Information and Communication Technologies for Reconstruction and Development

Afghanistan Challenges and Opportunities

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Introduction

The term *information and communication technologies* (ICTs) encompasses the range of technologies for gathering, storing, retrieving, processing, analyzing, and transmitting information that are essential to prospering in a globalized economy. Advances in ICTs have reduced the costs of managing information and introduced innovations in products, processes, and organizational structures that, in turn, have generated new ways of working, market development, and livelihood practices.

Internationally, ICTs are viewed as a basic enabler of informal social and economic discourse, leading to a strengthening of civil society and the promotion of economic activity. The importance the United Nations (UN) attaches to ICTs as enablers of economic, governance, security, education, healthcare, and social well-being reconstruction and development is evident in sponsorship of two international summits, the 2003 and 2005 World Summit on the Information Society (WSIS). These summits documented steps on how to establish and organize the Information Society, and their reports referenced the importance of ICT by frequently citing the phrase, "ICTs as a tool for social and economic development."[1]

While there is little doubt that ICTs are an engine for social and economic development, quantifying their impact is difficult. Evidence remains largely anecdotal, and the link between ICT deployment and reconstruction and development remains vague. The National Defense University (NDU) Center for Technology and National Security Policy (CTNSP) recently completed a study, known as the I-Power study, which looked at using information and ICTs to achieve success in stability and reconstruction (S&R) operations. The study results suggest that the strategic use of information and ICTs can increase significantly the likelihood of success in affected-nation, cross-sector reconstruction and development—if they are engaged at the outset as part of an overall strategy that coordinates the actions of outside interveners and focuses on generating effective results for the affected nation. This has certainly been the pattern in business, government, and social arenas in the Western world, where the information revolution has been a dynamic and positive factor. The combination of technology, information content, and people schooled in the use of each has reshaped enterprises and activities throughout the world.

Experiences from recent U.S. government (USG) and coalition interventions in the Balkans, Afghanistan, and Iraq repeatedly have demonstrated that ICT activities supporting stabilization, reconstruction, and development operations in an affected nation can be problematic. These activities suffer from a lack of adequate understanding of the affected-nation information culture and ICT business culture. There is no clear mapping of responding stakeholder organizations roles and responsibilities. Program development, project coordination, information sharing, and ICT implementation are largely uncoordinated and non-standard. No agreed architecture or plan is in place for affected-nation ICT reconstruction.

[1] Information on both summits is available at <http://www.worldsummit2003.org/>.

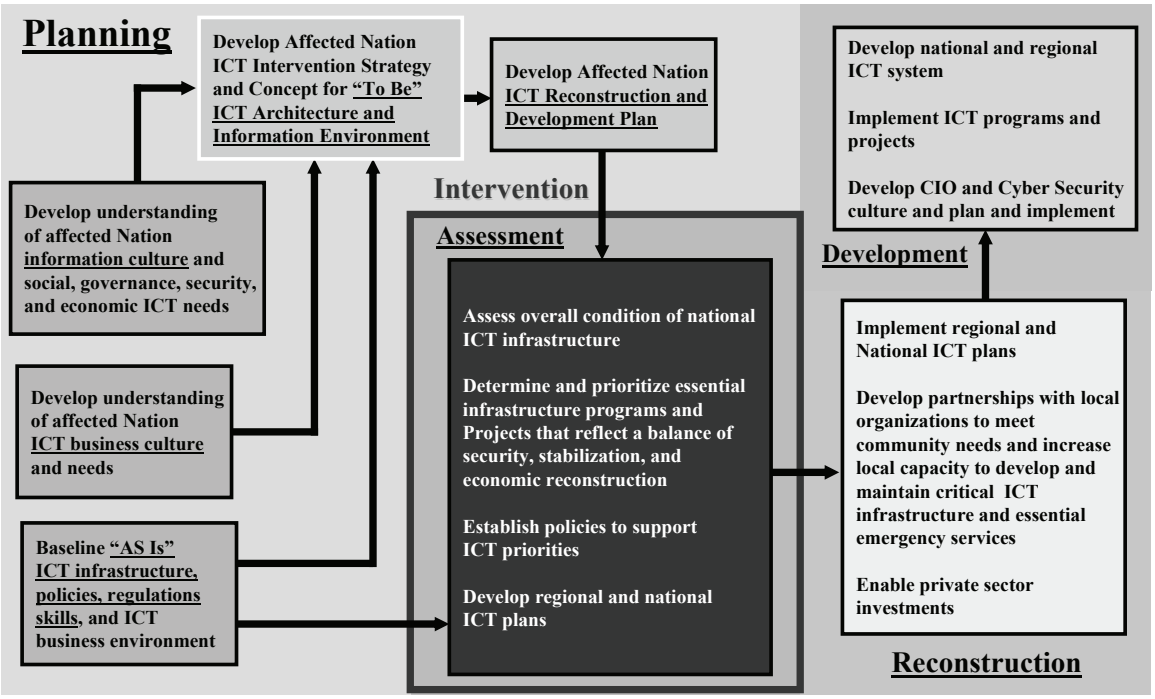
A coherent civil-military ICT strategy and plan for intervening coalition military forces, responding-nation civilian elements, international organizations (IOs), and non-governmental organizations (NGOs) is also lacking. No agreed mechanisms or procedures are in place to enable effective civil-military coordination and information sharing among participants and with the affected nation. Interveners consistently do not view ICT as a reconstruction and development priority equal to roads, power, and water or as an enabler of cross-sector reconstruction and development. Consequently, senior leadership has no framework to make investment decisions and track ICT-related reconstruction and development progress.

The situation on the ground also complicates the challenges of failed-state interventions in all regards, including ICT. Civil and military responders usually encounter spoilers interfering with the intervening forces; refugees and internally displaced persons (IDPs) requiring humanitarian assistance; buildings requiring reconstruction; roads, power, water, telecommunications, healthcare, and education systems disrupted or dysfunctional; absence of a functioning government as well as laws, regulations, and enforcement mechanisms; widespread unemployment and poverty; and a shortage of leaders, managers, administrators, and technical personnel with 21st-century information and ICT management, operations, and technical skills.

An ICT business model along the lines of the one depicted in figure 1, coupled with the smart use of information and ICT, could be employed to help create a knowledgeable intervention; facilitate appropriate integration of intervener ICT reconstruction and development initiatives with the affected-nation ICT strategy and plans; organize complex activities; and enable coordination, information sharing, and implementation activities among interveners and with the affected nation, making the latter more effective. Additionally, ICT can be used to link constituent parts of an integrated multinational reconstruction and capacity-building effort; help multiple sectors, such as, security, governance, education, health, agriculture, finance, and commerce simultaneously; and enhance situational awareness (SA) of cross-sector reconstruction and development activities.

Real world experience suggests that ICT can be (and is being) used to generate social, economic, cultural, and political changes, but, as noted earlier, it is difficult to quantify the impact of ICT initiatives and separate the influence of ICT from that of other factors, such as civil security stability, governance, or economic growth. Furthermore, internationally agreed indicators to measure and compare country experiences are lacking. Some countries are certainly doing much better in exploiting ICTs and adopting more effective ICT policies and strategies than others, but there is no agreed and uniform way to measure and compare. Although a growing body of anecdotal evidence suggests that ICTs have a real macro-economic impact, it is not clear to what extent ICTs have helped to directly reduce major reconstruction and development concerns, particularly those of the UN Millennium Development Goals, such as poverty, hunger, and sickness. Much work remains to be done to measure and comparatively assess the effectiveness of ICT as an enabler of cross-sector reconstruction and development.

Figure 1. ICT Business Model



The intent of this report is to raise awareness of the importance of the role of ICT in failed state intervention and follow-on reconstruction and development. Afghanistan is used as a case study to examine and highlight, by example, successes and some of the challenges encountered in trying to rebuild a war-torn country's telecommunications and IT infrastructure and to use it to enable other sector reconstruction and development.

A discussion of ICT as a sector and enabler of cross-sector reconstruction and development is introduced to set the context for a discussion of Afghanistan experiences. An overview of Afghanistan the country and the ICT environment follows to help the reader better understand and appreciate the initial conditions and related cultural, infrastructure, skill base, and implementation challenges. Some of the related coordination and information sharing challenges encountered by the multinational civilian and military participants are discussed, along with approaches used to address these challenges. Finally, a snapshot of the public and private ICT infrastructure is presented as well as some examples of ICT use in the education and healthcare sectors.

Afghanistan ICT has truly been a success story emerging from a country left dysfunctional after 23 years of war. ICT lessons derived from this success are highlighted, as are some thoughts on making more effective use of the ICT infrastructure in the future. Findings and observations of successes and challenges are based on visits by one of the authors to Afghanistan in April and May 2006 to research the rebuilding of Afghanistan telecommunications and IT and their use as enablers of cross-sector reconstruction and development.

ICT as a Sector and Cross-sector Enabler

ICT can be a powerful enabler of reconstruction and development goals. It is both a sector and an enabler of cross-sector reconstruction and development. As a sector, ICT supports national capacity building and export market focus and plays a critical role in reestablishing basic economic linkages by relieving communication bottlenecks from financial, governmental, and cultural information flows. As an enabler, it supports global positioning focus and adoption of cross-sector strategies that can be used to harness the uniqueness of ICT to accelerate a wider reconstruction and development process. It is also an essential enabler for boosting productivity by helping to establish a climate for job creation, investment, and sustainable growth. The real benefits lie not in the provision of technology per se, but rather in promoting creation of powerful social and economic networks by dramatically improving communications and the exchange of information.

ICT is pervasive and cross-cutting, can be applied to a full range of activities from personal use to business and government, and is multifunctional and flexible, allowing for tailored solutions to meet diverse needs. Using ICT, governments can improve the quality and responsiveness of their organizations as well as the services they provide to citizens by expanding reach and accessibility of services—and thereby enhancing government legitimacy. This can be facilitated through the use of e-government applications that provide government services and information to citizens over the Internet and other communication networks. E-government also can be used to help reduce corruption and enhance transparency in governance and thus offers an opportunity to positively influence attitudes of the leadership and general population.

ICT connects individuals, local communities, and businesses with information and resources beyond their geographic boundaries, encouraging information dissemination and exchange as well as communication. In developing nations, where it may take hours of travel to have face-to-face meetings between local and regional leaders, ICT can enable communications between and among such leaders in a matter of minutes. Additionally, in hostile environments where personal security is a concern, ICT can be used to connect leaders and other personnel without necessitating their travel through high-threat areas. Local communities can gain access to outside information sources, which often can alleviate the effects of insurgent propaganda and increase mutual understanding in the local community.

ICT contributes to a market economy by making it possible for users to acquire products and services directly from the original provider, reducing the need for intermediaries. By generating opportunities for employment, ICT can contribute to poverty reduction. Through the creation and expansion of networks, ICT can transcend cultural and linguistic barriers by providing individuals and groups the ability to live and work anywhere, allowing local communities to become part of the global network economy without regard to nationality, and challenging current policy, legal, and regulatory structures within and between nations.

ICT can facilitate the improvement of healthcare delivery by allowing access to remote consultation and diagnosis, medical databases and libraries, epidemic alerts, and treatment. Medical facilities can streamline processes and automate patient record systems. ICT also can improve the efficiency, accessibility, and quality of the learning process. Distance learning can be employed for higher level education as well as technical and vocational training, while primary and secondary education can access educational material, collaborate, and explore interactive learning techniques. Alliances can be formed between learning institutions within the affected nations as well as with off-shore institutions to facilitate capacity building.

Through its many roles, ICT extends the influence of the central government and can serve to revolutionize economic and social development, especially in rural areas. In rural areas it can be used to provide local access to government services; increase the visibility of government; spawn local entrepreneurs; help business owners identify market opportunities and find reliable and safe ways to transport goods and services; provide means for electronic funds transfer or other mobile commerce using cell phones and Internet banking; provide remote access to health services and information; and facilitate distance learning as well as other educational opportunities.

ICT is being used today in many developing countries to enable governance and security and to revolutionize economic and social development in urban and rural areas. Innovative implementation of ICT capabilities has done wonders for the poor around the world by creating new jobs and new ways of reducing the cost of doing business. Mobile phones (GSM, CDMA, GMPCS), data (EVDO, GPRS, Internet), satellite access (VSAT, INMARSAT RBGAN, and BGAN terminals), wireless networking (WiFi and WiMax), Public Call Offices (individuals selling cellular voice calling and Internet access service), and Internet Cafés and Telekiosks (voice and Internet access) are all used to provide instant communications in urban and rural areas. Such communication enables access to market, education, and healthcare information and also provides greater contact and improved relationships among families within a country and abroad. In rural areas, ICT such as cell phones, can be used to help the population communicate, gain access to information and advice and find job opportunities. ICT can be used to train and educate through the use of graphics and pictures combined with soundtracks or video on laptops.

Prime examples of the innovative use of ICT can be found in India, Africa, Bangladesh, Cambodia, Peru, and other parts of the world where cell phones, wireless ICT, and access to the Internet have become some of the best tools for poverty reduction and economic recovery. ICT benefits not only the rich but those who are less fortunate. For example, at the village level in rural areas, beneficiaries can be local entrepreneurs who make money selling phone services to villagers on a per-call basis; poor youth or small business owners selling pre-paid phone cards; and Internet cafe owners who offer Internet access service. Cell phones can be used creatively to gain market advantages and provide business and employment opportunities. Businesses can use cell phones to gain access to information about their domains of interest and reach subject matter experts for advice and counseling.

However, the poor cannot benefit from globalization without active involvement from the public and private sectors and without access to products and services that represent global standards. The rural area provides new growth opportunities for the private ICT sector and a forum for innovation. The global ICT industry has been addressing the more sophisticated market for some time, but recently has discovered a new market—the world's poor—and has risen to the challenges of lack of power, poor telecom coverage, dusty environments, and low literacy to innovate and provide easy-to-use, low-cost, and energy-efficient ICT options with features focused on rural area needs. Industry innovations include ultra-low-cost cell phones and longer-life batteries, bicycle-powered chargers, dustproof keypads, and booster antennas for areas with poor coverage; solar-powered WiFi wireless networking; easy-to-use, low-cost and energy-efficient laptops, voice over internet protocol (VoIP) for use on wireless networks, portable and fixed satellite access arrangements, cell phone access to Internet, and cell phones with built-in FM radios.

The providers of service in rural areas also have been extremely creative. In India, the wireless pony express of Daknet (a rural internet service provider) uses thousands of buses equipped with WiFi transceivers to pick up and deliver email wirelessly from village kiosks, providing the equivalent of a store-and-forward email service. Young men on bicycles carry mobile phones and go village to village selling calling service to the locals. In Afghanistan, government-run telekiosks and public call offices run by ex-soldiers and women as well as private Internet cafes with remote satellite access are used to sell both voice and Internet services to the local population. Discussions also are underway about micro-financing establishment of local community towers as a way to attract private cellular providers to put antennas on the towers, thereby extending cell service to rural areas. This creates both direct and indirect job opportunities and local income through leasing space on the towers and selling calling service and related cellular phone support services to locals. Local community and warlord buy-in adds an element of physical security protection for the cellular providers. In Cambodia, the "Motoman" project uses WiFi equipped motorcycles and a satellite connection to deliver emails to remote villages. Affordable, solar-powered, easy-to-install ICT systems for building Internet and telecommunications networks in rural areas with little or no access to electricity or affordable communications infrastructure are now available as off-the-shelf, prepackaged products.

Extending voice and Internet services to the rural areas is not a technology issue. Technology is an enabler. The challenges are assessment of rural community needs and constraints of the environment; development of a strategy and plans for providing service; identification of an appropriate portfolio of ICT capability packages to employ; and finding the funding to invest in public-sector initiatives and enable local entrepreneurs while providing incentives to the private sector to extend needed ICT services to rural areas.

Afghanistan

The Country

The Islamic Republic of Afghanistan encompasses approximately 652,000 square kilometers and is slightly smaller than the state of Texas. It is a landlocked plateau between Iran and Pakistan that also shares borders with China, Tajikistan, Turkmenistan, and Uzbekistan. High mountains, which are part of the Hindu Kush system, cover much of the country and small glaciers and year-round snowfields are common.

Afghanistan is one of the world's poorest and least developed nations. Because of years of fighting, roads, power, water, telecommunications, healthcare, and education have been disrupted or are dysfunctional. One in five children dies before the age of 5, mostly of preventable diseases. Life expectancy is about 42 years for males and 43 for females. The literacy rate is 36 percent in urban areas (51 percent for males and 21 percent for females) and even lower in rural areas. About 32 percent of the children are in school, but only 3 percent of girls attend school. Many schools for girls have been burned, and teachers and families of the girls going to school have been threatened or even murdered by insurgents.

Until recently, the country lacked a functioning government as well as laws, regulations, and enforcement mechanisms. Poverty and unemployment remain widespread; currently about 40 percent of the population is unemployed. The lack of skilled workers and administrators is also a pressing problem for labor. The Afghan economy largely depends on growing poppies and producing illicit drugs. Ninety percent of the world's opium is derived from Afghanistan, which has raised concerns that the country is in danger of becoming a full fledged narco-state. A growing insurgency is fueled by the booming drug economy.

Governance

Administratively, Afghanistan is divided into 34 provinces, which are further divided into 365 districts. Kabul, the capital, is located in east central Afghanistan at an elevation of about 5,900 feet. The major economic centers are Kabul, Herat, Kandahar, Jalalabad, Khost, Mazar-e-Sharif, and Kunduz. The population of the country is around 30 million (16 million females/14 million males), and 45 percent are under the age of 15 years. About 22 percent live in urban areas—more than 3 million live in Kabul alone.

Afghanistan is governed under a constitution that went into effect in 2004, but warlords continue to use militias to control their areas. President Hamid Karzai was elected in October 2004. The current parliament was elected in 2005. Among the elected officials are former Mujahadeen, Taliban, communists, reformists, and Islamic fundamentalists. Some of the early provincial governors were former warlords. Corruption and organized crime exist at all levels of society, including government elements and ministerial level involvement in the illegal narcotics trade. The constitution established an independent judiciary, but no laws may be passed that are contrary to Islamic law (Shari'a). Law is

administered on an intermittent basis according to a mixture of codified law, Shari'a, and local customs.

Although the Afghan National Police (ANP) are responsible for maintaining civil order, they are viewed by the average Afghan in many areas as a source of danger rather than security—they have been accused of improper treatment of the local population and have been ineffective in controlling crime. Interestingly, however, many Afghans in high-threat areas feel police presence does provide some degree of security protection. The emerging Afghan National Army (ANA), on the other hand, is widely considered a success as a multi-ethnic national institution with its young recruits, good training, and modern equipment. Outside Kabul, local and regional military commanders continue to exercise control. Often the military needs to respond to an incident because police are unable, largely due to lack of training and equipment.

Following the removal of the Taliban, international intervention and investments in Afghanistan have been substantial. However, 75 percent of reconstruction and development spending has been outside the Government of Afghanistan (GOA) channels without formal, centralized oversight. Seventy percent of spending has been in Kabul, where only 10 percent of the population lives. This has significantly impacted the ability of the GOA to establish legitimacy outside of Kabul.

Culture and Diversity

Afghanistan is still largely a tribal culture with a variety of social ills, such as poverty, interethnic strife, inequality of women, and widespread thievery, kidnapping, and banditry. Afghan women still rank among the worst off in the world; most are illiterate, many have no access to healthcare, and child and forced marriages are common.

Extremely close bonds exist within the family, which consists of the members of several generations. The oldest man or patriarch is the head of the family, and his word is law for the whole family. Family honor, pride, and respect toward other family members are highly prized qualities. Twenty-five percent of primary school-aged children work to support the family.

Afghanistan has long been known as the crossroads of Asia, and this is reflected in the country's linguistic and ethnic diversity. The official languages are Dari (50 percent) and Pashto (35 percent), but other spoken languages, such as Uzbek and Turkmen, are considered official in the areas in which they are primarily spoken. Religion is the strongest common bond with the majority of the population being Muslim—84 percent are Sunni and 15 percent Shia Muslim.

Security and the Battle of Confidence

The security situation in 2007 is tenuous and will likely impact the ability to conduct reconstruction and development, particularly in the southern, southeastern, and eastern regions. During the winter of 2006, the UN World Food Program reported the security situation remained relatively tense. In March 2007, the situation deteriorated significantly, with major and frequent incidents of improvised explosive device (IED)

attacks, suicide bombings, rockets, mine explosions, and riots. Violence in Afghanistan has been on the rise; in 2006 it was four times more intense than it was in 2005. Suicide attacks jumped from 27 in 2005 to 139 in 2006, and the use of IEDs doubled. International aid and reconstructions workers have been targeted, setting back reconstruction and development efforts in the hostile areas. The traditionally secure areas in the north and west also have been affected. Even Kabul started experiencing IEDs. In September 2006, just 50 yards from the landmark Massood Square that borders the main gate to the U.S. Embassy compound, a vehicle was detonated next to a U.S. military convoy, killing 16 people, including two U.S. Army reservists, and wounding 29 others.

No major attacks have targeted the ICT infrastructure, probably because the insurgents use it, too. There have been a few isolated incidents, such as the Taliban news announcement in May 2007 threatening attacks on the private cell phone provider Roshan if they did not stop dealing with U.S. and coalition forces. So far nothing has happened. Some criminal elements target ICT equipment to steal, especially at isolated, remote sites. For these reasons alone, ICT facilities are protected 24x7, using both fencing and hired armed guards. Private-sector estimates show that security costs are on the order of 10–20 percent of the cost of doing business. ICT contractors have had staff kidnapped and murdered, and informal reports suggest that government ICT staff manning Afghan Telecom facilities have been threatened. The security threats are a significant deterrent for contractors, consultants, government workers, and related reconstruction and development activities, especially in the provinces along the Pakistan border where ICT reconstruction largely came to a halt at the end of 2006. Additionally, it has been reported by ICT contractors working in the high-threat areas that they are finding it increasingly difficult to get Afghans not only to work for them openly but to work for them on more than one job. Hiring Afghan workers is becoming a one-shot deal in many areas.

Although progress has been made, some 6 years after the fall of the Taliban, many of those assessing and working Afghanistan reconstruction and development are beginning to perceive that the USG, the international community, and the Karzai government may be losing the "battle of confidence" among the Afghan people. Factors influencing these perceptions include the precipitous increase in Iraqi-like suicide bombings (a doubling over the last year), the unprecedented rise in hostility toward Westerners (many Afghans believe Westerners are afraid of them because Westerners do not go out of the protected compounds to meet freely with them), and the rising number of Afghans who are "on the fence" on the question of whether to support the government or the Taliban (recent military actions against the Taliban have resulted in the unfortunate killing of innocent civilians, which does not help win hearts and minds). With the window of opportunity to change direction (return to being viewed as a liberator and enabler of change rather than occupier) rapidly shrinking, the United States and the international community need to take dramatic steps to spur the delivery of governance, security, economic growth, healthcare, education, and social wellbeing services to stabilize Afghanistan. The general feeling is that only by injecting the country with much-needed resources and building local Afghan capacity can the United States and the international community help the government in Kabul establish its legitimacy and win back support from the Afghan people.

ICT and the Challenges of Recovery

After 23 years of conflict, under-investment, and neglect, the ICT infrastructure was left in disrepair with no national or international connectivity. Pakistan country codes were used in many border areas, and Afghans had to travel to neighboring countries to make and receive phone calls. Because music, TV, and Internet had been forbidden by the Taliban, these capabilities were largely non-existent.

ICT culture and skills had evaporated—most of the population with the needed skills left the country during the war years. Hence, there was (and still is) a serious shortage of Afghan leaders, managers, administrators, and technical personnel with 21st century, IT-oriented business and technical skills in the civil service, the private sector, and higher education institutions. Key skill areas of concern include business management and practices, project management, telecom and IT, and English language. In regard to English, most software applications and use of IT systems, including the Internet, requires some working knowledge of the English language.

Following the fall of the Taliban at the end of 2001 and the absence of any public and/or private national telecom sector operators, the Ministry of Communications [in March 2007, the MoC was renamed the Ministry of Communications and Information Technology (MCIT)] took over operation of what was left of a limited and outdated, analogue, fixed-line ICT infrastructure with fewer than 40,000 telephone lines for a population of more than 25 million. About 60 percent of the active lines were provided by a few fixed switching exchanges in Kabul with the rest in the cities of Heart, Mazar e Sharif, Kunduz, and Jalalabad. These exchanges were not interconnected and the service was unreliable. In April 2002, Afghan Wireless Communication Company (AWCC), who operated a limited ICT network during the Taliban era, began operation of a stand-alone Global System for Mobile Communications (GSM)—a digital cellular phone technology based on time division multiple access techniques—that provided communications capability to about 11,000 cellular subscribers largely in the Kabul area, plus some limited coverage in Herat and Mazar e Sharif. Coverage and quality of service were marginal, but the network was a start, and it allowed limited telecom access to the outside world.

Due to damage to the backbone satellite, microwave, and cable networks, Afghanistan did not have a functioning long distance network to support national or international service. The MCIT made early efforts to restore some long distance connectivity and establish international access. For example, a few Very Small Aperture Terminal (VSAT) satellite links were planned to connect the legacy switching exchanges in Kabul with those in other cities. Limited international access was available using the international gateway owned by AWCC, which employed a satellite link to route international calls through Guam. Direct inbound calls to Afghanistan were routed internationally using the +93 country code. International and some in-country, long distance calls could be made using satellite phones, such as Thuraya, Globalstar, Iridium, and International Maritime Satellite (INMARSAT). A number of UN agencies and NGOs provided VSAT sites that supported humanitarian assistance activities during the Taliban era and continued to operate after the fall of the Taliban. Many are still operating today. These facilities

provided basic voice and Internet access through their own IT systems and international satellite gateways. Public calling and Internet access were almost non-existent during the Taliban era. After the fall of the Taliban, the MCIT initially contracted with private companies to provide some limited Internet services for selected government agencies.

ICT Governance and the Road to Recovery

The Afghanistan transitional government established in December 2001 recognized that ICT would be critical to the success of the planned national elections and to facilitating communications among the central government and regional authorities. ICT was also recognized as important to the collection of taxes and customs duties, establishing a national banking system, and enabling other political, security, governance, judicial, social, and economic recovery actions.

The transitional government moved reasonably quickly to initiate the actions necessary to put a telecom and Internet policy and ICT strategy and plan in place to enable Afghanistan to become part of the global information society. In June 2002, the Afghan transitional government appointed a new Minister of Communications and designated the MCIT to have the leadership role to enact policies to create an environment conducive to private-sector investment. In October 2002, the Minister of Communications published a national telecommunications development strategy that outlined key ICT infrastructure development initiatives and set the conditions for developing an Afghanistan Telecommunications and Internet Policy.

In October 2003, the Telecommunications and Internet Policy was approved. The policy encouraged private investment through the introduction of measured competition; established Afghan Telecom as a state-owned corporation to operate the public ICT network with the right to accept private investment; and supported rapid expansion of telecom and Internet services at the local level. Additionally, the policy aimed to enable the rapid growth of affordable communications to all of the Afghan people so they might experience the Information Age; establish a fully functioning and affordable telecom infrastructure; and encourage the private sector to grow and take over these networks over time. The MCIT objectives included wide adoption of ICT to improve all aspects of Afghan life, including education, healthcare, employment, and access to information; growth of the local ICT industry to foster investment and employment; and use of ICT to increase government efficiency and effectively deliver improved social services. The policy was used to prepare the right legal framework and create a transparent regulator.

In 2005 the GOA published the Afghanistan National Development Strategy (ANDS), which articulated an interim strategy for achieving security, governance, economic growth, and poverty reduction. The ANDS five-year strategic benchmark for telecommunications stated that by the end of 2010, a national telecommunications network was to be put in place so that more than 80 percent of Afghans would have access to affordable telecommunications, and public revenues of more than $100 million U.S. dollars would be generated annually. Additionally, it stated that the government would establish a telecommunications regulatory system to raise investor confidence and

create a public telecommunications backbone on which the private sector could build, to ensure that economic and social discourse extended to rural areas.

A five-year MCIT development plan was issued in 2005 and has served as the guiding document for ICT-related initiatives. The ICT strategy promulgated focuses on two major thrust areas. First, use of the private sector and appropriate regulations to help jump start economic recovery through enabling private-sector investments in the rapid expansion of mobile voice services and introduction of Internet services (direct on-line and dial-up access and Internet cafes) in the urban areas. Second, use of the government to develop the public ICT for governance and make affordable ICT services accessible to the broader population. Hence, the private sector is driven by density and return on investments, and the public sector is driven by the need to extend government influence to the provincial level, improve public security and governance at all levels, and provide ICT access to the district level. Ultimately, the intent is to extend telecom and IT access to the citizens in all of the 6,000 villages nationwide and to use both public and private systems to do this. The driving theory behind this strategy is that communications provides the foundation for security, economic development, good governance, and improved social well-being. The plan also addressed the development and privatization of the public service provider, Afghan Telecom, and the development of the public ICT sector, including capacity building of the MCIT, other ministries' staff, and the public in general.

The government, public, and private ICT networks that have emerged from this strategy are described later. They include the Government Communications Network (GCN), Provincial Governor's Communication Network (PGCN), District Communications Network (DCN), Village Communications Network (VCN), Cellular GSM providers, Internet Service Providers (ISPs) and Internet Cafes, CDMA-Wireless Local Loop network and expansion, Fixed Line network (including local copper cable) and expansion, Local Fixed Service Provider (LFSP) licenses and the National Fiber Ring. A number of parallel initiatives were begun by donors and NGOs to use ICT as an enabler of reconstruction in other sectors, such as healthcare and education. Examples of these are cited later.

Although not discussed in this paper, independent ICT networks are being established by the Ministry of Defense (MoD) and Ministry of the Interior (MoI) to support the ANA and ANP respectively. These networks use a mix of fixed, satellite-based VSAT networks, tactical military ICT capabilities, GSM cellular, a digital trunked radio system [Terrestrial Trunked Radio (TETRA)], and other fixed and mobile ICT capabilities. The ANA network has an interface with the GCN hub in Kabul. There also may be selected subscriber access to GCN/DCN services in the future.

In December 2005, President Karzai signed the Telecom Law, replacing the Laws on Regulation of Telephone Services 1964, 1968, and 2000 and establishing an independent regulatory body, the Afghanistan Telecom Regulatory Authority (ATRA). Salient new features of the law include provisions for regulating tariffs of operators with "significant

market power" and for ATRA oversight of the Telecom Development Fund (TDF).[2] ATRA was created by merging the Telecommunications Regulatory Board and the State Radio Inspection Department of the MCIT. The Telecom Law was published in the Official Gazette on May 27, 2006. ATRA became fully responsible for all regulatory functions in the telecom sector: licensing and compliance, spectrum planning and assignment, numbering, ensuring network interconnection, promoting competition, and consumer protection, among other things. Five board members were appointed in June 2006, and organizational build up was initiated and continues. In fact, today ATRA is actively monitoring and controlling the telecom sector to ensure compliance with the law and license conditions.[3]

The MCIT established an ICT Directorate and an official MCIT web site.[4] The +93 country code has been recognized by international and regional carriers. The Afghanistan ".af" domain name was recovered. The Afghan Network Information Center (AFGNIC) manages the country code top level domain and National Internet Registry of Afghanistan and also serves as the Internet Exchange Point for Afghanistan.

At the outset of the intervention into Afghanistan, the international, coalition military, and USG interests and investments in public Afghanistan ICT reconstruction and development were problematic. There appeared to be a general lack of understanding of the Afghan information and related ICT business culture. Donors shunned providing telecom reconstruction funds for public services (largely influenced by the so-called "Washington Consensus" championed by the World Bank), and even the USG took a largely hands-off approach to underwriting Afghan ICT, despite the obvious need for emergency support following the war. In 2003, Afghanistan was able to clear its debt to the World Bank, in part with the help of Japan, the UK, Sweden, Norway, and Italy, which contributed to a trust fund for this purpose. Additional funds from the multi-donor Afghanistan Reconstruction Trust Fund (ARTF), which is administered by the World Bank, helped to clear the remaining arrears, allowing Afghanistan to become eligible for loans for projects designed to help meet the country's longer-term development needs. As a result, in early 2004 the World Bank and USAID became engaged and granted money to the Afghanistan MCIT to create a national telecommunications system to connect the central government with the country's 34 provinces and create public access centers for Internet and telephone communications at the district level. Subsequently, China, India, and Iran expressed investment interest, but outside of the USG, UN, and World Bank investments there was little interest from other Western nations or IOs.

[2] The TDF was based on a 2.5 percent tax on private sector operator revenues and used to fund telecom development projects that may not be undertaken on commercial grounds by these operators.
[3] The official ATRA web site is <www.atra.gov.af>.
[4] The official MCIT web site is <www.MCIT.gov.af>.

ICT—Putting the Pieces Together

An early initiative to provide government communications support for governance and emergency communications was a 2003 USAID-funded CODAN HF Radio network that linked the Kabul-based Afghan government with its 34 provincial government elements. Until the international community, GOA, and private investments enabled implementation of a nationwide ICT network, the HF network was the primary means for supporting governance and emergency communications to the provincial capital level. The CODAN network is still operational today with the base stations located in the MCIT buildings in provincial capitals.

Other early communications capabilities employed, even during the era of the Taliban, were over 100 VSAT nodes (providing access to International voice and Internet service) operated by NGOs and the UN and the Global Mobile Personal Communications by Satellite (GMPCS) phones. For some time, the VSAT nodes and satellite phones were the only means for accessing international communications and long distance communications within Afghanistan, and they are still used to a lesser extent today. Due to high costs, the satellite phones were (and are) not used by the common Afghan: the phones themselves are expensive and satellite-based phone calls frequently run over a $1 per minute for a voice call and over $5 per minute for low data rate calls. The GMPCS users tend to be foreign military; national government elements, such as Embassies and national aid organizations; IOs, NGOs, and foreign business representatives. GMPCS phones that have been used are Globalstar, Iridium (used by USG elements), Thuraya, and INMARSAT. ATRA has issued licenses to New Ansari Ltd. for Thuraya and AWCC for INMARSAT use throughout Afghanistan.

The main objective of the GOA Telecommunications and Internet Policy is to modernize and rapidly expand ICT networks and services and to achieve universal access to telephone and Internet across the country. The MCIT vision, strategy, and early efforts to establish a regulatory authority and policies enabled, with the help of the international community, significant progress to be made in the evolution (some might argue revolution) of Afghan ICT. The rapid introduction of ICT has served to help jump start the economy in the urban areas, extend ICT support to governance from Kabul to the provincial level, and establish telecoms and Internet access for the broader population at the provincial and some district levels. A good public-private partnership has proven to be the key to the success of the rapid growth of private cellular services and the early introduction of Internet services in urban areas.

Although at the outset the GOA, international donors, military, and private sector had no agreed, overarching ICT architectural framework to make investment decisions, there was a MCIT-led vision, strategy, and plan that influenced subsequent investment and implementation activities, resulting in the emergence of the "default" ICT architecture illustrated in figure 2. Investment and implementation activities of the MCIT/ATRA with support from international donors, such as the World Bank, USAID, and coalition military and investments of the private sector, such as the cellular providers, Internet

Service Provider (ISPs), and related Internet Café owners formed the basis for the public-private ICT networks that emerged. Additionally, coalition military and national government investments, supported by the MoD and MoI, formed the basis for the ANA and ANP ICT networks. The remainder of this section discusses the evolution of the ICT elements that form the basis of the default ICT architecture. Details of the ANA and ANP networks are not addressed.

Private-Sector GSM Networks and Services

As early as December 2001, private-sector efforts began to build a phone system in a country still emerging from more than two decades of war. Battling logistical problems, political instability, and physical insecurity, the Afghan Wireless Communications Company (AWCC) launched a new wireless operation in April 2002 in Kabul with plans to quickly extend to four additional cities (Herat, Mazar-i-Sharif, Kandahar, and Jalalabad) by the end of the year. An international gateway was established to provide international phone service, and during the April 6, 2002, ceremony to launch the GSM network, Afghanistan's interim leader, Hamid Karzai, placed the first call to an Afghan émigré in Germany.

AWCC, which is 80 percent owned by Telephone Systems International (TSI), a U.S.-based company, and 20 percent by the MCIT, was awarded the first nationwide GSM mobile license in January 2003. The Telecommunications Development Company of Afghanistan (TDCA)—doing business as "Roshan"—was awarded the second nationwide GSM mobile license that same month. Roshan is 51 percent owned by the Aga Khan Fund for Economic Development (AKFED)—the development arm of the Aga Khan Development Network (AKDN); 37 percent by Monaco Telecom International (MTI); and 12 percent by MTC. Areeba, owned by Investcom (Lebanon), was awarded the third nationwide GSM mobile license in September 2005. The United Arab Emirates (UAE) based, Etisalat, was awarded the fourth nationwide GSM mobile license in May 2006.

Although at the outset the GSM network performance was fragile in terms of coverage and quality of service (dropped calls and poor voice quality) and costs to use it were high, by the end of 2006 four licensed GSM operators were providing cellular phone service to major urban areas, quality of service had improved and costs had decreased substantially. The customer base grew to more than 2 million subscribers and is still growing. Of the four independent networks, AWCC and Roshan are nationwide and the other two plan to be. AWCC has about 900,000 subscribers and the most extensive terrestrial microwave network. Roshan is Afghanistan's leading cellular telephone service provider with a countrywide network of more than 160 cities and towns and about 1.2 million subscribers. They directly employ more than 800 people and provide indirect employment to more than 15,000. Roshan has invested over $240 million in Afghanistan and is the country's single largest investor and taxpayer, contributing approximately 6 percent of the Afghan Government's overall revenue. Areeba has coverage in Kabul, Mazar-e-Sharif, Kunduz, Jalalabad, Herat, Kandahar, and Zabul and is expanding fast to other cities. Etisalat plans to have its commercial launch in 6 cities in June 2007. The GSM networks have their own international gateways and employ a mix of satellite and

Figure 2. "Default" Afghanistan ICT Architecture

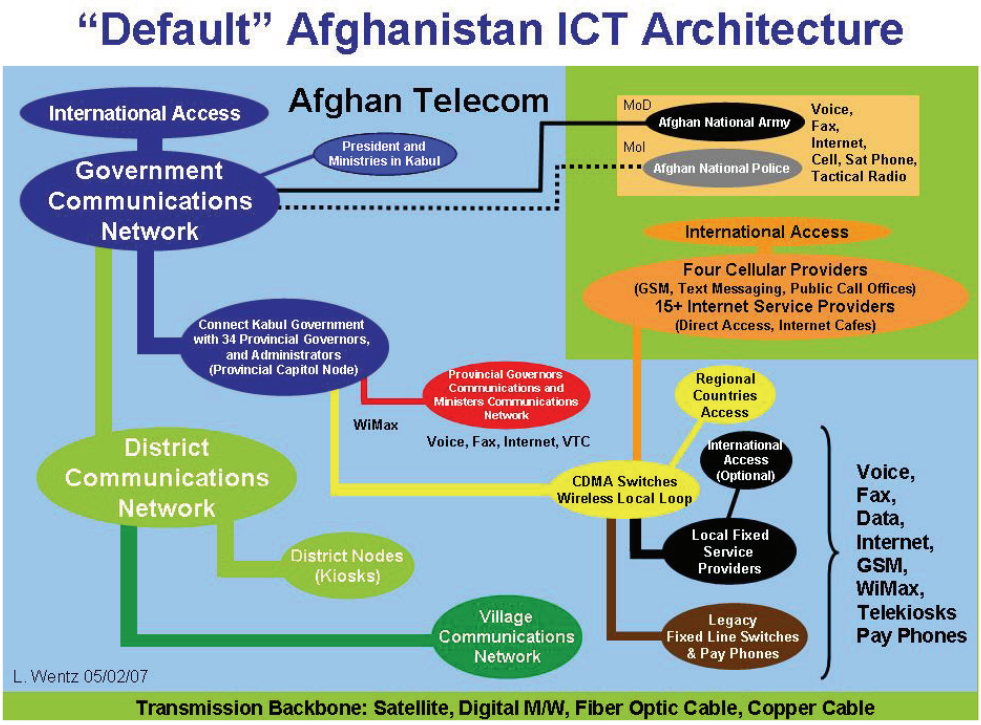
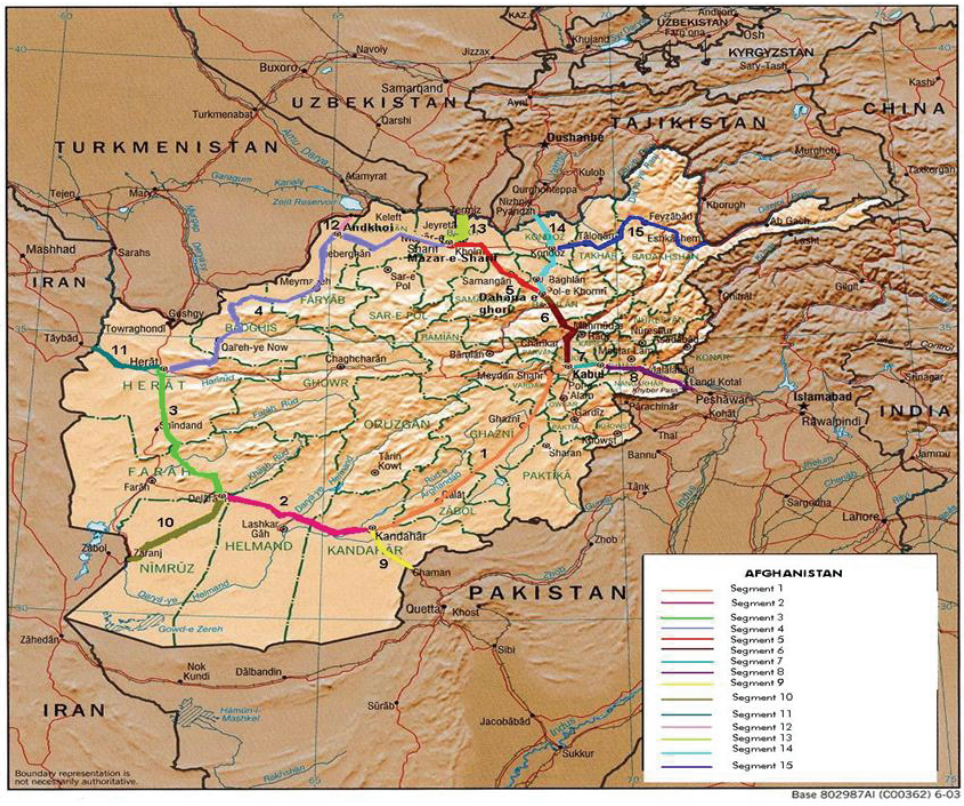


Figure 3. National Fiber-Optic Network



digital microwave transmission for network connectivity, and the networks are interconnected. Prices for calls between networks differ but will converge with competition. Some cell phone users have separate phones for accessing the different cellular networks. AWCC and Roshan each have active roaming agreements with other network operators.

In the 2002 timeframe, phones cost more than $400 and airtime averaged $3 a minute. The prices for mobile service dropped about 70 percent between September 2003 and March 2005. In the 2006 timeframe, the cost of phones was around $35 and airtime charges were roughly 10–15 cents per minute, dropping to 5 cents per minute in off-peak periods. Today, the cost of calls to other networks has come down from 30 cents per minute to 9 cents and Subscriber Identity Module (SIM) card prices have come down from $30 to $5.

The GSM providers offer short message service (SMS), and Roshan offers web-based management of SMS text distribution. Roshan is deeply committed to Afghanistan's reconstruction and socio-economic development and has tested and plans to offer General Radio Packet System (GRPS) service that enables customers to plug their laptop into the cell phone and browse the internet, check email, and send data. They offer low-margin public call office (PCO) service to benefit more remote and less affluent sections of society. In some places women's groups and former soldiers have been able to establish PCOs to provide phone services for people without telephones. Someone who runs a PCO can make up to $120 a month. Additionally, Roshan has tested the mobile commerce service offered by Vodafone's M-PESA mobile remittance transfer service, which enables mobile phone subscribers to transfer money to other mobile users via SMS text messaging. They also are exploring with ATRA and the Da Afghanistan (Central) Bank (DAB) licensing cell phones for electronic cash transfers. Other cell phone techniques are being developed that use SIM cards and text messaging to swap airtime for goods and services.

Private Internet Cafes and ISPs

In mid 2001, the Taliban banned the use of the Internet to stop access to vulgar, immoral, and anti-Islamic material. With the fall of the Taliban, ad hoc Internet cafes emerged as early as 2002 in Kabul. AWCC opened the first Internet Café in the Kabul Intercontinental Hotel in July 2002. Since then, hundreds of privately run Internet cafes have opened around the country—mostly in urban areas such as Kabul, Herat, Mazar-e-Sharif, Khost, Jalalabad, and Kandahar. In an Internet Café visited in Khost, it cost about 40 rupees (67 cents) per hour to use the Internet and approximately 60–70 customers visited per day—mainly youth checking emails and chatting on either Yahoo or MSN messenger. Although the Internet has become one of the most efficient ways for Western firms to communicate and conduct business with distant clients, Afghan business use of the Internet has been slow to catch on and nearly nonexistent outside the largest cities. A December 2005 World Bank report suggested that businesses in cities such as Kabul, Herat, and Mazar-e-Sharif were using the Internet, but in Jalalabad and Kandahar only a few firms reported using websites and email to interact with clients and suppliers.

The first ISP was licensed in 2004. Since then, ATRA has licensed more than 15 ISPs that provide Internet service to over 500,000 users. Although most of the ISPs can provide a satellite connection anywhere in Afghanistan to facilitate access to the Internet and many use WiMax in major urban areas to accommodate local direct access arrangements, there is no nation-wide ISP equivalent to Verizon, Cox, or NETZERO. ISPs typically offer VSAT arrangements, wireless broadband up to 20 Mbps, and dial-up access up to 56 Kbps. Some of the major Afghan ISPs are Ariana Telecom**,** CeReTechs**,** Neda**,** Insta Telecom**,** New Dunia Telecom**,** KBI AF (VARIA), and LiwalNet. The cost of Internet access from an ISP has dropped over the last several years; the Afghan ISP Association cited a reduction from $1,500 for a "shared 64 Kb/s" connection to about $200.

Public Fixed Line and Wireless Local Loop Services

A few, legacy, fixed line switches provide local voice services and support some 300 pay phones in Kabul. A few other fixed line switches and pay phones are found in a couple of the other larger cities, such as Herat, Mazar e Sharif, and Kandahar. These switches are interconnected with the local CDMA wireless local loop switches.

In 2003, the GOA contracted with Huawei and ZTE of China and TCIL of India to implement a Code Division Multiple Access (CDMA)[5]network to provide wireless local loop service in urban areas. Plans are also in place to expand this service to rural areas. There are now 31 CDMA switches and 85 Base Transceiver Stations (BTSs) deployed throughout Afghanistan, providing wireless local loop service. Nine provinces have Hauawei-China switches, 10 have ZTE-China switches, 11 have TCIL-India switches, and one has a Siemens EWSD digital switch. The existing CDMA network, along with the fixed line network, provides access to over 165,000 digital lines and has the capacity to build out to 225,000 CDMA lines and 101,400 fixed lines. The network connectivity is a mix of satellite and digital microwave; 27 provinces are connected by satellite and seven by digital microwave. CDMA subscribers have both desktop and handheld versions of CDMA phones. There is, however, limited mobility (restricted to geographic coverage area of the BTS providing service), since the network does not have national or global roaming capability. Interconnections exist between the CDMA and GSM networks enabling calling between networks. The CDMA network is managed by Afghan Telecom and uses post-paid call billing. Afghan Telecom has been considering adding a pre-paid billing capability and Mobile Switching Centers (MSCs) to accommodate roaming services. This would create a public CDMA-based cellular network that would compete nationwide with the four private GSM networks. A Packet Data Switching Node (PDSN) is being used to pilot mobile data service in the Kabul area, and there are plans to extend this service throughout Afghanistan.

In early 2007 actions were taken to issue a request for proposal (RFP) to broaden the coverage of the CDMA network and add functionality. ATRA issued a tender for a CDMA-based mobile network and a landline operator, both supporting the MCIT plans. Afghan Telecom plans to re-configure and re-orient the existing CDMA and Fixed Line networks and implement the first CDMA-based, fully mobile, pre-paid voice and data

[5] A digital cellular technology that uses spread-spectrum techniques.

network, covering all 34 provinces in Afghanistan. The CDMA network will offer pre-paid services using the Wireless Intelligent Network platform and the data services will be provided by PDSNs. The Fixed Line network will offer pre-paid service using Fixed Intelligent Network platforms and DSLs and ADSLs data services will be offered using data cards in the Fixed Line Switches and DSL and ADSL equipment at the customer premise. During an April 2007 MCIT presentation on the status of ICT, it was noted that contracts have been signed for 150,000 digital lines in the major cities of Kabul, Kandahar, Mazar, Jalalabad, and Kunduz at a cost of $40 million and a 50,000 digital line expansion in Heart at a cost of $15 million. Completion is expected the first quarter of 2008.

Afghan Telecom Network and Services

To enable public ICT reconstruction and development, the World Bank and USAID provided the MCIT funding to help create a government and public communications network, which is now maintained and operated by Afghan Telecom. When fully implemented, this network will provide voice, fax, and Internet services, national and International calling access to provinces and districts, and video teleconferencing (VTC) services to provincial governors. Funding included an international satellite gateway in Kabul to access global voice, data, and Internet services. The World Bank invested $16.8 million to develop the government communications network (GCN) and another $3.7 million to rehabilitate the International Satellite Gateway in Kabul. The GCN provides International voice and Internet access and communications services to support governance to the provincial capital level—governor and key administration elements, including in some cases police chiefs. USAID invested $14.2 million to develop the district communications network (DCN) to extend voice and Internet access to the district level for use by local government officials and the local population. GCN and DCN serve to enable good governance at the provincial and district levels by helping remote communities and government offices throughout Afghanistan communicate effectively with each other and the world.

In 2004, the MCIT contracted with the American firm Globecomm Systems, Inc. (GSI) to engineer and implement the GCN and DCN and rehabilitate the International Satellite Gateway. The 34-node GCN network was commissioned in 2005, and the rehabilitated International Satellite Gateway in Kabul was commissioned in July 2006. The GCN network connects 42 ministries and other major offices in Kabul to each other and links the central government in Kabul to the governors of the 34 provinces. A meshed satellite network supported by some digital microwave links provides the network connectivity for GCN and the Kabul-based GCN satellite gateway provides access to the Hong Kong International gateway for worldwide calling and global Internet access. The rehabilitated earth station provides alternative routes for both national and international calls and also has been connected to the Afghanistan Radio and Television facility in Kabul to support TV Broadcasts. The GCN satellite links provide T1 connectivity (but can be engineered for higher data rates) between the network nodes. The network supports voice, fax, Internet, and VTC services to the provincial capitals and key Kabul-based government elements. In regard to the latter, a Taliban-era fiber optic ring, supported by digital microwave links, provides connectivity in the Kabul area for interconnecting the ICT

capabilities of the offices of the President, Ministries, and Kabul city offices with the GCN.

Because of funding limitations, GCN service was only extended to the MCIT buildings in the provincial capitals, not to the governor and other key offices as originally intended. A program, referred to as the Provincial Governors Communications Network (PGCN), was developed to acquire and implement ICT capability packages to extend services from the MCIT building to the governor and other key administrative offices. In 2006, the coalition military [Combined Forces Command-Afghanistan (CFC-A)] used the Commander's Emergency Response Program (CERP) funds to purchase and implement a PGCN solution package that provides WiMax terminals at the MCIT facility and related end user equipment to extend GCN voice and Internet services to the governor and related administrative facilities—five telephones and five computers. The initial CERP funding covered 12 provinces and these sites are now operational. Sources of funding are being explored to equip the governor and related administrative facilities in the remaining 22 provinces. One option under consideration is a two-phase effort where CERP funding would be used for part of the project and MCIT would fund the remainder. If this occurs, it will illustrate the successful use of U.S. government funds to jump-start a reconstruction program that is then transitioned to the local government for completion.

The initial PGCN extended only voice and Internet services to the governor's facilities; the governors had to go to the MCIT building to use the VTC service. Since the VTC capability is used frequently by President Karzai to conference with provincial governors, and since it is becoming increasingly dangerous for the governors to travel in certain areas, actions have been taken to extend the VTC to the governors' facilities. Several of the 12 PGCNs implemented have been adjusted to accommodate VTC, and the remaining installations are being engineered to do this. Implementation of the remaining 22 PGCNs will include extension of voice, Internet, and VTC.

Only 337 of Afghanistan's 365 districts have been funded to receive DCN nodes. By early 2007, only a few more than 200 of the 337 funded district sites had been commissioned and were connected by a VSAT star network configuration. The network offers district-level access to phone, fax, and Internet services. At each DCN node, a telekiosk arrangement provides access to five phones, five workstations with Internet access, and a fax machine. The DCN links operate at roughly 256 kbs but could be engineered for higher data rates. Since there is no national power grid, diesel generators and batteries power the DCN nodes and related ICT equipment. The DCN sites are located near district centers to enable the local population to make voice calls within Afghanistan or internationally and access the Internet. A small fee is charged for these services, typically 1 Afghani per minute for calls within the district, 5 Afghanis per minute between districts, and 25 Afghanis per minute for international calls; Internet access is 20-30 Afghanis per hour. The exchange rate is about 50 Afghani to one U.S. dollar.

It was recognized during the initial phases of the DCN network implementation that most nodes likely would not be able to generate enough revenue to be self-sustaining, but there

was also a desire to not operate at a major loss. Overall, it has been reported that Afghan Telecom is currently losing several million dollars per year. As noted earlier, the intent was to rapidly expand coverage to districts and start marketing DCN services so that the demand for services would be sufficient to generate the needed revenue to allow the nodes, and the network in general, to become a viable operation. The operational growth in network traffic to date provides evidence that the demand for DCN services is there, but the network statistics also suggest that usage is not consistent across all nodes. It is not clear why some nodes are more successful than others. A large number of the DCN nodes commissioned have been unable to generate enough revenue to sustain their operations cost effectively. This has been attributed to a lack of customers, largely driven by the inability to market the availability of DCN services at the district level. Until recently, there were no marketing plans, no signs on DCN buildings or in the towns to advertise voice and Internet services, and no local radio advertisements. Many locals do not know that DCN service exists in their area. Additionally, some of the nodes are located outside population centers in protected enclaves that do not make it conducive to walk in off the street. Provincial Reconstruction Team (PRT) personnel are now actively involved with the MCIT in several provinces to explore ways to help increase local use of the DCN services.

As a result of the low demand, some DCN sites are only open 2 hours a day, if at all. Some only power up if a customer arrives. The MCIT is monitoring the revenue produced by DCN nodes to identify poorly located and managed DCN sites. Plans will be developed to relocate the equipment and services from these sites to more appropriate locations. There have been MCIT/ATRA discussions about franchising DCN nodes as a way to develop a more profitable customer base and make DCN a financially viable and sustainable service. It has been estimated that monthly revenues of about $3,000 would be required just to cover operating expenses and break even. Cost of fuel alone for the diesel generators is about $800 per month and a key factor in the cost of doing business.

Availability of district communications buildings (usually two buildings, one for the ICT equipment and one for the generator) and physical security concerns due to increased insurgent threats have slowed the implementation of DCN nodes, but MCIT/Afghan Telecom are optimistic the remaining nodes will be completed by the end of 2007. However, of the 337 sites programmed for DCN equipment, and for which the equipment has already been purchased and stored in a warehouse in Kabul, only 275 have funding for building construction. The funding comes from a variety of sources, including USAID, PRT CERP money, United Nations Development Programme (UNDP), and Afghanistan Stabilization Program (ASP). Funding for the remaining 62 buildings has not yet been obtained. Delays in funding could impact the ability to complete implementation of the 337 DCN node network by the end of the year. Additionally, funding for DCN equipment and buildings for the remaining 28 unfunded district nodes is yet to be determined. Some of the remaining 28 nodes will be candidates to use equipment relocated from the poorer performing DCN nodes.

The GCN/DCN implementation challenges for GSI were related to both environment and system integration. Outside Kabul, there was little or no infrastructure, roads, or

electricity. Security was a continuing concern. According to GSI reports, in some areas implementation teams had to unload trucks in the middle of nowhere, hand-carry the electronics across a stream, get the truck across the stream, then reload it. Security protection had to be provided by GSI. Unexpected systems integration challenges also caused problems. For example, the MCIT purchased CDMA switches that when implemented formed islands of wireless communications with no outside connections that then needed to be interconnected to form a network. The GSI team was called upon to engineer the interconnection of the CDMA switches with the GCN and its long distance network.

GSI installed a soft switch at the GCN hub in Kabul to handle the GCN/DCN routing, call setup, and tear down, as well as support the CDMA network and the associated fixed line switches connected to it. The CDMA network uses the GCN satellite gateway for international calling; access links connect the CDMA switch in Kabul to Pakistan (digital microwave) and the Siemens EWSD switch in Heart to Iran (fiber optic cable). Similar links to other neighboring countries are planned in the future. The CDMA switches also have interfaces with private cellular networks, and this arrangement provides the means for calling between the public and private networks within Afghanistan. The interconnection of the various networks has served to establish the foundation for evolving to a nationwide network. In fact, what originally had been planned to be a purpose-built network serving government needs and strategic objectives rapidly became a public network, which in a sense serves as the default nationwide backbone network with international and regional access.

In 2005, the GOA approved a decree to transfer the MCIT's public ICT network and operations to an incorporated public company, Afghan Telecom, which is now responsible for providing government and basic public telecommunications services nationwide. The MCIT holds 100 percent of Afghan Telecom; opportunities are being sought to sell this interest to private companies. Plans are also in place to privatize Afghan Telecom. The timeframe for this action is under consideration by MCIT/ATRA.

As part of the MCIT/ATRA and Afghan Telecom objective to extend ICT services to the broader public and, in turn, create investment and job opportunities consistent with approved Telecom Policy, licenses are being issued to allow the private sector to establish essentially independent telephone companies that will eventually become part of Afghan Telecom. This initiative is referred to as the local fixed service provider (LFSP) program. Its main objectives are to facilitate faster roll out of services to small towns and rural areas and to provide investment opportunities for small-to-medium local investors across the country. It is hoped that the LFSP initiative will result in more than $100 million in investments, the creation of thousands of new jobs, and rural areas receiving ICT services sooner.

In May 2006, the first LFSP license was granted to Wasel Telecom to implement wireless services in small towns and rural areas in the provinces of Kunduz, Jawzjan, and Balkh; the first facility was commissioned in Mazar in April 2007. In February 2007, three additional licenses were issued: one to Shaheen to cover 20 districts in the Logar, Paktya,

and Khost provinces, and one each to Ertibat and Watan to provide services in five districts of the Herat province. The LFSP providers can offer wireless voice and data services. The LFSP facilities interconnect directly with the Afghan Telecom CDMA switches and also may interconnect with the private cellular networks. Additionally, while the LFSP license offers the opportunity to use their own international gateways, MCIT/ATRA has directed that they use the GCN International gateway as part of the Afghan Telecom suite of nationwide capabilities.

Rural area ICT coverage is essentially non-existent today. The MCIT and Afghan Telecom have proposed exploring low-cost and low-power solutions for the rural area, referred to as the Village Communications Network (VCN). It is envisioned that the VCN would be an extension of access to DCN voice and Internet services for the rural areas and that low-cost ICT capability packages would be employed to interconnect with the DCN network.

A number of vendors already have suggested the use of low-cost ICT packages in rural areas, consisting of a solar-powered wireless data communications capability that provides customers wireless service to access the Internet and use VoIP for voice service. These ICT packages would be connected to a DCN node. Afghan Telecom plans to launch a pilot program and estimates equipment to get started would cost approximately $10,000 for an ICT package with Internet connectivity or $4,000 for basic telephone service. Additional costs would include transport to the site; site preparation; training; maintenance; operational and/or security staff; and telecom usage charges. This could be an ideal solution for an entrepreneur or perhaps run by the village elder. Funding for part of the extension of services to rural areas likely will be supported by the TDF. The fund had about $9 million in 2006 and the MCIT expects an additional $10 million in 2007.

Through a U.S. Trade and Development Agency (USTDA) grant, ATRA has hired a consultant to recommend how to manage the TDF and make the best use of the funds to provide rural communications.

Public and Private-Sector Transmission Networks

At the end of 2006, ZTE Corp was awarded a contract for a national fiber optic network along the national ring road that connects the major population centers (Kabul-Ghazni-Kandahar-Heart-Mazar-Samangan-Baghlan-Kabul) around Afghanistan. Figure 3 illustrates the route and shows the 72 access nodes planned along the ring to provide connection points for additional microwave, satellite, and cable links to connect all district centers and key cities. The fiber ring will be about 3,200 km in length, have a total of 1,008 E1 (2 Mb/s) links, and be carried in a three-tube layout with 12 optic fibers per route for a total of 36 fibers. There will be links to all neighboring countries [two into Pakistan and single links into Tajikistan, Uzbekistan, Turkmenistan, and Iran (existing)] and to the world. The fiber ring will greatly reduce the cost of voice and data traffic, pave the way for more affordable services, and position Afghanistan to become a leading international traffic carrier between the Gulf/India and Central Asia/Newly Independent States. The project cost is $65 million. Implementation started in April 2007 and is hoped to be completed in 24 months.

In addition to the planned fiber ring, private cellular phone providers already are implementing digital microwave links along the same ring road to urban and other areas. New companies, such as the Asia Consultancy Group (ACG), are starting to build digital microwave links to support public and private provisioning needs. ACG is currently constructing a digital microwave link for Areeba that connects Kabul and Jalalabad and extends connectivity into Pakistan.

The fiber optic network and digital microwave links could be used to provide alternative means for provisioning GCN/DCN, CDMA network, GSM, and other connectivity, thus allowing an eventual migration of the satellite-based connectivity from largely VSATs to a mix of satellite and terrestrial connectivity. Contracts also have been let with ASTER of India and Sher-Gandhi of Iran/Kabul for fixed line outside plant copper cabling in the cities of Kabul, Heart, Mazari Sharif, Kandahar, Jalalabad, and Kunduz.

The mix of satellite, fiber, copper cable, and microwave transmission links could be combined to form a national backbone transmission capability that could be used to provide connectivity for public and private networks and also provide a means for rapidly accommodating surge capacity needs during crises as well as restoration and recovery of failed connectivity due to natural or manmade disasters. It also could be used to create a competitive environment for achieving lower-cost network connectivity through more openly competing backbone transmission provisioning.

ICT Support to Cross-Sector Reconstruction

Private VSAT networks are used to support business communications and information exchange needs of the larger contractors who have reconstruction sites and offices throughout the country. As noted earlier, the UN has VSAT nets and NGOs manage more than 100 VSAT-based sites to support their communications and information exchange needs. Additionally, IOs and NGOs are employing innovative uses of telecommunications and IT to enable sector development, such as healthcare and education. For example, in the healthcare area, Partners in Technology International (PACTEC) implemented a VSAT link, associated LAN, and workstations throughout the Cure International Hospital in Kabul to provide doctors, nurses, and other medical staff Internet access for research and reference material, as well as to facilitate lab work such as remote tissue analysis, support reachback to subject matter experts for consultation, and provide other electronic-Healthcare (e-Healthcare) uses. Donated lab equipment allowed electronic images of tissue samples to be digitized in the lab and sent over the Internet as a .pdf file attached to emails to pathologists in the United States and elsewhere who conducted an analysis and sent the results back to the hospital within 24–48 hours. Before implementing this Internet-enabled service, actual samples of tissues had to be sent out of the country to Pakistan and elsewhere, requiring weeks to get results. Personal Digital Assistants (PDAs) with medical diagnostic software tools have been provided as well and are being used by doctors to diagnose patient symptoms and prescribe medications and treatments. Software updates can be downloaded from the Internet. World Wide Lab, another NGO, provided a software package for a patient record system for the hospital. The software package automated the in-processing of patients as well as

the recording of their medical and payment history and also included an inventory control capability for the hospital's pharmacy.

In the education area, NGO supplied workstations, LAN, and VSAT provide Internet access for the Journalism Lab at Khost University. A CISCO Academy is also located on the same campus and has separate VSAT, LAN, and workstations to support IT training. Ironically, the Computer Science Lab next door to the Journalism Lab and across the street from the CISCO academy has not been as fortunate. It has some 20 workstations, but no power to operate them or LAN or Internet access arrangements. Situations like this are ideal opportunities for the military/PRT, aid organizations such as USAID, IOs like the UN, or NGOs to consider funding an arrangement to leverage capabilities on campus and provide Internet access for a broader student population. In Kabul, for example, the NATO "Virtual Silk Highway" project provides affordable high-speed Internet access to staff and students at Kabul University (Kabul campus is wired with fiber optic net and NATO provides satellite access to Internet) and seven other educational institutions in Kabul. There are partnership and e-Alliance programs between Kabul University and universities in the United States and other off-shore institutions that are part of the Afghanistan eLearning and capacity building programs. The San Diego-Jalalabad Sister City program supports efforts to equip Nangarhar University and Medical School and elementary and middle schools in Jalalabad with computer labs and Internet access. However, not all Afghan universities have comparable capabilities. Additionally, universities within Afghanistan are not electronically linked together over the Internet or otherwise. Medical schools are not electronically linked with local hospitals either but could be as well.

ATRA has taken some initiatives to use the public network to promote distance learning. In discussions with two of the LFSP licensees, it was agreed they would provide free Internet connectivity to each of the schools in the districts they are licensed to serve. It is anticipated that these schools could serve as community access points for distance learning. ATRA also has provided money from its TDF to the Ministry of Education for computer equipment (servers) that will allow video on demand retrieval of educational programming already being broadcast nationally by the government-owned TV station. These broadcasts consist primarily of a new weekly half-hour program similar to Sesame Street. ATRA is also exploring the availability of finances or subsidies for the construction of community towers to expedite rural area service availability from mobile service providers. ATRA will launch public consultations to work out the details and develop simple procedures for communities to obtain funding. An approach being considered would be for the community to sign a petition and simple application. On that basis, ATRA would commission a site survey and a "reverse auction" for funding to build the tower (the least subsidy requirement would win the project). Other selection factors might include how fast the site could be made operational. Space on the towers would be leased to private cell phone providers and other telecom and IT providers as appropriate.

The DAB has licensed 12 commercial banks. Out of the 12, seven are full-fledged commercial banks. Most of the 12 commercial banks licensed to operate in Afghanistan

are concentrated in Kabul and provide services primarily to international donors and businesses, foreign NGOs, and foreign government agencies. International funds transfers via SWIFT have been available through the Central Bank since July 2003. Commercial banks are currently offering International Funds Transfers, some using their own facilities and others using the Central Bank's capabilities. Domestic transfers can be arranged throughout 32 provinces in Afghanistan through the Afghan Funds Transfer System (AFTS). Although relatively new, AFTS has been successfully tested and DAB Kabul is now sending and receiving domestic funds transfers on a daily basis. However, because of widespread distrust of the banking system, many local businesses continue to use the *hawala*[6] system for short-term loans to finance working capital needs, or rely on family and friends.

Given the continuing high risk security environment and lack of broader public access to nationwide banking, MCIT/ATRA, the DAB, and the private sector are exploring alternative means for financial transactions, such as the use of cell phones for electronic funds transfer, G-Cash, e-Wallet solutions, and mobile commerce. Such capabilities could revolutionize economic and social development by offering people a means to swap SIM card credit for goods and services or initiate money transfers using SMS text messaging. New capabilities could be used to automatically pay soldiers and police in remote locations without, as is the case today, having to physically deliver cash to them and then have them leave their posts for several days to take the money home. Funds could be electronically transferred to a family electronic account. A 2007 pilot project between Roshan and DAB successfully tested the Vodafone M-PESA mobile commerce capability, and Roshan plans to apply for a permanent license to offer a range of financial services using the personal cell phone.

The judicial system is exploring e-Solutions and databases and the Ministries are exploring the use of e-Government. A National Data Centre (NDC) is being planned to archive national information records to support and be available to government entities. The Afghan Parliament recently urged the government to accelerate the process of creating a National Identity Card and National Passports, with special focus on decentralizing the application and issuing processes. Other examples of interest in government services to be provided include: record keeping and operations for foreign trade; government pension beneficiaries; utility billing; central bank, population, and demographic databases; and national statistical databases.

ICT Capacity Building

USAID, UNDP, World Bank, and other organization have focused on capacity building initiatives that include rehabilitating the MCIT Telecoms Training Center, upgrading it to a modern ICT Institute, and establishing 12 MCIT ICT training centers and six CISCO networking academies around the country to train Afghans in the use of computers and IT. Establishment of the ICT Institute is ongoing with new buildings under construction, laboratory and curriculum being developed, and training of the trainers underway. The

[6] Hawala is an informal value transfer system based on performance and honor of a huge network of money brokers which are primarily located in the Middle East, Africa and, Asia.

first batch of students will enter in 2007 and enrollment is set to produce 50 engineers annually. Plans have been made to add three more CISCO academies in 2007.

University programs are being developed and degrees in Computer Sciences are being offered at major institutions, such as Kabul, Jalalabad, and Khost Universities. There are also initiatives to introduce English language training and Business Management programs. New universities such as the American University of Afghanistan (AUAF) in Kabul are opening up as well. AUAF is offering two undergraduate degree courses, one in Business Administration and the other in ICT.

Local businesses are also emerging to teach computer usage skills and English language. No government certification is required for these training programs, rather it is believed that the community will self discipline and weed out those elements not providing adequate training.

Cyber Security and Electric Power Challenges

Cyber security is an essential component of developing information based services, such as those to be incorporated in the Ministries and National Data Center. There are regulatory requirements for digital signature, cyber crimes, and data protection, and these are being addressed in a proposed ICT law. The appropriate regulatory environment is essential for the development of secure e-commerce, e-health, e-education, and e-government-like services.

The creation of a National Cyber Security Strategy and Plan and the establishment of a National Cyber Security management structure has been under consideration by the MCIT for some time, and some starter elements have been put in place. There are plans to create an Afghan Cyber Emergency Response Team capability (AFCERT). Assignment of information security officers in Ministries and other government organizations as well as establishing cyber training and awareness programs are being considered. Much remains to be done to improve the cyber security posture of the government and public and private networks, including public-private cooperative arrangements.

The lack of reliable electric power for ICT continues to be a major issue, especially in rural areas. Generators are currently the primary power source for ICT equipment with battery backup. The private cellular networks operate 24x7 and use a mix of generators, solar power, and battery backup. The GCN is a full period service as well and operates its nodes 24x7 using diesel generators for power and batteries for backup.

On the other hand, the DCN tends to be operated as an on demand service and therefore does not operate 24x7. DCN nodes use generators and battery backup. Because the fuel to run them is expensive by Afghan standards, many only operate a couple of hours a day or when a customer needs to use the system. The rest of the time the nodes are powered down. In an attempt to provide a lower cost power solution for DCN nodes, the U.S. military has used CERP funds to purchase and implement solar power for 35 DCN nodes

(ZTE is the contractor). Positive results from this effort could result in a more general replacement of DCN diesel generators with solar power.

Designers, providers, and users of ICT have not paid sufficient attention to the use of energy efficient ICT equipment, such as laptops versus desktop workstations or power savings procedures to reduce the demands for power.

Since Afghanistan has no national power grid, a need exists to explore the use of a mix of alternative power sources to reduce pollution caused by generators which are costly to operate and maintain. Alternative power sources such as solar, small-wind, and micro-hydro are being explored.

A Continuing Success Story

In spite of overwhelming challenges, Afghan ICT has proven to be a major success growing from essentially nothing to over 2.5 million subscribers in four years. This represents a telephone penetration rate of 8 percent, a milestone that took India and Pakistan over 10 years to achieve. The ICT sector has generated more foreign investment, high-quality jobs, and new tax revenue than any other legitimate sector. Foreign investments in ICT exceed $700 million. The MCIT estimates the telecommunications sector today directly and indirectly employs some 40,000 people in Afghanistan—over 8,000 jobs are direct employment by telecom companies and the rest, indirect jobs in the form of sales channels, subcontractors, and telecom services companies. Revenues from the telecom sector make up about 12 percent of total government revenues—rising from less than $20,000 in 2002 to more than $100 million in 2006 (issuing two GSM licenses brought in over $80 million alone). By 2010 the government aims to ensure that more than 80 percent of the Afghans have access to telecommunications services—current MCIT estimates suggest that 50–60 percent of Afghans now live within a coverage area of the Afghan ICT network with the ability to have access. It also is estimated that the number of cellular subscribers will grow by about 100,000 per month, increasing from approximately 2 million in 2006 to more than 5 million in 2010, and that the ICT sector will contribute more than $200 million a year in public revenues.

Figure 4 is a high-level systems architecture representation of the "as is" Afghanistan ICT. The 34-node GCN network is fully operational including the International gateway. Twelve of the 34 PGCN ICT capability packages have been implemented, and it is estimated that it will cost about $1.5M to implement the remaining 22. More than 200 DCN nodes are operational and estimates to build out the network to 365 nodes are about $14M. The CDMA network is growing with plans to make it a nationwide mobile voice and data service. The LFSP (one contactor setting up a network and three preparing to do so soon) have now become active elements of the network. These networks are managed by Afghan Telecom from the network operations center located in their headquarters building in Kabul.

The Village Communications Network concept is part of the MCIT five year plan and is now incorporated into the ANDS goals—it has high visibility within Afghanistan and the international community. Initiatives such as LFSP are beginning to reach out to address

Figure 4. Afghan ICT "As Is" Baseline

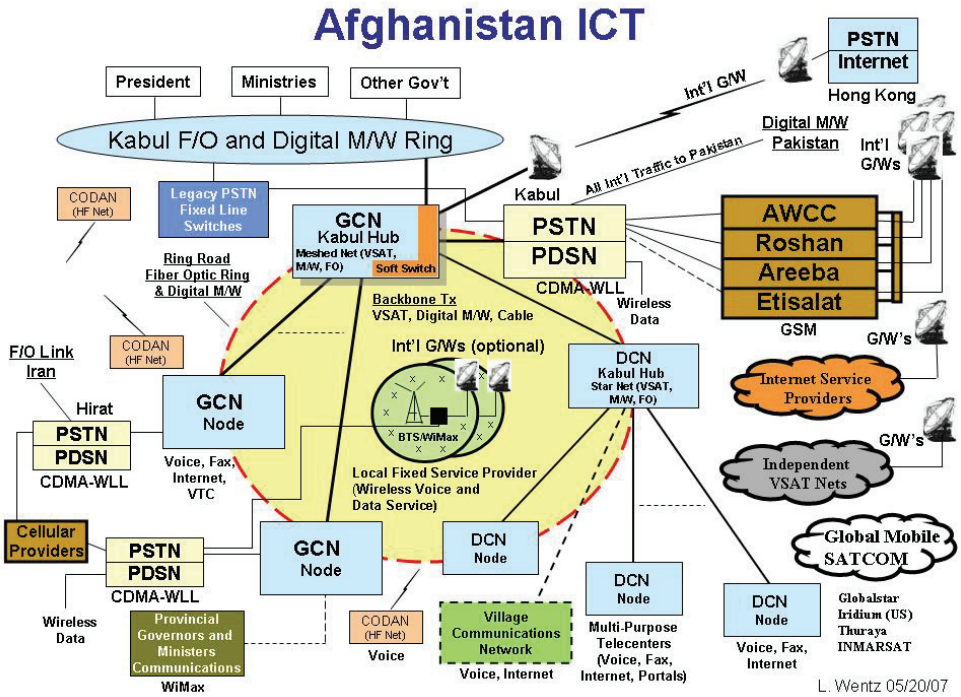
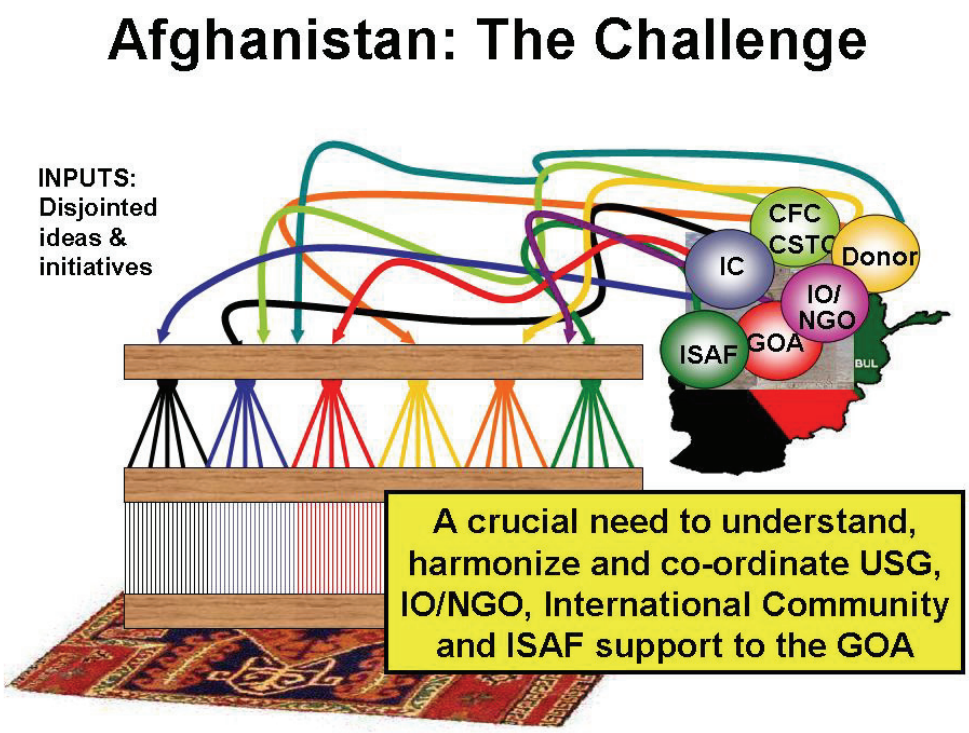


Figure 5. Afghanistan: The Challenge



some of the rural area needs. Cellular service is also starting to reach some rural areas with MCIT/ATRA initiatives encouraging further expansion. Several technologies are available to provide tailored ICT services at the village level, but more detailed analysis is needed regarding power requirements, information culture and related village requirements. The cost of providing a family of VCN ICT capability packages to 6,000 villages is estimated to be on the order of $47M.

Two of the four licensed GSM cell phone providers now offer nationwide urban area coverage and all are planning to expand coverage to rural areas. Additionally, 15 licensed ISPs and hundreds of privately run Internet cafes around the country now operate largely in urban areas with plans to expand to rural areas.

The private cellular companies operate on a pre-paid phone card basis where as Afghan Telecom has been operating on a centralized billing (post-paid) basis. This has proven to be problematic for Afghan Telecom due to an inadequate centralized billing system and a culture that believes government run services should be free. Afghan Telecom has acquired and commissioned a centralized billing system to improve revenue collection. As noted earlier, Afghan Telecom also plans to introduce pre-paid service as part of the CDMA-WLL and fixed line expansion initiative.

A National ICT Council of Afghanistan (NICTCA) has been created to facilitate coordination of ICT actions of all government sectors. With the creation of the NICTCA, the MCIT has taken on the role of the National Chief Information Officer (CIO) and the Ministry reps to the council the roles of Ministry CIOs. An Afghanistan Network Information Center (AFGNIC) was created to coordinate between different private and public organizations concerned with IT/ICT. Spectrum management and usage enforcement is a problem due to a lack of adequate monitoring capabilities—a mobile station for spectrum monitoring has been procured. Pirate cellular and ISP operations exist and the government hopes the new spectrum monitoring equipment will help them better manage spectrum use and eliminate pirate elements. Some illegal operators already have been discovered and their equipment has been confiscated and operations shut down.

Professional ICT societies have been established to improve social networking among the public and private elements. Organizations established include the Afghan Computer Science Association (ACSA), National ISP Association of Afghanistan (NISPAA), and the National ICT Association of Afghanistan (NICTAA). A Kabul chapter of the Armed Forces Communications and Electronics Association (AFCEA) was established in June 2007 and will serve to further the improvement of military, public, and private social networking in the ICT area.

Community Radio

Although not discussed in this paper, radio and television are other means to provide information services to the broader population. Initiatives to extend radio and TV throughout Afghanistan are being implemented. Like ICT, initial efforts have been focused on Kabul and other urban areas, and reaching people in remote areas remains a

challenge. For rural areas, where there is no power and the literacy rate is extremely low, radio offers an easy means to communicate useful information about healthcare; local, regional, national, and international news; the weather; educational opportunities; jobs and business opportunities; and government services. Most Afghans have access to radio receivers and are accustomed to using radio as a source of news, information, education, and entertainment.

A possible option to explore for the rural areas is community radio which is a radio station that is community-based, independent, and participatory. The station is based in its community and accountable to it. The legal owner is a local not-for-profit organization, such as an NGO, educational institution, cultural association, municipality, or a partnership of such associations. The station is independent of government, donors, advertisers, or other institutions but operates within the boundaries defined by law and by the constitution/guiding principles of the station. Community participation can be exercised in a wide variety of ways depending on the specific nature of the station, its objectives, and the characteristics of the community. On the whole, community radio is a low-cost and effective way of contributing to medium and long-term efforts for reconstruction, development, and nation-building.

Community radio is already in place in a number of rural Afghanistan areas. For example, in April 2006 one of the authors visited the Tangi Saidan Village Community Center, built by the NGO Morning Star Development, that has a medical clinic serving Afghan families in a rural area 40 miles south of Kabul. Part of this facility is a FM Radio Station that serves the 39 surrounding villages.

Efforts need to be accelerated to provide broader rural area access to radio-based information services, and expanding community radio is an approach to be considered.

Coordination and Information Sharing

Certainly many good people are doing good things in Afghanistan, but the degree to which activities are harmonized, coordinated, and leveraged with information shared about their activities remains problematic. This is not a technology issue. It's a combination of people, policy, culture, and organization issues. Technology is an enabler; the international and USG civil-military crisis response community can (and should) do better.

There was (and still is) no clear mapping of responding stakeholder organizations, such as the U.S. Embassy, USAID, coalition military, International Security Assistance Force (ISAF), coalition civilian partners, IOs, NGOs, and the GOA roles and responsibilities, particularly in the area of ICT reconstruction and development. Figure 5 (see page 29) highlights the current conglomeration. No institutional arrangements or agreed ICT mechanisms and processes (including within USG civil-military elements) are in place for synchronizing and coordinating multinational (and national) actions and information sharing. ICT program development, project coordination, information sharing, and implementation are and continue to be loosely coordinated, ad hoc, and in some cases non-standard, especially across ICT support to Afghan ministries. Harmonization,

coordination, and information sharing is largely personality driven—the right persons at the right place and the right time with the right attitudes. Since the process is not institutionalized, every time there is a change of command, leadership, or personnel, the process starts all over again. This can happen as often as every six months to a year in both the civilian government agencies (U.S. Embassy and USAID) and military elements (PRTs and ISAF). IOs and NGOs also experience turnover challenges. Continuity of support activities and trust relationships built over time are key to success, and the current disruptive approach is not a good way to do business in a complex environment such as Afghanistan.

Given the military is driven by a culture of "plan we must" and the civilian community by one of "plan if we can," there were (and still are) various versions of draft and approved plans developed by the U.S. Embassy, Combined Joint Task Force-76 (now CJTF-82), Combined Forces Command-Afghanistan (CFC-A, which no longer exists), Combined Security and Transition Command-Afghanistan (CSTC-A, formerly the Office of Military Cooperation-Afghanistan, OMC-A), ISAF, PRTs, USAID, UNDP, World Bank, NGOs, and others. There was (and still is) no agreed coherent, holistic plan and the degree to which the independent plans were (and are) coordinated and synchronized with Shared situation awareness differed among participants and, in general, was problematic (and still is). Coordination and information sharing among responders and with the Afghans remains a challenge. Even among the USG civilian and military participants, where various ad hoc mechanisms were employed to facilitate coordination and integration, there were interagency and personality related challenges, making it difficult to produce a coherent, holistic plan for reconstruction including the ability to share a common picture of civil-military reconstruction and development.

Although limited reconstruction situation awareness information was shared and tracked among participating civil-military elements, ICT was not one of the categories actively tracked or even recognized as important to track. Coalition civil-military emphasis was mainly on roads and to a lesser extent water and power. In contrast, the rural area Afghans' needs were water then roads and power. This suggests some disconnect in the view of what is needed versus what should be provided by coalition reconstruction efforts. In fact, many locals were of the view that the coalition emphasis on roads was driven more by military operational requirements and logistics than the needs of the local community. The international civil-military community must do a better job of understanding the needs through the eyes of those being helped rather than what the community believes to be in their best interest. Obviously, some balance must be achieved.

The lack of standard formats for data poses significant hurdles to sharing. Free-form text documents make timely roll-up and data-mining efforts nearly impossible. Military data tends to be classified and the declassification process is a challenge. The lack of relational database management systems does not make it any easier—the military process tends to be slow and risk averse. When sharing works it tends to work largely due to the personalities of key personnel on the ground not by institutional policies, procedures, or ICT support capabilities, such as collaborative information environment

(CIEs), shared web portals, common geographic information system (GIS) databases, and shared civil-military SA tools.

Ad hoc approaches continue to be the means to an end to try to improve operations and actions on the ground. Afghanistan was (and to some extent still is) filled with: liaisons; coordination teams; special groups, such as the U.S. Embassy Afghanistan Reconstruction Group (ARG) that consisted of subject matter experts who reported to the State Department but were recruited by DOD from the American private sector; other special purpose USG elements at the U.S. Embassy in Kabul; and national reach back groups in the United States, such as the DOD Afghanistan Reachback Office (ARO) in the Pentagon. Multiple in-country civil and military liaisons took place between and among national and international elements and with Afghan Ministries and UN and USG sponsored subject matter experts who were embedded in the ministries. The MCIT, for example, had U.S. Embassy, USAID, and U.S. military advisors and liaisons as well as embedded subject matter experts, for example, USAID funded BearingPoint support to the MCIT and ATRA. There were multiple efforts to develop GIS based Afghanistan reconstruction SA tools and web portals. For example, the UN, USAID, ISAF, U.S. Army Corps of Engineers, and the office of the U.S. Assistant Secretary of Defense for Networks and Information Integration (ASD NII) were developing tools and/or web portals. Only the ASD NII effort was focused specifically on Afghanistan ICT.

One of the more successful USG in-country efforts to facilitate ICT coordination and information sharing in Afghanistan was the creation and staffing of the office of the Senior Telecom Advisor (STA) in the ARG. The first STA arrived in October 2005 and left in early October 2006. His replacement did not arrive until December 2006, creating a potential several month gap in Kabul office operations. In order to maintain continuity of operations and provide appropriate ICT focus and support to the MCIT and others in country during this time, ASD NII provided a subject matter expert in country to bridge the gap until the new STA arrived. There have been several subsequent extended ASD NII deployments to support the office of the STA over the last year and plans are in place to continue to help as appropriate.

A number of the first STA's initiatives to improve collaboration and information sharing are candidates for best practices for future operations as well as ongoing operations in Afghanistan. He was successful in getting the U.S. Ambassador to designate the STA position as the principal U.S. Embassy spokesperson for ICT matters and as the U.S. liaison responsible for dealing with the Afghanistan Minister of Communications. To create a cooperative environment, he established a U.S. integration team, referred to as the I-Team, which consisted of U.S. ICT representatives from the U.S. Embassy, USAID, and the U.S. military. Over time, the team was expanded to include ISAF, the GCN/DCN contractor GSI, and BearingPoint experts embedded in the MCIT and ATRA. I-Team meetings were held several times a month to share and coordinate ongoing ICT activities and discuss challenges and approaches to leveraging activities. Meetings were action-oriented and used as a means to inform, coordinate, and develop a shared agreement on initiatives to be pursued.

The STA established two U.S.-based reach back capabilities to build social networks to coordinate and share information on important ICT-related issues and actions and to seek advice, assistance, and best practices. One group supported USG-only activities and included the U.S. I-Team members, ASD NII, DOS, USAID, ARO, NDU, Army Corps of Engineers, and other U.S. government elements as appropriate in CONUS. This group held weekly teleconferences. A second group consisted of U.S. industry volunteers with an interest in helping Afghans and Afghan ICT be successful. They were engaged to seek advice and best practices as well as provide mentoring support for Afghans and related ICT initiatives. This group held a teleconference about once a month and the STA participated on an as appropriate basis.

The STA also led an effort to try to get the GOA to set up an I-Team led by the MCIT ICT directorate to bring together ICT reps from the MCIT, Afghan Telecom, MoD, Ministry of Foreign Affairs, and MoI to discuss ICT initiatives, share and coordinate ongoing activities, and discuss public and private sector, ANA, and ANP challenges, including emergency services ICT. It was envisioned that the USG and GOA I-Teams also would meet on some regular basis to coordinate and share information. The MCIT ICT directorate agreed to try to set up a GOA I-Team, but it never really happened.

The STA initiated an effort to establish a coherent USG ICT strategy and plan for supporting the MCIT ICT strategy and plans. Although some early success was achieved in starting to build a strategy and plan, the effort was not approved by the Ambassador as the framework and way ahead for selecting and implementing USG ICT initiatives. As a result, this remains an important gap in the USG strategy and plans supporting Afghan ICT evolution and capacity building—the process is still ad hoc.

The STA, in cooperation with ASD NII and U.S. Navy SPAWAR, set up an Afghanistan-ICT portal as a way to openly share ICT-related information and inform the community on related policy, technical, operational, and implementation activities, issues, and opportunities. It was to be a repository for all relevant ICT documentation and serve as an electronic library with links to other key web sites, such as the Afghan MCIT, ATRA, USAID, UN, and others. Chat room capabilities also were offered to facilitate collaboration and coordination among those in different geographic areas and time zones. Unfortunately, the portal never realized its expectations. Other independent databases, such as the USAID SharePoint reconstruction database, the UN Afghanistan Information Management System (AIMS), and the ISAF Afghanistan Country Stability Picture (ACSP) GIS database were established, but information was not actively shared on a regular basis and the databases were not electronically linked or held to common data standards. In early 2006, the U.S. Army Corp of Engineers was tasked by the U.S. Ambassador and U.S. military commander to develop a GIS-based Afghanistan common operational picture for reconstruction. This effort was subsequently rolled into the ISAF ACSP effort. None of the databases mentioned actively tracked ICT activities.

The current STA continues to try to sustain an effective in country civil-military CIE, but it is a challenge due to the large turnover of civilian and military personnel and the fact that the collaboration processes put in place by the first STA were not institutionalized. In

the absence of an agreed process, collaboration and information sharing becomes a function of having the right people at the right place at the right time and with the right attitude. It's a learning and trust building activity that gets repeated with every change over of civilian and military personnel. The current STA has continued weekly teleconferences with ASD NII and NDU and has initiated actions to strengthen the USG relationships with the MCIT and ATRA and U.S. Embassy relationships with USAID, U.S.-led ISAF, and the new CJTF-82.

The STA has the lead role for the international community support to the MCIT who has the lead responsibility for the ANDS telecommunications working group activities. This working group meets twice per month to review the MCIT ICT goals and results. The MCIT ANDS working group includes key MCIT managers, executives, and representatives of: ATRA, Afghan Ministry of Finance, USG Afghanistan Reconstruction Group (ARG) and U.S. Embassy Economic Section, Bearing Point, USAID, United Nations Assistance Mission in Afghanistan (UNAMA), UNDP, and other invited guests. The output of the working group is a document that outlines the MCIT's ICT Sector Strategy, which is presented to the GOA ANDS General Council for review and incorporation into the national goals and strategies.

The STA also has taken action to build a stronger ICT-oriented relationship with ISAF and the PRTs. In this regard, he meets with PRT reps (typically PRTs do not have an ICT expert, however, some members of the civil-military team have ICT skills) when they are in Kabul to discuss with them ICT-related opportunities in their area of interest. He has created a "Briefing Handbook on Afghan Civil Communications Systems" for their use and he also arranges meetings between the PRT reps when they are in Kabul and the MCIT, ATRA, and Afghan Telecom to discuss ICT opportunities and issues, such as the construction status of DCN buildings in their areas of interest.

The NATO-led ISAF IX implemented several initiatives to improve the civil-military response to reconstruction and to improve coordination and information sharing. Two Development Advisor positions (one from the UK (DfiD liaison) and one from the United States (USAID liaison)) were created to advise ISAF on reconstruction matters and they report to the Commander. As noted earlier, the ACSP was created and maintained by ISAF to share reconstruction SA status information with the civil-military community. ISAF scheduled a series of PRT conferences in Kabul to build a more informed and shared understanding of ongoing PRT reconstruction-related activities, needs, support opportunities, and activities among ISAF, the PRTs, other coalition military, national government elements, IOs, and NGOs. A PRT Handbook was created by ISAF and its development involved military as well as civilian elements. A PRT Executive Steering Committee was established to provide PRT policy guidance; pre-deployment PRT training courses were established; improved arrival orientation training was provided; and an ISAF PRT help desk and portal were created to facilitate ISAF response to PRT questions and needs. These are representative of many of the ISAF actions taken to improve PRT coherence.

PRTs also took actions to improve their ability to conduct reconstruction operations. For example, the Nangarhar PRT[7] developed a method of programming development funds at a sub-national level to positively affect a counterinsurgency in Eastern Afghanistan. A strategy for affecting stability through maximizing resources each agency brought to the table to create a "unity of effort" was developed along with an eight-step process of project development that culminated in the execution of a series of projects. The steps proposed included: Understanding the Strategic Framework; Operationalizing the Strategy; Determining Geographic Focus through Tribal Analysis; Defining Project Parameters; Conducting the Project Identification Process; Gaining Government Approval; Holding the PRT Project Nomination Board; and Implementation. The eight steps were developed by the command group (CG) of the PRT, which consisted of a representative from USAID, DOS, U.S. Department of Agriculture and the U.S. Army Civil Affairs.

Other Reconstruction Challenges

Trust is an important element of the Afghan culture. Trust is earned over time but can be easily broken and much harder to re-earn. In Afghanistan, trust is earned through multiple visits and many long conversations with Afghan leaders that include discussions about beliefs, values, and family. All of this must be undertaken before entering into discussions about things that need to be done to help the local Afghans. Additionally, it is important to have a working understanding of the culture and it helps to be able to speak a little of the local language. One needs to be understood and accepted by the Afghans in order to do business. It's sometimes referred to as the "three Chai tea" rule. You need to have at least three teas before starting to discuss business. Perception of power counts as well, and one needs to keep their word. The poor literacy rate in rural areas also can create special challenges for military and civilian reconstruction teams dealing with local leaders, warlords, and tribal leaders who may not be able to read or write but are shrewd operators. It is important to manage expectations: do not over expect Afghans' ability to perform and likewise, don't raise expectations of the Afghans if one is not sure of their ability to deliver.

A number of other factors create challenges for conducting civilian and military ICT-related reconstruction activities, particularly in high-threat areas. For example, military and civilian government personnel security protection rules add complications to conducting ICT reconstruction and development activities. The rules of engagement tend to be risk averse, leading to protecting the forces having a significantly higher priority than conducting reconstruction activities. The imbalance in the application of priorities can (and does at times) impact the ability to effectively execute reconstruction activities, especially in high-threat environments. Operational risks must be better managed. One consideration would be to give higher operational priority to conducting the reconstruction mission so that the military and civilian protection forces can more effectively balance force protection with reconstruction mission needs.

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[7] Michelle Parker, "Programming Development Funds to Support a Counterinsurgency: A Case Study of Nangarhar, Afghanistan in 2006," *Case Studies in National Security Transformation*, Number 10, Center for Technology and National Security Policy, available at <http://www.ndu.edu/ctnsp/pubs/Case%2010%20-%20PRTs.pdf>.

In the higher threat areas, PRTs were formed to create a safe and secure environment for conducting reconstruction operations. The teams combine military personnel and civilian staff from the diplomatic corps and developmental agencies and their mission is to extend the authority of the Afghan central government, promote and enhance security, and facilitate humanitarian relief and reconstruction operations. PRTs are provided by the United States as well as other nations under ISAF command, and the size, scope, and mission focus differ among national elements. Additionally, each PRT's composition and mission is tailored to meet its national rules of engagement and the requirements for security, political, and socio-economic dynamics in their area of responsibility. For example:

- A U.S. PRT consists of both military Civil Affairs and force protection personnel, civilians from USAID and/or DOS, and sometimes reps from U.S. Department of Agriculture and other USG elements as needed. The civil-military teams are based in heavily protected military compounds and they frequently travel by military convoy into their area of responsibility. The travel in the local area typically requires three up-armored High Mobility Multipurpose Wheeled Vehicles (Humvees) with military in full battle gear and weapons loaded. Civilians are required to wear body armor and helmets while in the Humvees. There are also locally hired armed protection teams that perform the roles of cultural specialist, interpreter, navigator, and hired gun. They travel in Toyota trucks and provide front and rear security protection for the military convoy. Dismounted operations include armed force protection teams.

- The German-led PRTs are precluded by the German Federal Parliament directives from taking on combat roles, and this has had an impact on their willingness and ability to escort aid and reconstruction workers in high-threat areas, thus affecting the capacity to conduct these activities. Additionally, the German-led PRTs maintain a strict division of responsibility between the military and civilian components. They function more as a "secure guest house" for the civilian specialists.

In high-threat environments, contact with the local population is often of short duration and limited in many cases to key local leaders. The short visits with local leaders can make it hard to build trust relationships and conduct business. Hence, assessing shortfalls and needs, conducting reconstruction activities, and building trust relationships with the local Afghan people and leaders is a constant struggle under such conditions, especially for the civilian elements.

Even in a lower threat environment (but still a wartime environment), such as Kabul and its surrounding area, conducting civilian reconstruction related activities is a challenge. U.S. military and civilians are restricted to living and working on protected compounds within a security zone. Civilian travel outside of the compound and within the city limits must be scheduled and is by armored vehicles with an unarmed local hire Afghan driver and no force protection personnel. Travel is only allowed to and from destination meeting

points within the city limits, and unescorted walking around the city is not permitted. Travel outside of the Kabul city limits must be approved by the U.S. Embassy Regional Security Officer (RSO), and armed security details are provided by Diplomatic Security personnel, private security contractors, or the military. Civilians must wear body armor and helmets while traveling in vehicles outside of Kabul city limits. During trips outside of the city, walking around a town or village with the personal security detail is permitted, including spending time talking with local leaders, shop owners, and the local population.

In response to an incident, such as the detonation of a bomb or a rocket attack, or increased threat warning levels, the protected compounds (both in Kabul and at PRT locations) often go into "lock down" for hours. Depending on the seriousness of the situation, travel outside of the compound can be restricted for days to essential mission need personnel only—this was experienced by one of the authors during his visit to Afghanistan. Following a riot in Kabul at the end of May 2006, the U.S. Embassy and ISAF compounds were in lock down for several hours. Additionally, for several days after the incident, only essential personnel were allowed off the U.S. Embassy/USAID compound. These actions not only impact the ability to conduct business with the Afghans but also can impact the morale of the personnel, especially the civilians.

The continuing threat conditions also can create morale problems and reluctance on the part of some civilian elements—largely driven by personal security concerns—to travel outside of the protected compounds. Trips are often limited to within the city limits and few trips are taken to the local countryside or to the PRTs. In fact, some civilians have been known to spend their full tour of duty on the U.S. Embassy/USAID compound in Kabul, only leaving this area to go to the U.S. military base, Camp Eggers, which is also located within the security zone of U.S. elements in Kabul, for the local Afghan crafts bazaar held each Friday.

Afghans can be invited to come into the protected compounds to conduct business, but this, too, can be a challenge. In Kabul, Afghans can be invited to visit U.S. Embassy/USAID and military personnel, and many come to the compound for meetings. There are, however, very restrictive search procedures that can be offensive to some Afghans, and hence, a number refuse to come for visits or meetings. In the higher threat areas, local leaders can access the military compounds to visit PRTs but such visits also can be problematic. Restrictive search procedures that include the disarming of bodyguards are offensive to some Afghan leaders and they refuse to come for visits. For others, this is not a problem. For example, during one of the authors visit to the Khost PRT, the provincial governor visited the PRT commander at his office on the military compound once a week, and other key personnel, such as the Director of Education also made frequent visits. Yet other local leaders would not come on the compound. As a result, it can be a challenge to effectively conduct meetings and build trust relationships with key officials and business leaders both in Kabul and in the high-threat areas.

ICT-Related Lessons from Afghanistan

Significant progress has been made in the Telecommunications and IT sector in Afghanistan, and it has truly been the "success story" emerging out of the recovery of a country left dysfunctional from 23 years of war. Progress towards bridging the digital divide and moving Afghanistan into the 21st century information age has not been accidental but is largely due to having the right people at the right place with the right vision, energy, and expertise to make reasonable decisions and take actions to make things happen.

Afghanistan ICT success was and continues to be enabled by a number of factors:

- A GOA understanding of the importance of ICT as an engine of economic development and its role as an enabler of cross-sector reconstruction

- Early GOA establishment of ICT policies, regulations, laws, and a regulatory authority

- Knowledgeable and experienced Minister of Communication (now Communications and Information Technology)

- MCIT vision, strategy, and plan for moving Afghanistan ICT into the 21st century information age supported at the highest level of government, President Hamid Karzai

- Establishment of a good public-private partnership that enabled private ICT investments and rapid growth of their networks

- International and USG community support

    - Placed early emphasis on ICT capacity building, including the establishment of related educational institutions, training facilities, and capabilities

    - Willingness to invest in and support Afghan MCIT creation of a national telecommunications and IT network

The U.S. Army Center for Lessons Learned some years ago made the observation that lessons are learned when behavior changes. Opportunities to change the international and USG intervener community behavior and approaches to ICT reconstruction and development remain. Some key areas where changes need to be made are as follows:

- Policy actions
    - Recognize ICT as an engine of economic development
    - Agree on importance of telecoms and IT as an enabler of cross sector reconstruction and development
    - Elevate ICT investment priorities to be equivalent to roads, power, and water
    - Ensure "political will" to coordinate and share ICT-related reconstruction and development information
- Strategies and plans
    - Improve understanding of affected-nation information and related ICT business cultures
    - Develop agreed coherent community strategies and plans for supporting and enabling affected-nation ICT reconstruction and development strategy and plans
    - Improve management of the risks of protecting civilian and military elements and implementing reconstruction initiatives.
- Collaboration and information sharing
    - Agree on mechanisms and processes to facilitate coordination and information sharing, including a shared SA of reconstruction and development activities, especially for ICT
    - Institutionalize agreed process
    - Agree to implement shared ICT capability packages that enable and facilitate collaboration and information sharing

The Way Ahead

Much remains to be done to make Afghanistan ICT a viable and robust network to effectively support civil security, governance, economic growth, healthcare, and education. A discussion of gaps and shortfalls and some thoughts on actions that could be taken to overcome them and help realize the network's full potential follows.

The Afghan ICT network is fragile but growing and becoming more robust. ICT capacity building has started but much remains to be done. International and USG ICT-related support activities are fragmented and not well coordinated. For example:

- The telecom network has limitations in effectively supporting emergency response services. During riots in Kabul at the end of May 2006, the cellular network was overloaded, which impacted the ability of first responders and others to make calls during the crisis.

- ICT infrastructure and processes are not adequately protected against cyber and physical threats.

- Nationwide coverage, service quality, and capacity has been marginal but improving with increased competition. Cost of services was high to start with but has been coming down. The growth of DCN for public access and extension of GCN for governance has been slow.

- Data services and access are inadequate to support e-Solutions. There is a shortfall in broader community access to the Internet. MCIT and ATRA have plans to offer expanded, nationwide, fixed and wireless data services as well as expanded community access to the Internet including rural areas.

- Rural area information and ICT service needs remain unmet by public and private ICT investments.

- Cyber security is a major problem: the GOA lacks adequate virus and spyware protection, intrusion detection-protection, and firewalls. The government is unable to effectively control use of pirated software and hardware. Within government ministries, inappropriate surfing of the Internet introduces viruses and spyware that corrupt network operations. There are no cyber laws or enforcement mechanisms. A Computer Emergency Response Team (CERT) is planned but not implemented.

- Most Afghan ministries have minimal IT organizations and implementation of internal IT capabilities and services are uncoordinated and non-standard. There is a lack of a "CIO Culture" with agreed cross-ministry business processes,

standards, and best practices. There is also a lack of an "Information Security Culture."

- A thin layer of ICT competence and skills is present in the workforce of the Government elements and related Ministries. The MCIT, with the help of USAID, the UN, and others, is taking action to establish ICT training facilities for its staff.

- Reliable power is lacking for ICT. Current solutions do not employ energy saving ICT options such as the use of low power IT equipment and power saving procedures. A mix of alternative power sources must be encouraged, such as expansion of the national grid, solar, generators, small wind, micro-hydro, and batteries.

- There is no agreed, coherent international (or USG) strategy and approach for supporting Afghan ICT reconstruction, development, and capacity building. There are independent and loosely connected activities, such as U.S. military funding of the PGCN and solar power for DCN nodes and USAID funding of selective DCN initiatives. The USAID Afghans Building Capacity (ABC) program includes initiatives related to ICT capacity building and these are loosely connected with UN and NGO related ICT capacity building initiatives.

The international community, and the USG in particular, needs to take a leadership role to promote support of the Afghan ICT evolution and protect its ability to sustain capabilities already realized. To do this, as a minimum, there is an urgent need to create a coherent USG investment strategy and plan that supports the GOA intention to use ICT to create jobs, enable economic activity in all sectors, and improve governance, civil security, education, healthcare, and social well-being in general. Some specific actions to be considered by the GOA, USG, and international community are as follows:

- Security and governance certainly needs to be high on the priority of ICT opportunities and capability packages to be considered for implementation.

- An ICT support strategy and plan should be developed for emergency response command and control and emergency services ICT support (police, fire, hospital, rescue). Specific plans to be considered are a U.S.-like National Response Plan, a supporting ICT strategy and plan, and Critical ICT infrastructure protection strategy and plan.

- MCIT, MoD, MoFA, and MoI need to create an ICT-based CIE to facilitate coordination and information sharing of their ICT initiatives related to improving ICT support to emergency services and security needs.

- The USG needs to actively pursue enabling (including sources committed to funding) the implementation of the remaining 22 PGCN capability packages to support extension of effective governance to the provincial governor level.

- Actions need to be taken to extend GCN services to key ANA and ANP elements to help improve security and emergency response communications.

- DCN implementation needs to be accelerated and services pushed out to key local district government officials as a means to increase the reach of civil security and governance to the district level and to extend access to ICT services and government services for the broader population.

- To more effectively respond to and support emergency services needs, consideration should be given to:

    - Accommodating embedded emergency services in the cellular network by introducing priority access and call set up for first responders and key decision makers.

    - Investing in crisis response and ICT recovery and restoration needs, such as network operations tools to accommodate surge capacity and recovery management and deployable emergency ICT capability packages to accommodate network access, coverage and recovery management.

- MCIT should develop a strategy, architecture, and enhancement plan for a robust, national, long-distance network and backbone infrastructure to enhance Afghan ICT coverage, access, services, and performance. The following steps would assist:

    - Consider creating a virtual backbone transmission infrastructure and implementation of network operations tools and platforms to facilitate provisioning, managing services, fault recovery and reconstitution, and usage mediation and service billing management.

    - Improve GCN/DCN network robustness, capacity, coverage, services, and marketing (DCN franchises) as a means to make GCN/DCN an effective provider of security, governance, and other network services as well as a sustainable and financially viable business.

    - Develop new initiatives to enable and enhance public and private data service offerings nationwide and to enhance regional and international access and capacity to better position Afghanistan for access to and participation in the global market economic environment.

    - Explore early introduction of e-Commerce solutions and mobile commerce, such as Internet banking, G-Cash/e-Wallet, and M-PESA on cell networks to accommodate remittance transfer service which enables mobile phone subscribers to transfer money to other mobile users via SMS text messaging.

        - Results of a Vodafone pilot program are currently being discussed among ATRA, USAID, cellular providers, and Afghan National Bank for possible implementation.

        - Internet Banking services to improve financial transactions are being explored as well.

        - Licensing electronic funds transfer arrangements will revolutionize economic and social recovery, especially in high-threat environments and areas where access to banking services does not exist.

    - Encourage USG, ISAF, and other interveners to selectively invest in Afghan ICT enhancements to provide coverage and capacity in areas to support their operational needs then lease back services rather than build their own systems.

- As part of enhanced capacity building, Afghan ICT needs to be used to:

    - Support literacy and community empowerment. This can be done by providing access to the following:

        - USAID, UN-Habitat and Ministry of Education programs for reading, writing, and interpersonal and other life skills

        - USAID and Ministries of Women's Affairs, Health, and Education "Learning for Life" program to improve reading, writing, health, and hygiene skills

        - Computers, video, CD players, commercially available DVDs, educational video tapes, CDs, and Interactive electronic books, such as the International Medical Corps "Family Health Notebook."

        - Telekiosks and community centers with Internet access and related capabilities

        - Distance learning for education and training

            - Computers, English language, business practices, health care, family health, and medical advice

            - Internet portals for education, health care, and medical advice

    - Enable Internet access for schools and universities.

        - Support provision of ICT enabling infrastructure to wire up schools and universities and offer access to Internet
        - Provide wired and wireless local area networks on campus with access to Internet that uses both public and private ICT for voice, data, and Internet access
        - Make available e-Learning and e-Education capabilities and tools
        - Offer access to up-to-date teacher training material
        - Develop centers for teaching and learning
    - Open up opportunities for distance learning, such as English language training, computer skills, use of ICT, and e-Solutions training
        - Use the Internet to link universities within Afghanistan and with universities outside of Afghanistan and provide opportunities for:
            - Partnership programs and alliances
            - e-Learning, e-Education, e-Library
            - Access to Centers of Excellence and subject matter experts
    - Enable Internet access for healthcare and hospitals
        - Wire up hospitals and healthcare centers and provide medial software
        - Provide software for medical diagnostics, administration, pharmacy, and patient records systems
        - Provide ICT connectivity and Internet access to
            - Link Medical schools with hospitals and healthcare centers
            - Link hospitals with healthcare centers
            - Link hospitals and health care centers with international centers of excellence and subject matter experts
            - Offer e-Training, e-Learning, e-Diagnostics, e-Healthcare, and e-Reference

- Establish alliances with medical schools, facilities and experts outside of Afghanistan, and

- Healthcare web portals, on-line Medical diagnostic tools, and medical and related subject matter experts

- Efforts need to be accelerated to provide rural area access to ICT services. In this regard, mobile communications can revolutionize economic and social development in rural areas and Internet can be used to educate and help improve literacy. Making information more widely available also can help eliminate abuse by making government more accountable, improving legitimacy, and reducing corruption. Consideration needs to be given to actions, such as:

    - Funding a pilot program for ICT capability package options for the VCN;

    - Supporting investments in community provisioning of towers to encourage cell phone providers to extend services to rural areas;

    - Developing private-sector incentives for expanded LFSP licenses that target the rural areas;

    - Expanding cell network coverage to rural areas;

    - Implementing a pilot DCN franchise targeting expanded coverage to rural areas; and

    - Provisioning micro-financed loans for VCN-like capabilities.

- The GOA should be encouraged, and the USG prepared to help, to enable an early introduction of a CIO-like culture and e-Government capabilities into the ministries.

- The NICTCA must be leveraged and the MCIT in its role as National CIO needs to enable more effective government use of IT with the following actions:

    - Standardize ICT capabilities across ministries;

    - Coordinate cross-ministries ICT investments;

    - Standardize business processes including application of e-Government-like solutions;

    - Prioritize ICT spending to support anti-corruption goals;

- Oversee and advise on cross-ministries ICT processes that support data sharing and audits of software via development or purchase and use of the National Data Center;

- Enable "CIO" capacity building through cooperative efforts with educational institutions, such as the NDU Information Resource Management College (IRMC) CIO education and training programs and ICT and eServices capacity building through alliances with universities around the world; and,

- Automate government business functions and processes and extend and improve GOA provided services to the population to establish transparency and legitimacy and reduce corruption.

- Develop and implement a National Cyber Security Strategy and Plan that includes actions such as:

  - Creating a cyber information security culture;

  - Assigning Information Security Officers in Ministries and key government agencies;

  - Initiating training and awareness programs;

  - Establishing an Afghan CERT with a national cyber-security management structure;

  - Adopting cyber-security laws, regulations, standards, and policies and implementing enforcement mechanisms;

  - Defining the cyber security organizations;

  - Adopting a prioritized, defense-in-depth strategy; and,

  - Implementing Cyber-Security Plans, to include:

    - Public-private cooperative arrangements, and

    - Key asset protection (infrastructure, people, and electronic)

Conclusion

Study findings suggest that ICT has been an enabler for developing the Afghan government, economy, and social well-being. While there have been successes, challenges remain. Continued smart investments and use of information and ICT will serve to further enhance government capacity, legitimacy, and transparency, help reduce corruption, increase economic growth, and support social stability. Information is power and the generator of stability for countries undergoing stabilization and reconstruction—the theme of the NDU CTNSP I-Power study. It is certainly a key to being successful in Afghanistan.

A word of caution must be issued, however, now that the ICT sector in Afghanistan has been relatively successful and appears to be operating reasonably well on its own initiative, there may be a desire on the part of international elements, coalition military, and the USG to shift support to other sectors that have not been as successful. Such a shift without careful consideration of not only first order but second and third order effects could have significant unintended consequences, especially if the ICT sector is not yet prepared to truly sustain operations on its own without the support and attention of the international community. Consideration of such a shift in international and USG support needs to be carefully assessed, monitored, and managed over time to ensure informed choices and decision are made and that progress continues to bridge the digital divide and move Afghanistan into the information society of the 21st century.

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