ICT Challenges for the Arab World

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Introduction

The purpose of this chapter is to discuss ongoing developments in the Arab world in the areas of information and communication technology (ICT) and to highlight the obstacles to and present recommendations for further development. We looked at the environment as well as individual, business, and government variables in assessing the current state of development and the impact of national and regional ICT strategies. Our recommendations are addressed to policymakers at the national and regional levels. The scope of this chapter encompasses thirteen countries, which we group according to geography. We define the "Gulf," the "Arabian Gulf," or "Gulf states" as comprising Kuwait, Saudi Arabia, Bahrain, Qatar, the United Arab Emirates, and Oman. Our definition of "Levant" includes Lebanon, Syria, Jordan, and Egypt. We classify Tunisia, Algeria, and Morocco as the "Maghreb states."

Overview of Progress in ICT in the Arab World

ICT strategic intent can be measured against published strategy documentation, actual progress in the implementation of ICT strategies, and the presence of technology-building initiatives and research and development (R&D) institutes. We reviewed the ICT-awareness of Arab governments by looking into their strategic plans and operational five-year plans, and observed that there are uneven levels of awareness of and importance given to ICT both in stated national strategies and demonstrated success in implementation.

Arab states are adapting their legal and regulatory frameworks for ICT

As Arab states join the World Trade Organization (WTO), they have been adapting their legal and regulatory systems to accommodate trademark, patent, and intellectual property rights (IPR) protection. Some states have been part of the early stages of IPR[1] protection; others have retroactively signed the agreements and sought membership of the World Intellectual Property Organization (WIPO) (see Figure 1). Nine of the countries in the scope of this study are members of the WTO, and eleven joined the Paris Convention for the Protection of Industrial Property,[2] on whose principles the WIPO was founded. Arab states' participation in interim treaties is uneven: only four have signed the Patent Cooperation Treaty[3] (PCT) and three the Patent Law Treaty (PLT). There has been improvement in the mid-to-late 1990s, when eight of them joined the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). A joint WTO-WIPO framework, TRIPS revisits the entire IPR protection system, standardizing intellectual property definitions, affirming and enforcing national treatment and most favored nation principles through a series of procedures, and providing

Figure 1. **Status of Arab States on Intellectual Property Rights**

	WTO Member	WIPO Treaties								
		Paris Convention	WCT	PCT	Madrid Agreement	Hague Agreement	TLT	PLT	Nairobi Treaty	TRIPS
Gulf										
Kuwait	✓	✗	✓ (1998)	✗	✗	✗	✗	✗	✗	✓ (1995)
Saudi Arabia	✗	✗	✓ (1982)	✗	✗	✗	✗	✗	✗	✗
Bahrain	✓	✓ (1997)	✗	✗	✗	✗	✗	✗	✗	✓ (1995)
Qatar	✓	✓ (2000)	✓ (1976)	✗	✗	✗	✗	✗	✓ (1983)	✗
U.A.E.	✓	✓ (1996)	✓ (1974)	✓ (1999)	✗	✗	✗	✓ (1999)	✗	✓ (1996)
Oman	✓	✓ (1999)	✗	✓ (2001)	✗	✗	✗	✗	✓ (1986)	✓ (2000)
Levant										
Lebanon	✗	✓ (1924)	✓ (1986)	✗	✓ (1924)	✗	✗	✓ (2000)	✗	✗
Syrian AR	✗	✓ (1924)	✗	✗	✓ (1924)	✗	✗	✗	✓ (1984)	✗
Jordan	✓	✓ (1972)	✓ (1972)	✗	✗	✗	✗	✗	✗	✓ (2000)
Egypt	✓	✓ (1951)	✗	✗	✓ (1952)	✓ (1975)	✓ (1999)	✗	✓ (1982)	✓ (1995)
Maghreb										
Tunisia	✓	✓ (1984)	✗	✗	✓ (1982)	✓ (1930)	✗	✗	✓ (1983)	✓ (1995)
Algeria	✗	✓ (1966)	✓ (1975)	✓ (2000)	✓ (1972)	✗	✗	✓ (2000)	✓ (1984)	✗
Morocco	✓	✓ (1917)	✓ (1971)	✓ (1999)	✓ (1917)	✓ (1930)	✗	✗	✓ (1993)	✓ (1995)

Key: ✗, not signed or nonmember; ✓ (date) signed on date

WIPO: World Intellectual Property Organization; WCT: WIPO Copyright Treaties; PCT: Patent Cooperation Treaty;

TLT: Trademarks Low Treaty; PLT: Patent Law Treaty

for standard dispute treatment processes. At this stage, only Lebanon, Syria, Algeria, Saudi Arabia, and Qatar are yet to enact the agreement.

Arab states will increasingly become attractive investment targets as TRIPS regulations begin to be enforced. With a standardized IPR protection system and the fact that by January 2005 Arab states are required to extend product patent protection to types of products not previously patented, the region is due to witness further integration into global research and development. Arab states are also drafting new laws to foster ICT growth and investor confidence at the national levels. Figure 2 highlights Arab states' current efforts in adapting their IPR-related laws to the specific needs of technology and ICT. The legal framework upgrade has been uneven: the Levant area and the Maghreb have been, in general, more advanced in creating frameworks, thanks to their earlier exposure to the global legal culture. Latecomers include the Gulf states; their efforts pertaining to the upgrade of these laws have therefore been more recent.

Creation of a research-promoting environment

Arabs states display significant interest in technology initiatives. Materialized via technopoles[4] and/or technology incubators,[5] the benefits of these initiatives include

providing an environment for research and development in collaboration with private initiatives, developing technology diffusion, benefiting the social and economic fabric by creating new employment possibilities, building the ecosystem for business development, and enhancing technological transfers between the public and private sectors. In all cases, private-public partnerships and universities play central roles. The political and regulatory environment in the Arab world is being adapted in accordance with best practices from the United States and Europe.

Arab states have been prolific on both the technopole and incubator fronts: all countries discussed in this chapter have at least launched a national planning process for these technology-building initiatives, with varying degrees of success in implementation. Figure 3 highlights the readiness and operational facilities of Arab states. Technology-dedicated research facilities are operational components of Arab states' national strategies. In the Gulf, Kuwait, Saudi Arabia, and the United Arab Emirates stand out in terms of research facilities. Initially sector-oriented (mineral and petrochemical sectors), these facilities now encompass ICT and high technology. Levant and Maghreb states drafted plans for such facilities as early as the 1960s (for example, Lebanon drafted its National Council for Scientific Research in 1969 and a general framework to

Figure 2. Selected IPR-related Laws Enacted per Country

Country	Year:* Law/Decree/Act
Gulf	
Kuwait	2001: Patent Law 2001: Trademark Law 2000: Copyright Law
Saudi Arabia	1984: Trademark Law 1989: Patent Law 1989: Copyright Law
Bahrain	1977: Patent Law 1991: Trademark Law 1993: Copyright Decree
Qatar	1978: Trademark Law 1995: Copyright Law
U.A.E.	1992: Patent and Industrial Design Law 1992: Trademark Law
Oman	1987: Trademark Law 2000: Royal Decree on Patent Law 2000: Royal Decree and Law on Trademarks, Indications, and Secrets and Protection against Unfair Competition
Levant	
Lebanon	1946: Patent Law 1999: Copyright Law
Syrian AR	1949: Copyright Law 1980: Patent Legislative Decree
Jordan	1953: Patent and Industrial Design Act 1999: Trademark Law 1999: Copyright Law 2000: Layout Design of Integrated Circuits Law
Egypt	1949: Patent and Industrial Models Act 1969: Trademark Act 1992: Copyright Act
Maghreb	
Tunisia	1956: Patents decree 1936: Trademark decree 1994: Copyright decree
Algeria	1966: Decree 66–60 concerning patents and innovation certificates 1966: Ordonnance 66–57 relative aux marques de fabriques et de commerce 1966: Ordonnance 66–223 relative aux dessins et modèles industriels 1993: Décrêt legislative 93–17 relatif à la protection des inventions 1997: Ordonnance 97–10 relative aux droits d'auteurs 1998: Décrêt exécutif 98–366 portant statuts de l'Office National des Droits d'Auteurs et des Droits Voisins (ONDA)
Morocco	1916: Patents Dahir 1997: Industrial Property Law 2000: Copyright Law

*Dates indicate latest modifications and amendments

develop the country's scientific potential). Moroccan research and ICT involvement, led by the Centre National de la Recherche Scientifique et Technique, was inspired by leading French research institutes. Six countries operate technopoles dedicated to research and development in technology. Saudi Arabia's King Abdulaziz City for Science and Technology (KACST), for instance, has evolved from its petroleum focus to include atomic energy, astronomy and geophysics, computer and electronics, and aerospace. Other countries, such as Jordan, with its newly established ICT plan, have adopted a narrower focus. Technology incubators plans are ready, but we identified only three operational technology incubators of national magnitude across the area. As venture funding is still marginal in the area, most technology incubators have yet to flourish.

Deployment of ICT infrastructure improvement programs

There are several ongoing ICT-infrastructure development initiatives in the Arab world; they are strategically important because of the magnitude of investment, anticipated benefits, and fit with national ICT plans. Progress is measurable in network and teledensity achievements, regional and global connectivity, as well as in operational e-government facilities.

National network upgrades, teledensity improvements, enhanced national connectivity, and the gradual introduction of new Internet provider (IP) delivery technologies are creating a favorable environment for the uptake of ICT. However, much progress remains to be made. The International Telecommunication Union (ITU) has ranked states based upon national teledensities—Group A, the lowest rank, for countries with less than 1 percent fixed line penetration rates in 2001; and Group G, the highest rank, with teledensity rates higher than the 50 percent threshold in 2001 (ITU 2002). Of the thirteen countries under consideration in this chapter, six ranked in the C category (teledensity between the 5 percent and 10 percent); the D and E categories each had three countries, and the United Arab Emirates was on par with Spain and Portugal in the F category (35 percent to 50 percent). National teledensity improvement has to remain a priority in most Arab states.[6]

Geographical disparities between the Gulf states and the rest of the region have led to the adoption of diverging national fixed line development strategies. Most Gulf states are in the process of completing the digitalization of their public networks, whilst Maghreb states are working on densification and upgrading the existing telephone networks. With small populations but high investments in their national networks, Gulf states have matched or outperformed international standards in ICT infrastructure, whereas the densely populated Levant and Maghreb

Figure 3. **Aspects of Political Leadership to Promote Use of ICT**

	Aspects of Political Leadership to Promote Use of ICT							
	ICT Strategy Clearly Spelled Out*	**ICT Implementation Plan Clearly Articulated****	**Operational ICT-Dedicated Research Facilities**	**Plan of ICT-Dedicated Research Facilities**	**Operational Technopole Initiative**	**Plan of Technopole Initiative**	**Existence of Technology Incubator**	**Planned Technology Incubator**
Gulf								
Kuwait	✓	✗	✓	✓	✗	✓	✗	✓
Saudi Arabia	✓	✓	✓	✓	✓	✓	✗	✓
Bahrain	✓	✓	✓	✗	✗	✓	✓	✓
Qatar	✓	✗	✗	✗	✗	✗	✗	✓
U.A.E.	✓	✓	✓	✓	✓	✓	✓	✓
Oman	✗	✗	✗	✓	✗	✗	✗	✓
Levant								
Lebanon	✓	✓	✓	✓	✗	✓	✗	✓
Syrian AR	✗	✗	✗	✓	✗		✗	✗
Jordan	✓	✓	✓	✓	✓	✓	✓	✓
Egypt	✗	✓	✓	✓	✓	✓	✓	✓
Maghreb								
Tunisia	✓	✓	✓	✓	✗	✓	✗	✓
Algeria	✗	✓	✓	✓		✓	✗	✓
Morocco	✓	✓	✓	✓	✓	✓	✓	✓

Key: ✓ = Yes, ✗ = No

*   Our definition is that an ICT strategy is clear when individual countries publish a set of strategic objectives in the field, either through a national plan or some other medium, and mark measurable and quantifiable accomplishments unto a milestone path.

** Our definition is that an ICT plan is clear and operational when budgets have been dedicated to the ICT strategy, a task force, whatever the format, is operationally in place, and when clearly published implementation process is underway."
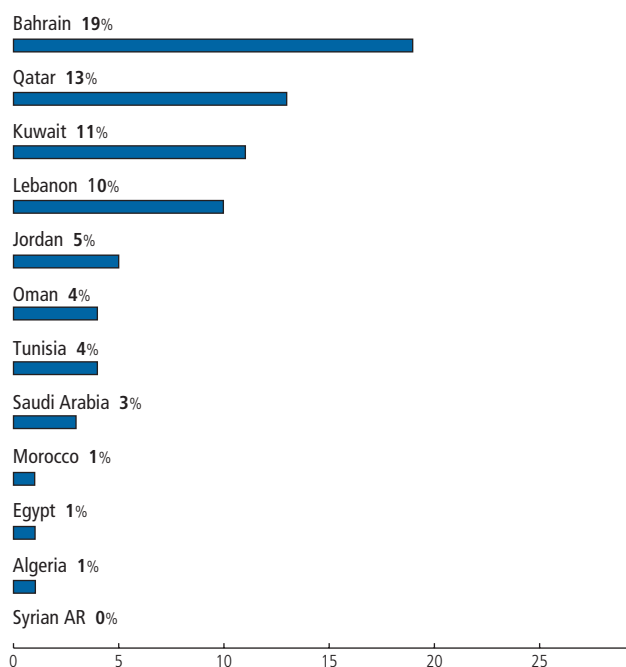
remain underserved. However, it is important to note that significant progress has been achieved over the last years, as budget allocation for national telephony has been (and continues to be) a priority for most states in the region.

Successful interregional connectivity initiatives are increasingly linking Arab states. ArabSat, an inter-Arab satellite communications and transmissions solution, is one of the best examples of the ability of Arab states to collaborate in creating a solid and resilient communications network. On the land connectivity front, the model has been replicated on a geographical area basis. The Gulf Cooperation Council (GCC) states have created the Fibre Optic Gulf[7] (FOG) network, a 1,300 km cable system jointly owned by the national telecommunications operators of Kuwait, Bahrain, Qatar, and the United Arab Emirates. Other examples of cooperation[8] include that between Syria, Lebanon, Egypt, and Cyprus.

Arab elite increasingly exposed to ICT

In many Arab states the speed of the introduction of Internet access devices is increasing rapidly. Individually, Arabian Gulf states display ICT and Internet penetration levels comparable to the West (see Figure 4). The United Arab Emirates penetration rate of almost 30 percent at the end of 2001 is higher than the European average. RIPE, the European IP

Figure 4. **Internet Users as Percentage of Population, 2001**

Bahrain **19**%
Qatar **13**%
Kuwait **11**%
Lebanon **10**%
Jordan **5**%
Oman **4**%
Tunisia **4**%
Saudi Arabia **3**%
Morocco **1**%
Egypt **1**%
Algeria **1**%
Syrian AR **0**%

Sources: World Markets Research Centre for Arab statistics, Harris Interactive for the U.S. statistics, and Jupiter for the U.K. statistics

association, ranked the United Arab Emirates 20th globally for Internet host penetration, with a population-to-host ratio of 37, placing it above Israel and six places below the United Kingdom (Finland was first with a ratio of six) (World Markets Research Centre 2002). In March 2001, computer chip manufacturer Intel stated that it expected the number of Internet users in the Arab region to reach 8 million by the end of 2002, and the demand for personal computers (PCs) to increase by 30 percent. Other sources predict that there would be 10 to 12 million Arab Internet users by the end of 2002. The expectation is that the Arab Internet market will double in size during 2002. We believe that national ICT plans will foster that growth through ubiquitous IP initiatives, PC subsidies, and government endorsement of ICT adoption. Lebanon, Jordan, and Egypt are good examples of government-endorsed Internet adoption strategies.

Poor technology awareness and a natural resistance against the English language-dominated medium are often given as underlying reasons for the poor spread of ICT in many parts of the Arab world. More generally, ICT and e-commerce only replicate on a wider scale the fragmentation of Arab society: educated elites versus a mostly illiterate population; thinly-populated high-income states in the Arabian Gulf versus highly populated low-income populations elsewhere; and the ensuing distortions in distribution of access facilities, payment tools, and technological literacy. The "digital divide," which we discuss later, is a strong indicator of Arab society's income inequalities. Internet access capabilities and individual online transactions remain the privilege of an elite. The gap in Internet connectivity devices between Arab states and the rest of the world is exceedingly large: in 2001, the ITU ranked the Arab region as having the third lowest Internet penetration (2.2 percent overall), ahead only of South Asia (0.3 percent) and sub-Saharan Africa (0.6 percent), and below the developing nations' average of 2.9 percent (Gray 2001). The United Arab Emirates and some Arabian Gulf states, with wealthy but relatively small populations, are statistical outliers in the overall Arab Internet access landscape.

ICT and e-commerce: benefits to Arab businesses

Corporate and multinational segments are responding favorably to ICT. By building transactional and e-commerce platforms, several Arab central banks are laying the ground for operational e-banking and online payments. Despite low levels of readiness in credit card penetration rates in the area, regulations are being designed for online payments. Good examples can be found in Saudi Arabia, the United Arab Emirates, Lebanon, and Jordan. More than one-fifth[9] of banks operating in the area now offer online services, from simple banking facilities to payment schemes. For example, by moving some documentary credit procedures online, Lebanese banks now offer escrow services to facilitate and guarantee e-commerce procedures. The United Arab Emirates Central Bank has introduced SSL (Secure Sockets Layer),

PKI (Public Key Infrastructure), and smart card technology to foster online banking, and payment gateways are being implemented by some of the large national players.

Entrepreneurial initiatives abound in the area of business e-commerce. Private business-to-business (B2B) marketplace ventures, both Arab and foreign, are entering the market and working with corporations. Commerce One and Aregon, to name a few, are building and offering value propositions covering the whole spectrum of supply chain, enterprise resource management, and procurement. The practice of moving business operations and transactions online is spreading within the corporate sector. Tejari,[10] one of the best examples, now has more than 1,000 members within the United Arab Emirates alone (see Box 1). The beneficial effects of these initiatives translate into large institutions changing their business habits and moving several of their functions online. The progress is uneven across sectors, with success mostly by large petrochemical groups, contractors, banks, and multinationals.

Traditional Arab businesses: largely unaffected by new technologies

To speak of a uniform Arab business community is a misnomer. Within large national corporations and multinationals, the Arab world's ability to effectively integrate and compete in e-commerce and ICT is largely proven. Digital marketplaces, exchanges and clearing house initiatives abound, with the large corporate players employing best practices in the field. Unfortunately, this is not true for the rest—in fact, for the vast majority of Arab businesses. Arab small- and medium-sized enterprises (SMEs) shy away from technology despite the anticipated benefits. Due to security concerns and linguistic barriers, most SMEs rely on personal interactions and have not moved their operations online. Banks, the traditional business facilitators in the area, are poor technological mentors, especially in Egypt and the Maghreb. Underprepared for the ICT revolution, few offer transaction platforms, security features, and credit facilities for SMEs to acquire access technology. Most Arab business websites remain informational, offering at best online cataloguing. With little training and poor levels of awareness, SMEs do not benefit from access to new markets and inter-Arab trade potential.

Progression of Arab e-government

The governments of Arab states are moving many of their operations online. From simple online availability of administrative forms to full online automation, several are migrating their procurement, customs, and citizen management capabilities onto electronic platforms. The rationale behind the move is multiple: better cost control, increased business efficiencies, greater global integration and in some cases, competition across states (especially in the Arabian Gulf area). Special mention has to be made of

Box 1. **Tejari**

Home to Tejari, Dubai is one of the few administrations globally to have moved its procurement and dealings with suppliers entirely online. Tejari.com is one tool that has helped to make this possible. Lubna Al-Qasimi, Tejari's CEO and managing director, states that, "the Dubai government is also investing in other developments in parallel to Tejari; but Tejari creates a pull which catalyzes many other sectors, such as education of the community and opportunities for youth in the high-tech sector." (Al-Qasimi 2002). Indeed, the benefits of Tejari.com are visibly spreading to the private sector, blurring the traditional geopolitical boundaries of the region. Tejari.com, inaugurated in 2000 by Sheikh Mohammed bin Rashid Al Maktoum, Dubai's Crown Prince and United Arab Emirates Defence Minister, was launched in a record-breaking eight weeks. Tejari.com (literally, "trade" in Arabic, Farsi, Turkish, Urdu, and Hindi) is an electronic online exchange, initially aimed at streamlining and generating efficiencies as part of the Dubai e-government initiative.

A public-private partnership, Tejari.com was originally planned as the vehicle through which government departments could procure goods and services online and benefit from time and cost efficiencies. "The decision on the strategy was to start with the Dubai government first, due to their large pool of suppliers and to create confidence, proof of concept, and critical mass," notes Al-Qasimi. Cooperation with the government was sealed through an agreement (Tejari 2001) with Dubai's Ruler Court (agency overseeing the twenty-four government departments of the Emirate of Dubai), where a three-month timeframe was imposed on Dubai government departments to migrate transactions online, and hence lure the private sector online if they were to continue transacting with the government. Sources agree that the early take-off of the e-marketplace can be attributed to leadership of the Dubai government "forcing" the participation of their constituencies (i.e., the administration and the upper crust of the corporate sector).

Operating an "open horizontal" business model, Tejari covers a wide range of commodities including oil and gas, construction, pharmaceuticals, automotive and spare parts, electronics, office equipment, stationery, fast-moving consumer goods, and food and services. Although Tejari is not the only regional e-marketplace, it is the only such government-owned project and, significantly, one of the few marketplaces with a guaranteed demand side. Tejari's vision today is to become the leading B2B exchange in the Middle East and to play an active role in the transformation of the regional online economy.

The policy of government participation proved successful, as within its first year of operation, Tejari boasted over 125 members within and outside the Emirates. Tejari now claims more than 1,040 members,

with an average of about 500 reverse auctions per month. Trade revenues are increasing, and plans are to triple or even quadruple trade through its network to US$400 million or more in 2002. Most interestingly, by removing geographical boundaries, Tejari operates beyond the borders of the Emirate of Dubai, through a series of partnerships between platforms, and by recruiting members in the GCC, including Saudi Arabia, and as far as Algeria. "Basically, it is a community of buyers and suppliers, many to many, independent of where the buyers and suppliers are at the end of the day," comments Al-Qasimi. Tejari does much to educate the market. According to Al-Qasimi, "training of local resources too has been done heavily, in partnership with the community…we have partnered with ITI Zayed University and the Higher Colleges of Technology to create a real pull for the technology."

Al-Qasimi emphasizes how Tejari.com has not only proven to be a local success but has also created an international best practice: "Tejari.com follows, and often leads, the technical best practices of global B2B marketplaces. The creation of Tejari.com is an example of high local technological and business strategy input. Tejari is all home-grown, and we are proud to say that we have been able to export some of what we have learned and developed; many exchanges in Europe and the United States [have] adopted some of our business guidelines. Some are, in fact, looking to us for such tools as e-learning and e-cataloguing, in terms of strategy."

Tejari breaks the rules of traditional Arab trade patterns, leveraging technology to change the procurement habits of an entire Arab state, whilst creating urgency in the private sector to join the e-commerce bandwagon. This is one of the first examples of digital liquidity and real market efficiency in the region, crossing over the natural geographical and mental commerce boundaries of the area. The Dubai government has used the Tejari platform to raise awareness and educate its national market on the benefits of e-commerce, via marketing campaigns, educational seminars, and financial incentives. The Dubai government is now showcasing Tejari as a model for other Arab states' e-government and e-procurement initiatives.

Tejari is a good example for other Arab states to follow to move their business online and ensure a critical mass of the private sector migrates to electronic platforms. e-Government procurement platforms also enable inter-Arab trade by creating new channels to otherwise inaccessible markets. Government support is critical in championing the move, educating the market, and improving economic efficiency. Ensuring technology transfers and arabization to the benefit of other Arab governments will be a critical success factor: Tejari plans on furthering the "arabization" of its platform, as the model moves into countries with less knowledge of the English language.

the United Arab Emirates, and of the Emirate of Dubai in particular. Three initiatives represent Dubai's governmental commitment to ICT: Dubai Internet City, the e-government initiative, and Tejari. The aim of these initiatives is to connect government offices and citizens, facilitate transactions, and provide convenient services (e-procurement) to citizens (e.g., online payment of utilities). The success of the e-government and e-procurement initiatives have "forced" businesses wishing to work with the government to adapt their processes, invest in technological platforms, raise technology awareness, and to seek training.

e-Government and e-procurement models are spreading across the area—Arab states are demonstrating responsiveness to the need to integrate digitally and migrate some of their administration online. All governments are not seeking to replicate Dubai's ambitious model. We identified at least three fully operational e-government platforms in the area, but it is important to note that more than eight (new or extensions of existing) e-government initiatives are planned, with varying levels of technological sophistication and scope of ambitions. There are many examples of implementation, such as in Jordan and Lebanon, where the two governments harmonized their customs data systems using the United Nations Conference on Trade and Development (UNCTAD) technological support (United Nations Economic and Social Commission for Western Asia [ESCWA] 2001). Others include Morocco's (see Hajji 2001) and Jordan's[11] e-government initiatives. As telecommunications continue to deregulate and ICT access tools become more available, e-government is expected to become more successful in the area.

Challenges for the Uptake of ICT

Obstacles relating to the environment

Most challenges in ICT adoption and usage lie in the political and regulatory environment. With uneven records in legal and regulatory issues, weak ICT strategies, chronic R&D shortages, excessive reliance on foreign technology, and ongoing weaknesses in ICT implementation, Arab states are frequently lagging in their readiness for the networked future.

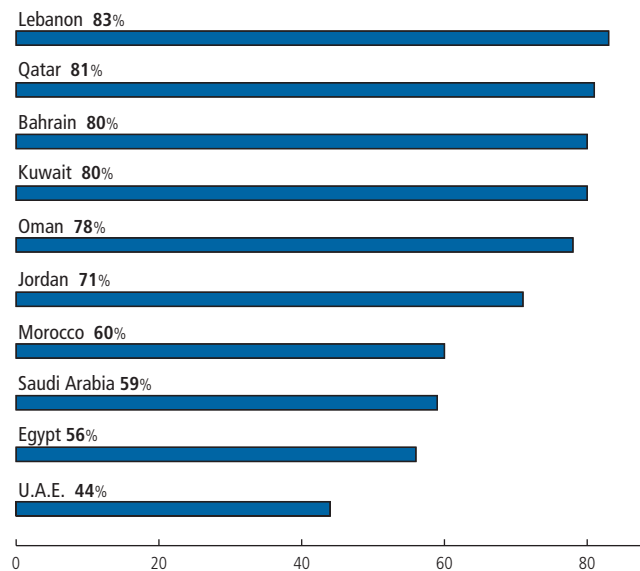### High software piracy rates jeopardize confidence

With one of the highest software piracy rates in the world and displaying poor records on IPR protection, Arab states increasingly suffer bad press and a lack of credibility, with looming restrictions in technology transfers. The Business Software Alliance[12] estimated year 2000 software revenue lost to piracy at US$376 million in the Middle East and Africa, representing 3 percent of global losses, versus 26 percent and 25 percent of losses incurred, respectively, in Western Europe and North America (Figure 5). If negligible in absolute terms, losses incurred in Arab states are dismally high in percentage

levels, with Kuwait, Qatar, Bahrain, and especially Lebanon, ranking at or above the 80 percent threshold. The United Arab Emirates, Egypt, and Jordan have made considerable attempts at tackling the issue, enforcing stricter controls and enacting antipiracy laws. Arab software antipiracy measures remain one of the key elements of U.S. industrial policy in the region, far outweighing similar domestic policies or policies in Europe.

Regulatory framework ignores the Arab citizen

As they seek WTO membership, Arab states are taking action to harmonize their legal systems with TRIPS (see Figure 1). By 2005, Arab states, classified as developing countries, are

Figure 5. **Arab Software Piracy Rates, 2000 (in Percent)**

Country	Rate
Lebanon	83%
Qatar	81%
Bahrain	80%
Kuwait	80%
Oman	78%
Jordan	71%
Morocco	60%
Saudi Arabia	59%
Egypt	56%
U.A.E.	44%

Source: Business Software Alliance, 2001

obliged to extend product patent protection on products not previously patented in these countries. Main provisions include standardized definitions of intellectual property, implementation of the "national treatment" and "most favored nation" principles, the establishment of antipiracy and protection enforcement procedures, and clauses for swift dispute treatment. While regulatory frameworks are being updated to ensure investor protection, personal liberty and consumer protection rights issues have not yet been fully addressed. Analysts question why Arab states maintain lax policies pertaining to encryption, while restricting and censoring the actual content available online. The fact that no Arab software company actually produces encryption technology or has such capabilities may be part of the explanation. With no national encryption technology at stake, Arab states do not have the same incentives as the United States in restricting encryption technology export or circulation. Conversely, moral and societal considerations seem to explain the tardiness of Internet introduction in the Arab world. Saudi Arabia, for example, has publicly stated[13] that it will seek to protect its citizens from immoral Internet

content. Other states, for political reasons, monitor Internet connectivity at government agencies. Independent agencies such as the Human Rights Watch regularly question personal freedom on the Internet. However, while the Arab consumer is highly constrained, consumer protection is largely absent from the regulatory environment in the Arab states. Very few consumer protection laws have been enacted at this stage. We expect those requirements to be increasingly addressed, in line with WTO requirements.

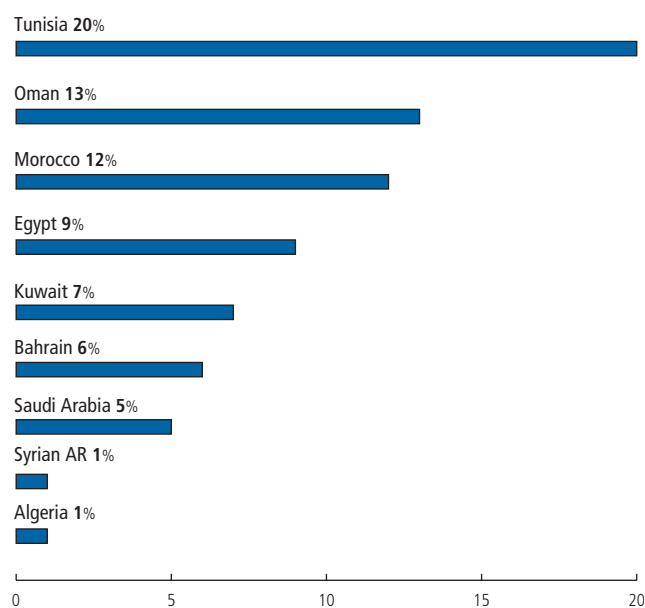## No common plan: foregoing ICT efficiency opportunities

Arab states are forgoing ICT efficiency opportunities and incurring heavy costs by building incomplete and inconsistent national infrastructures. There is no common strategic Arab plan for ICT, and little cooperation on the matter. Although all Arab states have ICT and e-commerce on their agendas, their approaches are often competing and fragmented, replicating the divide between the Gulf and other states.

The Gulf countries have powerful funding capabilities, and ICT plans are prominently included in their national programs. Governments are taking an active role in promoting ICT and e-commerce, with variable success in implementation. Most have translated their ICT plans into research institutes, technopoles, and technology parks (Saudi Arabia's KACST and Dubai's Internet City are prime examples of successful planning and implementation). The development models often rely on national-foreign partnerships with, in some cases, skills being acquired from foreign corporations, and include little indigenous technological development. Few countries have a "visionary" approach to ICT as an integral part of a national, social, and economic strategy. Jordan's 2020 vision, with its clear ICT component (REACH 1.0, 2.0, and currently, 3.0; see Box 2) is one of the few countries to have actually measured ICT benefits with an ongoing implementation plan. The Levant and Maghreb states, highly populated and with limited funding, have recognized the importance of ICT in their national development. Some national plans (such as the Lebanese plan) date back to the 1960s, but most have been articulated over the last few years. Plans include the creation of research institutes, technopoles, and incubators. Research is relatively strong in these countries. The Maghreb and Lebanon rely on cooperation with France, and seek technology transfer to promote indigenous research using local talent. They aim to replicate more advanced research structures and have signed effective public-private partnerships with French universities and leading research institutions such as the Centre Nationale de la Recherche Scientifique. Other states were late in recognizing the importance of ICT. Oman amended its original 2001–2006 Sixth Development Plan (bin Said 2001) to include ICT; the U.A.E. ICT plan dates to the late 1990s.

Insufficient funding for ICT research and development

The absence of serious ICT R&D funding commitments translates into a virtual absence of national Arab ICT and software industries, intensifying reliance on foreign expertise and furthering the "brain drain." With a share of R&D in Arab gross domestic product at a record low of 0.5 percent and high reliance on foreign technology, Arab states are structurally net importers of technology and ICT. Arab reliance on foreign technology has been researched by several sources (United Nations Development Programme [UNDP] 2002; Zahlan 1999). With the exception of Tunisia, all states are net importers of technology. Science and technology research in the Arab world has not achieved significant progress in industrial applications. In 1999, Tunisia, the leading Arab exporter of "recent innovations in high and medium technology," ranked 51st (out of 72 countries) on the UNDP's global technology achievement index with technology exports that reached 19.7 percent of total exports. As a benchmark, technology exports represented between 50 percent and 80 percent of the total exports of world leaders Finland, the United States, and Japan (respectively 1st, 2nd, and 4th). Technology exports of most Arab states are below the 5 percent mark (Figure 6). The consequences of this poor performance in technology are to further the "brain drain" and to accentuate the loss of sovereignty in implementing national ICT strategies. Few Arab states (e.g., Algeria and Tunisia) retain some degree of technology independence. Reliance on foreign technology could be symptomatic of a certain lack of government and business leadership and understanding of the benefits of indigenous ICT research and autonomy.

Figure 6. **Diffusion of Recent Innovations, High and Medium Technology, 1999 (as Percent of Total Goods Exports)**

Tunisia **20**%
Oman **13**%
Morocco **12**%
Egypt **9**%
Kuwait **7**%
Bahrain **6**%
Saudi Arabia **5**%
Syrian AR **1**%
Algeria **1**%

Source: UNDP 2001

Box 2. **REACH Case Study**

Some years ago, Jordan identified ICT as the industry with the most promising potential for generating foreign direct investment while leveraging local skills and creating sustainable employment opportunities. The REACH initiative was launched in 1999 as part of Jordan's 2020 development vision. REACH, which is an acronym for regulatory framework, estate and infrastructure, advancement programs, capital, and human resource development, stems directly from King Abdullah II's vision in building an export-oriented ICT sector in Jordan.

Championed by the Information Technology Association of Jordan (INTAJ), REACH was a collaborative and transparent model from its inception, incorporating key stakeholders of Jordan's digital future, including the Jordan Securities Commission, the Economic Consultative Council (ECC), and AMIR, a U.S. agency. Marwan Juma, INTAJ chairman, notes that: "from the beginning, the expectation was to educate government on the strategic priorities of ICT, its infrastructure and legal environment requirements, as well as the human resources and financial components to achieve sustainable results." REACH adopted an iterative development process where plans are formulated, quantified, and presented to the authorities; on a yearly basis, the plans are measured, revised, and adapted. According to Juma, "the model was compelling and successful in generating enthusiasm and commitment that the ECC adopted REACH as its model for other industries."

The initiative called on private and public sectors alike to assess Jordan's readiness in building an ICT industry, and to elaborate an action plan. From the onset, the objectives were impressive; the plan decided on quantified targets for 2004, including the creation of 30,000 IT-related jobs, generation of US$550 million in annual exports and US$150 million in cumulative foreign direct. Juma indicated that establishing the plan was not enough: "We had to explain that there was much more to building an ICT industry than taking the decision—the regulatory environment had to be adapted, the infrastructure upgraded and modernized, advocacy initiatives implemented, the financial system rendered more transparent and attractive, and most important, the human resources [had] to be prepared, not in terms of quantity but in quality."

Jordan amended several of its telecommunications regulations and revamped its administration to create the Ministry of Information and Communication Technology, elevating the sector's representation to the Cabinet level. To improve the investment climate, the regulatory body has been rendered more independent, modernizing more than thirty ICT and telecommunications-related laws and including the creation of an electronics transaction Act. The financial sector has also been tapped. By

focusing on capital markets and financing support requirements for building an industrial ICT plan, REACH is creating awareness in Jordan of the requirements for financial transparency, the need to offer exit strategies to investors, and the legal framework necessary to provide support. REACH is presently conducting its third series of workshops. Known as REACH 3.0, they aim to highlight the new challenges facing the development plan and what means will be taken to ensure the results are sustainable. An "e-readiness" assessment is expected to be published in September 2002. This assessment will cover such issues such as connectivity, e-leadership, information security, human capital, e-business climate, and public-private partnerships.

REACH is well on its way to accomplishing its 2004 objectives. According to INTAJ's chairman, 8,000 to 10,000 new jobs have been created because of the initiative; 45 percent of the foreign direct investment objectives have been achieved, and Jordanian annual ICT exports is estimated at between US$70 million and US$100 million. Specifically, ambitions focus on job creation by enabling the start of new companies, which become recipients of foreign investment, and by putting the emphasis on labor-intensive industries such as call centers and customer care. "Although our people are educated and [have] master[ed] the English language, we seek to increase the overall quality of [their] skills," says Juma. These developments are expected to showcase Jordan as an attractive ICT investment alternative in the region.

Foreign investment in the sector will be driven by deregulation and increased transparency on the financial front. Several acquisition moves by Arab and international investors into the Jordanian ICT arena[24] demonstrate that the country has become an attractive investment target. With further venture capital support and the creation of proper exit strategies on the Jordanian equity market, Jordan's appeal to foreign players is expected to increase.

By focusing on the development of local export-led IT businesses, Jordan expects to become a center of excellence in the Arab region: software creation, arabization, language localization, and consultancy services will enable Jordan to tap the developing but underserved markets of the Arabian Gulf and the Levant. REACH is a model that is transposable to other Arab states. The model is successful because it has managed to build consensus between the public and private sectors and because it has government endorsement at the highest level. The level of trust among stakeholders and the lack of complacency were critical factors in turning what was initially a sectoral plan into a national endeavor.

Telecommunications deregulation: slow and limited

The telecommunications sector, though not the central factor in explaining ICT development, is one of its founding components. Most Arab states are planning for telecommunications deregulation because of either pressures linked to imminent WTO membership or pursuits of privatization benefits. Deregulation has mostly applied to mobile telecommunications networks (GSM) and Internet Service Providers (ISP). With GSM, most Levant and Maghreb states present clear commitments to deregulation, with foreign entrants leading competitive offerings. Gulf states have been discussing deregulation and privatization possibilities over the last few years, but have not yet implemented GSM privatization. The ISP sector is thriving but is mostly limited to dial-up offerings; a few offer broadband connectivity and digital subscriber lines. However, land lines, fibre optic connectivity, and most broadband offerings remain government monopolies, with little deregulation and privatization. Consequently, unless steered in that direction by the state, national incumbents have few incentives to promote connectivity. Government monopolies leave little room for private infrastructure funding and pan-Arab connectivity initiatives. Also, connectivity charges remain high. Even for markets like Kuwait, analysts predict that dial-up connectivity will only become attractive under the US$20 per month mark (Figure 7). Speed of service remains a sensitive concern. With poor connectivity and high prices, the Internet has had little impact as far as changing business and working habits in the area. Arab entrepreneurs have little incentive to create communications ventures—although the ISP sector is privatized in most cases, high-value markets such as broadband remain off limits. Combined with the scarcity of seed money to create alternative communications champions, the slow pace of deregulation is stunting the development of competitive ICT offerings in the region.

"Digital poverty:" mediocre bandwidth and connectivity

The Arab world's mediocre performance on bandwidth and connectivity leaves some markets severely underserved. In 2000, the media announced staggering connectivity figures, equating the entire bandwidth availability for the Arab world to that of 500 U.S. cable modem subscribers. The image is more optimistic in 2002, but differences across states cause a "bandwidth divide." Basic infrastructure, in terms of national public switched telephone networks (PSTN) is uneven. Teledensity in the Gulf states exceeds international standards: the United Arab Emirates, Bahrain, Qatar, and Kuwait outperform most, and are rated by ITU in the F and D ranks, respectively, on par with Italy and Japan (F) and Eastern Europe (D) (ITU 2002). The densely populated Levant and Maghreb remain structurally underserved. Most (except for Syria and Lebanon) rank in the ITU's lowest categories, with teledensity under the

Figure 7. **Consumer Dial-up Charges, 2001 (US$)**
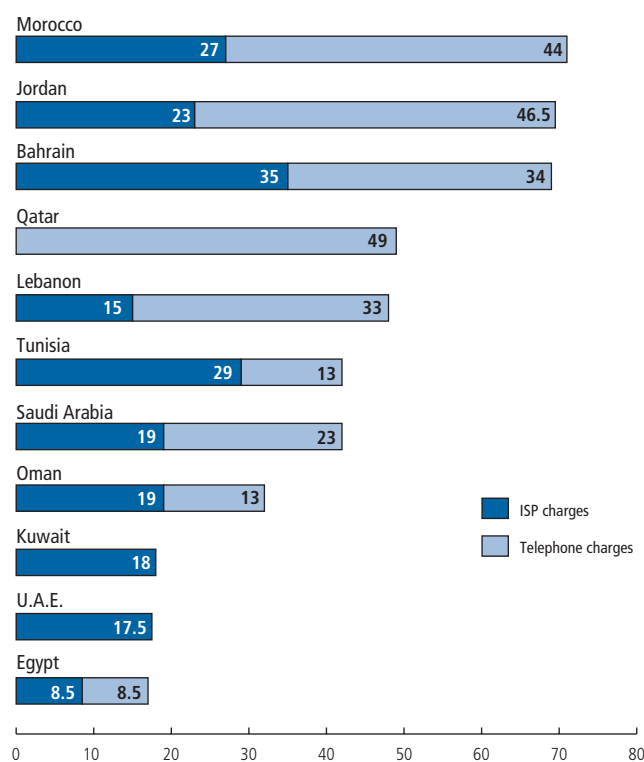
Source: ITU 2002

20 percent mark in 2002. IP connectivity follows the same pattern—there are bandwidth oases in Gulf countries that benefit from strong funding and rich client bases. In gulf countries the latest data transfer mediums and technologies are offered, from leased lines to ISDN (Integrated Services Digital Network)/DSL (Digital Subscriber Line) and WLL (Wireless Local Loop). In contrast, "bandwidth hunger" is rampant elsewhere, with poor dial-up connectivity rates and, of course, no broadband. Levant and Maghreb countries offer some broadband facilities, but those are usually reserved for corporate clients. As an alternative, Egypt and the Maghreb are relying on the multiplication of public access points to ensure that the population is connected to the Internet.

Poor interconnectivity of Arab IP systems

The various Arab IP systems do not interconnect, impeding interregional IP communications and inter-Arab trade and e-commerce. When a consumer in Cairo wants to access information on a Qatar-hosted website, his/her communication goes via the IP backbone into a New York gateway and is then redirected into Qatar! Figure 8 highlights the poor state of peering and interconnectivity between Arab states. With no Pan-Arab connectivity initiative, some Arab states rely on regional cooperation, linking their gateways to the global backbone. Fibre Optic Gulf, the leading GCC initiative, linking Kuwait, Qatar, Bahrain, and the United Arab Emirates, is a prime example of successful cooperation. Links between

Figure 8. Connectivity Status of Arab States

	National				Regional					International Direct Fibre Optic Connections		
	Tele dens. '02[2]	LL	ISDN	DSL	Satellite				Fibre Optic			
	%	Y/N	Y/N	Y/N	Arab Sat	Intel Sat	Eutel Sat	Inmar Sat	Name of Link	SE-ME-WE	FLAG	Other
Gulf												
Kuwait	20–35	✓	✓	✓	✓	✓	✗	✓	✓ FOG and link to KSA	✗	✗	✗
KSA	10–20	✓	✓	✓	✓	✓	✗	✓	✓ link to Kuwait	✓ (2 and 3)	✓ (Europe-Asia)	✗
Bahrain	20–35	✓	✓	✓	✓	✓	✗	✓	✓ FOG	✗	✗	✗
Qatar	20–35	✓	✓	✗	✓	✓	✗	✓	✓ FOG	✗	✗	✗
U.A.E.	35–50	✓	✓	✓	✓	✓	✗	✓	✓ FOG	✓ (3)	✓ (Link with New York)	✗
Oman	5–10	✓	✓	✗	✓	✓	✗	✓	✗	✓ (3)	✗	✗
Levant												
Lebanon	10–20	✓	✓	✗	✓	✓	✗	✗	✓ Berytar and Cyprus	✗	✗	✗
Syrian AR	10–20	?	?	?	✓	✗	✗	✓	✓ Berytar and Aletar	✗	✗	✗
Jordan	5–10	?	✓	✓	✓	✗	✗	✗	✗	✗	✓	✗
Egypt	5–10	✓	?	✓	✓ + NileSat	✗	✗	✓	✓ Aletar and links to Italy and Greece	✓ (1, 2, and 3)	✓	✗
Maghreb												
Tunisia	5–10	✓	✓	✓	✓	✗	✓	✓	✓ Links to Italy	✗	✓ (Europe-Asia)	✓ (Sprint)
Algeria	5–10	?	✗	?	✓	✓	✓	✗	✓ Links to France, Italy and Morocco	✓ (2)	✗	✗
Morocco	5–10	✓	✗	✓	✓	✓	✗	✗	✓ Links to Spain and Algeria	✓ (3)	✗	✓ (SAT 2)

Key: ✗, not signed or nonmember; ✓ (name) member of

LL: Local Loop; ISDN: Integrated Services Digital Network; DSL: Digital Subscriber Line; SE-ME-WE: South east Asia-Middle East-Western Europe

Levant states are underway. The consequences of infrastructure fragmentation are reflected in the Internet usage patterns of the area: slow service, minimal inter-Arab e-commerce, reliance on international private or semiprivate IP networks, and lack of competitiveness in connectivity alternatives. Few Arab states are privy to backbone connectivity initiatives at the global level. Saudi Arabia, one of the founding financers of FLAG[14] Europe-Asia, is linked via a 10 gbps gateway connection to the global backbone. It also partnered with France Cable Radio on the SE-ME-WE[15] project. The success of these initiatives in the early 1990s has not been met by expansion and upgrade plans. In subsequent developments, FLAG now offers its north east Asian loop a capacity of up to 3,800 gbps. Consequently, it is simpler for Arab end users to connect with European and U.S. IP destinations, rather than with IP destinations within Arab states.

Obstacles relating to individual capabilities and access to technology

Several of the obstacles faced by individual countries are deeply engrained. Such obstacles include societal rigidity, weaknesses in education, unfair income distribution, and uneven access to technology.

An increasing Arab "brain drain"

Arab states risk jeopardizing their efforts in building ICT and e-commerce industries—dissatisfaction with national economic reforms, and the deficits in work opportunities, research and education, are causing younger Arabs to seek expatriation. A cross-sectional poll of Arab youth conducted by the UNDP (2002) highlights a worrying trend: 45 percent of respondents expressed a desire to emigrate. The main concerns voiced in the poll were the lack of job opportunities (45 percent), education (23 percent), and distribution of income and wealth (8 percent). The term "educated elite" could be misleading: a two-tier educational system is emerging, where a wealthy minority enjoys expensive private education while the bulk of the population attends poorer-quality underfunded government universities. In the same report, the UNDP states that "the most worrying aspect of the crisis in education is its inability to provide the requirements for the development of Arabs, that is, [education is] losing

its power as a conduit for social advancement." The budgets allocated to education are decreasing—in relative terms, per capita expenditure on education in Arab countries dropped from 20 percent of that in industrialized countries in 1980 to 10 percent in the mid-1990s. The "brain drain" is well researched: 1 million highly-qualified Arab scientists and professionals reside in the Organisation for Economic Co-operation and Development countries. Far from slowing, this trend has been intensifying over the last quarter of the last century. The brain drain is unevenly spread across the region. The Maghreb and Levant areas suffer higher rates than the Gulf because of difficult socioeconomic conditions, lack of social incentives, limited employment perspectives, shortages in research budgets, and chronic technology underinvestment.

The brain drain translates into slowing down the process and pace of creating indigenous ICT industries, furthering the technology gap between the Arab world and the rest of the world, and increasing the reliance of Arab states on foreign technology transfers and aid.

Digital divide remains

The digital divide is caused by a combination of the structural fragmentation of societies and the lack of leadership in many Arab states with regard to ICT policies and implementation. The divide is aggravated by the absence of cross-Arab initiatives, lack of financing, and poor education. There are three aspects to the digital divide in Arab states: (1) the divide between the Arab world as a whole and the rest of the world, (2) the divide across Arab states, and (3) the divide within Arab states. The digital divide with the rest of the world can be measured using variables such as teledensity, PC penetration, numbers of websites, and number of Internet users. Studies rank Arab states, as a whole, poorly as compared to other groups of nations (World Bank 2001). Although Arab states do not severely underperform when ranked by world standards in teledensity and PC penetration, they remain weak on number of websites and Internet users. Limited local content and the monopolistic nature of the telecommunications sector are key obstacles. The benefits of using the Internet as a source of knowledge creation, as opposed to accessing existing knowledge, is not sufficiently recognized in Arab societies.

The digital divide across Arab states reflects the income and population characteristics of the region. The UNDP contrasts the situation of the more advanced GCC states with countries in the rest of the region, which are largely characterized by poor infrastructure, an uncompetitive telecommunications industry, resistance to the introduction of new ICT services, limitations in banking facilities, and limited political and regulatory leadership. Others report little progress on the digital divide issue (Dewachi 2002). The same factors dividing Arab states seem to be at play on the national level, accentuated by the linguistic barrier (local educated elites accessing English language knowledge online vs. local-language literate and illiterate masses), cultural aspects (gender segregation), and weaknesses in the educational system.

Arab states have undertaken new initiatives[16] to reduce the digital divide. Although these initiatives create technology awareness, they highlight the inaccessibility of PC equipment for most of the population. We did not identify any large-scale public-private partnerships between policymakers and the banking sector to create credit facilities for computer purchases. Most are private initiatives, and do not address a national requirement or need for ICT penetration. Maintaining the digital divide negatively impacts the Arab market's uptake of ICT and e-commerce, as the equipment acquisition decision is endlessly postponed and e-commerce transactions remain unaffordable to the masses. Given the regional infrastructure deficiency, ESCWA estimates that an investment of around US$40 billion is required to bring ICT penetration rates up to the world average.

Obstacles in business and governmental sectors

The private sector, especially banks, is accentuating structural flaws by not actively promoting the necessary market uptake initiatives. Governmental initiatives remain limited, as they rely excessively on foreign policymakers in their procurement decisions and neglect the local language as a development tool.

Scarce Arab payment and transaction platforms

Few local banks offer operational transaction platforms, and credit card penetration is low amidst concerns of poor security and fraud. The lack of national financial development policies has a direct impact on private investment and business development in general, and on IT infrastructure in particular. The Arab retail banking market is excessively reliant on "brick and mortar"—from large multinational banking groups to regional players, and from generalists to specialized Islamic banking actors, transactional e-banking preparedness is low. In 2000, only 18 percent of banks offered online transactional facilities. Although there were some local players (in Lebanon and the Gulf), these were mostly foreign banks with regional presence. Thirty-nine percent of the banks in the region did not even maintain an informational website. Arab e-banking and e-transactions also suffer from the absence of clearing house alternatives to central banks, as most clearinghouses have yet to move their operations online. The absence of digital certification laws and the nonexistence of credible local third-party security enablers discourages Arab banks from moving online. Credit card penetration in Arab states is fragmented along income lines, which is caused by the same factors as those causing the digital divide. Gulf states

rank above the 20 percent credit card penetration rate level, whilst most Levant states and the Maghreb are under the 5 percent threshold.

Weak local ICT capabilities

Statistics on Arab ICT procurement decisions show that nearly all equipment is imported. In the absence of local ICT production, Arab ICT, e-commerce, and related industries cannot be thought of as having a bright future unless local technological development plans are elaborated on and adopted, either by one champion nation, or through an inter-Arab decision. Weaknesses in local software development capabilities increase reliance on foreign technology, especially in terms of programming, language standards definition, and software development. Most servers belong to the UNIX system family, and almost all are in the public domain. There is also incompatibility between the Arabic provided on these platforms and the commercial Internet browsers that populate the overwhelming majority of Arab PCs. The proportion of software published and translated into Arabic is low, reflecting limited Arab software development demand. The conflict between proprietary and open standards[17] renders information available on servers only marginally displayable on proprietary platforms, and this deters Arab content developers.

Marginal local language content

The lack of local language content availability shuts out the Arab public from ICT and e-commerce. Most content available in the Arab world is informational (vs. transactional). Whereas there are 300 million Arabic speakers in the world, ranking the language as the 6th in terms of usage, websites in the Arabic language represented less than one percent of all websites in 2001[18]. Despite domain name registration progress in Arab states, the inability to offer reliable, up-to-date content in local languages is an obstacle. Because of the lack of capability to develop software and representation tools (e.g., Arabic HTML—HyperText Markup Language—tags), the absence of programming languages in Arabic (e.g., C++), and the absence of Arabic tools or protocols for data representation (e.g., HTML and XML —Extensible Markup Language), the limitations on content development are high, as technicians are required to master both English and Arabic. When added to the problem of standards, this human resource limitation severely restricts content development. Addressing this limitation calls for major policy decisions on standards enforcement and the buildup of local content skills capabilities. A single country cannot make these decisions; this highlights the need for inter-Arab cooperation.

Prescriptions

Based upon our research described in the previous sections, we outline below some policy prescriptions for business and government leaders in the Arab world.

Create a common Arab ICT strategy aligned with national ambitions

A Pan-Arab planning effort aiming to create a transnational ICT strategic plan[19] is recommended as a starting action item. Based upon a critical assessment of the region's capabilities, the plan would define the overall objectives of the various nations and translate objectives into measurable milestones. This common ICT strategy should be treated with a clear commitment for implementation. The strategic recommendations of a transnational Arab ICT-planning agency, independent of national contingencies, will nevertheless have to rely on Arab funding. Ensuring that the funding and commitment requirements will be met is key. That implies creating transnational teams devoted to the overall strategy and that are expected to lead the implementation of the initiative.

Arab ICT planning should not be reduced to infrastructure acquisition decisions, but should encompass all aspects of ICT, including software and content development. The importance of the plan being Arab, and building on Arab strengths and weaknesses, cannot be overstressed. The Arab ICT plan should, above all, seek to anchor the Arab world as a key player of the ICT revolution, not merely a participant at the buyer level. The plan should also include an assessment of how industrial and economic benefits can be generated, and seek to build regional centers of ICT excellence as a source of technology exports using local, not imported, skills. No ICT planning is conceivable without the freedom of movement of skills and capabilities across borders. The scarcity of local skills makes this condition essential. To reverse the brain drain effect, a special "technology passport" could be created as the symbol of inter-Arab policy.

Benefits should flow down to the regional and national levels, with appropriate implementation and funding support. The implications are threefold:

1. Creating an investment plan for inter-Arab technology development with allocation mechanisms across countries, aimed at financing the creation and growth of the critical components of an ICT industrial base.

2. Coordinating national funding plans with the overall Arab ICT funding program. An inter-Arab ICT strategy should build on the complementarities and competitive advantages of Arab nations. We expect this to generate substantial efficiencies compared to the overlaps caused by independent and parallel national approaches.

3. Engaging with the banking and financial community in building technology financing mechanisms with government support. This will be critical to developing a commercial credit policy that favors local companies that have the skill to compete and win contracts in both Arab and international markets.

Proceed towards technological sovereignty

Technological sovereignty means autonomy in choices, control of national destiny, and technological development. Technological sovereignty begins by "building not buying;" that is, by not reducing ICT-building initiatives to procurement decisions. Arab states should aim for the development of an indigenous ICT industry. Empowered with a national strategy in mind, Arab states should use joint-venture collaboration as sources of technology transfers, through local value-added requirements.[20] "Buying local" when the product and service are available and giving advantages to suppliers from fellow Arab countries, will enhance the overall inter-Arab ICT planning and implementation effort. ICT and e-commerce within the Arab states will require infrastructure decisions that encompass the entire area. A coordinated infrastructure plan across the region is critical. Secure and resilient, the Arab interconnectivity system will have to be technology independent and coupled with a human resources plan for installation, management, and maintenance. The inter-Arab connectivity plan will have to be institutionalized via a Pan-Arab structure, with official acceptance and funding. Such an endeavor should seek to leverage some of the national centers of excellence.

Increase the competitiveness of the telecommunications industry

Deregulation in the Arab world is often misunderstood, being perceived as a source of generating new money for budget deficits and as the government abandoning the sector. The competitive benefits of deregulation, such as better access to technology and enhanced creativity, are often misrepresented. Successful deregulation examples can be found in areas where local skills or local technological environments or a combination of both exist. We recommend ensuring that deregulation is a consistent part of the national strategic ICT plan to inject new technologies into the ICT sector and provide more competitive services to Arab citizens. Governments should continue the deregulation of the telecommunications industry, ensuring that results achieved are congruent with national plans, and intervene in a clearly defined legal framework to steer the industry when necessary. By promoting the spin-off of local centers of excellence, Arab states can deregulate certain sections of their national telecommunications industries to the benefit of national Arab players. Alternative connectivity providers and trade media, such as marketplaces, can extend the ISP deregulation footprint by generating economic activity, which would allow the emergence of Arab ICT champions. Deregulation can also be a tool to acquire technology transfers from foreign entities by including the stipulation that entry of foreign players requires technology transfer and investment in the training of local talent.

Recognize, attract, and build human capital

Researchers and technologists do not elicit the same level of respect in the Arab world as they do elsewhere. Arab states need to take measures to ensure that proper skills are developed and retained in the region. The skills lost in the brain drain cannot be attracted exclusively with financial incentives. Creating higher institutes of learning and R&D at the Pan-Arab level will garner respect, enthusiasm, and support from learning communities elsewhere. Such institutes could thrive in the region, were they to have a standardized knowledge base and be endowed with appropriate levels of funding. Committed to a national preference policy in research, the institutes would create incentives for educated elites to apply their talent locally. A good reference example is the investment made by the Indian government to create elite institutions of higher learning, such as the Indian Institutes of Technology and the Indian Institutes of Management. Graduates of these institutions play important roles in the development of the Indian ICT industry, and these institutions serve as magnets attracting expatriate Indian scientists home.

Reduce the digital divide

The Arab citizen should be at the center of efforts to develop ICT in the Arab world. Building the human base and reducing the digital divide are critical to these efforts. Reducing the digital divide and attenuating its effects offers benefits beyond ICT penetration, such as fostering social cohesion and producing a new generation of national leaders. While commending the initiatives underway, we highlight the importance of expanding these initiatives' magnitude, by

1. Multiplying ubiquitous IP initiatives to educate the market and generate enthusiasm to study and learn technology in schools and universities[21];

2. Encouraging the adoption of ICT access devices (such as PCs and personal digital assistants) as a national priority, with policies subsidizing ICT equipment purchases; and

3. Partnering with the banking sector to create policies and financial incentives for investments in ICT. The goal of such action should not be limited to ICT equipment acquisition, but should include the creation of the "ecosystem" necessary for a widespread adoption of ICT in Arab societies.

Stimulate Arabic content

The creation of Arabic content is central to the robust development of ICT in the Arab world. Enhanced ICT adoption and use allows for better communication and coordination across different stakeholders in the Arab world, such as individual citizens, businesses, and governments. Thus, it is natural that Arabic has to evolve as the language of choice. Standardization and the creation of a

"language watchdog" are useful approaches. We recommend planning the evolution towards an institutionalized Arabic research watchdog and orientation team composed of industry leaders to collaboratively establish a research reference in the Arabic language and articulate current and future needs. Matching the Arab technological research and procurement mandates with local linguistic needs can be achieved by allocating research budgets for language localization initiatives in universities and the private sector, and signalling the critical role of "arabization." By favoring companies and universities that develop "arabization" using Arab human resources and researchers, member states will confirm their commitment to building a national ICT plan. This could entail buying only bilingual Arabic/ foreign software adhering to the adopted standards, and making the usage of Arabic mandatory on government and administration systems.

Endnotes

1. The definition covers both industrial property, which includes inventions, patents, trademarks, and industrial designs, as well as copyrights, which include literary and artistic works, films, musical works, and architectural designs.

2. The Paris Convention provides for substantive rule on national treatment in each of the member countries, the right of priority, common rules in the field of substantive law, and the overall administrative framework.

3. The Patent Cooperation Treaty (PCT) provides for international patent application filing procedures, a single patent office, and other standardizing and centralizing measures.

4. "Technopoles" are defined as geographically delineated entities at which both industrial and research efforts are pursued with a view to fostering technology and expertise transfers. Various technopole "subflavors" include technology parks, innovation centers, and high-tech clusters, with varying degrees of scientific advancement.

5. "Technology incubators" are business incubators, with a clear emphasis on developing university research into industrial and commercial ventures, with selective financial output and measurement criteria.

6. U.S. Department of Commerce. *Overview of the Telecoms Sector*. Various reports. Office of Telecommunications Technologies in the International Trade Administration. Kuwait (1997), Saudi Arabia (1997), Qatar, Bahrain, Oman (1997), Syria (1997), Jordan (2002), Egypt (2000), Tunisia (2001), Algeria (2001), Morocco (2001). Online. http://www.ita.doc.gov/.

7. FOG offers a 5 gbps capacity and is capable of carrying 180,000 telephone calls or equivalent data circuits between the four countries to other parts of the world simultaneously. It cost more than US$83 million and was inaugurated in 1998. FOG also provides gateway access into Fibre Optic Link Around the Globe (FLAG; see endnote 14), with a landing site in the United Arab Emirates.

8. ALETAR link from Alexandria, Egypt to Tartous, Syria; and BERYTAR link, from Beirut, Lebanon to Tartous, Syria.

9. According to ESCWA, 18 percent of Arab banks offered online transaction facilities in 2000.

10. See Box 1 Tejari.com case study.

11. See Box 2 Reach 1.0, 2.0, 3.0 case study.

12. The BSA is an industrial alliance grouping the software and Internet industry, focussing on protecting software copyrights and cyber security.

13. Public statement of H.E. Saleh Abdulrahman Al-'Adhel, KACST president, February 1998.

14. FLAG is a global IP and telecommunications carrier. See http://www.flagtelecom.com.

15. SE-ME-WE is a global cable link between Southeast and East Asia, the Middle East, and Western Europe. See http://www.marine.francetelecom.fr.

16. Such initiatives include Tunisia's 1998 "Publinet" initiative, Algeria's "multiservice kiosks" 2000 initiative, and the recent Syrian Computer Society's "IT for everyone" campaign.

17. This conflict is due to the nonconformity of some corporations with internationally recognized language encoding standards such as the International Standards Organization's ISO 8859-X, and Unicode.

18. In 2001, Gartner, a consultancy firm, identified less than 1 percent of global websites in the Arabic language, with 43 percent in English and 32 percent in other European languages.

19. The institutions capable of carrying forward this mission statement already exist; they include the League of Arab States and ESCWA.

20. Following the Indian joint-venture law requiring majority local ownership and requiring technology transfers as a prerequisite to business operations.

21. They could be complemented with "electronic notebook" programs in schools as well as more pervasive approaches to create real "stickiness" of the technology.

22. For example, Microsoft acquired two local Internet portals and BATELCO, Bahrain's telecommunications operator, acquired local ISPs.

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