Castells (1999) refers to as the 'milieu of innovation'. According to Camagni (1995), it is increasingly acknowledged that the driving force of national economic performance are sub-national technology districts. These innovative regions

are characterized by strong links between firms institutional structures committed to the technological and economic advancement of the region.

As has been discussed Gauteng and the Western Cape have established such initiatives that are grounded in the current theory and practice of cluster development. It was recognised in these areas that the 'brain drain' of IT professionals from South Africa was a severe and growing concern for the economic development of the country. The Cape IT Initiative (CITI), launched in the Western Cape facilitates initiatives to develop the IT industry through business incubation, provision of venture capital, IT education, industry research and marketing, and networking of individuals and organizations (SAITIS Baseline Studies, 2000). It has been argued that CITI is well on its way to becoming a model for other regional high tech cluster initiatives in South Africa. Similarly in Gauteng, an Innovation Hub was established. According to the Gauteng Provincial Government, the Innovation Hub is essential to the development of high technology businesses and the growth of high-tech opportunities for SMMEs within the Gauteng economy.

KZN however has lagged behind Gauteng and the Western Cape, in terms of IT sector development, the retention of the skilled IT workforce, and the output of IT diplomates and graduates from tertiary institutions. It is for this reason that the Innovation Support Centre was conceived of in KZN. The Innovation Support Centre is in the process of being established. The ISC has been projected as the Information Technology Hub of KZN whose aim is to support SMMEs, foster technological innovation and encourage the production of skilled professionals. This study has

revealed that KZN has remarkable potential to develop a thriving IT innovation cluster.

It has been revealed that **innovation** is the key to a dynamic and successful IT sector in KZN. Innovation will not only contribute to the success of SMMEs, but also attract and retain skilled IT professionals and graduates in KZN. The ISC, therefore, can be regarded as a significant tool to promote regional development, and foster innovation and the growth and development of a successful SMME sector in the province.

This dissertation has presented a baseline scan of the IT sector and the information available at the time the research was conducted. I trust that this study will form the basis for further and more in depth research into the IT sector and the factors that encourage the retention of the skilled IT workforce in KwaZulu Natal.

REFERENCES

Alavi, M and Carlson, P (1992) 'A Review of MIS Research and Disciplinary Development', in **Journal of Management Information Systems**

Babbie, E and Mouton, J (2001) **The Practice of Social Research**. Oxford University Press: Oxford.

Barnett, R J and Cavanagh, J (1994) **Global Dreams**. Simon and Shuster: New York.

Beck, U (2000) **What is Globalization?**, London

Bishop, G (1994) **Health Psychology**. Allyn and Bacon: Singapore.

Bogdan, R C and Biklen, S K (1982) **Qualitative Research for Education: An Introduction to Theory and Methods**. Allyn and Bacon: Boston

Bretherton, L (1998) 'US Visa Bonanza to Aid SA Brain Drain', in **ITWEB**, 25 September, 2001.

Cairncross, F (1997) **The Death of Distance**. Orion Publishing: London.

Camagni, R (1995) "Global network and local milieu: towards a theory of economic space" in: Conti, Sergio, E. Malecki and P. Oinas (eds), **The Industrial Enterprise and Its Environment: Spatial Perspectives**, pp.195-214. Aldershot: Avebury

Castells, M (1996) **The Rise of the Network Society**. Blackwell Publishers: Massachusetts.

Castells, M (1998) **End of Millennium**. Blackwell Publishers: Oxford.

Castells, M (1998) **Information Technology, Globalization and Social Development**. Paper prepared for the UNRISD Conference on Information Technologies and Social Development, Palais des Nations, Geneva, 22-24 June 1998.

Crede, A and Mansell, R (1998) **Knowledge Societies ... in a Nutshell**. International Development Research Centre, Ottawa, ON, Canada.

Crevoisier, O and Maillat, D (1991) 'Milieu, Industrial Organization and Territorial Production System: Towards a New Theory of Spatial Development' in Camagni, R (ed.), **Innovation Networks: Spatial Perspectives**. Belhaven Press: London.

Denscombe, M (1998) **The Good Research Guide**. Open University Press: Buckingham.

Denzin, N and Y Lincoln (1994) **Handbook of Qualitative Research**. Sage: London.

Department of Arts, Culture, Science and Technology (1997) **White Paper on Science and Technology**.

Department of Arts, Culture, Science and Technology (1999) **Technology for SMME Programme – Call for an Expression of Interest.**

Diana, G (2001) Presentation - Innovation Support Centre, 01/08/01

Figel, J (1997) ‘Promoting small and medium-sized enterprises in central and Eastern Europe’ in *Pour débat à la Commission Permanente* - Voir article 47 du Règlement

Giddens, A (1990) **The Consequences of Modernity.** Polity Press: Cambridge

Grewan, R (2001) “ICT Clusters” in **Saitis News**, May 2001

Guinet, J (2001) **Boosting Innovation: The Cluster Approach**, International Workshop on Innovation Clusters and Interregional Competition, Kiel Institute of World Economics, 12 – 13 November 2001

Harrison, B (1993) ‘Industrial Districts: Old Wine in New Bottles?’ in Ebel, R D (series ed.) and Norton, R D (volume ed.), **Research in Urban Economies - Structuring Direct Aid: People Versus Places**, Volume 9. JAI Press: Greenwich.

Held, D; McGrew, A; Goldblatt, D and Perraton, J (1999) **Global Transformations – Politics, Economics and Culture.** Stanford University Press: California.

Herbert, R (2001) ‘Brain Drain’, in **Business in Africa**, October 2001.

Hodge, J and Miller, J (1997) **The State-of-the-Art and Implications for National IT Policy** – Working Paper No. 3, Development Policy Research Unit: University of Cape Town.

Hutton, W and Giddens, A (2000) **Global Capitalism**, London

Isaacs, S (1997) **South Africa in the Global Economy: Understanding the Challenges - Working Towards Alternatives**. TURP (University of Natal): Durban

Jones, S (2001) ‘Southern Focus IT Portal Open Many Sluices’ in **Business Report**, 28 January 2001.

Kaplan, B. and Maxwell, J.A (1994) ‘Qualitative Research Methods for Evaluating Computer Information Systems’, in Anderson J G; Aydin C E and Jay S J (eds.) **Evaluating Health Care Information Systems: Methods and Applications**. Sage: CA.

Kirkup, G (1992) The social construction of computers: hammers or harpsichords? in Kirkup, G and Keller, L S (eds.) **Inventing Women: Science, Technology and Gender**. Polity Press: Open University, Cambridge, UK. pp. 267–281.

Keller, S L (1992) 'Discovering and Doing: Science and Technology: An Introduction' in Kirkup, G and Keller, L S (eds.) **Inventing Women: Science, Technology and Gender**. Polity Press: Open University, Cambridge, UK.

Leedy, P (1997) **Practical Research Planning and Design**, (6th edition). Prentice Hall: New Jersey.

Lincoln, Y S and Guba, E G (1985) **Naturalistic Inquiry**. Sage Publications: Beverly Hills

Lofland, J and Lofland, L H (1984) **Analyzing Social Settings**. Wadsworth Publishing Company, Inc: Belmont

Maggs, J (2001) 'Pressure on – the secret backroom boys' in **Upfront** October 2001.

Martins, J H (1996) **Global Population Growth and Structural Changes in the Republic of South Africa population, 1951-2011**. University of South Africa.

McDonogh, F (2001) 'Dimension Data address IT skills shortage' in **Enterprise**, October 2001

Mowlana, H (1997) **Global Information and World Communication**. London: Sage Publications

Neuman, W (1997) **Social Research Methods**. Allyn and Bacon: London

Orlikowski, W J and Baroudi, J J (1991) 'Studying Information Technology in Organizations: Research Approaches and Assumptions', in **Information Systems Research**, Volume 2.

Parker, D (2001) "Digital growth targeted – City positions itself to become high-tech hub" in **Daily News**, 25/06/01

Patton, M Q (1990) **Qualitative Evaluation and Research Methods** (2nd ed.). Sage Publications: Newbury Park

Rathgeber, E (1995) 'Schooling for What? Education and Career Opportunities for Women in Science, Technology and Engineering', in United Nations Commission on Science and Technology for Development Gender Working Group (ed.), **Missing Links: Gender Equity in Science and Technology for Development**. International Development Research Centre: Ottawa.

Roberts, J (2000) **From Modernization to Globalization**. Oxford

Robson, C (1993) **Real World Research**. Blackwell: Oxford.

Rosenberg, N and Nelson, R R (1996) 'The Roles of Universities in the Advance of Industrial Technologies' in Rosenbloom, R S and Spencer, W J (eds.) **Engines of Innovation – U.S. Industrial Research At The End Of An Era**. Harvard Business School Press: Boston.

Sabel, C F (1989) 'Flexible Specialisation and the Re-emergence of Regional Economies' in Hirst, P and Zeitlin, J (eds.), **Reversing Industrial Decline? Industrial Structure and Policy in Britain and Her Competitors**. Berg: New York.

SAITIS (2000) **Executive Summary: A Survey of the IT Industry and Related Jobs and Skills in South Africa**. www.saitis.co.za

Salgado, I (2001) "Durban develops support center for SMMEs" in **Sunday Tribune Business Report**, 18/04/01

Schatzman, L and Strauss, A L (1973) **Field research**. Prentice-Hall: Englewood Cliffs

Schmitz, H (1992) 'Industrial Districts: Model and Reality in Baden-Wurttemberg, Germany' in Pyke, F and Sengenberger, W (eds.), **Industrial Districts and Local Economic Regeneration**. International Institute for Labour Studies: Geneva.

Simpson, M and Tuson, J (1995) **Using Observations in Small-Scale Research: A Beginner's Guide**. Edinburgh: Scottish Council for Research in Education.

Sitas, A and Collett, G (2000) **KZN ICT Sector: Dynamics and Trends**. University of Natal – Durban.

Smith, J K and Heshusius, L (1986) 'Closing down the conversation: The end of the quantitative-qualitative debate among educational inquirers'. **Educational Researcher**.

Sours, J S (1997) **A Descriptive Analysis of Technical Education Learning Styles**. University of Arkansas: Unpublished Doctoral Dissertation.

South African ICT Sector Development Framework, **SAITIS**, 2000

Stake, R E (1978) 'The case study method in social inquiry'. **Educational Researcher**.

Stallings, W M (1995) 'Confessions of a quantitative educational researcher trying to teach qualitative research'. **Educational Researcher**

Standing, G (1999) **Global Labour Flexibility – Seeking Distributive Justice**. Macmillan Press: Hampshire.

Storper, M (1997). **The Regional World: Territorial Development in a Global Economy**. The Guilford Press: New York.

Strauss, A and Corbin, J (1990). **Basics of qualitative research: Grounded theory procedures and techniques**. Sage Publications: Newbury Park

Van Dijk, J (1999) **The Network Society: Social Aspects of New Media**, Sage Publications: London

Yin, R K (1994) **Case Study Research, Design and Methods** (2nd ed.), Sage Publications: Newbury Park.

Websites

Borg, A (1999) 'Models for Innovation Bring Women to the Table'.
http://www.cra.org/CRN/html/9903/expanding/ab.2_2_t.shtml [01/05/01]

Daly, J.A 'Improving Technology Performance in Small and Medium Enterprises' (www.worldbank.org) [05/08/01]

Designing Surveys and Questionnaires' (www.statpac.com/surveys/index) [17/09/01]

Hinojosa-Barragán, V. M (1999) Globalisation, SMEs upgrading and UNIDO Support
<http://www.fes.de/fulltext/bueros/botswana/00554001.htm> [14/08/01]

‘Information Technology’ www.citi.org [12/11/01]

IOCORE in black empowerment venture with Southern Focus, Issued by PR People,
Johannesburg, 25 May 2001, www.itweb.co.za/office/iocore [23/07/01]

‘Iocore Southern Focus provides SAP HR solution to Petronet’, 31 May 2001.
www.southernfocus.co.za [23/07/01]

Microsoft Corporation Case Studies (2001) ‘Microsoft training leads to real
employment’, (www.microsoft.com/southafrica/casestudies) [22/11/01]

National Commission on Higher Education (1996) ‘Working Group on Libraries and
Information Technology’.(www.hsra.ac.za) [11/06/01]

Office of Technology Policy (2000) ‘America’s New Deficit: The Shortage of
Information Technology Workers’ www.ta.doc.gov/reports/itsw [10/07/01]

‘Racism Still Lingers in South Africa’. english.peopledaily.com.cn [12/08/01]

Rathgeber E M (2000) Women, Men, and ICTs in Africa: Why Gender is an Issue. International Development Research Centre (www.idrc.ca/books/focus) [16/10/01]

'Spanning the Digital Divide: Understanding and Tackling the Issues', 21 June, 2001. <http://www.bridges.org/spanning/report.html> [17/08/01]

Steenkamp, W (2000) **Brain Drain Reaching Mind-Bending Proportions.** www.iol.co.za [16/03/01]

www.globalpolicy.org [12/11/01]

www.innovationhub.co.za/about/partners/gpg2 [16/10/01]

www.intervid.co.za [15/05/01]

Warnick, J.E "Industrial Districts and Innovation Milieux: Two explanations for the occurrence of regional change and regional growth" in www.pitt.edu [10/04/01]

Articles

‘Accelerating ICT Cluster Development’ **SAITIS News**, Volume 1, No 3: Spring 2000.

‘A failed legacy set to change’ in **Skilling SA**, February 2001

‘South African Mission to the European Union’ in **Science and Technology Bulletin**:
1999

APPENDIX A

INTERVIEW SCHEDULE

1. What is your role in this company/organization?
 - 1.1 What duties do you perform in your current position?
 - 1.2 What particular skills do you possess that are relevant to your current job?
 - 1.3 What skills/abilities do you possess that are not being utilized by the current market?
2. What are some of the frustrations and limitations that you have encountered in the IT sector as a whole?
 - 2.1 What are the limitations, problems and constraints that you are confronted with at your firm presently?
3. What, in your opinion, would be your firm's unique contribution to the growth and development of the a) IT sector and
b) the economy as a whole?
4. With regard to the IT sector in general, and your area of expertise in particular, what global networks have you established?
5. In terms of the duties that you perform presently, and your area/s of expertise, where in your opinion does the competition lie?
6. What are your views on the calibre/quality of IT skills and skilled IT professionals in South Africa?
 - 6.1 What in your opinion are the skills that are essential in this industry?
 - 6.2 What are your views on the kinds of skills necessary for the type of work that you perform?
7. What are some of your organization's noteworthy innovations?
8. Can you describe the way you organize work in terms of who's responsible for a particular job, for example are there hierarchies in terms of competence and so forth?
9. What policy changes do you think are necessary for the growth and development of the IT sector in South Africa?
10. What would make you leave KZN?
11. What keeps you here?