Government unplugged

Mobile and wireless technologies in the public service

CENTRE FOR PUBLIC SERVICE INNOVATION

in partnership with
Technology Research (State Information Technology Agency)
Council for Scientific and Industrial Research - *i*comtek

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ForeWord

The advent of e-government enables the delivery of public services in faster, more convenient and value-added ways. The move by the South African government to implement a comprehensive programme of on-line, real-time service delivery is based on a commitment to utilizing information and communication technologies to leap-frog development, and hence address service delivery inefficiencies as quickly as possible. Mobile technologies provide the opportunity to both reach citizens who are currently under-serviced by government, largely as a result of the lack of land-line connectivity, and to provide greater convenience to all citizens who are already accustomed to using their cell-phone as a primary means of communication.

The potential value of mobile technologies to service delivery is currently largely unknown. It is hoped that this Future Watch report will stimulate vigorous debate on the role mobile solutions should play in government's overall service delivery strategy and provide opportunities for identification of applications that create access to improved education, health care and justice. We call upon industry to actively engage government on future possibilities, and build today mobile solutions that will radically change the way in which government interacts with its public in the future.

Muthanyi Robinson Ramaite
Director-General, Department of Public Service and Administration
June 2003

ForeWord

The communications landscape has and continues to change at a rapid pace. This change is no more evident than in the current changes in the adoption of communications technology in South Africa. The historical reliance on fixed-line communications has been surpassed by mobile communications within the past decade. The rapid changes in technology has also hastened the convergence of technology platforms and nature of transmission of content via these platforms. For the public sector and the delivery of online government services, it is critical that we embrace and harness the opportunities presented by these changes.

As government we have to maximise the opportunities to deliver services to our citizens, thereby providing a better life for all.

Andile Ngcaba
Director General, Department of Communications
June 2003

PreFace

Wireless technologies are crucial for the future, with particular significance for both the public and private sectors. Mobile and wireless not only offer opportunities for efficiency gains, but also the potential to impact positively on quality of life, knowledge, communications and economic activity, by providing access to services, which has not been possible before. Killer applications will be built on this type of platform, and the CSIR is committed to ensuring and supporting the research and development of these types of platforms, in collaboration and partnership with public and private institutions.

Sello Matsabu,
Director, CSIR Information and Communications Technology

Wireless technology is able to deliver a variety of applications that make an impact on the way business is done, and the convergence of communications infrastructure opens up a myriad of exciting opportunities for enhancing public service delivery and access to information. Whilst facilitating the successful introduction of mobile and wireless technologies into the work of government departments and agencies, this report will drive the development of even more innovative product solutions. South African citizens will be the primary beneficiaries of creative mobile applications for government, and the accompanying efficiencies and productivity improvements will enhance South Africa's economic growth and international competitiveness.

Dr Yvonne Muthien,
Group Executive: Corporate Affairs, MTN Group.

Since the turn of the century, barely a day has gone by that we have not seen the release of a new product or service that can be described as mobile or wireless, globally as well as in South Africa. The next decade will see not only more innovations, but the maturing of the flood of technology presently coming onto the market. We will see mobile commerce become commonplace in the next five years, just as electronic commerce did in the last five years.

Arthur Goldstuck,
Managing Director, World Wide Worx

PreFace

The convergence of technologies will remove the boundaries to which we have become accustomed, between fixed and mobile, visual, verbal and virtual. This presents the public sector with a range of interesting challenges with regards to the choices that are made now about delivery mechanisms for e-government. The importance of seeing relevance not only today, but five years into the future is critical and should inform connectivity and service delivery choices. Understanding the potential of mobile, and beginning to think through its possible applications, will better prepare government for maximizing its value.

Glenda White,
Executive Director, Centre for Public Service Innovation

Wireless technologies offer a significant opportunity for Government to enhance productivity and to improve service delivery. Some offer immediate benefits, while others will only mature in the medium to long term. This report is a logical extension of major ongoing projects such as the Government Gateway and Government Common Core Network. These projects promise to "bring Government to the People" and make Government services accessible to every citizen. We as South Africans are becoming ever more advanced users of technology in the daily execution of our tasks. We should, however, always adopt new technologies in a focussed drive to enable our business and not merely to follow media and industry hype.

Dr. Dimakatso McKay Motshabi,
General Manager, Research and Development, SITA

This report was made possible by the efforts of a team led by World Wide Worx, working in collaboration with the Centre For Public Service Innovation (CPSI), Technology Research (SITA) and CSIR *i*comtek.

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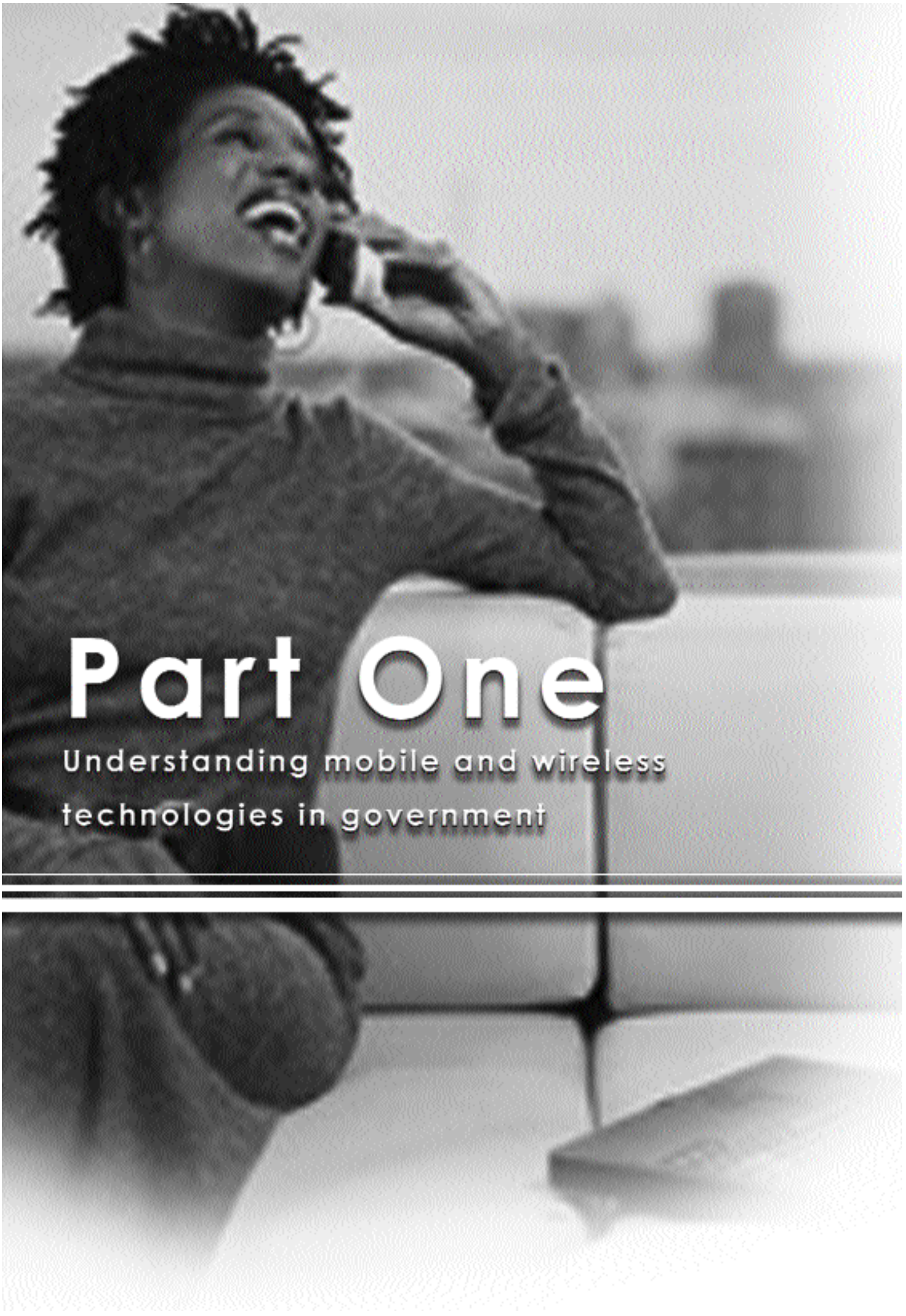


Part One

Understanding mobile and wireless technologies in government

The way it could be …

It is early one summer morning in the year 2008. Tom and Thandi, a married couple, are on their way to work, and today is Tom's turn to take the kids to school. But first, he stops outside the Gautrain terminal, where Thandi will catch the next train into central Johannesburg.

She quickly checks the schedule on her wireless watch organiser. Yes, the next hi-speed train is dead on time, due to arrive in precisely 185 seconds. Just enough time to get to the platform, hit the sequence of buttons on the organiser that would reserve her seat, and pay for it with a quick data link from her watch to the turnstile receiver.

It is so convenient, she thinks to herself, that they built a hi-speed terminal right outside the bank's headquarters. And, with the growing popularity of the Gautrain, mobile booking ensures a seat.

An hour later, the kids are at school and Tom is standing in line at the Post Office's upgrade desk. The half-hour queue is the price he has to pay for waiting until the deadline to upgrade his physical post box to a digital envelope. But it will be worth it. From today, he will be able to have all his post, including bills, bank statements and official notices, stored electronically, and he will be able to get access to it via his Internet connections at home and the office, or using the connection on his handheld. No more collecting post; even those with no electronic access at home or work have now been given electronic post box accounts and can send post through the Public Access Terminals at their nearest postal kiosk. They have the choice of typing letters in at the terminals in kiosks, or writing them at home and having them scanned in at the kiosks. With a few exceptions, actual deliveries will soon be limited to parcel drop-offs.

Even Tom's sick mother living in a remote village in the Northern Province is e-mailing Tom with updates on her medical condition. Just three years ago she had vowed never to go near one of those "machines that eat your post". Now she uses the kiosks as if they have always been part of her life. Of course, she has no idea that it is all made possible by the combination of a wireless local area network known as Wi-Fi and the cellular network providers' tall masts. The only thing she cares about is that it works.

Finally, Tom reaches the window. He holds up his wristwatch organiser, hits the digital signature button, and his identity details are beamed across to the terminal. A moment later, it beams an encrypted access code into his watch. Tom can now add dig-

ital mail to his array of messaging options, from e-mail and instant messaging to voicemail and videomail to positioning and remote working.

Just to make sure the new codes haven't corrupted the data on his watch, Tom quickly types the key sequence for his daughter's location. The name of the school flashes up on the screen, with duration at the location, and request for confirmation of contact. He clicks the cancel button. In the past, he has not been able to resist the temptation to confirm the request, and tell his son or daughter exactly where they are. The embarrassment it has caused for them, having "daddy check up on his babies" has made him well aware that he should use the full functionality of his wristwatch organiser only when it is necessary.

The fact is, he reminds himself, the child locator buttons were issued by the SA Police Services to ensure general safety of children, not for parents to play nanny every minute of the day, and not as a replacement for child care. If the child hits the emergency key, or the locator is forcibly removed, or the child is not in the appropriate location, that will be the time for action.

As he leaves the post office, Tom is stopped by metro police. It's a routine check. Tom hands his driver's license to the police officer, who scans it into his handheld crimecheck device. While the details are being

Box 1 - The technologies

Radio-based – two-way radio (professional or public mobile radio) and radio broadcasting

Cellular phone-based

Mobile Voice – the way most of us use mobile phones, i.e. talking on them. Would be used for normal voice communications when government staff are out of the office, or to reach members of the public who have provided mobile numbers.

SMS – Short Message Service. Short text messages sent to or from mobile phones. Can be used to deliver information or alerts to mobile phones from other phones or computers. Can be used with a system called Wireless Internet Gateway (WIG) to request data from menus and to access accounts and databases.

WAP – Wireless Application Protocol. Users can browse remote information sources using WAP-enabled mobile phones. Can be used to drill down through menus into databases or access information on WAP-enabled web sites.

GPRS – General Packet Radio Services. Used for maintaining a high-speed, constant connection with information sources from mobile phones. Suitable for fast data downloads, for the likes of large files and even videos.

UMTS – Universal Mobile Telephone Services. Better known as 3G, or 3rd Generation, the next generation of mobile networks, with new capabilities. Allows for speeds of up to 2 Mbps, fast enough for video-conferencing on cellphones.

Mobile device-based

Notebook Computer – Or laptop computer. A portable computer which can be used while on the road. Has all the features of a normal PC, but can be carried around and connected to other networks. For use by anyone with a need to continue working on a computer while not at their desk.

Tablet computer – New variation on notebook computers, which usually consists only of a portable screen that allows information to be "written" in on the screen itself with a pen-like device. Some convert into notebooks. Intended for fieldwork.

PDA – Personal Digital Assistant. Handheld computers intended for organising information and activities. Can connect to networks or services, to retrieve e-mail or database information.

Bluetooth – A standard for linking devices that are up to 10m apart without using wires. Usually consists of a chip that connects devices like printers and laptops or cellphones and headphones to each other when they are in proximity.

GPS - Global Positioning System. Between 1978 and 1994 the US Department of Defence placed 24 satellites in orbit to form the global positioning system, with a minimum of four of these

above the horizon at any point on earth. Any handheld device containing a GPS receiver can pick up the signals from these satellites and fix the user's exact location. Can be linked to a PDA or cellphone.

Pager – Wireless radio receiver for displaying short text messages dispatched from a central control room. Used by emergency personnel, media workers and others who need to be mobile.

Network-based

Wireless LAN – Usually based on the 802.11b standard, and known as Wi-Fi. Allows PCs and laptop computers to access a network wirelessly at high speed (2.4-2.5GHz). Used increasingly for public and company "hotspots", to allow Internet access to mobile workers and travellers. Intended for connecting equipment up to 100m apart but usually operates better over shorter distances.

The bottom line for all these technologies is not that one is better than another, but that some represent better technical solutions than others for certain problems, and it is entirely a matter of the most appropriate solution rather than the best technology.

verified by a database somewhere in Pretoria, the officer keys in the car's registration number. Instantly the screen displays the offences history of the car and driver, and current status. Tom is clean. The officer hands back his license and waves him on.
Tom drives into the government-parking garage, and the boom automatically swings open as a remote sensor detects the e-tag in his car.

Strolling past the one-stop government urban mall, he marvels once again at the absence of queues. Since they have allowed people to fill in applications at Public Access Terminals, verify their identities through fingerprint scanners, and pay a nominal fee to be advised via SMS of documents being ready, lines of people waiting to apply for or receive government services have become a quaint footnote in history.

At the Department of Agriculture, where Tom works, the front door slides open instantly as it scans the new arrival for an identity e-tag, and picks up and verifies the passive signal in Tom's wristwatch. But there's a problem: the lifts aren't working this morning – again! Thank goodness for government hotspots, Tom thinks as he sits down in the reception lounge and takes out his laptop. He switches it on, and it instantly detects the Wi-Fi access point. Tom logs on, and he is connected to the network as if he is in his own office ……

Box 2 - A mobile foundation

The foundation for a mobile revolution in South Africa has been well and truly laid down by the three cellular networks: Vodacom, Mobile Telephone Networks (MTN), and Cell C.

When Vodacom began full commercial operations in 1994, it connected 10 000 subscribers on the first day. By February 2003, Vodacom and MTN had respectively signed up 7,5 million and 5 million subscribers in SA. MTN alone has approximately 4 000 sites covering 19 200 km of road, 900 000 km^2 of land and provides access to 94,5% of the population.

Cell C, was named as the third cellular operator in SA in February 2001. After six months of operations, Cell C passed the 500 000 subscriber mark. While the original plan had been to achieve just over 800 000 subscribers in year one, Cell C celebrated its first birthday by passing the 1 million mark.

This brought the total market to more than 13 million subscribers, with Alan Knott-Craig, Group CEO of Vodacom, estimating that there would be 21 million cellular phone users in SA by 2007.

While this forecast may be optimistic, since it doesn't take account of market saturation at a lower level, the overall numbers reveal a population that has taken to mobile communications in a way that no other service has ever been embraced in South Africa. While it would be overstating it to say that we have witnessed a technological miracle, it is still a phenomenon that speaks volumes for the sheer usefulness and value of mobile communication.

From the networks' perspectives, South Africa leads the world in rolling out new business models – such as pre-paid contracts – and network technologies like interactive voice response. Add to this a vibrant developer community: numerous companies, both established and start-ups, are adding their offerings to the existing software and hardware industry to create a broad range of mobile products and services. It is not out of the question for these initiatives to produce the next Thawte, the digital certification company started by Mark Shuttleworth in South Africa and sold to Verisign for more than half a billion dollars. These companies not only add to the spectrum of technology products available, but they also help to develop an increased awareness of the possibilities, and greater acceptance of the technology environment as an enabling environment.

It is against this backdrop of dramatic uptake and acceptance that the opportunity for enhancing the processes of the public service with the use of mobile technology.

There is one proviso, however: where there are weaknesses in existing processes, the transfer of those processes to a mobile environment will highlight the weaknesses, rather than repair them. Mobile and wireless is not a cure for existing ills within the operations of the system, but rather an add-on to existing systems.

The reality

The tale from the year 2008, told above, is not science fiction. It is based on technology that is available today and developments that make the scenario possible. With the rapid take-up of cellular phones across all levels of South African society – and growth set to continue thanks to the planned distribution of 4 million free SIM cards to disadvantaged South Africans, and the extension of cellular networks into even the most remote parts of South Africa – there is tremendous potential for mobile and wireless technology in this country.

Wireless technology is ready to be deployed

Already, there are South African government agencies that have used wireless networks successfully (see case study 1 on the SITA wireless network pilot) . Many departments are in various stages of creating mobile office environments – from issuing officials with devices that combine cellphones and handheld computers to providing remote access to e-mail and intranet resources. Police, medical and emergency services are already using a variety of mobile devices to make themselves more efficient.

The crimecheck device is based on capabilities that are already being rolled out by the Johannesburg Metro and the SA Police Services (see case studies 9 and 10), while the locator buttons are based on a feature that the US Federal Communications Commission has made mandatory in cell phones from 2005.

The Post Office has already started rolling out Public Information Terminals with the long-term objective of providing ever citizen with an e-mail address, and it has been named the preferred supplier to government of digital signatures, which make it possible to produce, transmit, sign, authorise and verify documents that exist only in electronic format. Text services to cellphones, advising of traffic conditions, airline schedules, exchange rates, bank transactions, special offers, sports results, and so on, are commonplace. Text-to-speech technology is maturing. Remote sensing of identity tags on both cars and people is becoming common in new buildings and tollgates.

And efforts are not only about getting city slickers more connected. Initiatives currently under way show that rural areas can benefit as much from mobile and wireless technologies (see case 2 - rural connectivity for development). The opportunity lies

not so much in hi-tech possibilities like telemedicine – using technology to provide medical care while not in the same location as the patient – but rather in basic infrastructure provision through wireless networking and radio, cellular or other wireless communication in locations where the physical environment cannot be wired up. Other simple solutions for remote areas include handheld devices containing databases or allowing instant wireless access to databases, such as drivers' licences and vehicle registries.

In short, wireless networking, mobile vehicle and driver status verification, pinpointing location of individuals, connecting deep rural areas, and accessing networks from any location using any device, are possible today, and can be a commonplace reality by 2008.

Box 3 - A brief history of mobile

1890: Nicholas Tesla provides theoretical basis for wireless communications.

1894: Guglielmo Marconi demonstrates wireless transmission of signals over two miles, and became regarded as the father of radio. Fifty years later US court finds Tesla should have been awarded the patents given to Marconi.

1901: Marconi begins renting telegraph message receiving and transmitting systems to ship owners. Voice transmission come shortly after.

1910: Enrico Caruso, singing at the Metropolitan Opera in New York, powers the first song to be transmitted by radio.

1910: The vacuum tube is invented, not only allowing voice to be transmitted over long distances, but also for commercial receivers to be built and sold to the public.

1915: World War I - American military is the first government department to use mobile technology: debuts radio communication between, initially, pilots in aircraft and troops on the ground.

1916: Two way communication between two airplanes for the first time. This set the scene for the birth of personal wireless communications.

1921: Detroit police departments adapts radiotelephones installed on ships for their patrol cars. Size, buildings and uneven landscapes make the devices far too unreliable.

1935: Invention of Frequency Modulation, or FM, by Edwin Howard Armstrong, allowing for high quality, two-way mobile radio communications. First used extensively on the battlefield in World War II. Motorola develops the first Walkie-Talkie during the war.

1947: On 15 August an experimental telephone service from moving trains to any other telephone is tested, and an experimental mobile telephone service opened along the Boston-Washington highway a month later. But a mere 12 simultaneous callers could be "on the air" in a city like New York.

1947: AT&T scatters low-power transmitters throughout a metropolitan area, using them to "hand off" calls from transmitter to transmitter as customers moved around in their vehicles. This "cellular" technique represents the official birth of the personal wireless technology industry, although it takes another 20 years to develop the technology to manage "handing off" and to get regulatory approval.

1962: Radio pagers approved in the US by the Federal Communications Commission in 1962; first "Bellboy" radio paging system used at the Century 21 World's Fair in Seattle.

1973: Motorola unveils the DynaTAC mobile phone, the first relatively small, personal radio telephone.

1977: Experimental licences awarded to AT&T, Motorola and American Radio Telephone Service, but strictly limited geographically.

1981: FCC published the first formal regula-

tions for the wireless communications industry, allowing two licences in each of 306 urban areas and 428 rural areas. AT&T granted the first of these licences – in Chicago - on 6 October 1983. The following year Washington, D.C. has two competing wireless providers.

1982: Beginning of the digital wireless revolution, as Nordic Telecom and Netherlands PTT propose a new digital cellular standard to the Conference of European Post and Telecommunications (CEPT) to cope with an expected explosion in demand.

1987: CEPT signs the charter agreement for GSM, which then stood for Groupe Spéciale Mobile, and was later changed to Global System for Mobile Communications.

1992: The first GSM network operator goes live in Finland.

1993: First digital mobile network in the USA established.

1993: By the end of the year, there are 13 GSM networks on air in 7 countries. Since then, more than 400 GSM networks have been established across the globe, all subject to an agreement which defines the GSM standard and makes international roaming - and thus true international personal connectivity - possible.

1994: South Africa embraces GSM, when Vodacom and MTN are awarded the first cellular licenses in Africa. An expected total subscriber market of 100 000 is reached within in 12 months, and today around 13 million South Africans – more than a quarter of the population – use cellular phones.

The Mobile Value Proposition

The story of Tom and Thandi is not about technology, but about improvements in the operations of government that are now possible because of mobile and wireless technology. Using the growing body of local and international experiences (see Part 2 for a collection of 18 case studies), six major areas of application have been identified.

These six major areas cover both front-office applications (enhancing service delivery) as well as applications in the back-office (improving internal efficiencies).

They are:

Connectivity **–** A public service within a knowledge economy requires increasing numbers of "knowledge workers", from Director-Generals, to policy analysts to project mangers. To be effective, these workers need to find and use routine and non-routine information from a variety of sources – both seamlessly and cost-effectively. More and more of this information is now available in electronic format but is scattered among a variety of sources – including web sites, intranets, e-mail systems, document management systems, knowledge management systems, and portals. In addition, many of these workers are spending less and less time confined to a specific office or desk and are effectively mobile workers. Connectivity and access to these information systems have been advanced through the establishment of wireless hotspots, remote access using GPRS and cellular technology, and the development of innovative software solutions for handheld devices.

Connectivity is the basic building block of all other forms of mobile and wireless communication. Many of the potential applications and benefits begin with connectivity before extending to the specific applications.

Personal communications – From basic voice communications using mobile phones through to mass communication of text messages to individuals' phones or e-mail to their computers, communications has already been revolutionised by mobile and wireless technology. The challenge now is to identify the applications that will harness this revolution, using forms of personal communications to enhance the functioning of government departments and agencies. In the field of health, for example, experimental and practical uses have already proved the benefits of using SMS for health alerts, advising of pathology results, and providing reminders for taking lifesaving medicine.

Generic applications, such as informing people of the availability of documents via SMS, and then supplying requested documents via e-mail, are already in extensive use, but not on an institutional or strategic level. In most cases, the business case does not have to proven – it becomes merely a case of using technology that is already rolled out, and simply taking advantage of underlying functionality. This has been successfully

achieved by a number of private sector institutions, including Avis car hire and First National Bank.

Information management **–** The key to the usefulness of mobile and wireless technology lies in the quality of information that will be generated and accessed through the connectivity options made available. This quality will in turn depend on how well the applications that rely on connectivity have been integrated into back-end systems, and how user-friendly they have been made for the end-user, whether in government or members of the public. The better the applications can be used to access, input and manipulate data, the greater will be their efficiency, and hence the benefits they are likely to provide. This includes accessing information from back-end databases, inputting information into systems, either as part of a workflow process or simply data capture, and extracting data for wider distribution.

Logistics **–** In the corporate world, supply chains are being transformed by the use of mobile and wireless technologies, from the manufacturing stage using wireless and remote monitoring, through the warehouse and distribution phase using wireless barcoding devices and handheld computers for inventory management, to the retail level where barcode readers, wireless cash terminals and inventory databases are all connected seamlessly. Without realising it, the broad public shopping in supermarkets, among others, is benefiting directly from the efficiency brought about by both mobile and wireless technologies in logistics. The implications for government are immense. From mobile asset management to warehouse management, from re-ordering goods to managing suppliers using a PDA, the efficiencies that can be harnessed here, combined with an active information management strategy, can transform the business of managing government.

Positioning and identifying **–** Emergency services have often been touted as the major beneficiaries of location-based services, since a GPS chip (see box 1 on technologies) in a cellphone will enable an ambulance crew, for example, to pinpoint the exact location of an accident victim. In reality, the use of positioning technology is initially likely to be far more prosaic, such as for incident reporting, be it criminal activity or pothole maintenance. A far more likely application at this stage is the use of existing technology for emergency caller identification and customer service based on the likely identity of a caller.

Transactional **–** The mobile commerce promise is still a long way off in South Africa, despite early experiments in mobile banking, ticket sales and large-ticket items. However, with improved interfaces and applications, transactional usage could be extended to areas like municipal bill payment and even electronic purchasing of services. The most successful commercial application, topping up prepaid airtime from a mobile phone, suggests possibilities of extending the model to topping up prepaid electricity using mobile devices. However, the business case must be carefully examined for each application, as the cost of

implementation may not be justified by the number of people who will benefit, or the savings this will bring to government or the public. On the other hand, if an application can result in a dramatic improvement in convenience and time saved for the public, it should be seriously considered.

Box 4 - Is my organisation ready for wireless?

It's not necessary to reinvent the wheel every time we try to embrace one of these new technologies. In many cases, it's been done before, or proved before, and it is usually more cost-effective to piggyback on predecessors.

The big question, however, is whether both the technology and your organisation or department is ready. If you answer just half of the following questions positively, chances are you may be in a position to initiate specific wireless and mobile solutions.

(1) Is the technology ready for myenviron ment, and is my environment ready for the technology? Requires an under standing of the time horizon within which the technology will be ready for roll-out, and also within which the department will be ready to implement. Applications like mobile office and Wireless LAN, for example, would fit into a 1-12 month time horizon, while mobile enablement of workflow processes may fit into a 1-3 year time horizon. To answer this question, however, you also need to answer the following:

(2) Does my IT strategy allow for easy inclusion of mobile and wireless technologies? (i.e. it does not specifically exclude it)

(3) Does my IT strategy specifically make provision for mobile and wireless? (i.e. does it mention these as possibilities?)

(4) Is there widespread use and presence of mobile devices (cellphones, laptops, PDAs, etc) in my department or organisation?

(5) Is the technology that will enable this business requirement mature?

(6) Does my back-end system operate on standards that allow for extension into mobile and wireless technology?

(7) Can my back-end databases be accessed from any computing or data device, and information be presented in a simplified format on a small screen such as those on cellphones?

(8) Does the technology I have in mind enable a business requirement of my department or organisation?

(9) Will the time it takes to implement the technology be an obstacle in the successful implementation and use of the technology? Requires alignment between, on the one hand, the immediate, short-term and long-term needs of the department or organisation and, on the other hand, the complexity of the implementation and therefore the impact it will have on ongoing operations.

(10) Will the cost be justified by the business case for the technology?
(In some cases, the cost of an application may seem high, but would in fact be low relative to its benefits. It should always be remembered that, in deciding whether an organisation should adopt wireless, it is not always necessary to replace what is already available or to invest heavily in developing new technology. Three broad routes are available:
- Take advantage of what is already available;
- Go for applications that require only a few interventions or data sources; and
- Adapt to one arena what already works in another.

Factors to consider

If all these applications are possible, and some already happening, the question has to be asked, why aren't we seeing their wider use and benefits? The reality is that the decision to implement is not as simple as it may appear at first sight.

Four central factors have been identified that will influence the decision to implement, namely:

- Maturity of the technology;
- Institutional readiness;
- The policy and regulatory environment;
- Ease of application

Maturity of technology

Any given application may be possible and may be happening, but mobile and wireless technology is generally still immature, even if rapidly moving towards maturity (see box 5 – the Gartner Hype Cycle). So while it is available, it is not well-established. Most of the existing applications are experiments, test cases, pilot projects, and are largely individual initiatives. The successes and learnings from these experiments have not been extensively shared and evaluated and have therefore not informed departmental or overall strategies. This underlines the fact that mobile and wireless is a real option, but still in a very immature technological environment.

There are a number of obvious reasons for this immaturity:

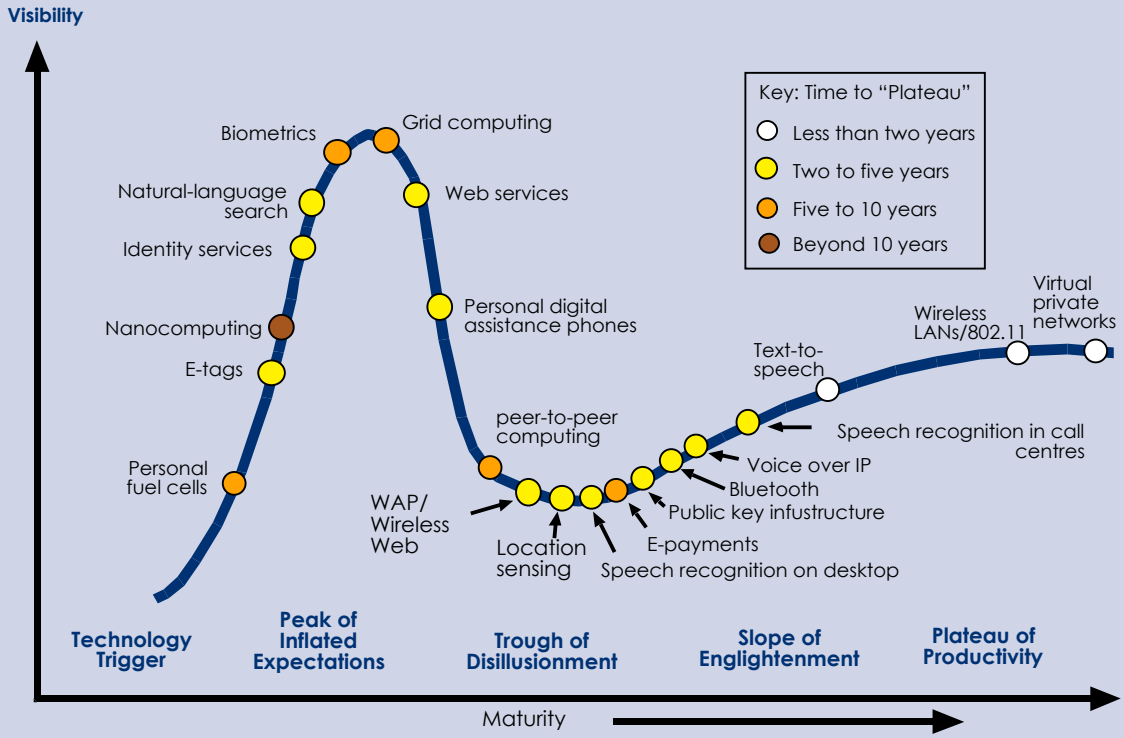
- Potential users and managers are not aware of the possibilities and options;
- Many potential users, on a departmental management level, are only willing to invest in what is needed to get the basics of government service in place. In this context, they see wireless as hype, not as contributing to the basics;
- They have not effectively identified potential applications in their environment;
- The technology itself is not fully mature, even though implementation is occurring worldwide;
- The potential for improving the bottom line for business is not always obvious, which means that the private sector is not investing heavily in this area, which in turn means that maturity of the technology is held back in terms of on-the-ground experience of users.

Cellular phones represent a ubiquitous technology platform

The negative view of this situation is that, despite all the possibilities, limited efforts are being made to move forward. However, this must be seen in the context of strategic thinking about business requirements of the future. Rather than making decisions based on technologies, decisions should be made based on business needs, and those decisions must not exclude mobile simply because the strategy did not allow for it.

The positive perspective is that there is enormous opportunity for moving forward. While these technologies are volatile, significant improvements appear by the day, and a decision must be made at a certain point in the evolution

Box 5 - The Gartner Hype Cycle, 2002



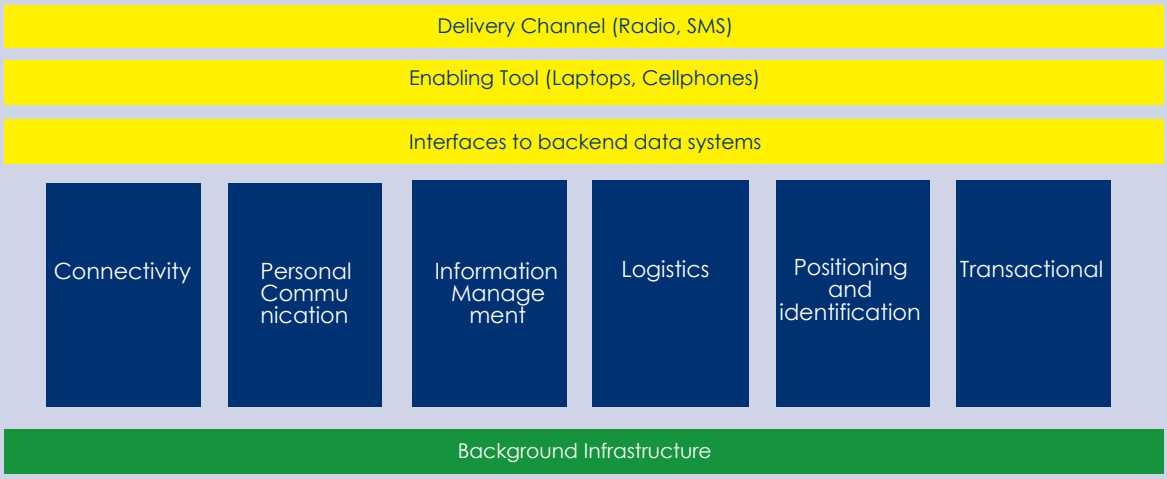
The Gartner Hype Cycle is a graph used by the Gartner research organisation to describe the life cycle of new technologies according to market acceptance and business success, rather than the quality of the technology itself. It provides a useful rule-of-thumb for when cautious organisations should consider implementing new technologies, or when business cases should be based on a stable marketplace.

When new technologies are introduced, they tend to rise up a curve of enthusiasm which reaches its highest level at the Peak of Inflated Expectations before plummeting to the Trough of Disillusionment, as e-commerce did three years ago.

Mobile and wireless technologies register strongly on this graph, due to the enthusiasm for their potential.

However, seen in the light of the cycle of hype and realism, this graph provides a useful guide to the mobile or mobile-enabling technologies that should be avoided for now, such as Biometrics and PDA phones. More important, though, it provides a vote of confidence for those technologies that are considered on the verge of maturity, such as Wireless LANs and, to a lesser extent, Bluetooth and Speech recognition in call centres. Quite clearly, location-sensing and WAP, or the wireless web, are still a few years away from that level of maturity.

Box 6 - Mobile technology as enablers



Mobile and wireless technologies can ultimately be viewed in the context of four enablers:

- as background infrastructure, seamlessly integrated into systems without the awareness of the user;
- as delivery channels, such as radio or SMS, where the technology is used to provide content, messages or data, regardless of the specific technology in use;
- as enabling tools, such as laptops and cellphones, which will tend to be carried by the user; and
- as interfaces to databases and information systems -.

The choice of which level will be used is naturally a function of the value proposition. This will in turn be based on who is providing information or services, and who is using it. In business terms, it depends entirely on the market segment. The business world tends to divide its market broadly into consumer and business markets, in the form of B2C, for business-to-consumer, and B2B, for business-to-business. The public service has to consider two other key segments, namely government and employees of government. That presents us four distinct market segments, namely:

- Government-to-government (G2G) – typically interdepartmental functions or services, such as information-sharing;
- Government-to-employee (G2E) – typically internal database functions or services, ranging from networking infrastructure to human resources services;
- Government-to-business (G2B) – typically services and functions that relate to business registration, taxation, import and export and employment and training-related issues
- Government-to-citizen (G2C) – relating to any of the services for which citizens rely on the government.

Box 7 - Alternative approaches to evaluating mobile applications in government

This report is not intended to describe long-term options or evolutionary approaches, but rather to provide a guide to what can be done in the short- and medium-term with what is available right now.

In its report on "Preparing for Wireless and Mobile Technologies in Government", IBM recommends a matrix comprised of technology readiness on the one side and sophistication of technology on the other.
This presents a fairly clear picture of the "low-hanging fruit", i.e. applications that are available for immediate deployment, as well as high-impact projects that will provide strategic advantage, and projects with mere potential at this stage that require a wait-and-see attitude, but still encourages piloting.

The problem with this approach is that it focuses on justifying a certain level of implementation regardless of where on the matrix a technology falls. It is useful as a starting point, however.

In the South African context, the larger issues are not the technologies available, but the state of the existing system. If back-end systems are not compatible with new technologies, then those technologies will be even more expensive than their "cover price" would suggest. And if the back-end processes aren't working, then piling new technologies on top of old processes will only worsen the problem, and make it a more expensive proposition.

The first steps that are recommended, then, are to:

- sort out the back-end
- align the back-end processes with front end technologies
- make the business case for the new technologies

		Degree of Sophistication of Technology	
		High	**Low**
Technology Readiness of Target Segment	**High**	**Stars** *High Impact Projects* Mission-critical applications of high strategic advatages should be taken: high level commitment needed for success	**Low-Hanging Fruit** *Go for immediate wireless development* High probability of successful adoption
	Low	**Future Potential** *Wait and see* Applications more complex; go forward with pilots; educate/train employees; wait for mature technology	**Near Havests** *Educate/train target segment* High probability of successful adoption

of the technology to leverage what is available. Simply waiting for new technology to arrive, or existing technology to mature, is a recipe for business paralysis.

It is a rapidly evolving field, but don't always wait for the technology to reach perfection

The challenge is to identify both the conditions existing now that make it easier to make this vision a reality, and the factors that will influence that reality – positively and negatively. The nature of the environment in which the applications are rolled out may provide the basis for acceptance. For example, cellphone penetration is a major facilitating factor, and continued growth in cellphone usage will make it an even more effective vehicle, but that does not mean people want to use cellphones for anything other than voice and personal text messages, security remains an issue, and the reliability of mobile communications is not yet at an optimum level.

The real issue is not whether such things can be done, but rather whether they will be cost-effective, whether the intended users can be persuaded to change over from the old style of doing things, and whether existing back-ends, like databases and networking infrastructure, will be able to support the new technologies.

Institutional readiness

The biggest obstacle to the use of mobile technologies in public services appears to be not technology or even cost of technology, but rather the attitudes of decision-makers. In other words, the real issue is one of management rather than of technology. In surveying government departments, it was found that numerous obstacles were on the table, while very few benefits had been clearly recognized.

Barriers to implementing mobile and wireless solutions identified within government departments included:

1. Lack of knowledge of scope and capability
2. Potential theft of devices
3. Non-payment by communities
4. Complexity and cost of approval process
5. Lack of general knowledge in cost justification techniques and post-implementation monitoring models
6. National employment objectives often in direct conflict with mobile solution benefits.
7. Time to critical mass

An eye-opener in such discussions is the fact that capacity and capability are specifically not regarded as barriers to implementation, although it stands to reason that a major educational process would have to be carried out to make users and managers fully aware of what can be achieved in the use of mobile technologies.

Box 8 - What can go wrong?

In Aldous Huxley's disturbing novel of the future, Brave New World, we are constantly reminded how advanced technology might make sense from a technical point of view, but can spell human disaster. Is this the case in the world of mobile and wireless? Probably not, but it is essential that we have a clear view of what can go wrong.

Already, there are two classic disaster stories in the implementation of mobile technologies:

- 3G – European networks invested so much in bidding for a new cellular technology that was not yet available, namely 3G or UMTS, they did not have the ability to invest in the actual infrastructure. All this while existing technology, known as 2.5G, in the form of GPRS, was available to do most of what 3G promised.
- WAP – the ability to "surf" the Internet with a cellphone was hyped beyond reason, despite the fact that the interface for WAP was almost unusable – and few people imagined using a device the size of a cellphone to browse the Web.

Specific disasters that can occur in a departmental or organisational implementation include:

- Security – if a wireless access point is not sufficiently secure, it can compromise data, which in turn can result in loss, damage and severe public relations fallout.
- Simplicity – if a service is made available on mobile devices, and is too complex for users, it will not be used.
- Standards – mobile and wireless implementation must be based on standards, or it can result in far costlier replacement or redevelopment in the future than would normally be necessary.
- Narrow vision – in line with standards, development must not only be for one device or manufacturer, otherwise the user is painted into a corner, and forced to rely on a single supplier or manufacturer, and on their roadmap.
- Proprietary architecture – open architecture is crucial, for the same reasons as the above.
- Obsolescence – understand the risks of obsolescence with any investment in this technology, unless you're deploying for immediate benefits.

Box 9 – A word on cost and financing

Cost and related considerations go hand-in-hand with technological considerations, as new, unproven technologies also tend to be the most expensive technologies. The failure of Bluetooth to take off, for instance, has been directly ascribed to the high cost of Bluetooth-enabling enough devices for it to make commercial sense on an organisation-wide basis. One can view cost almost on a matrix of affordability, availability and existing roll-out, with mobile phones at the bottom in terms of cost but a the top in terms of availability, making for highest potential in terms of platforms for service delivery to the public. However, this does not take into account custom solutions as well.

On the other hand, some fairly new technologies have matured very rapidly, so that it is easily possible to show an immediate cost benefit of wireless networking for almost any network. Compatibility issues, security and management resistance then become more significant barriers to implementation.

One potential route that has been adopted successfully around the world is partnership between public and private enterprise, with the private sector often carrying the cost of initial implementations in order to prove the effectiveness of the technology. This works for the government department, in that it does not have to incur initial cost, and if the technology proves itself may save it future costs even if it has to be paid for on a commercial basis. It also works for the private sector companies providing the technology, in that it provides them with an "account" of the costs of developing solutions making use of mobile phones. In general, though, this would apply to most platforms for delivery and operation of public services, with the proviso that, the newer the technology, the more expensive the cost of "test bed" on which to prove the technology, as well as to develop case studies of successful implementation which can then be used for commercial marketing. This is a best-case scenario for initial roll-out of public services using mobile technologies.

At the same time, the issue is not so much one of moving from old or legacy systems to mobile, but rather one of organisational dynamics. In moving from a static desktop working environment to one in which a team is mobile, the team need to be re-skilled not only for new technology but also for new business process. In other words, all the old checks and balances used in legacy systems must be put back into place, but in a manner appropriate for a mobile environment, and in a way that does not hold back the full service solutions mobile is intended to deliver. This also implies that end-users must be educated in the use of these technologies, which may not always be practical.

Security is a real issue, but should never be a limitation

The reality on the ground, however, is that end-users will often dictate how such solutions are used. If it does not work for the user, it will not work for the government department trying to reach that user. This also makes an additional demand on the public service to engage in a process that would be alien to many senior officials, i.e. responding to public demand rather than imposing a solution on the public due to internal demand.

The opportunity suggested by cellular phones, for example, is that they can be used as a means of paying for services from local authorities, such as pre-paid electricity. However, if old attitudes are brought to bear on this new option, it would remain a "pay-or-be-cut-off" situation. What the technology allows for, and what citizens would wish for, is a communications attitude rather than a decree attitude. So, if someone's electricity is about to be cut, they could receive a timely alert on their mobile phones, which could then in turn be used to make the payment or top it up. In other words, mobile delivery becomes an interactive tool, rather than a mere technological update on the old top-down way of delivering public service.

Within government departments, this is less of an issue, and it is more usually a case of convincing department heads of the feasibility and benefits of the technology on one hand, and that it will not disrupt the department on the other. This means that, where the technology will require new business processes, it will meet greater resistance. Something like Wi-Fi, which should make no difference to the way in which individuals function, aside from less clutter caused by cables, should be easier to implement from this point of view. In other words, if the technology operates as advertised, and the user is not even aware of the move from fixed network to a wireless network, organisational barriers should fall away. They will fail to do so, however, where departmental management is resistant to any technological change.

Ultimately, it is advisable for any government department to evaluate its current use of mobile technologies, both in terms of numbers and uses, in order to understand present capacity. The next step would be to develop the capacity to evaluate the potential for mobile technologies for their departments.

Box 10 - Standards and their implications

While there are few global standards accepted on an international governmental or commercial level, the standards issue is not a major hindrance to roll-out of technology on a regional or organizational level. The following are some of the central standards issues with regard to currently available technology:

Mobile phones – South Africa has adopted the GSM standard, which is dominant globally, although about half-a-dozen other standards for mobile communication also compete for attention. GSM is compatible with all so-called next-generation mobile technologies. This means that the GSM standard is suitable both for current and future versions of mobile phone applications like Short Message Service (SMS) and the phone-based web browsing system called Wireless Operating Protocol (WAP). It is also appropriate for "always-on" phone technologies like GPRS, currently available for South Africa cellular phones, and UMTS, which is available in some countries but not yet in South Africa.

Radio – Numerous standards are in use globally, but two leading standards have emerged within South Africa, namely Tetra (Terrestrial Trunked Radio), defined by the European Telecommunications Standardisation Institute (ETSI), and Tetrapol. The major user of this technology in public service is SA Police Services, which is likely to dictate the future standard. However, local authorities, such as the Cape Metro, are also major users of radio.

Mobile computers – The standards issues here revolve around the chips driving the hardware, with Intel and AMD being the major manufacturers, and the operating systems managing the software, with Microsoft's various versions of Windows dominant, while the "open source" system called Linux is beginning to make inroads. None of these are global standards, however, and the ultimate decision will focus on cost and stability.

Handheld computers – A standards war still rages around handheld computers, with the Palm standard still dominant on devices in use in South Africa, but Microsoft's Pocket PC standard making major gains. Especially with the use of Pocket PC on the popular Compaq iPaq handheld computer, it is becoming a favourite among developers as well. The battle is by no means won, however, and this is in area in which public service delivery should proceed with great caution.

Wireless networks – There are a number of old standards in wireless networking, but all are under the auspices of the international standards body, the IEEE, and are likely to be inter-operable once they become commercially available. The best known of these are:

- Wi-Fi, or wireless LAN, which allows computers to connect to a local network without cables; The official standard carries the reference number 802.11b, and stipulates the frequency band in which Wi-Fi operates. The standard becomes a major investment issue if it is replaced by other standards, as some technical observers expect. However, market forces appear to favour its survival; and
- Bluetooth, which allows devices that are close together to be connected without cabling. Here, again, for now the considerations are cost and efficiency, rather than standards. Some see it as only a

cable replacement technology, but as services are added to it, it will increase in functionality and relevance.
- Other standards in the 802.11 family are expected to grow in significance, in particular 802.11g and 802.11a, which offers dramatically faster data rates than 802.11b.

Satellite delivery – There is no global standard for satellite delivery of data, since most satellite operators develop proprietary systems that match their own business goals. While the ITU is looking at the possibility of a satellite broadband standard, the lack of such a standard is not a direct hindrance to the roll-out of the technology where it is most appropriate, such as rural areas with lack of communications infrastructure.

Thanks to GSM, cellular technology is about as standard as anything can be in South Africa, while a similar stability exists in wireless networking with Wi-Fi and Bluetooth. When it comes to PDAs, however, we are at war. One logical approach would be to focus on the standards that are dependable from the point of view that anyone who is talking about technology is talking about the same technologies.

The policy and regulatory environment

While technological and institutional readiness are key factors in the rollout of new applications, the policy and regulatory environment will determine whether the applications will be allowed in the first place. Among the issues that will have an impact on mobile and wireless technologies are:

- Wireless networking – due to the complex provisions of the Telecommunications Act with regard to the use of voice and data networks, users of Wi-Fi enter a legal minefield when their networks are not confined to a single building for the sole use of staff based in that building. While there are numerous benefits to be had from making Wi-Fi access available on a community level, this is not allowed for in the legislation. Even "hotspots" – wireless network access points for use by the public, such as in airports or coffee shops – cannot be rolled out on a commercial or even non-commercial basis due to uncertainty surrounding the law and its interpretation by ICASA in this regard. Since Wi-Fi is one of the clearest examples of a wireless technology that can be rolled out without delay within government departments, it is an issue that must be given high priority (For more detail on legislation affecting WiFi, see box 12).

- Open-source software – with the government coming out firmly in favour of the use of open-source software in public services, it seems a fait accompli that new development should be on the Linux operating system platform. However, most existing implementation is on Windows in one form or another, and this is unlikely to change very quickly. As a result, open-source cannot be regarded as a given when examining the applications available or potentially available for public services.

Legislation must be considered but is not an immovable obstacle

- Electronic bill payment and presentation – The Electronic Communications and Transactions Act allows for electronic bills and statements to be recognized by the Receiver of Revenue, but places various obligations on the biller, including the need to retain the original version of the document for a certain period of time. It also allows for the recognition of digital signatures as legally binding, if they comply with certain specifications. The Post Office has, however, been designated as the preferred (although not legally required) provider of digital signature services, and any future implementation of electronic billing must take this into consideration.

- General regulations affecting implementation – A wide range of governmental and departmental regulations can hamper roll-out of new

Box 11 - What is the security challenge?

Security is one of the most commonly cited reasons given for not investing in mobile and wireless solutions. However, the real issue is equivalent to the problem of road safety. If motorists keep to the rules and principles of safe driving, they are far less likely to have an accident than if they speed, overtake recklessly, or ignore road signs and regulations.

The situation with security is no different: if the principles of secure networks are ignored, then networks will not be secure. However, by following basic principles, maintaining security systems according to best practice and keeping up to date on threats and protection, it is unlikely that security will be an issue in the implementation of mobile and wireless technologies. A lackadaisical approach to security, on the other hand, will result in a data privacy nightmare.

Wireless networks, in particular, tend to suffer from lack of adequate protection, especially where access to the network is based only on distance from the access point. If access is not rigidly controlled and managed, then any passerby with a laptop computer and a Wi-Fi card is able to access the network. This is a common practice in countries with mature roll-out of Wi-Fi, and is known among mobile hackers as "wardriving". However, appropriate security policy and implementation can block the wardrivers. (see case study 1 – the SITA wireless network pilot)

Box 12 - Wi-Fi in SA – killer application or hype

Everyone wants to be in the hotspot game: setting up a public area with wireless access to the Internet. The city of Paris wants to make the entire municipality a public hotspot, while in South Africa the Airports Company is experimenting with a pilot project at Johannesburg Airport, and numerous potential entrants into this market are knocking on ICASA's door for regulatory clarity. It's even been suggested that a government hotspot be established in Parliament.

But does all this enthusiasm represent a clear business case for hotspots in South Africa? Or even for the general roll-out of Wi-Fi by businesses for their own use?

The single biggest obstacle is the regulatory environment. According to the Independent Communications Authority of South Africa (ICASA), the technology (wireless telecommunications in the 2,4 to 2,5 GHz band) "can only be used without the required telecommunications licences if specific conditions are adhered to, beyond which it will amount to a number of contraventions of the Telecommunications Act". These conditions include the ruling that "telecommunication services can only be provided in terms of valid telecommunication licences, certificates or authorities unless an exemption has been made in terms of the Act".

The only specified exemption came in a Radio Act Declaration on 17 November 1995, which has been incorporated as a regulation in the 1996 Telecommunications Act. ICASA interprets the declaration as stating that the "Use without a licence is therefore limited to a single person or entity, for themselves on single contiguous sites and within the power limitation as an alternative to cables between computer equipment. It could not be used on a commercial basis to provide service to other persons or from one property to other properties, which would be illegal and constitute a criminal offence. An example of abuse is provision of local access from an Internet user to Internet service provision." (2.4GHz ICASA Notice, 2002)

Between this legalese lies a minefield that few have successfully navigated. Until now, ICASA has been unwilling to give clear rulings on specific implementations, such as hotspots, and according to some interpretations it has given, existing projects like the airport hotspots could be considered illegal. Recent announcements that the Internet service provider M-Web will provide the connectivity for wireless hotspots at Mugg & Bean coffee shops and the three major international airports in South Africa are also likely to test the law to its limits.

In response, it is believed that ICASA may shortly issue a white paper to clarify the situation. By the time this report appears, the interpretation may have evolved, and it is advisable that ICASA be contacted for clarification on any intended project.

Meanwhile, telecommunications law specialist Lisa Thornton advises that the following is required to operate a hotspot:
If a VANS network is used for the provision of wireless Internet access, for example, public Internet access provided using a wireless VANS network or a wireless LAN (a "hotspot"):

- A VANS licence (Value Added Network

Service – required by all Internet Service Providers, for instance)
- All telecommunication facilities must be obtained from Telkom or the Second Network Operator when it is licensed;
- No voice may be carried on a VANS network;
- A frequency licence to use the relevant frequencies;
- Equipment approval for all equipment connected to the network.

(Presentation on Wireless Internet Access, by Lisa Thornton, iWeek conference, Johannesburg, 12 September 2002)

Once it makes legal sense, however, will it make business sense? In the United States, it is argued (see box 14 -What are the technology gurus saying?) that hotspots won't make a profit for another four years, due to the critical mass of users required. This sounds similar to the situation facing Internet service providers during the early years of the Internet boom, when many businesses were set up in response to the huge public demand, rather than to a clear business case for making a profit from such demand. With Wi-Fi, the pressure of public demand is convincing a variety of players to enter the hotspot market, but without a clear path to profitability. Applying this to government, the technology is appealing to those who are at the cutting edge, but may be meaningless to government employees in general. The business case must be made, rather than the technology embraced for its own sake.

The bottom line is the same as for most other technologies: it should be considered where it improves the efficiency of an existing service, or fills a need that has been clearly identified or expressed. It should not be used simply to show that a department is up to date with the latest in hi-tech.

or innovative technologies or processes. These include tender procedures, which would stand in the way of public-private partnerships designed to develop new solutions rather thanmeet existing requirements based on standing needs.

Many of these obstacles would have to be overcome in the implementation of the e-government Gateway project, which should pave the way to more effective decision-making in this arena.

Ease of application

There is one simple rule of thumb for any technology that will be used by government employees or the public: is it easy to use? If the application is needlessly complex relative to its benefits, it will be stillborn upon implementation.

Business needs as well as citizens' needs should drive applications

Even if high benefit is perceived, and it requires a steep learning curve, it may fail. For example, creation of databases offers tremendous benefit in data collection and analysis, but the complexity of the process means that it is left to specialists. That is the key challenge of rolling out new technologies: it must be meaningful beyond the domain of the specialist. At the same time, it must be convenient to use, meaning it should not require too many steps, even if it is simple.

Mobile access to the Internet carried great promise with the arrival of WAP (see Box 1 for a description of WAP), but the interface for WAP, and the time taken to reach information made it a non-starter – even before the airtime cost of accessing WAP sites was taken into account.

Box 13 - Recent development in mobile devices

If you're trying to think up useful ways in which handsets might be used in your department in the future, it would be useful to know what these gadgets are going to be capable of doing in the first place.

It's hardly breaking news that more and more cellphones now come with a built-in camera. It may be intended mainly for sending personal pictures to loved ones, but the implications for other uses, from policing to monitoring of remote projects, are huge. And that's just the start of adding new applications to the basic cellphone.

Already, there are cellphones with built-in USB, ir Univeral Serial Bus, ports, which allows it to be connected to a normal keyboard or mouse, not to mention anything from GPS devices to computers. Some so-called "smart phones" even feature full personal digital assistant capabilities while still looking and feeling like a phone. Some have mini-keyboards attached, either as separate modules or sliding out of the phone itself; others have handwriting recognition built into their screens, allowing the user to write a note into the phone or dial with a plastic stylus.

A Wrist PDA, right out of the futuristic tale that introduces this booklet, has been released by one trendy watch manufacturer: it is strapped onto the arm and forgotten – after it allows PDA users to beam contact, calendar, and to-do list information onto the device.

Giant chip manufacturer Intel gave mobile computing a push forward at the beginning of 2003 with their announcement a new platform for mobile computing, called Centrino. It combines the latest Intel chip design for smaller and lighter chips, a mobile processor, designed to save battery life, and a mini Wi-Fi card, for connecting to 802.11b networks without physical links.

Intel says that Centrino technology is built from the ground up for mobility, supporting a wide range of industry wireless-LAN security standards and leading third party solutions now and in the future. Intel also works with VeriSign and Check Point Software Technologies to provide better wireless security solutions. In addition, Intel and Cisco are working together to extend Intel Centrino mobile technology's security capabilities to support leading wireless security protocols.

Do you need all this? Almost certainly not. But it provides a clear indication of the vast potential of the cellphone, both in what can be done to it technologically, and how it can be adapted for numerous plain common-sense uses.

Box 14 - What are the technology gurus saying about mobile technologies

Gartner
The number of "frequent" Wireless LAN users in North America will rise from 4.2 million in 2003 to 31 million by 2007 – but providers of public access hotspots won't make a profit until the audience reaches the saturation point of around 100 000 hotspots. Ken Dulaney, vice president and research director for Gartner, says the growth will be driven by applications that need broadband connections. More than 50 percent of WLAN deployments will be within vertical markets such as education and healthcare over the next year.

The cellular industry beat all expectations in 2002, selling 423 million cellphones, up 6% from 400 million in 2001. Growth is expected to rise into double digits in 2003, for the first time since 2000.

Jupiter
71 percent of large enterprises (those generating $100 million or more in annual revenue) in the USA currently support wireless LANs (WLANs), or plan to in the next 12 months. However, 64 percent of them have 10 percent or less of their employees connected wirelessly.

InStat/MDR
Worldwide revenues from hotspot backhaul services (the last mile connection that carries data traffic from the public wireless LAN to the Internet) will grow from $70.5 million in 2002 to well over half a billion by 2007 while the number of connections needed to support these hotspots will grow just over 10 fold during the same time frame. "While all of the attention has been on wireless cards, coffee shops, and how to combine them to generate revenues, the backhaul already presents a revenue stream coming out of the hotspot market," says Daryl Schoolar, a Senior Analyst with InStat/MDR. "

Pyramid Research
Enterprise wireless LAN equipment revenues will grow by a compound annual growth rate of approximately 33% between 2001-2007, topping $1 billion in 2007. In Europe's mobile enterprise business segment, Wireless LAN is the area with the strongest revenue potential for operators and vendors.

Harris Interactive
According to a survey of adults in the US who do not own a mobile phone, conducted by Harris Interactive for AT&T Wireless, 20% of respondents who do not own a mobile phone say they plan to buy one in the coming year, but 61% would still like one for emergencies, when they are running late and when lost. Still, 49% say they do not need a mobile phone. When asked to give the reasons why they do not have a mobile phone, 22% of respondents say they are too expensive, while 12% say they do not like mobile phones.

Yankee Group
64% of the US population had a mobile phone in 2002, up from 53% the year before. 50% of respondents in an earlier Yankee study didn't see a need for mobile data or Internet services. 16% felt the service was too expensive.

And how they get it wrong…
In the year 2000, International Data Corp. (IDC) predicted that "by mid-2001, all digital

cellular/PCS handsets shipped in the world will be WAP-capable … So, it's very realistic that the majority of Internet access will shift so that it is through wireless and not wired means." (Iain Gillot, vice president, Worldwide Consumer and Small Business Telecommunications research at IDC, quoted in CyberAtlas.

According to IDC forecasts, by the end of 2002, there would be more wireless subscribers capable of Internet access than wired Internet users. When this happened, they forecast, there will be a fundamental shift in the thinking of the Web community and the IT industry as a whole. The factors driving the shift to wireless Internet access included e-customer care for carriers, e-billing, and notification services.

While these forecasts were always dubious, as it was clear even then that the size of a cellphone screen did not make it a useful device for accessing the Internet, it is a fairly typical example of expecting the user to follow the technology's capabilities, rather than understanding the need to adapt technology to user needs. This is a lesson that is vital to grasp for anyone wanting to roll-out mobile or wireless solutions for government: they must focus on the user and the needs of the user, rather than merely on what the technology can do.

Should I wait or should I replicate?

Ultimately, it comes down to the types of applications that will be relevant, the factors influencing decisions to implement, and the factors influencing implementation itself. The options presented are a synthesis of the research and analysis conducted for this report, and should be regarded as the starting point for decision-making rather than the final word on the subject.

Business requirements must not change. But mobile enables you to look at meeting business requirements in a new light

After taking into account all of the answers to these questions, it will be possible to examine technologies from the point of view of the best strategy for addressing them. In some cases, it is clear that a technology has been successfully implemented regardless of context, and can simply be replicated. In other cases, it is clear that further piloting is required, or that the technology is still so immature that it would be best to wait for it to develop further.

The research team has developed the following categorisation to assist in positioning applications according to strategic approach:

Replicate **-** *Value shown, costs known, rapid implementation possible*.

After assessing the impact of time horizon, time taken and cost, a number of areas were identified as leading applications in mobile technology within the next three years. All of these areas have been extensively piloted or implemented, and have demonstrated value. The challenge then becomes one of replication, rather than attempting to prove the business case.

These include:

- Setting up mobile offices (see box 18)
  - Those that need access to e-mail, the Internet, and shared files when away from office
  - Those that need to submit documentation and send e-mail while away
- Rolling out wireless LANs
- Managing patients and patient records more effectively

Demonstrate **-** *Business case evident but clear value needs to be demonstrated*.

Several areas were identified as having potential application in the medium-term. These applications will move to the forefront once additional research and development has been conducted and pilot projects have been initiated.

These include:

- Information management applications
  - Those that need access to back-end databases because they work away from the office
- Those that need to manipulate live

Box 15 - Groundbreaking South African initiatives

We've said it before in this document, but it bears repeating: South African companies have been responsible for world-leading applications in the mobile field in the past, and is likely to do the same in the future. One of the companies referred to later, 2Big Mobile Applications, is a small black owned company that specialises in providing Government, parastatals, private companies and small business with access to their databases through any mobile device. While this is not revolutionary, it represents homegrown services and solutions, and provides for innovation that is based on needs at home, rather than responding to broad international trends. It is meeting such real-world needs, however, that often result in world-leading technologies.

At the other end of the corporate scale, an organisation like ATIO provides the full scope of enterprise mobile solutions that could be expected of any global organisation. It specialises in the mobilisation of voice and data between back-end systems and handheld devices in a secured manner using wireless connections, which is again not revolutionary – but again it is implemented based on local needs and local understanding.

The same applies to many other services and innovations. Take the concept of pre-paid cellular phone use, pioneered in South Africa by MTN. It was initially an innovative response to providing phones and airtime to clients who could not meet the stringent credit requirements of airtime contracts. Prepaid is today the biggest driver of growth in cellular subscribers worldwide.

Airborn, a division of the MTN Group's Strategic Investment arm, has also been responsible for two global patented "enabling engines", namely remote interactive voice response (RIVR) and two-way instant short message (TWIST), both world firsts. RIVR allows users to access information on the move via voice, and TWIST links any cellphone with any database or PC.

SecureWorx designed a secure authentication solution in collaboration with SITA R&D. This solution enables security and single sign on in a Wi-Fi solution, without significant user intervention, where the security is non-intrusive, but as secure as the existing LAN security. This is also a world first.

Numerous small developers are rolling out innovative approaches to SMS, from the cost-effective sending of bulk SMS to integrating e-mail with SMS. In the security arena, South African companies large and small, and even government developers like SITA (see SITA wireless case study) are adding significantly to the body of technology and understanding.

What does all this mean for public services or government departments? Mainly the fact that innovation and expertise is all around. If you can think of an application, chances are you will find someone in this environment who can or already has come up with a way to make it work.

Box 16 - Views from business

What will prevent mobile and wireless technologies from taking off? In interviews with industry leaders, the following barriers to success were cited most often:

- Lack of user education;
- Handset compatibility and varying end-user device capabilities; Handset availability and cost;
- Airtime cost;
- Matching business and consumer expectations and requirements;
- A clear picture of return on investment;
- Cost of providing blanket mobile coverage;
- Cost of high bandwidth, and limitations on bandwidth;
- Power blocs that are worried about changes;
- Organisations without experience getting it wrong and leaving potential users disillusioned;
- Telecom regulations on running data and voice within the same carrier;
- Security of data on mobile device;
- Lengthy and cumbersome procurement processes;
- Old, custom-designed and data-hungry legacy applications in use by government;
- Lack of a wireless infrastructure to extend mobile services to roaming government officials;
- Gaining access to the appropriate people within different government agencies;
- Lack of standardisation between different systems implemented at different government organisations;
- Lack of understanding of the needs of each department or sector.

Where mobile and wireless solutions are being considered, these factors should serve as a checklist to see whether they are applicable to the specific implementation, and whether they will hamper it. If solutions are pursued without regard to these obstacles, buy-in from both government and the public could be affected, with damaging consequences for both the projects in question and future attempts to rectify the damage.

data on an ongoing basis while away from the office
- asset management, particularly management of mobile assets (vehicles, laptops)

Investigate **-** *Buzz and hype is strong but the business case needs to be estab - lished or applications still need to be developed*

In many cases, applications and products are being talked up by the media, but are usually not ready for large-scale roll-out or sometimes even for piloting. Prototypes and even commercial products are available, but very much aimed at the early adopter market. Neither government employees nor the general public will usually be in a position to make use of such applications – or in some cases even see their relevance. Examples include:

- workflow processes
- capacity management

Wait **-** *High levels of hype, limited practice*

A number of interesting and potentially killer applications have been touted by developers and manufacturers, often based on what is still on the drawing boards or in concept stage. These require proof of concept, usually from the private sector, before they can be considered for public piloting.

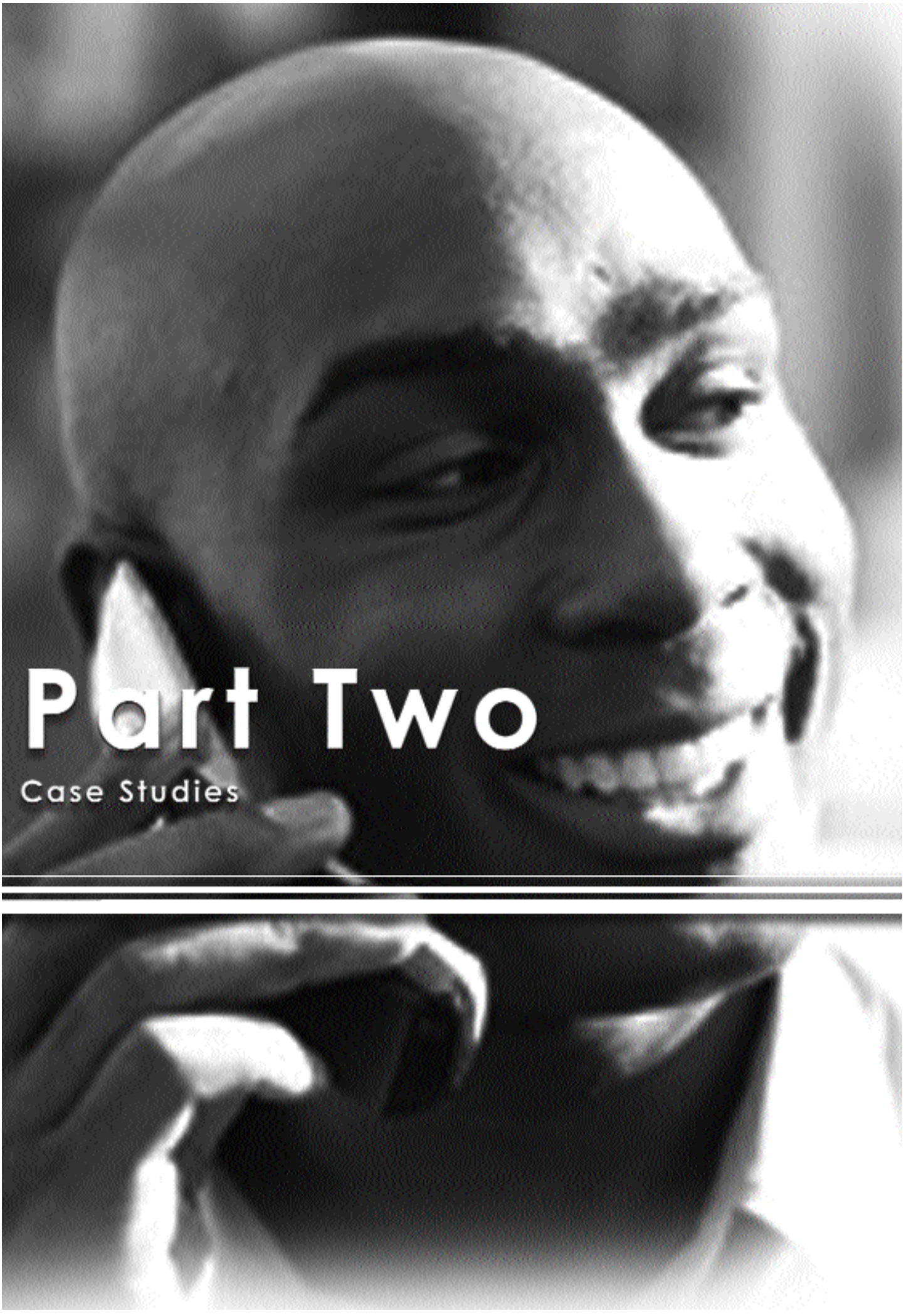
- Location-based services
- Biometric identity verification

A guide to action

Combining the value proposition, factors to consider, and the nature of implementation, the following framework is provided as guide to action for government agencies.

Using the framework, it becomes possible to plot specific applications according to category and approach, and allows any department, division or organisation to see at a glance whether the application they have in mind fits into their overall strategic framework and capacity.

	Replicate	Demonstrate	Investigate	Wait
Connectivity	Wireless LANs. Cellular.	Government hotspots	PAN (Bluetooth)	Third generation cellular services.
Personal communications	Conversation. Messaging.	Interactive Voice recognition (IVR)		Voice recognition. Electronic voting.
Information management	Updating databases. Data collection. Simple database access to basic information. Document management.	General database access (back-end ready). Information lookup by citizens. Submitting electronic application forms.	General database access (legacy back-end).	Cross-department database integration. Database access by citizens.
Logistics	Warehouse inventory management. Vehicle tracking. Telemetry (remote equipment monitoring).	Asset management. Workflow. Scheduling. Incident reporting.	Capacity management. Driver performance tracking.	
Positioning and identifying	Emergency caller identification.		Emergency location-based services.	
Transactional			Bill payment. Electronic purchasing of services.	Electronic voting.



Part Two

Case Studies

Connectivity

The need to access, source and use routine and non-routine information from a variety of sources, including web sites, intranets, e-mail systems, document management systems, knowledge management systems, and portals, makes connectivity the basic building block of all other forms of mobile and wireless communication in delivery of public service. In addition, the ability of individuals and communities to access government services often depends on the level of connectivity made available to them.

Case 1: The SITA wireless net - work pilot

Every commentator points to Wireless LAN – the office network with no physical connections – as the quick win or low-hanging fruit of mobile and wireless technology. Just how feasible is it, how quick a win, and how low-hanging? SITA recently conducted a pilot project to determine its viability for deployment in SITA and Government institutions. The concept was tested in the Technology Lab and then deployed live on a limited scale in an operational environment.

The entire process, from choice of technology and site to architecture and security decisions, provides an insight into the decision-making process that will face other government departments, and the challenges and issues they will have to address on the way.

Choice of Technology

The choice of technologies was driven by four requirements:

- Users needed full access to traditional applications such as e-mail, Internet and other networked applications and stored data files;
- Users had to have access at all SITA premises;
- The technology had to be mature enough for immediate deployment;
- Vendor lock-in, i.e. dependence on a single vendor or on the original suppliers, had to be avoided.

The overall technology decision was to use Wireless LAN based on the IEEE 803.11b standard, which is regarded as the most mature standard for wireless networking in the world today. As a result, it best matched the requirements set out at the start.

Lessons Learnt

Security - The initial expectation, that security issues were the greatest risk and would pose the biggest challenge, proved correct. While a large number of excellent proprietary solutions are available, these are mostly dependent on proprietary extensions of standards. Due to the volatility of this market, any proprietary solution has quick obsolescence built in.

After unsuccessful testing of most of the available offerings, the team engaged a separate company to develop the security solution that met its requirements. While this increased cost, it also resulted in a unique solution, both with regard to

capabilities and ease of access.

Interoperability - Any solution must offer interoperability, not only of the new components particular to the project, but also with legacy architecture pertaining to the existing wired network and the applications running on it. It was found that products from different vendors did not pose a problem – as long as only the standardised features were utilised. However, most vendors offer enhanced features that are very attractive, but are only available on a proprietary solution, especially with regard to security of the solution.

Planning and Site Survey - Since 802.11 is a radio based technology, issues like data reception and transmission, which are not usually factors in wired networks, have to be addressed, along with physical, human and technology issues.

Factors that had to be taken into consideration included:

- The ***number of users*** who will be affected. 802.11b is a shared architecture, which means that the addition of a user in a particular cell affects the data access of all current users on that cell. The team limited the number of prime users for the project to only those identified as high mobility users to ensure an optimum quality of service at all times.
- ***Physical constraints*** of building sites. The construction material may have a shielding effect and limit transmission to less than the specified range. This can only be determined by thorough site surveys. Access points were also placed in a flexible manner to enable relocation once user access is physically tested.
- ***Locations*** where data access will be available. User density affects data throughput. Vendors are willing to assist with site surveys.
- ***Physical security***. Many access points can operate independently and pose a significant risk for theft. These are small, high value items that can be utilised at home or any other environment, so they have to be placed covertly. Few vendors offer assistance on this issue.
- ***User maturity***. The team chose to use minimum user technological expertise as a departure point and therefore to construct a solution which required the minimum user intervention.
- ***Stability of legacy architecture***. This provided the most valuable lesson: If there are current (and probably hidden) problems in the areas of LAN user authentication, network stability and network access, addition of wireless components will expose these problems and may delay the successful completion of the project until they are satisfactorily addressed. Therefore, a prior LAN audit should be considered when planning for a wireless project.
- ***Not a silver bullet***. Wireless is not for everybody and every application. It should be restricted to high mobility requirements and only replace wired LANs where standard cabling is deemed impractical or even impossible (such as in historical building sites).

Typical Architecture - The architecture for wireless LAN revolves heavily around security, in order to ensure that investment in the project not be compromised. (see box 17 - Setting up a wireless network – a technical guide).

Case 2: Rural Connectivity for Community development

For the past four years, the CSIR Consortium has worked to support integrated rural development initiatives, including renewable energy, building operations, health, education, agriculture and small business development. With support from the Department of Science and Technology Innovation Fund, an alternative communications infrastructure was developed and implemented in a deep rural community in the Eastern Cape, independent of the Telkom network, to support local economic development.

The communications infrastructure was based on the use of wireless and GSM technologies, as GSM coverage is good in many rural areas. The wireless technology was developed by the CSIR and was seen as an effective solution for rural connectivity in establishing a rural intranet. The 11 Mbps broadband wireless system enabled data, voice over IP, and video communications.

The wireless technology provided point-to-multi-point connectivity within a village, linking a school, clinic, hospital, police station and a community telecentre - all within a 10 km diameter cell.

The wireless technology provided voice communication throughout the cell through what was in effect an extended intranet. Each site was assigned it's own number and the base station routed calls using a software PABX. However, since there is no link outside the cell, the sites are only allowed to talk to each other within this intranet.

Case 3: SITA executives get connected

SITA executives, like other senior managers in government, are continuously on the move and require rapid access to their e-mail accounts and the ability to browse the web. To facilitate the deployment of a mobile office solution as a service to other government departments, SITA requested a proof-of-concept from MTN in April 2003.

The proof-of-concept was required to evaluate four issues of concern to SITA. These were security, financial implications, the end-user experience and the performance of the data bearers of MTN. The MTN data bearers included DataFast (i.e. High Speed Circuit Switch Data or HSCSD) and DataLive (General Packet Radio Services or GPRS). A total of twenty high-level executives were included in the proof-of-concept with the intention of developing a viable solution that could be offered to the rest of the public sector.

The proof-of-concept is at an advanced stage. Initial evidence indicates significant potential for introducing mobile services for the public sector. At a mini-

Box 17 - Setting up a wireless network – a technical guide

What you will need?

The following components were required specifically to add wireless capability to an existing wired LAN during the SITA pilot project.

Secure Gateway - The Gateway deployed integrated a secure firewall, DHCP server, DHCP requester (tunnel), PKI authentication and VPN software that ensured data transfer security. It also includes Intrusion Detection and Prevention and operates as a second layer bridge, which makes it network transparent. The combination of these services in a single device is the only truly unique solution in the project.

Switches - These are standard LAN switches and should ideally be the same as current LAN switches. It should preferably be power injection enabled, although separate power injectors may be used where necessary.

Access Points - Provided the total solution is adhered too, access points from any reputable vendor may be utilised.

Client WLAN Interface Cards - Most new notebooks have integrated 802.11b cards included. New cards need only be purchased for those that don't. This is one reason why a proprietary solution was not envisaged: it would be impossible to manage card standardisation at the user level. This does not mean that standardisation should not be imposed where possible and practical, since it would drive down operational costs and therefore Total Cost of ownership.

Security Software - This a two-tier solution installed both in the Wireless Gateway and on each client. Microsoft offers integrated IPSEC software with the operating system, but this was not utilised due to added stability requirements and to minimise user intervention.

Cabling - The only requirement for cabling is to use a unique colouring code for the wireless cables to enable identification of wireless unique infrastructure. Otherwise only standard Cat 5 Enhanced cabling was done

What will it all cost?

Wireless Gateway - Costs are structured on a per user basis. Expect costs to start at R15 000 per device for 10 concurrent users. Tests in the Lab pushed this limit to 30 users per device.

Switches - Costs are dependent on functionality and the number is dependent on physical location factors. Costs vary widely from R1 000 to R30 000 per device.

Access Points - Prices vary by big percentages and the number of devices required is dependent on the number of users and the expected data traffic volume and type. Allow for 8 to 12 users per access point on average. Budget R2 500 per unit.

Users - R1 000 per user for those users whose notebooks are not WLAN ready.

Security Software - Budget for R6 000 per WLAN Gateway and an additional R1 500 per user. These prices are typically on a sliding scale and are less if more users are enabled.

mum, applications such as e-mail access and web browsing would significantly enhance the productivity of most government employees who are mobile.

The mobile platform proposed by MTN is robust and workable and has integrated well with the SITA Government Common Core Network (GCCN).

Users who are participating in the proof-of-concept are actively using the service and this indicates a potential high-level of interest by other government departments. However, successful rollout would depend on adequate user support and training to give users peace of mind and confidence in using mobile services.

MTN is currently involved in a financial modelling exercise to assist SITA in rolling out mobile remote access on a commercial basis to the rest of the public sector.

For more information, contact Francis Malema from SITA (083 376-7000) or Ncaba Hlophe from MTN (083 222-5619)

Case 4: Enabling the Digital Doorway with GPRS

The Digital Doorway project was inspired by the successful "hole in the wall" project in India, where a computer was placed in a wall in a poor urban community. The use of the computer was monitored remotely by the project team.

The results of this research project showed that children possess the ability to learn functional computer skills with minimal teaching intervention. This phenomenon has become known as Minimally Invasive Education.

The first Digital Doorway site in South Africa was launched in the Cwili Township in the Eastern Cape in December 2002. A lone computer terminal, accessible 24-hours a day, was placed outside a busy community hall. The applications and educational programs on the terminal included Maths tutors, Science software, Music programs, language tutors, HIV/AIDS presentations, the Internet, and word processing and spreadsheet software. There was immediate interest among a wide spectrum of users, male and female, who used it from as early as 4:14am through to 1:20am the following morning.

Due to the lack of fixed telecommunications infrastructure in the likely locations, GPRS has been identified as one of the most appropriate technologies for connecting such "digital doorways" to the Internet.

Furthermore, once regulatory hurdles are overcome, wireless LAN, or Wi-Fi, can be used to connect such terminals to networks in nearby government or educational institutions, or even to business premises, where public-private partnerships have been established for the project.

For more information, visit www.digital - doorway.co.za

Key Learnings - Connectivety

It is obvious from the above that even the most low-hanging of fruit is not as aesy to pluck as it seems. Despite the obstacles, however, SITA believes that Wireless LAN is a mature technology with practical benefits that should be investigated for use in the SA Government now.

Provided sufficient attention to detail and planning is exercised and that the technology is only applied where applicable, it can add value in a cost effective way to many government services and employees. Its biggest advantage is in increasing productivity for highly mobile users, who require access to information and applications when on the move, within office environments and out.

Connectivity solutions at the infastructure level often require multiple technologies. The more complex the problem, the more necessary it becomes to enter partnerships for implementation. The CSIR is already playing a leading role in cutting edge, mobile and wireless applications. It presides over Bluetooth development at the chip level, i.e. developing entirely new solutions that rely on the global Bluetooth standard, but not on imported technology. It is also an early adopter of Wi-Fi solutions, proving the technology and building on it, and thus enabling it to develop solutions for thier clients in both the private and goverment sector.

Box 18 - Setting up a virtual office environment in a day

Business people and government officials who are constantly on the road find that the biggest drawback of their travels is a stable working environment. While they often use laptop computers, and can work on the same documents wherever they go, they often do not have access to the resources of their organisations' networks. That includes background documentation and archives on the one hand, and e-mail and Internet facilities on the other. Even where the laptops have built-in modems and can be connected to any phone line or network point, the organisation may not have allowed for such access to its mail system.

This is only the beginning of the challenges for the high-level mobile worker. When the basic connection issues are sorted out, there is still the problem of different facilities in every location, and lack of standardised forms of access from one hotel to another, for example.

And then there is the office that has to be set up in a hurry, as with start-up businesses or new project teams. Waiting for a landline can destroy a project even before it starts.The typical solution is a "virtual office", which usually consists of a laptop computer and a cellphone with data connectivity. But what if you need to connect up several people and devices?

MTN offers a quick win for those who find their workspace particularly challenging. It's called Instant Office, and provides a cost-effective communication solution to the business sector, allowing multiple data and voice connections through one small mobile unit and a single SIM card. The unit allows a user to simultaneously connect a fax, desktop PC orlaptop and a telephone in the most remote locations.

Aimed at small and medium businesses, it is also known as Office-in-a-box, so simple is it to unpack, connect and get up and running. While it may be cheaper to run a landline, set up and maintenance costs are lower, and a landline cannot beat it for convenience .

MTN demonstrated its effectiveness when it took the media down a long dirt road in an isolated part of Pretoria, past plots and pigsties, to a table standing in the middle of nowhere. The table held a notebook computer, phone, fax machine, and a printer. The power was supplied from a car battery – and everything was up and running, fully connected to a company network and the Internet. It was the Instant Office, and it had been set up in a matter of hours.

For more information, contact Ncaba Hlophe from MTN (083 222-5619)

Personal Communications

Ordinary users of ordinary cellphones are beginning to take extraordinary applications for granted. For example, someone returning a hired car is able to get instant confirmation of contract and cost details via SMS, within minutes of handing back the keys. Confirmation of credit card purchases is taken for granted. The implications for facilitating purchasing and payment by government employees on the move are enormous. But this is just one aspect of using mobile technology to enhance personal communications. From basic voice communications through to mass communication of text messages to individuals' phones or e-mail to their computers, communications has already been revolutionised by mobile and wireless technology

Case 5: Mobile medicine

Telemedicine does not have to be about new technology, infrastructure and regulatory approval. Often, it's just a case of making the best use of what you have. In the Eastern Cape, for example, several pathology labs have been provided with computers fitted with ordinary GSM phones to send blood-test results to rural clinics as soon as they're recorded. As a result, patients can be treated immediately. This single intervention is already aiding early treatment of tuberculosis, assisting in reducing the impact of the disease in the Eastern Cape.

But it doesn't stop there. In Cape Town, Dr David Green initiated a project to send daily SMS reminders to TB patients to take their medication – the one gap in treatment that can be filled simply by reminding people. This idea has now been expanded into the On-Cue project, serving more than 10 000 patients managing chronic diseases ranging from AIDS to arthritis. The cost is carried by a range of players, including medical schemes, pharmaceutical companies and the Cape Town city council.

A similar project, called CellLife, has been developed for AIDS patients by the University of Cape Town, the Cape Technikon, the HIV Clinical Research Unit and the Vodacom Foundation. It goes a few steps further, however, and provides therapeutic counsellors with standard cellphones loaded with CellLife software. This enables them to collect information during their visits to AIDS patients and submit it via SMS using a simple menu on the cellphone screen. The information can then be accessed by doctors or nurses who have the necessary authority, and the patient's health can be effectively and expertly managed.

(Source: Vodaworld magazine)

For more information, visit www.on-cue.co.za

Case 6: Mass alerts

When a 14-year-old boy created a hoax web site claiming that Hong Kong was designated as an "infected city", some

residents panicked about Asia's mystery illness, Severe acute respiratory syndrome. In response, authorities sent a blanket text message to every mobile phone in Hong Kong - around 6 million phones in a city of 6.8-million people. The message from the Commerce, Information and Technology Bureau was simple. It read: "Director of Health announced at 3 p.m. today there is no plan to declare Hong Kong as an infected area." The real significance, however, was the fact that it was the first time a blanket message has been sent by government to an entire region in this way. A British company has launched a service to send terror alerts to subscribing Londoners, but it is not a government initiative.

Case 7: Land of the free

Californians can now instantly access important information from the California State home page anywhere, anytime with a new wireless feature.

It lets users register to receive up-to-date information about energy warnings, traffic snarls blocking commutes, press releases from the governor's office and even the winning state lottery numbers via a pager, a cell phone or a hand-held personal digital assistant (PDA).

California is one of the first state governments offering free wireless services to its citizens, the governor's office claims. To sign up, users click on California's web portal, my.CA.gov, for more information.

(Source: Silicon Valley/San Jose Business Journal, July 11, 2001)

Case 8: Mobile justice

South Africa's Department of Justice was one of the first government departments to embrace the concept of electronic government. And, although it has not yet embarked on a programme to introduce mobile justice, it has identified some possibilities in the use of mobile phone technology, including:

- Reporting of crime on pre-programmed numbers – since cell phones allow a network to identify who is calling and where the person is calling from, they can make the procedure more efficient. Call centres can then divert emergency calls to a vehicle or officer in the vicinity.
- Reports to members of the public using SMS is an easy quick win but a major deliverable.
- Keeping a witness informed as to when exactly a case is being heard would allow for a limit on the waste of time.

Key Learning - Personal Communications

Existing technology is already geared towards innovative healthcare solutions. The strategies employed are relevent across most service areas, from justice to traffic management: it is usually a case and rolling out the services. However, free service, as provided in Carlifonia, must be seen as pilot projects and not model implementation.

Box 19 - Government services menu on a cellphone

One of the biggest opportunities in mobile service delivery lies in applications that will not rely on new technology, but rather on adapting existing technology. It is for this reason that the standard cellphone remains the most natural route to reaching the public in terms of mobile services. It is probably the most commonplace technology ever rolled out in South Africa, with more than one in every four, and soon one in every three, South Africans using it.

The challenge is to adapt the cellphone to service delivery, and the most obvious means of doing this is via SMS. As shown in examples of health services using SMS alerts for patient management, the solutions are often very obvious and very simple.

But it cannot always be only about pushing information down to the public. The technology can also be adapted to pull information down from government departments. Two-way SMS, offered by a number of South African developers, is one solution. Another is WIG, or Wireless Internet Gateway, which requires an additional menu on the cellphone. WIG is in effect a menu-driven system of requesting information via SMS in a structured and pre-determined format.

While WIG is not available to all phones presently in use, since it requires a SIM card with higher memory capacity than the standard cards in issue, it has enormous potential.

A set of government services menus could be available to users, depending on their specific requirements, and it could be accessed in the language of their choice.

Very little development or innovation is required to adapt a WIG menu, and the underlying technology is standard.

The ideal, of course, is for this functionality to reside on the mobile network itself, rather than on the SIM card, so that anyone can access it at any time, regardless of what is actually on their phones.

In terms of G2E applications, however, WIG could truly come into its own in the shorter term. By issuing appropriate government employees with phones containing WIG-enabled SIM cards and the appropriate government services menus installed on the cards, a range of government services could suddenly become a lot more efficient. These include requesting information from databases or submitting entries, which could be integrated while the employees are in the field rather than waiting for them to return to the office to upload data.

Government procurement, particularly in hospitals, could also become more efficient through appropriate staff accessing government services with cellphones. Fleet management, roadworks alerts and vehicle registration are just some of the examples of how it could be applied on the roads of South Africa by different departments.

The possibilities are immense, but enthusiasm must be tempered with the complexity of creating simple, intuitive menus in the limited space available on a cellphone screen. Both language and clarity issues, not usually taken into account when implementing technology for its own sake, must be central to any such project.

Information Management

The heart of mobile-and wireless-enablement is the ability to access key back-end databases, to input and to manipulate data. The ability to extract the data for wider distribution or use is, naturally, more important than the question of which technology is in use for the purpose.

Case 9: Fighting crime with mobile phones

It was in the hours before dawn when a squad of plainclothes policemen swooped on a nondescript warehouse somewhere in Gauteng. Acting on a tip-off, they had been watching he place for days, and were finally ready to go in. They burst through the front gate and immediately had their suspicions con - firmed: the yard and warehouse were filled with cars in various stages of disas - sembly, and piles of carefully sorted parts covered every available space. It was a chop shop. Whipping out their cellular phones, the police immediately set to work …

No, that last sentence was not a mistake. Mobile phones, rather than firearms, are about to become the most potent weapon in the fight against car theft in South Africa. Thanks to new applications available for cell phones, police are now able to access a database of stolen vehicles through the short message service (SMS) capacity of ordinary phones. By typing in registration numbers, engine numbers, serial numbers and other part numbers, they can get instant conformation on whether a vehicle or even a spare part is stolen.

The application was developed in South Africa, for the Johannesburg Metropolitan Police, the municipality's city police force. It is made up partly of former traffic officers and partly of new recruits, with the purpose of making policing "visible". The 1200 officers target traffic offenders, enforce municipal bylaws, and provide a constant presence on the streets, in order to free up the regular South African Police Services to concentrate on more serious crimes. However, the challenges have been huge. For example, until now, the only way for field officers to verify the status of vehicles was to contact a call centre by radio. If the call centre was busy, officers were compelled to leave a vehicle without verifying if it was stolen or not, or whether the driver's license was valid.

The solution is an Integrated Information Management System, which relies heavily on mobile solutions. The metro is working with, among other, mobile solutions provider 2Big to explore a system that will include the use of GPRS-enabled mobile phones to check the status of vehicles in real-time and access drivers' licenses and warrants direct from databases without delay. Officers will also be able to access information on legislation, fines or municipal by-laws on demand in order to make informed decisions.

Case 10: Mobile law enforce - ment

South African Police Services have embarked on an ambitious program to provide mobile access to databases and critical information relating to potential crimes. Already they have implemented a project whereby Nokia GSM phone-cards are inserted into notebooks, from where an officer accesses a mainframe via a dial-up service. For example, if police raid a chop-shop equipped with these notebooks, they can work from the site, identifying part numbers and engine numbers which have been stolen. Using the same system at roadblaocks, the project has already been successful in terms of identifying and recovering stolen vehicles.

The next phase will include:

- user name and password authentication to access an Oracle database, querying vehicle information, ID number, engine number, chassis number, etc, via a standard cellphone which is WAP and GPRS enabled.
- Using an iPaq PDA with an integrated telephone and Java applications to access far more detail than on a cellphone, but also via GPRS. Also useful in cases where Telkom cannot give police stations Diginet infrastructure or telephone lines, such as in very rural areas.
- Testing a new mobile access router developed by Cisco, which accesses both GPRS and wireless LAN, so that the moment the user is in a metropolitan area and has a wireless LANs deployed within, say, Schoeman Street or Pretorius Street, it will use the wireless LAN to communicate; the moment the user is out of reach, it will automatically switch to GPRS.

Case 11: Wireless medicine

One of the exciting prospects in mobilizing public services lies in the field of "telemedicine", which refers to providing medical services from a distance in areas where medical facilities are not immediately available. This can range from actual medical diagnosis and advice being dispensed remotely to technical support via wireless links.

However, things are not always as simple as they seem. Take a hypothetical but common requirement of creating a wireless local area link between a hospital and a remote clinic in an outlying area of South Africa. Generally, the most practical solution is a local area network via wireless (802.11b, or Wi-Fi) technology. Specialist Wi-Fi suppliers are available to provide such solutions cost-effectively, including research, consultation, Wi-Fi equipment including masts and antennas, commissioning, installation and maintenance contact.

Approval from local authority for the construction and implementation of the antennas does not tend to be a problem, as it is in the interests of the community. But then comes the real obstacle: ICASA approval to operate a Wireless network in a public environment, as well as Type Approval Certificates, designed

to approve devices in use. The latter can take at least six months to obtain.

As implied earlier in this document (see box 12), it can prove difficult to obtain answers and guidance from ICASA in this matter; different representatives give different interpretations of the act with regards to the kind of rural situation described here.

The easiest route tends to be applying for a temporary license, which takes as little as a month to obtain, and can be renewed every three months, on condition that only ICASA approved equipment will be used and that it will be used for a non-commercial purpose.

That ICASA approved element can be the biggest challenge of all, however. If you want to hook up videophone technology, for such services as remote diagnosis, you will have new regulatory hurdles to cross. Some projects of this nature have ground to a halt precisely because the equipment did not meet with official approval.

One example where such a project did work, however, was in the creation of a wireless link between the Tslitwa clinic, and the Sulenkama hospital, 20km apart. A wireless link was created between the two, and an Ethernet camera incorporated into the network. Basic training was given to a clinic sister at Tslitwa and a doctor at Sulenkama.

The project has already had a significant impact on the community, both in terms of direct cost saving from travel and early diagnosis, and in terms of empowering the clinic sister, who now feels better able to provide a service to her community. Safety and security have also been improved, both due to contact with the local police station and a reduced need for travel on unsafe roads.

Expansion of the project, however, depends on a more conducive regulatory environment.

For more information on such projects, contact the Department of Health and the Medical Research Council, who jointly operate the South African Primary Healthcare Telemedicine Workstation Research. The aim of the project is to combine education with the provision of low cost technical support to the primary health care worker.

Case 12: The mobile state

In July 2002, The US state of Virginia, long a pioneer in electronic government services, become the first state to make its home page and government information services available on wireless devices. It launched My Mobile Virginia to give access to government services via PDAs and cellphones.

Managed by the state government's Virginia Information Providers Network (VIPNet), it launched with a wide range of services including:

- House of Delegates and Senate member listings with contact information;
- A complaint selector to find the right avenue for filing a consumer com-

plaint;

- Tourism information on the state's accommodation and leisure options;
- Election polling station lookup system linked to residential addresses where within seconds their polling place name, location, and voting district information is returned.

Still on the agenda were:

- Department of Motor Vehicle (DMV) service center location look-up;
- Department of Human Resource Management (DHRM) state agency and employee lookups;
- Virginia Lottery winning information and results;
- Library of Virginia public library location search;
- Virginia State Police (VSP) area headquarters and field office locations search; and
- State Parks information and location search.

Key Learnings - Information Managment

While South Africa may often be seen as a recipient of technologies developed in other countries, a tremendous amount of innovation occurs within its own boarders. In the mobile and wireless arena, this is no less true. Many of the applications identified for use in public service delivery can be sourced locally, at lower cost and with direct support, rather than imported. However, it is sometimes more cost effective to make use of off-the-shelf, imported solutions or to replicate successful implementations from other counntries. This means that the numerous local subsidiaries, representative, agents and distributors of imported products and services should not be ignored in the quest for identifying the ideal mobile solutions.

As in the previous cases, public-private partnerships are also producing results, such as collaboration between the Johannesburg Metropolitan Police and 2Big Mobile Applications, which resulted in the stolen vehicles database access capacity .

Logistics

Mobile and wireless technologies are revolutionising the field of logistics, from mobile asset management to warehouse management, from re-ordering goods to managing suppliers using a PDA. Resultant increases in efficiency, combined with an active information management strategy, can transform the business of managing government.

Case 13: Prescribing a cost - benefit analysis

A pilot study conducted in the United States is proving immediate cost and health benefits from mobile applications in public service.

The first was a response to a growing trend of using wireless PDAs loaded with doctors' order-entry software. This is supposed to improve efficiency and accuracy of the drug prescription process, but often requires even more work. At one private hospital, a multimillion-dollar computerized ordering system was suspended for this very reason. "The doctors found writing paper prescriptions easier and quicker," reports the Government Technology web site. Other PDA-prescription systems were also scrapped, and state governments paid close attention to the failures, to avoid repeating them. Now, reports Government Technology, several states are investigating a solution developed by a company called ePocrates, which gives doctors information on cheaper drugs preferred by medical aid organisations, and gives doctors immediate access to information on drug interactions, possible allergic reactions and dosages.

The biggest saving is expected to be in prescription costs. In Washington state, the Medical Assistance Administration (MAA), part of the Department of Social Services, spends more than $1 billion every two years for prescription drugs. It wants to save $60 million of this, largely through using less expensive drugs, and expects the ePocrates system to contribute by giving doctors immediate access to preferred drug lists.

Doctors also applaud the safety benefits: a study in the Journal of the American Medical Informatics Association found that the software could help each doctor eliminate one or two errors per week - perhaps even cutting down on the 98 000 Americans that die in hospitals as a result of mistakes.

The moral of this particular case, particularly for South Africans critical of the quality of public service delivery, is that mobile solutions can not only benefit the government in its finances, but also its citizens in their experience of government service.

Case 14: Wireless city

In the city of Bellevue in Washington state, USA, wireless technology links staff members to a range of critical government applications via Bellevue's intranet, e-mail system and other resources, thanks to one of the most comprehensive wireless initiatives yet undertaken by

municipal government. Examples of specific applications include building and safety inspectors being outfitted with wireless devices, typically Compaq iPaq personal digital assistants (PDAs) that will allow them to send and receive building-permit and code-compliance data in the field. The city will then provide same-day inspection results to builders and developers with the new system. In a later phase, the city will equip transportation and parks crews to report on completed tasks and receive new assignments in the field, improving efficiency and responsiveness.

Case 15: Local government in the pocket

The Pocket P-City pilot project in the USA, a private-public partnership between the International City/County Management Association (ICMA) and corporate partners ESRI and HP, saw local governments supplied with iPAQ handheld computers from HP and ArcPad 6 mapping and GIS software from ESRI. The target: improving emergency response, IT infrastructure inventory, well and storm water quality, inspections, and infrastructure inventory and repair. A total of 91 cities applied to be included in the pilot and, according to the Government Technology web site, ten were selected, based on idea originality, usefulness, transferability (applicability to other local governments), innovative management (use of unique resources or new approaches to information management), collaborative uses internally and regional approaches.

Already, municipalities are reaping the rewards. One of the first to implement a full system is Grand Rapids, Michigan, which is using the system to coordinate citizen requests and complaints with service delivery, and manage assignments and responses.

Paul Klimas, GIS administrator of Grand Rapids, told Government Technology that the pilot was one part of an overall shift toward "community oriented government". The next step is to integrate the GIS component developed through the pilot with Internet mapping services, a computerized maintenance-management system and custom document-management software".

And, of course, the public-private partnership approach to piloting, proving and popularising the technology is an ideal model for piloting mobile and wireless projects in countries like South Africa, where the business case for the technology remains a distant goal.

For more information on the last three cases visit www.govtech.net

Key Learnings - Logistics

Logistics tend to be a specialist arena for mobile-and wireless-enablement, and requires levels of expertise that are not usually found within one department or organisation. It is an ideal area for public-private partnerships. The benefits are not to be found in greater internal efficiencies, but also in better providing services directly to the public.

Positioning and identifying

Positioning technology is still in a highly experimental phase, but this does not mean that mobile technology is not ready to provide a limited level of services that rely on the technology to assist in identification, among a variety of other existing options.

At the one end of the hi-tech spectrum, GPS technology is already available for integration into handheld devices, and can be used to enhance emergency services.

At the other end of the spectrum, simple telemetry can be used to monitor equipment.

Case 16: Endless parking

The Toronto Parking Authority has increased revenue by 60 percent since the 1999 installation of Web-based, wireless-powered Pay and Display parking terminals.

It's not getting people to pay that is revolutionary; it's keeping the meters working. The authority is able to evaluate the status of an on-or off-street terminal through a Web site connection.

The technology determines the status of each machine by assessing its condition, the amount of funds that have been collected and whether funds need to be emptied from the terminal.

The terminals can also accumulate credit-card security and statistical data. Thanks to the system, the Parking Authority has been able to decrease the amount of support staff needed to maintain the parking terminals because of the increased efficiency.

Case 17: Nursing the risk

In 1999, the Scottish Office invested £500,000 of new resources from the NHS Modernisation Programme to ensure that every community nurse, midwife and health visitor in Scotland – 7000 health workers – had access to a mobile phone unit linked to a comprehensive security network with in-built alarm facilities.

As well as improving their personal security, the phones were intended to help them to provide a more effective service for patients.

The system included a telephone and hands-free kit, together with emergency software which when a nurse enters a high-risk situation, involves the nurse entering a security number and the time the visit will take. If there is no cancellation of the security code, then there is immediate notification to the security centre and help made available.

Case 18: Cutting to the quick

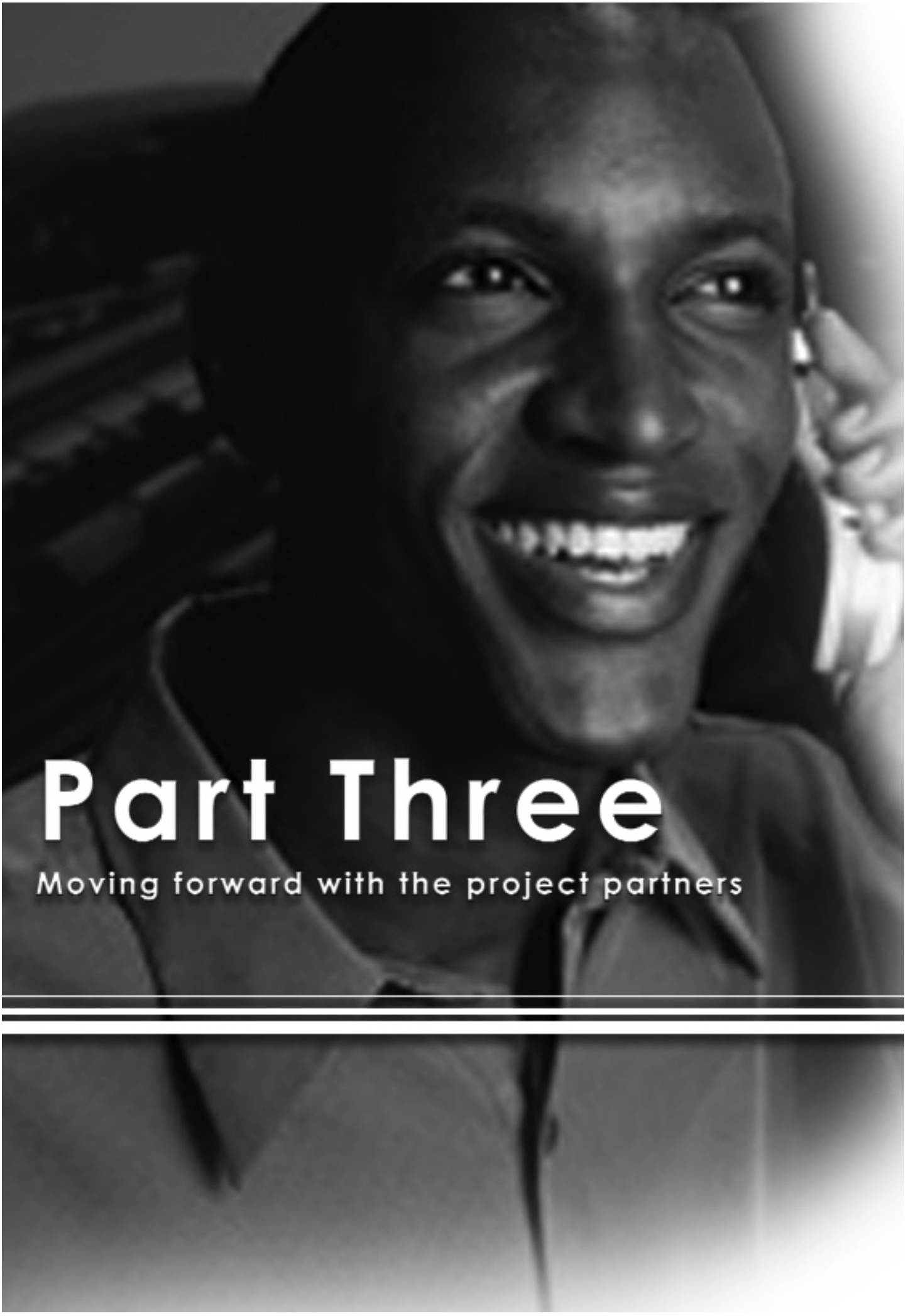
Many South Africans can recount the experience of phoning the emergency number allocated by their cellular network provider and, as they are being

routed to the appropriate emergency services, they are addressed by name without first identifying themselves. Although this is not standard - networks advise callers that they need not provide their numbers, as these appear on the system – it is possible, and can save precious time.

Services like MTN Directions provide a useful stopgap on the road to automatic positioning, as it were. Callers phone 22522 from MTN cell phones, tell the operator where they are and where they want to be, and precise street guidance is given to the caller until they reach their destination safely.

Key Learnings -Positioning and identifying

The area of positioning and identifiying is still primitive in its implementation, but it offers a range of promising possibilities, especially in emergency services



Part Three

Moving forward with the project partners

Moving Forward

You know the issues, you know the problems, you know the opportunities. Now you want to take the next step. Where do you start?

There is an old saying about how you eat an elephant: little by little. That certainly applies to most mobile and wireless projects that might be envisaged for the public service. As big as the final implementation may seem, it will often be necessary to tackle it in stages, taking on small elements of the overall vision, one by one, rather than trying to tackle the whole thing in one bite.

The one requirement that will not go away, however, is the need to address such technology from a strategic point of view. This means that the strategy for even considering mobile or wireless solutions must be addressed at three levels:

- At the IT strategy level. The IT strategy of a department or organisation must be tested against mobile and wireless technology. If the existing strategy does not allow for the implementation of such solutions, then it will either complicate or entirely prevent implementation. Alternatively, the IT strategy would have to be changed to accommodate the possibility of mobile and wireless. This implies, in turn, that when IT strategy is being developed or revised, it must take into account the possibility of mobile and wireless solutions from the start.
- At the business case level. The decision to go ahead with a project must be based on sound reasoning, research and testing against departmental or organisational objectives and needs.
- At the implementation level. Have a clear idea of what you want to do and how you will do it. This book is one starting point, but it may still be necessary to conduct research and development, define requirements, and identify partners before even deciding who will implement the project.

One option is to begin with the resources already available within government and parastatals, including the CSIR, SITA and CPSI. Each of these bodies has a central role in advising government departments on both the business case and the technical aspects of technology decisions. They have the ability not only to advise, but also to act as partners in the roll-out of mobile and wireless technologies.

The CPSI as partner

The Centre for Public Service Innovation (CPSI) is an initiative of the Minister of Public Service and Administration, established to identify, support and nurture innovation in the public service, with a view to improving service delivery. The CPSI is an autonomous, not-for-profit institution, reporting to a Board of Directors.

Innovation can be defined as the application of new ideas, which result in benefits through cost-savings, efficiency improvements and new products or

services. Innovation therefore should not be equated to creativity, but rather be seen as the means by which the outputs of the creative process are put into practice.

The CPSI has a strong project focus since the bulk of its work is geared towards the application of ideas. To facilitate the development of innovation projects, the CPSI engages in research aimed at informing decision-makers on emerging technologies, methodologies and institutional arrangements.

Located in the space between government and the private, the CPSI is ideally positioned to work with both parties by:-

- Facilitating the introduction and testing of solutions available by the private sector
- Assist departments in sourcing solutions and partners in the private sector as well as the Research and Development (R&D) community.

Of the 12 major industry players interviewed for this report, every single one expressed an eagerness to partner with government or supply solutions in this arena to government.

Is this eagerness matched by a commitment to working with government? Not entirely. Only eight of the 12 companies interviewed had a dedicated division geared towards government services and solutions. And only five, less than half of these major players, had conducted research into the needs of the public and government in using mobile and wireless devices to access its services. Of these, only one has conducted formal research in Africa.

The danger exists, then of the private sector partnering with government only for the sake of increased sales, rather than through a commitment to providing unique solutions geared to the specific needs of the public service in South Africa. This factor must be borne in mind at all times when pursuing partnerships with the private sector.

Having said that, the private sector has also been waiting for clearer signals from government that it will commit itself to ICT investment, before businesses themselves invest more in supporting this commitment.

Where businesses large and small business wish to work more closely with government, and vice versa, the case for each partnership must be clearly made, and the parameters clearly laid out. The CPSI is positioned to assist in this regard, and will also facilitate contacts with the private sector.

For more information, contact:

Imraan Patel
Programme Manager: Research and Knowledge Management
Telephone: (012) 672-2825
e-Mail: imraan.patel@sita.co.za
Web: www.cpsi.co.za

The CSIR as partner

The CSIR has a mandate is to foster industrial and scientific development, either by itself, or in partnership with public and private sector institutions, to contribute to the improvement of the quality of life of the people in South Africa. One of its central roles is supporting innovation in South Africa to improve national competitiveness in the global economy. To achieve this technology services and solutions are provided in support of various stakeholders, and opportunities are identified where new technologies can be further developed and exploited in the private and public sector. Mobile and wireless applications in the public service naturally fall square in the middle of this agenda.

The CSIR has clients in both the private sector (micro, small, medium and large enterprises; formal & informal), as well as in the public sector (national, provincial and local government), and is able to support this client base through an international network of partner organisations, tertiary educational institutions in South Africa, and through collaboration with various donor and funding agencies.

The principles that the CSIR applies to partnering include:

- a focus on building relationships and strategic alliances)
- a global perspective
- the client/contractor principle (external income; parliamentary grant)
- investing to build competence and capacity and to develop innovative product and service offerings
- providing independence and objectivity as an "honest broker"
- through technology acquisition and transfer ("funnel and bridge concept")
- through teamwork

To find out how the CSIR could assist or partner in a specific mobile or wireless initiatives, contact:

Laurens Cloete
Programme Manager: ICT Programme
Telephone: +27 12 841 3165
E-mail: jcloete@csir.co.za
Web: www.icomtek.csir.co.za

SITA as partner

SITA partners with Government clients on new projects through an R&D unit which, like the CSIR, interacts globally with industry, other research institutions and academia, as well as with local players. It has access to extensive research and testing facilities and can conduct pilots to predetermine the operational applicability of new technology.

The following focused business units within SITA R&D are geared to meeting specific needs:

- Business Management Consulting – provides consulting services on technological choices;
- Knowledge Management Services – collects, stores, and disseminates relevant ICT information and knowledge from research partners, including CSIR, Gartner, META, OVUM, AST,

Smart Card Association, and universities;

- Technology Assessment – develops instruments for techno-economic and financial analysis of technological choices, and IT performance measurement;
- Center for e-Governance Solutions and Strategies – aims to position government, businesses, and communities for sustainable e-governance;
- Center for Advanced Technologies – develops targeted research and development in emerging technologies for correct positioning within SITA and in the broader South African Government space;
- Enterprise Architecture Center of Excellence – provides enterprise-wide consulting to its client base and establishes best practices;
- Applied Research – interacts with clients and the other R&D units to translate business requirements into technology solutions in adherence with Government policy and regulation.

To find out how SITA could assist or partner with you on a specific mobile or wireless initiative, contact:

Dr. McKay Motshabi
General Manager: R&D
Telephone: (012) 482 3230
e-Mail: mckay.motshabi@sita.co.za
Web: www.sita.co.za

Part Four

Potential applications by sector

Potential applications by sector

A number of specific applications have been identified on the basis of the six value propositions discussed in Part 1 of this report. The information in these tables serves as guidelines to initiate further work where the technology enablers, the implementation model as well as cost and time are investigated and confirmed.

Technology enablers refer to both the mobile channel and device

Five possible ***implementation models*** are proposed. These are:-

- Off-the-shelf (OTS);
- Adapting existing applications (AE);
- Customisation (Cus);
- Development through outsourcing (DO);
- Development through partnership (DP)

The table provides relative ***costs*** when compared to traditional methods on a three-level scale. These are:-

- Low – cost-effective relative to traditional method;
- Medium – similar to traditional method;
- High – Expensive relative to traditional method

Finally, ***time*** refers to the time required for implementation. Once again, a three-level scale is used. These are:-

- Low – quick implementation (typically six months or less);
- Medium – reasonable time for implementation (between six months to 2 years);
- High – lengthy implementation (greater than 2 years)

Justice

Application or operational goal	Technology enablers	Implementation model	Cost	Time
More efficient access to "case load" information	Wi-Fi, Cellphone, SMS, PDA	DO, DP	Low	Medium
Enhanced resource scheduling of court and legal staff	PDA, cellphone, SMS	DO, DP	Low	Medium
Faster case resolution due to instant access to case details and historic precedents	Laptop, Wi-fi	Cus	Medium	Medium
Improved public service and image of judicial efficiency	all	N/a	N/a	N/a
Potential to limit opportunity for corruption	all	N/a	N/a	N/a

Safety and security

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Better organization and management of police information data files.	PDA, laptop	AE	Low-Medium	Low
Instant access to a national SAPS database	Cellular, SMS, WIG, Laptop	DO, DP	Low	Low
Enhanced ability to access and retrieve relevant information from various national, state, and local databases	Cellular, SMS, PDA	DO, DP	Medium	Low
Improved crime scene and overall crime analysis	Cellular, SMS, GIS, Laptop	DO, DP	High	Low
Better computerized capabilities to make lists, produce maps, and carry out sophisticated statistical analyses	GIS, Laptop	DO, DP	High	High
Enhanced ability to communicate with other law enforcement officials and with headquarters during an operation	Cellular, radio	AE, Cus	Medium	Medium
Improved electronic surveillance technologies to monitor suspected criminals.	Cellular, radio	AE, Cus	Medium	Low
Improved, computer-aided dispatching tools	Cellular, radio	AE, Cus	Low	Low

Transport

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Instant vehicle registration and drivers license information	Cellphone, SMS, WIG, GPRS	DO, DP	Medium	Medium
Instant access to, and collection of national traffic information resources on the ground	Cellphone, SMS, WIG, GPRS	DO, DP	Medium	Medium
Improved utilisation of resources and vehicle management	GPS, Radio, Cellphone	AE, Cus	Medium	Medium
Improved efficiency in procurement and inventory control	PDA, GSM, SMS, WIG	OTS, AE	Low	Low
Better computerised capabilities to make lists, produce maps, and carry out sophisticated statistical analyses	Cellphone, PDA, laptop, SMS, WIG, GPRS	AE, Cus	High	Medium

Health

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Distributed access to national health database, provincial databases, hospitals, clinics' as well secondary healthcare databases.	Cellphone, PDA, laptop, SMS, WIG, GPRS	DO, DP	High	High
Improved access to information at hospital or unit level.	Cell, SMS, PDA	DO, DP	Low	Low
Improved collection and use of information at all levels resulting in increased clinical efficiency	Cell, SMS, PDA	DO, DP	Low	Low
Better pharmacology databases, improved clerical and admin functions as well as improved revenue collection	Cellphone, PDA, laptop, SMS, WIG	OTS, AE, DO, DP	Medium	Medium
Improved efficiency in procurement and inventory control	WiFi, PDA	OTS, AE	Medium	Medium
Improved HR records and efficiency, salary and overtime systems	WiFi, PDA	OTS, AE	Medium	Medium
Improved utilisation of resources and vehicle management	GPS, Radio, Cellphone	AE, Cus	Medium	Medium
Warehouse and distribution control	WiFi, PDA	OTS, AE	Medium	Medium
Bulk SMS for "broadcasting" health warnings	Cell, SMS	OTS, AE	Low	Low

Defence

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Improved communications in the field	Radio, Cell, GPRS	OTS, AE	Low	Low
Improved management of databases and information distribution and access.	Cellphone, SMS, WIG, GPRS, WiFi	DO, DP	Medium	Medium
Improved information sharing and intelligence gathering capacity and rapid assessment and interpretation	Cellphone, SMS, WIG, GPRS, Radio	DO, DP	Medium	Medium

Revenue

Application or operational goal	Technology Enablers	Implementation model	Cost	Time
Efficient access and alerting to intraday market information	Cellphone, SMS, WIG, GPRS	AE, OTS	Low	Low
Transaction tracking notified to all parties	Cellphone, SMS, WIG, GPRS	AE, OTS	Low	Low
Efficient access to legislation and legal precedents	Laptop, WiFi	AE, OTS	Low	Low
Improved resource scheduling of fixed, movable and human capital	Cellphone, SMS, WIG, GPRS, WiFi	DO, DP	Medium	Medium

Education

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Speed of implementing internet access to schools pending less expensive fixed line solutions	WiFi, GSM	DO, DP	High	High
Student project, research, collaboration and submission.	Cell, PDA, Laptop, WiFi	AE, Cus, DO, DP	Medium	Low
Communication with education lecturers and staff, with feedback capability	Cell, SMS AE,	Cus, DO, DP	Low	Low
Multi-method deployment of courseware, with ongoing tracking and assessment capability	Cell, GPRS, PDA, SMS	AE, Cus, DO, DP	High	High
Reduced physical infrastructure education dependency.	WiFi, GPRS	AE, Cus, DO, DP	High	High
Increased capability to manage the deployment of education resources	Cell, GPRS, PDA, SMS	DO, DP	High	High
Reduced "book" cost of deploying printed works	PDA, Laptop	DO, DP	High	High

Local Goverment

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Statement enquiries, transfers and payments via cellular handsets and PDAs.	Cell, PDA, SMS, WIG	OTS, AE, DO, DP	Low	Low
Interactive voice response for call centre integration	Cell	OTS, AE, DO, DP	Medium	Medium
Credit card payment processing in real time using a phone	Cell, PDA, SMS, WIG	OTS, AE, DO, DP	Low	Low
Works order management and vehicle tracking	WiFi, PDA, GPRS, GPS	OTS, AE, Cus	Medium	Medium

Trade and Industry

Application or operational goal	Technology enablers	Implementation model	Cost	Time
Premium rate telephony , which can include financial and trade news or information, such as tender news and grant applications.	Cellphone, SMS, WIG, GPRS	AE, OTS, Cus	Low	Low
Mobile lotto	Cellphone, SMS, WIG, GPRS	AE, OTS, DO	Low	Low

Agriculture

Application or operational goal	Technology enablers	Implementation model	Cost	Time
GPS devices and ruggedised mobile devices, from pen tablets to GSM-enabled PDAs, for field use.	GPS, GPRS, GSM, Cell, PDA	OTS, AE, Cus	High	Low
Geographic Information System software	GPS, GPRS, GSM, Cell, PDA	OTS, AE, Cus	Low	Low
Data captured in the field, activities logged and information dispatched using a hand-held device	GPS, GPRS, GSM, Cell, PDA	OTS, AE, Cus	High	Low

Generic departmental applications

Application or operational area	Technology enablers	Implementation model	Cost	Time
Wireless networking	WiFi	DP, DO	High	Medium
Access to office productivity information from any device, anywhere	GPRS, GSM, Cell, PDA, Laptop, WiFi	DP, DO	High	High
Secure access through voice and data between back-end systems and handheld devices	GPRS, GSM, Cell, PDA, Laptop, WiFi	DP, DO	Medium	Medium
Integration of back end systems with wireless networks and devices	WiFi	DP, DO	High	Medium
Remote office connectivity, remote document collaboration	Laptop, GPRS	AE, DP, DO	Medium	Low
SMS solutions for use internally for communicating with staff or externally for customer relationship management	Cell, SMS	AE, DP, DO	Low	Low
Procurement or stock checks via mobile device, where the appropriate security hierarchies and permissions are in place	PDA, GPRS, GSM, WiFi	AE, DP, DO	Medium	Medium
Wireless barcode devices for stock control	PDA, GPRS, GSM, WiFi	AE, DP, DO	Medium	Medium
General purpose telemetry and monitoring	PDA, GPRS, GSM, WiFi, GPS, laptop	AE, DP, DO	Medium	Low

Part Five

irectory of wireless and mobile services and
roduct providers in South Africa

At the start of the research process, an open call was made to mobile service providers to be included in a listing. This call for providers generated huge interest, which confirms the possibility of significant growth in the development of mobile applications over the next few years.

Mobile Services and Applications

2Big Mobile Applications	(012) 349 2355	mokgatlem@softstart.co.za	www.2big.co.za
3Com	(011) 700 8600	Mauritzio_zussa@3com.com	www.3com.com
ABSA	(011) 350 6195	hannelig@absa.co.za	www.absa.co.za
African Gateway Connection	(011) 789 9998	info@agwc.co.za	www.agwc.co.za
Airborn	(011) 301 6000	info@airborn.biz	www.airborn.biz
Akimo Enterprises	(011) 468-4568		
Amvia	(011) 806 6670	info@amvia.com	amvia.com
arivia.kom	(011) 233 0800	info@arivia.co.za	www.arivia.co.za
AST	(012) 674 7600	info@ast.co.za	www.ast.co.za
ATIO Corporation	(011) 235 7000		www.atio.com
Atos KPMG Consulting	(011) 328 5196	Mike.halberstadt@akc.co.za	www.atoskpmgcon sulting.co.za
Business Edge Systems	(011) 803 9330	info@businessedge.co.za	www.businessedge.co.za
Bright Crayon		Mark@Shuttleworth.net	www.unimobile.com
C3			www.c3ltd.co.uk
Celerity Systems	(021) 409 7815	info@bulksms.com	
Cellsys	(011) 448 1501	info@cellsys.co.za	www.cellsys.co.za
Cisco Systems South Africa	(011) 267 1000	cnieckau@cisco.com	www.cisco.com/global/ZA
Citrix	(011) 706 7738	sales-tm-sa@ctxuk.citrix.com	www.citrix.com
Clickatell	(021) 948 7150	info@clickatell.com	www.clickatell.com
Cointel	(011) 326-4800		
DAC Systems (Pty) Ltd.	(011) 805 5908		www.dac.co.za
Datatec	(011) 233 1000	info@datatec.co.za	www.datatec.co.za
Development Group	(012) 661 0232		
Dimension Data	(011) 709 1000	pr@za.didata.com	www.didata.co.za
D-Link	(012) 665 2165	attie@d-link.co.za	www.d-link.co.za
Enterasys Networks	(011) 884 2195	glevin@enterasys.co.za	www.enterasys.co.za
Ericsson	(011) 844 2000		www.ericsson.com
Exactmobile	(011) 467 1677	info@exactmobile.com	www.exactmobile.com
Fujitsu Siemens Computers	(011) 652 7129		www.fujitsu-siemens.co.za
Fundamo	(021) 943-2200	info@fundamo.com	www.fundamo.com
Gendac (Pty) Ltd	(012) 349 1981		www.gendac.co.za
Grapevine Interactive	(021) 702-3333	enquiries@vine.co.za	www.vine.co.za
HP	(011) 775 5300	hayward_rose@hp.com	www.hp.com

HR Active (Pty) Ltd		info@hractiv.co.za	
IBM	(011) 302 9111	ibm4you@za.ibm.com	www.ibm.com/za
Intel South Africa	(011) 806-4530		www.intel.com
Intelleca Voice & Mobile	(011) 442 4242		www.intelleca.co.za
Integrat HiGate (Pty) Ltd	082 994 1814	norman@integrat.co.za	www.integrat.co.za
iTouch	(021) 415 2100	info@itouch.co.za	www.itouch.co.za
iVeri Voice	(011) 269-4101	barry@iveri.com	www.iveri.com
Kobi Interactive Systems	(012) 348 0885		
Magma Tec Mobile	(021) 670 7900	webmaster@magmate.co.za	
MapIT	(012) 345 8020		www.map-it.co.za
Marketel	(011) 883-4477	info@marketel.co.za	
Marconi Communications	(011) 256 3400		www.marconi.com
MGX	0861 088 061		www.mgxgroup .com
Microsoft	0860 225 567	mssatalk@microsoft.com	www.microsoft.com/southafrica
Mine WorX International	(011) 310 2260	ron@mineworx.com	
Mobile Intelligence	(011) 787-2127		www.mobileintel.co.za
Mobile Internet Gateway(MIG)	(011) 257 8300	info@mig.co.za	www.mig.co.za
Mobi-X	(011) 807 2480	Peter.turvey@mobi-x.com	www.mobi-x.com
Mybeat Interactive	(011)448 2123		
Nortel	(011) 808 4000	info@nortelnetworks .com	
Orbtech Holdings	(011) 652 6350	info@celtron.co.za	www.celtron.co.za
Opto Africa	(011) 792 4886		www.optoafrica.co.za
Orion Telecom	(011) 713 6600	contact@oriontele.com	www.oriontele.com
Rangegate	(011) 723 9300	info@rangegate.com	www.rangegate.com
Siemens Telecommunications	(012) 678 2000	marketing@siemens.co.za	www.siemens.co.za
Sitesmith (Pty) Ltd	(021) 683 7378		www.sitesmith.co.za
SMC Networks Business	(011) 314 4873	paul.luff@smc-europe.com	www.smc-europe.com
Software Futures	(021) 700 5000		www.softwarefutures.com
Starfish Mobile Technologies	(011) 881 54 39	info@starfishmobile.com	www.starfishmobile.com
Starship Systems		info@starshipsystems.com	www.starshipsystems.com
Striata	(011) 530-9600	shellin@emailco.net	www.emailco.net
SecureWorx	(011) 667 5350		www.secureworx.com
Symbol Africa	(011) 8095300	cheryl.folly@za.symbol.com	www.symbol.com/africa
Virtual Card Services	(011) 802 4233	support@vcs.co.za	www.vcs.co.za
WaspLab	(011)-806-5181		
Webtec	(011) 233 5091/6	info@webtec.co.za	webtec.co.za

ICT Mobile Solutions and Integration

Comparex Africa	(011) 266 5111	info@comparexafrica.co.za	www.comparexafrica.co.za
Grintek Telecom	(012) 672 8216		
IQ Works Pty Ltd	(011) 259 4405		www.reunert.co.za
Motorola	(011) 800 7800		www.motorola.com
Nokia (RF Group)	(011) 799 7400	caroline@nokia.co.za	www.nokia.co.za
Symbol	(011) 809 5300	support@za.symbol.com	www.symbol.com/africa
V Technology (Pty) Ltd	(011) 656 1786		

Mobile Access Devices

eZuza (Pty) Ltd	(011) 7153780		
Spescom	(011) 266 1500	info@spescom.com	www.spescom.co.za
Stouf.com	082 562 8926	adzup@mweb.co.za	www.stouf.com

Mobile and wireless networking vendors

Flash Media Group (Pty)Ltd	(012) 430-7597	info@flashmedia .co.za	www.flashmedia.co.za
LEAF Wireless (PTY) Ltd.	(011) 326 1844	info@leafwireless.com	www.leafwireless.com
Mobi-X	(011) 807 2480		
Optron Technologies	(011) 467 0400	sales@optron.com	www.optron.com
Oracle South Africa	(011) 266 4000		
Palm South Africa	(011) 507 4000	beth@palmusers.co.za	www.palmusers.co.za
Siemens Wireless Components	(011) 652 2707		

Internet Service Providers

Internet Solutions (IS)	(011) 575 1000	info@is.co.za	www.is.co.za
M-Web	(021) 596 8300	info@mweb.co.za	www.mweb.co.za
Synapp (Pty) Ltd	082-7803088		
The Digital Message Network	(011) 11 475 0300	info@dmnet.co.za	www.dmnet.co.za
Tiscali World Online	(011) 286 2600	info@worldonline.co.za	www.worldonline.co.za
UUNet SA	(011) 235 6602	info@uunet.co.za	www.uunet.com
MTN Network Solutions	(011) 280 0860	sales@mtnns.net	www.mtnns.net

Cellular Networks and Service Providers

Benefon	(011) 888 1618	info@benefon.co.za	www.benefon.co.za
FutureCellular/AccPac	(011) 803-7327	accpac@pr.co.za	www.accpac.com
Mobile Solutions	(011) 672 1841		
Nashua Mobile Pty	(011) 207 8564		www.nashuamobile.com
Radiospoor	(011) 315 3090		www.radiospoor.co.za

SMS Software and Services

Always Active Technologies	(031)-764-7085		www.aat.co.za
Datapro	(011) 809 1500	info@datapro.co.za	www.datapro.co.za
Econoserv (321 Technologies)	(011) 483 1190	keith@321.co.za	www.321.co.za
Evolutionary Service Provider	(21) 434 2574	info@esponline.co.za	www.esponline.co.za
Mobile Internet Gat	(011) 257-8300		www.mig.co.za
SMS Cellular Services (Pty) Ltd	(011) 448 1501	barryp@cellsys.co.za	www.cellsys.co.za
SMSwhiz	(011) 475 0300	info@dmnet.co.za	www.smswhiz.co.za
Trilogic Solutions	(011) 7192930	ian@trilogic.co.za	www.trilogic.co.za
Unimobile/Bright Crayon		mark@shuttleworth.net	www.unimobile.com

Terrestrial telecommunication networks

Telkom	(012) 311 3911	contact@telkom.co.za	www.telkom.co.za
Transtel	(011) 359 2470	info@transtel.co	www.transtel.co.za
Sentech	(011) 471 4400	claassjr@sentech.co.za	www.sentech.co.za
Esi-tel	(011) 871 2291		

Cellular telecommunication networks

CellC	(011) 324 4000	www.cellcdirect.com	www.cellc.co.za
MTN	(011) 301 6000	info@mtn.co.za	www.mtn.co.za
Vodacom Group	(011) 653 5000	cc_ct@vodacom.co.za	www.vodacom.net

Satellite and radio telecommunication networks

Intelsat South Africa	(011) 535 4700		www.intelsat.com
SwiftNet	(012) 663 1820/1	buitenjj@telkom.co.za	www.fastnet.co.za

Part Six

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Online resource sites

802.11 Planet	www.80211-planet.com
Cellular.co.za	www.cellular.co.za
Ericsson	www.ericsson.com
Government Computer News	www.gcn.com
Government Technology	www.govtech.net
GSM World – Web site of the GSM Association	www.gsmworld.com
Mcommerce Times	www.mcommercetimes.com
Mobile Media Japan	www.mobilemediajapan.com
MobileVillage	www.mobilevillage.com
Motorola	www.motorola.com
Commonwealth of Virginia home page	www.vipnet.org/cmsportal
Nokia	www.nokia.com
Official Bluetooth Web Site	www.bluetooth.com
Palm	www.palm.com
Wireless Design Online	www.wirelessdesignonline.com
Wireless Internet & Mobile Computing	www.wirelessinternet.com
Wireless Developer Network	www.wirelessdevnet.com
Wireless Week	www.wirelessweek.com