CHAPTER FIVE

INFORMATION TECHNOLOGY AS AN IMPERATIVE FOR SECURING DEMOCRACY IN SOUTH AFRICA

Introduction

The turn of the century has seen many nation states transcending to post-Fordist societies. Information technology (IT) particularly has been diffusing to large numbers of nations all over the world and is now cutting edge of socio-economic development. It has come to be seen not only as a developmental issue in itself, but also as a necessary component of all other developmental programmes.

The ominous characteristic of modern information technology threats to democracy is that they change the proverbial convention of national security embedded in democratic political systems. National security no longer refers simply to the conduct of wars among nations, but rather to the protection of its citizens, interests and property from outside threats of any kind, thus the protection of democracy.

Technology, as in other areas, is a double-edged sword. While it greatly empowers those who would or might threaten South Africa, it also empowers South Africa in the effort to defend itself and harm its opponents. For instance, while technological advances may put missile technology in the hands of rogue states, they may also enable South Africa to defend itself against missile attacks.

There is a need to maintain a balance between threat and opportunity. The nature of threats to South African security and the available means to contend with them are changing with lightning speed, and it is vital to remain conscious of these changes and their implications.

The South African democratic political system no longer views national security as predominantly a military and police problem but rather as incorporating political,

economic, social and environmental concerns. Of paramount concern is the security of its people. Security is thus an all-encompassing condition in which individual citizens live in freedom, peace and safety, where society participates fully in the process of governance and enjoys the protection of fundamental rights; have access to resources and the basic necessities of life; and inhabit an environment that is not detrimental to their health and wellbeing. The objectives of security policy therefore encompass the consolidation of democracy and political stability. Stability and development are regarded as inextricably linked and mutually reinforcing. (White Paper on Defence, 1996).

The development of technology has been inextricably linked to national security concerns. Nations' efforts to arm and defend themselves against others have often driven them to engage in scientific research and development, in the hope of making use of the resulting technologies. Computers were first used to direct artillery shells against moving targets. The Internet was created by the Pentagon to safeguard vital communication in case of nuclear attack. Advances in most forms of technology have been carried out in the name of national defence.

The genie of technology is difficult to contain once released, and others can soon turn advances made by a nation against it in their own defence. A country may, for instance, create the atomic bomb as deterrent, but other countries may copy its efforts, thus threatening its security. The Americans, for instance, created the Internet but must now face the possibility that rogue states or even individuals could use it against them.

The expansions in personal electronic media along with the exploitation of computer-telecommunications convergence have paved the way for the creation of a worldwide web of networked computers. Expansion of cyberspace into virtually all spheres of human activity and the growing number of Internet users worldwide exacerbated the concept of information technology, which has changed the world. The nature of these changes is, however, contentious with conflicting explanations of the impact of the information technology revolution and the relationship between technology and national security, which invariably underlie the character of threats and vulnerabilities in a democratic society. In this respect it is deserving to review the nature and character of national security as presented by the challenges in information

technology. Given the national security aspects and its relationship with information technology, it is imperative to note that, other things being equal, democracy is usually prevalent where threats and vulnerabilities are minimal. This study investigates and departs from a self-constructed hypothesis that advance in information technology may enhance political stability in a democratic political system, and that where stability is maintained, threats and vulnerabilities are minimised and thus consequently a perennial national security can be enhanced. Therefore the absence of threats and vulnerabilities also reduces the high level of insecurity in a democratic political system.

The nature and scope of information technology[2]

Information technology (IT) is the term that describes the disciplines encompassing systems analysis, programming, telecommunications and multimedia (combining audio, text and video information) applications. It came into common use in the late 1980s, supplanting other terms such as electronic data processing, management information system, information resources management, data communication, etc. (http://govt.ghana.gov.gh/story.asp?ID=68.02/07/19). The term could also be credited to former US Vice President Al Gore, who coined the phrase in the early 1990s as a piece of political rhetoric to capture the imagination of the US electorate. (Tsagarousianou, Tambini and Bryan, 1998). Information technology is the concept that is generally used to refer to the use of computer, electronics, and telecommunications equipment for processing and distributing information in a digital form. Martin describes it as the acquisition, processing, storage, dissemination and use of vocal, pictorial, textual and numerical information by a microelectronics-based combination of computing and telecommunication. (Martin, 1988).

Information technology is deeply seated in computing, telecommunications and microelectronics technologies and its distribution from the Worldwide Web network, from individual to industry services, which includes television broadcast and electronic mail service. According to the United States Commission on National

2 The terms information technology (IT) and information and communication technology (ICT) are inextricably bound and are used interchangeably in most literature resources. However for the purpose of consistency in this study, the term IT will be used throughout, unless otherwise specified.

Security in the 21st Century, the entire world will be linked by 2025, so that from any stationary or mobile station it will be physically possible to send and receive near-instantaneous voice, video and other serial electronic signals to any other stations. (USCNS, 1999).

To have a comprehensive approach as to how these technological capacities could have an influence on national security, it is important to perhaps outline developments in these areas, i.e. information, communication and technologies (ICT).

The development of ICT has undergone several stages, encompassing to capture, store, process, transport and display information. Eventual constraints upon the distance, speed, volume and reliability of information handling have progressively been reduced. The current stage in the development of information and communication technologies is marked by the substitution of more powerful, reliable and flexible digital systems. The technical foundations of this process lie in the innovation of a common language of microelectronics for both computing and, later, telecommunications. (Schiller and Fregoso, 1991). With the development of digital switches and digital transmission facilities came the transition from analogue to digital networks. The process accelerated, and by the late 1980s most of the office telephone switches in the advanced industrial market economies had been digitised.

Information and communication technologies (ICTs) encompass all those technologies that enable the handling of information and facilitate different forms of communication among human actors, between human beings and electronic systems, and among electronic systems.

There is the general view held by many scholars that the basis for the current information revolution has been the advent of the radio or television, or even computers. However, the basis was the magnitude of transformation of the microchip, and its impact of microelectronics on computers and on telecommunication devices has been compact, cheap, reliable and disposable (Martin 1988). Microelectronics has been the basis for the developments both in computing and in telecommunications. Bankes and Builder (1992) maintain that it was the developments in solid-state electronics that brought all of these devices, i.e. telegraph,

telephone, radio, television, and electronic computers, into practical form that could be mass-produced and distributed to individuals throughout the world.
The developments in information and communication technologies did not occur separately from one another. Digitisation meant that all the media became translatable into each other (Brand in Saxby 1990) and this has been fundamental to the information revolution. Convergence, that is the ease of interaction between information and communication technologies, occurs at different levels and in different directions. Martin (1988) asserts that convergence is not only the marriage of two technologies but also the erosion of functional barriers as between data processing and communications as well as the vertical integration of industries. As voice (traditionally the terrain of telecommunications), data (computing), text (publishing and library services) and video (broadcasting) are translatable into one another, service suppliers become more interrelated. (Cowie 1989).

The information technology is not only about developing the broader scope for ICT but the fact that it has been diffusible to societies. The scope of information and communication media that are available for personal use and to an extent controllable by individuals, has expanded tremendously from TV sets and citizen band radios in the 1940s to desktop and laptop computers, personal fax machines, handheld video cameras, cellular telephones, cable television and satellite uplinks in the 1990s. (Ganley 1991).

These expansions in personal electronic media along with the exploitation of computer-telecommunications convergence have paved the way for the creation of a worldwide web of networked computers. In the late 1960s the US Department of Defence embarked on a research project that would be the precursor of the Internet, as it is known today. A decentralised computer network was established to link several research sites, universities and other institutions conducting experiments to maintain military communication in the event of a nuclear attack. Because the Internet was never linked to any critical military application or system and was burdened with security classifications, black budgets, or secret technical specifications, Chapman (in Pretorius, 2001) suggests that it is precisely the research character of the Internet that explains why it was so easily absorbed by the civilian sector and commercial enterprises.

The spread of modems and networked computing in 1990 brought the Internet to average citizens and commercial enterprises. A wide range of interactions became possible in cyberspace, such as browsing information stored on other computers and searching databases, exchanging electronic mail, participating in discussion groups on a multitude of topics, and increasingly engaging in e-business. (Kitchin, 1998). Expansion of cyberspace into virtually all spheres of human activity and the growing number of Internet users worldwide exacerbated the concept of information revolution that has changed the world.

The information technology (IT) sector is unique because it represents a scientific discipline and industry in its own right, as well as cutting across all other sectors. Even a cursory glance at the other sectors reveals the all-pervasive role of IT at the close of the 20th century. The IT sector is also unique in its pace of change and the rapid convergence of 'traditionally' distinct areas of human endeavour - broadcasting, print media and telecommunications. Indeed, it is almost impossible to construct a definition of IT that will last longer than about six months. The boundaries shift continually. While other manufacturers and energy suppliers are presently the largest global corporate players, new IT conglomerates are challenging this position. (Hamelink, 1997).

The nature of these changes is contentious however. Conflicting explanations of the impact of the information technology revolution can be traced to different theoretical approaches towards the relationship between technology and national security, which invariably underlie the character of threats and vulnerabilities in a democratic society. The democratic South Africa cannot be discounted from developments in information and communication technologies that did not occur separately from one another. The country’s exposure to this digitisation means it is also party to fundamentals in the information technology.

Information technology in South Africa

The South African democratic political system operates in very challenging circumstances as a result of dynamic social, economic and technological developments. One of the challenges it faces is the challenge of advances in information technology that can expand or impede democracy. Information technology can make it easier for people to follow up on bureaucratic decisions, party politics, economic policies, welfare agenda, legislation, etc., to express their will and keep check and balances on the government, and can also mobilise and rally support for specific interest. ICT can make policy-making a more participatory approach. Numerous failures of democracy in some African states have been cited as being directly linked to the inability of some African parliamentary democracies to generate enduring popular support among their populace, which is seen as incomprehensible and distant. (Lyons and Lyons, 1999).

The technology as panacea approach misses key elements of the circumstances facing some African states. A case presented in this regard is the World Bank's effort in which US$6,5m has been spent since 1995 on establishing a long-distance learning capacity that will obviate the need for local teachers, libraries, and even paper. Yet an established fact is that the sporadic delivery of electricity power in (South) Africa creates obstacles to the Internet's reliability and utility. (Alden, 2001).

In order to have a clear focus on the South African environment it is also important to have a global overview of ICT circumstances that influence the socio-economic and political perspectives that are a potential for the conflict.

The nature of global conflict has changed during the past century. The bloody battles of the First and Second World Wars were followed by the Cold War in which the tensions shifted from a military to a political nature. A more recent shift is that the world is currently embroiled in a global economic battle. One of its consequences is that economic security will become an increasingly important part of national security. (Pistorius, 2001). Economic changes also affect productivity output as influenced by advances in information technology.

The new mode of production, which is centred around information technology and instantaneous worldwide electronic communication, has become dominant in the era

of multinational capitalism. (Louw, 1994). South Africa took interest in strengthening its information and communications capabilities. It is understood that the technologies that had lifted the advanced industrial countries to exceptional economic and material wealth could be used to accomplish the same results in South Africa as an emerging economy.

Perspective on information technology and democratisation

Looking at the accounts and lessons from other spheres it is interesting to note that most developing countries' policies were concerned with the availability of technological products, rather than with the more complex problems of the associated political, economic and cultural integration of such products. In South Africa a different approach was followed, and ample attention was given to meeting the infrastructure needs for an industrious adaptation of technology. Policies regarding technology choice were identified, as well as problems in implementation, as the democratic nature often requires over-stretched public consultation on alternatives.

Policy-making was characterised by an emphasis more on the national system of innovation as a framework of policy and policies set out in the White Paper than on the promotion of effective distribution of available knowledge as a critical function in this context. (White Paper on Science and Technology, 1996).

Another critical issue to draw from developing countries is that in these countries, where mostly the transferred technology increased considerably in volume such that it usually consisted of end-products rather than of technology as such, much of the transfer took place as intra-firm movements, that the conditions under which transfer took place were often disadvantageous, and that much of the technology was inappropriate, obsolete, over-priced, or all of these together. (Hamelink, 1997).

The introduction of IT, such as telephony, television and satellite communications, in developing countries, began to show a specific pattern of social benefits in the 1970s. Various studies suggested that the primary beneficiaries were the companies that provided the equipment, like the telephone companies, banking consortia providing the financial resources, and local administrative leaders who used the new technology.

Often unforeseen negative secondary effects occurred, such as serious balance of payment problems associated with the capital intensity of the new technologies. (Clippinger, 1976). In the same period employment and economic growth were covered by the acquisition and adaptation of manufacturing technology, which brought rapid growth in employment and incomes, particularly in the Republic of Korea, Malaysia and Singapore. The industrial revolution was triggered by technological change, and most economists argue that technological progress plays a pivotal role in sustained long-term economic growth. Cross-country studies suggest that technological change accounts for a large portion of differences in growth rates. (UNDP, 2001).

During the 1980s these countries took a stand to share the expectation within industrial nations that innovations in telecommunications and computer technologies could markedly improve industrial performance and increase economic productivity. There was a common belief among them that ICTs in fact enable developing economies to leapfrog over industrialisation into a post-industrial society. With this hope, developing countries began to launch policies and programmes to acquire a share in international satellite communications and trans-border data flow networks.

There was also anxiety concerning the possibility that ICTs might imply serious social risks. People were concerned about issues like the potential for cultural colonialism, the replacement of jobs by machines, and the erosion of individual privacy, national sovereignty, hence national security as such. Towards the end of the 1980s these fears seemed to have abated, and the general view on the relation between ICTs and national security entered a third and current phase. This phase is driven by a very strong fear of being left behind and being cut off from the emerging global digital highway. Therefore the "digital divide" is on to create and broaden ICT links. (Hamelink, 1997).

The current levels of IT amongst South African citizens tend to be weak and proportionate to levels of income, education, race and gender. The use of ICTs in South Africa presents a challenge that should be viewed as an important agent for change in overcoming social problems and closing the information gap.

The advance rate of information technology has influenced the social, economic and cultural changes, which have stretched the resources of the strongest economic sectors.

As South Africa has adopted a National System of Innovation (NSI), many argue that technological innovations, particularly in the information and communications technology (ICT) sector, are the main drivers of these changes. Some authors refer to an emerging 'knowledge society' as the fundamental cause. The operational meaning of information and communications technology covers digital technologies facilitating the acquisition, processing, presentation, management and communication of information. These technologies include the microelectronics, computer and telecommunications industries, etc. The ICT sector is dominated by the rich countries and a few large, international corporations, while on the other hand small entrepreneurs with the right niche products are able to enjoy rapid growth with reasonably modest start-up costs. Over half of the growing worldwide information processing market is related to software production. Growth areas include software packages and systems integration services.

South Africa is the 20th largest country market for ICT products and services, accounting for 0,6% of worldwide revenues. 60% of PCs are connected to networks, which compares favourably with OECD norms. In the Financial Services sector there are 74 PCs per 100 employees; with around 24 in Wholesale and Retail; 17 in Manufacturing, and 7 in Government. (IMD, 2002).

Over 95% of hardware revenues by distributors are from imported products and components. South Africa contains a third of all main lines and 85% of all cellular subscribers in Africa. Telkom, 70% state-owned, is the 28th largest telecommunications operator in the world. Its expansion is being financed on the international bond markets with the intention of reaching undersubscribed peri-urban and rural areas and becoming the primary international African hub for telecommunications, computing media and international services.

South Africa is regarded as the largest global system for mobile communications (GSM) market outside of Europe, and the fourth fastest growing GSM market in the world. By 1997, 20% of the country's telephone volume were mobile units. In 1993/4 the telecommunications industry was estimated to have a turnover of roughly R3-billion, employing some 7 200 people. ICT professional services had a turnover of R2,3-billion in 1995, but little of this was spent on cutting edge research and development. (IMD, 2002).

The Industrial Revolution produced a social pact among governments, workers and employers, which sustained growth in capitalist economies for over a century and spawned competing ideologies to the right and left. That balance is now being challenged by a shift to new ICT-mediated modes of producing goods and services. The new paradigm is enabled by ICTs, while simultaneously driving the development of new ICTs.

Distance and time are no longer limiting factors in production. Companies locate operations based on local labour skills and costs, taxation and incentive arrangements. Concentration on 'core business' provokes outsourcing and the creation of 'virtual business entities'.

Within the economic perspective, the ICT deployment challenges the bureaucratic/industrial organisational model. For instance, the "7 x 24 working" is replacing the working week with part-time, more flexible hours and shifts to short-term flexible contracts. The service sector is becoming dominant in the marketplace. Labour market flexibility may reinforce insecurity and isolation in the industrialised world and lead to less tolerance of different conditions and value systems.

The information technology industry resounds with great expectations for a profitable all-digital future and an exponential increase in consumer purchases of digital devices. Chipmakers such as Intel, in particular, in 2001 spent $7,3-billion on capital investment to help build manufacturing capacity and increase manufacturing efficiency. They expect enormous growth in the market for digital consumer electronics: digital set-top boxes and decoders for satellite and cable television; video-

game consoles; digital videodiscs and small-size dishes for direct digital broadcast television. (Intel, 2002).

There is a clear indication in most literature that in hardware, the most important trends of the recent past have been increasing speed, miniaturisation, more efficient energy use, greater capacity, and lower costs. These tendencies may continue. But in addition there may well be completely new developments, such as the optical computer that processes information through light waves instead of electrical pulses. Universal digital fibre optic networks may combine with wireless networks to expand communications capacity enormously. Meanwhile, one of the latest developments in digital convergence is the symbiosis of television sets and personal computers that creates new forms of interactive television, a recent example being with DSTV interactive, making the television act as a personal computer to be able to shop, send e-mail and use the TV. (DSTV, 2002).

ICTs are dominant in the global market. Trade in ICT products and services was worth over $1 trillion in 1995. On the one hand the G7 countries and a few large, international corporates dominate the ICT sector, while on the other hand small entrepreneurs with the right niche products are able to enjoy rapid growth with reasonably modest start-up costs. The trend amongst the major world economic players is to extend their markets into developing countries.

The world competitiveness yearbook ranked South Africa's investment in telecommunication at number 4 out of 47 countries, where 1,165% of the GDP was spent on telecommunications with 118 people per 1 000 number of mainlines per inhabitants of the country in 1999. The number of mobile telephone subscribers in 2001 was 234,2 per 1 000 inhabitants. (IMD, 2002).

Challenges and disparities in information technology

Concern about the information gap between rich and poor, and rural and urban communities, is well founded. There seems to be a wide-ranging perception in the scientific literature and in public policy statements that the ICT gap between the haves and the have-nots in South Africa is widening, and that this hinders the integration of the country into the global information society.

The hype and fervour about the digital divide makes it difficult to gain an overall understanding of the problem, the different approaches to solutions, and, what is really making it difficult, the fact that there are multiple definitions of the "digital divide", conflicting reports of whether it is growing or shrinking, and a range of opinions on the key factors affecting it. What is clear is that the disparity between the "haves" and the "have-nots" is growing, and that the potential impact on society, whether good or bad, will be exacerbated by technology. In fact, the digital divide is a complex problem that manifests itself in different ways in different countries. It presents both practical and policy challenges. Moreover, it is apparent that solutions that work in one country cannot simply be transplanted to another country's environment. Solutions must be based on an understanding of local needs and conditions. (Bridges, 2002).

The infusion of ICT in South Africa paints the existing landscape of poverty, past discrimination and division onto the new canvas of technology use. Because ICT can reward those who know how to use it with increased income and cultural and political advantages, the resulting digital divide shows up in increasingly stark contrast. Therefore, ICT disparities usually exacerbate existing disparities based on location (such as urban-rural), gender, ethnicity, physical disability, age, and, especially, income level, and between "rich" and "poor" communities.

The gravity of the ICT gap in South Africa can be presented by posing the question whether communication technology is leading to globalisation or polarisation? Current access to ICT runs along fault lines of society, dividing the educated from the illiterate, men from women, rich from poor, young from old, urban from rural. (UNDP, 1999.) This is clearly confirmed by the situation where only 11 percent of

black/African families have telephones in their homes, compared with 43,6 percent of Coloureds, 77,2 percent of Asian/Indians, and 89 percent of whites. (Cape Times, 7 Sep 1999:3).

The widening gap in information technology capacity raises serious questions about whether the poorer communities will be able to overcome the financial obstacles that hamper their access to information technologies.

Since reducing the IT gap requires a major financial effort, one central concern is whether the foreign and local business communities are ready to provide the massive investments needed for the technology innovation and the upgrading and expansion of networks in South Africa. To understand the magnitude of the challenge, it is useful to remember that the world competitiveness yearbook 2002 has ranked South Africa 39 out of 49 countries, with the number of Internet users per 1 000 people being 67,53, compared to 267,96, and the number of computers per 1 000 people being 79, compared to the 309 of the 49 countries ranked. (IMD, 2002).

Total reliance on international initiatives and foreign investment poses some serious concern, while being self-sufficient requires massive capital investment. For instance, South Africa's telecommunication investment of 1,165 percent of the GDP is hardly sufficient to compete globally and enhance socio-economic development. These international initiatives coincide with continuing concern about the appropriateness of the technologies being transferred and the capacity of recipient countries to gain control over them. In fact, there is at present no convincing evidence that the owners of advanced technologies will change their attitudes and policies towards the international transfer of technology. Throughout the past decades, the prevailing international policies in this field have erected formidable obstacles to the reduction of North-South technology gaps. There is no indication that the current restrictive business practices, constraints on the ownership of knowledge, and rules on intellectual property rights that are adverse to developing country interests are radically changing. And, in this case, there are no realistic prospects that the relations between ICT-rich and ICT-poor communities will change in the near future.

Furthermore, the key actors in international ICT policy-making have expressed a clear preference for leaving the construction of the global information infrastructure to "the forces of the free market", and there is room for doubt as to whether the institutional arrangements of a corporate-capitalist market economy allow for the development of an equitable information society. At any rate, it is important to think carefully about whether, given the realities of the existing international economic order, there can be any serious reduction in existing ICT disparities. It may well be an illusion to think that ICT-poor countries can "catch up" or keep pace with advances in the most technologically advanced societies. In the North the rate of technological development is very high and is supported by enormous resources. This is certainly not to say that poor countries should not try to upgrade their ICT systems. But they should not do so in the unrealistic expectation that those who are ahead will wait for them. The situation may improve for poorer countries, but the information divide between North and South is not likely to go away. (UNISRID, 2001).

South Africa, having taken on the concerns of the “digital divide”, through President Thabo Mbeki’s initiatives in October 2001 organised the first meeting of the International Presidential Advisory Council on Information and Communication Technology, where global corporate and other leaders in the ICT environment met to advise on the complex, dynamic and exciting area of human activity. The first task of the Council is to close the digital gap that already exists between the world and South Africa. (Mbeki, 2001.) There is a general belief that, without adequate access to the system, South Africa cannot hope to be economically competitive. Therefore the "digital rush" is on to create and broaden links with electronic networks in the fields of trade, finance, transport and science. Such a position is inspired by recognition of the obvious benefits that digital information and communication technologies have to offer in a number of ways.

There is also the preponderance of educational problems in South Africa. Education facilities, for example, could be improved by using ICTs to facilitate distance learning and development through the use of online library access. In this regard, there are very promising pilot projects in schools that have been linked electronically for the provision of a host of online services. Electronic networking has also been used to improve the quality of health services, since ICTs permit remote access to the best diagnostic and healing practices and, in the process, cut costs. (Durant, 1996). Digital

technologies for remote resource sensing can provide early warning to sites vulnerable to seismic disturbances, and they can identify suitable land for crop cultivation.

South Africa is in an extremely precarious position with regard to international competitiveness. According to Pistorius (2001), the country's sustained poor performance in the competitiveness domain is a national threat. The growing ICT demand in South Africa finds expression in waiting lists for telephone connections, growing use of cellular systems and rapidly expanding numbers of Internet users. To meet this demand, consideration of information and communications technologies is increasingly becoming an integral part of national development agendas. The planned increase in telephone lines in South Africa has presented challenges, which resulted in Telkom experiencing continued growth in data and multimedia revenues largely from the corporate sector. During the 2000/2001 financial year Telkom installed approximately 2,1 million lines, taking the total to 5 million fixed lines in the country. According to BMI-TechnKnowledge and IDC, it is estimated that revenue from the provision of telecommunication services has reached R48-billion, approximately US$4bn, and it is expected to grow at a rate of 10,5% per annum. With the approval of the second national operator (SNO) and as South Africa's approach to the gradual liberalisation of the telecommunication industry, it has undertaken to sell a portion of its share in Telkom in an initial public offering (IPO). (SNO, 2001).

This is expected to be achieved largely through a massive inflow of foreign capital. And, to encourage the latter, countries are deregulating and opening their markets for equipment manufacturers and service providers. A rapidly increasing number of developing countries are scheduling the privatisation of their telephone companies.

Looking at this phenomenon, South Africa has over the past five years inaugurated its cellular networks, of which the cellular industry has been described as an economic miracle generating more than R15-billion worth of economic activity. The growth in this market has been spectacular, with a current subscriber base of over 8 million (Vodacom 55% and MTN 45%) and extensive infrastructure rollout. The high growth

in cellular phone use by both high and low-income communities has seen a third cellular operator (Cell C) being licensed in 2001. (SNO, 2001).

A holistic approach which aims for real access to technology is needed that will be effective and sustainable so that people can put it to use to improve their lives. Improving the lives of people through the diffusion of ICT may raise societal concern, which may not be overlooked in attempting to bridge the digital divide, particularly when concerns become issues of national security.

Balancing the discourse on democracy and information technology

Information technology is important not only because of its value in advancing science and technology but because it has very laterally changed almost every aspect of life in an astoundingly short period of time. The ways in which society works, governs, educates, shops, entertains, communicates and maintains aspects of national security are dramatically different from those of the last century. Information technology has democratised nation states and has also shaped the strategic environment in political systems. It has dramatically increased the interconnectedness of people around communities, societies and the world.

The implementation of information technologies has now made it possible to monitor millions of people in their daily activities around the clock, to store information about their misdemeanours forever, and to re-create their experiences through information manipulation.

The ethical challenges posed by information technologies are rooted in conventional questions such as privacy and intellectual property, which are more pressing in the context of information and communication technologies. With more information available there will also be more information that people would prefer to have censored. Although this has always been the case to some extent, the total velocity and flexibility of information transmission now make border controls less realistic than ever before.

Information technology also obscures dividing lines between the mass media and the private sphere. In fact, this convenient division between regulatory domains is disappearing. Private e-mail can be broadcast to a million receivers, most of whom never asked to receive the message. In addition, information technologies have made the manipulation of data, images and sound so easy that it is possible to use and reuse all sorts of materials without consulting the initial author-owner. Rules against piracy activities cannot always be legally enforced, and a large grey area of contested intellectual ownership emerges. It is precisely for this reason that issues of security are necessary, and where the line can be drawn with regard to the protection of privacy.

An additional threat to privacy involves the use of medical and biological information. The collection of sensitive personal data through diagnostic techniques like genetic screening is becoming a reality; and these techniques can generate information about future diseases. The potential for the exclusion of "high-risk" persons from employment or health insurance is great under such circumstances. A real prospect looms that firms may sell genetic profiles to insurers and employers. The violation of privacy will follow the spread of advanced digital technology around the world. Admittedly, people have very different conceptions of privacy. The protection of privacy is important not only for individual citizens but also for nations. Information technology creates transparent societies and "glass-house" countries that are very vulnerable to external forces which can undermine their sovereignty. (De Vries, 1990).

Not only does information technology magnify security concerns, it also raises completely new security issues that are intimately related to specific features of these new technologies. Questions arise, for example, in connection with its reliability at a time when it is depended upon. Information technology involves risks. If the technology is tampered with, airline passengers may die in a crash, patients may be seriously injured, companies may go bust, or enemy forces may gain advantage. Should the information technology fail and cause great social and political harm, the responsibility of the different actors involved must be defined, e.g. hardware manufacturers, software designers, and users,. This becomes especially complex, however, when in the course of events electronic agents, smart robots, or other

intelligent software makes decisions, or when decisions are based on the information provided by expert systems. Increased vulnerability to technology failure in many aspects of life is reinforced by the unreliability of digital computers. Forester and Morrison (1990) argue that computers are inherently unreliable as "they are prone to catastrophic failure; and secondly, their very complexity ensures that they cannot be thoroughly tested before use".

National security issues are raised by the possibility of combining human beings and electronic systems in cybernetic organisms. The dividing lines between humans and non-human systems begin to blur, and questions arise about the moral quality of this new existence. (Schroeder, 1994). What are the implications of creating software robots that might permit an information resurrection of the dead? What enormous power does this bestow upon those who can create such personality constructs? And how can this power be socially controlled? To what extent can the information technology power be polarised? (Schroeder, 1994).

Edward Luttwak (1998) maintains that during the cold war local and regional conflicts were often instigated or at least encouraged and materially supported by the rival great powers. Now by contrast it is the absence of the functioning great powers that is the cause of the world's inability to cope with violent disorders that persist even in the absence of instigation, encouragement or military support by the great powers. The result is that not only aggressive small powers, such as Serbia or even Burundi, not only an armed secessionist of all kinds, but even mere bands can now impose their will or simply rampage from without in today's world, even when there is neither the danger of great power wars nor the relative tranquillity once imposed by each great power within its own space of influence. (Luttwak, 1998). IT has changed South Africa as an emerging economy in fundamental ways. Its mechanisms, both powerfully revolutionary and subtly insidious, will continue to change the landscape of communication, commerce, national security and community, for years to come.

The relevance of information technology in defence research and development to sustain democracy in South Africa

The South African defence industrial complex in 1995 achieved a sales turnover of R678 million with direct contribution to the economy. (NRTA, 1998.) The defence industry in general is a repository of technology and its technology strategy should be seen in the context of the National System of Innovation (NSI) that the development and application of science and technology in South Africa should be central to the success of the Growth and Development Strategy as it seeks to address the needs of all South Africans in the maintenance of political, constitutional, social and economic changes introduced by the government. The NSI as an enabling framework for science and technology is intended to support the government's Growth and Development Strategy. This is imperative as it will be central to the empowerment of all South Africans as they seek to achieve social, political, economic and environmental goals. The development of innovative ideas, products, institutional arrangements and processes will enable South Africa to address the needs and aspirations of its citizens. This is particularly important within the context of the demands of global economic competitiveness, sustainable development and equity considerations related to the divided society of the past apartheid system. (White Paper on Science and Technology, 1996).

The preservation of a strong technology base is a requisite of the defence strategy and must serve to maintain the capability to detect threats, being aware of trends in military technology and their implications for the defence. The technology base should be able to produce technology demonstrators that can rapidly be turned into military technology if necessary, be capable of providing expert advice for procurement purposes, provide test and evaluation services, and support upgrade and maintenance activities.

The essential concern of defence technology in South Africa has been whether sufficient spin-offs can occur for the Defence Research and Development budget to have a positive effect on high-technology development in the civilian sector. The spin-off paradigm focuses on the military products, processes and organisational innovations, including national technology infrastructures and firms that transform

and enhance the civilian economy. However, there are also instances of "spin-on" technologies, that is technologies developed in the civil sector that have found military applications.

There is increasing predominance of dual-use technologies in the defence arena, where performance requirements for commercial markets have caught up with military specifications, and the increasing development costs can now be supported as easily by the volume of sales of consumer products as by the guaranteed markets of military procurement. Product life cycles in competitive markets are considerably shorter than those for military systems. In this sense, the civilian economy has proved itself an even more voracious consumer of technology-intensive products than the military.
It is clear, therefore, that the future of the South African defence industry cannot be seen as distinct from that of its civilian manufacturing counterpart and that dual-use concepts should be understood and applied. The view that defence technology should be phased out in favour of civilian technology, or converted into it, is not tenable. Instead, the defence industry must make special efforts to leverage spin-offs in the civilian sector and to develop relationships with civilian institutions in the NSI to promote spin-ons. It is via this partnership route that the defence industry will achieve its rightful place in the mind of the South African public. (White Paper on Science and Technology, 1996).

Information and communication technologies will not by themselves change existing institutional settings. This will need processes of political decision-making that are guided by the genuine aspiration to bring about sustainable and democratic social development. The UNESCO World Science Report warns that the use of ICTs within conventional social and institutional frameworks may not only hamper the realisation of possible benefits, but may also reinforce the possible social risks (UNESCO, 1996).

Conclusion

The arguments presented in the preceding sections suggest that a number of issues require extensive research conducted on national security and information technology. The main purpose of further study and debate would be to provide policy makers with analytical perspectives and empirical data that create a better match between technological potential and preferred futures. It is assumed that these futures should be both sustainable and democratic.

The first area could be concerned with the design of democratic and pro-active policies and programmes that make it possible to realise the socio-economic development potential of information technologies. Among other things, this entails studying the roles that public and private sectors should play in the design and execution of these policies and programmes; the forms of public intervention that are conducive to shaping technological change in accordance with desirable social goals; and the establishment of new and more democratic relations between producers and consumers of ICTs, so that technological progress becomes much more responsive to social needs.

A second area of concern is centred around the definition of those social and institutional changes that are required to maximise the social benefits and to minimise the social risks associated with the adoption and deployment of information technologies. This entails considering various ways of adjusting the organisational structures that are relevant for economic productivity, political participation, and cultural diversity in line with preferred social scenarios; and the cultural appropriateness of educational methods and training materials required for the realisation of the technological potential. Again it is important to discuss the design and adoption of information technologies that strengthen sustainable national security. This involves creating information technologies that reduce the threat and vulnerabilities, and encouraging environmentally sustainable applications of IT.

The future of information technology and national security is compounded by uncertainty – no one knows how the technological advancement will continue to unfold. The goal for the future will be to somehow bridge the theoretical possibilities with technological capability. Research focused on the goal of ubiquitous information

technology will be concerned with a number of important technological obstacles, such as how society could enjoy the benefits of information technology without nation states being too worried about its impact on national security, and society that is ready for a pervasive system that surrounds its communities and monitors their day-to-day activities as there is a worry that ubiquitous networks will present new and emerging challenges to personal privacy which may destabilise security.

Some scientists suggest that the most powerful 21st century technologies, for example robotics, genetic engineering, and nanotechnology, could threaten to make humans an endangered species. Bill Joy predicts that as technology advances, humans will increasingly delegate responsibility to intelligent machines able to make their own decisions and, referring to the writings of Theodore Kaczynski, known as the Unibomber, wonders whether these same machines might not reduce humans to "the status of domestic animals". (Joy, 2000).

Information technology is shaping the strategic environment in which a conflict may take place. For instance, revolutions in military affairs are the dependent variable driven by mostly the political, economic, social and ethical dimensions of the information technology. Given that IT has contributed to the dramatic increase in the interconnectedness of the South African society and people around the world, it is imperative that there should be good entrepreneurship, and government policy that encourages and supports equity, development initiatives and sufficient funding to finance them. The major problem in the South African situation, particularly in deep rural areas, is that without basic electrical and telecommunications infrastructure programmes and universal service initiatives by government, information and communication technology companies will have little incentive to develop new products to meet the needs of people who cannot use or afford their existing services. And, government policies will become ineffective without ground-level programmes to take advantage of them.

Finally, information technology could in future greatly benefit society if its advancement is harmonious with the needs of the people.