

**DIGITIZATION AS THE AGENT OF TECHNOLOGICAL
REVOLUTION IN STORAGE OF AND
ACCESS TO INFORMATION[†]**

ALI HOUISSA
CORNELL UNIVERSITY

Much of the information that used to exist solely print has passed into digital form. Electronic publishing has replaced to a large extent old type setting techniques, and the trend towards digitization is affecting all three segments of the information industry—computing, telecommunications, and broadcasting.

In general, “Digitizing” is perceived as encompassing:

1. The process of creating and publishing new digital documents or resources and making them universally available in various media such as CD’s, digital tapes and disks, and on the Internet.
2. The process of converting the content of physical media or analog materials (including periodical articles, books, manuscripts, cards, photographs, vinyl disks, film, audio, and video etc.) to digital format, the binary form used by the computer.

While online publishing is popular and cheap, simple archiving to tape and CD for both conservation and backup is a major part of digitization. As an example, 100 images of a large poster in 4 different resolutions, the highest being print quality, can be stored on a standard digital compact disk. Converting information to digital form offers efficient means of storing and accessing information, while it ensures that each copy retrieved is exactly identical to the original. Computer data storage makes it possible, for instance, to fit the entire Quran (including both text and recitation) along with several collections of *Ḥadīth*, *tafsīr*, and *Fiqh* on a single CD-ROM.

Digital technology is not without peril: digital information may be at risk of disappearing or becoming inaccessible. Either the media on which the data were stored might be disintegrating, or the computer hardware and software needed to retrieve digital information might become obsolete. Here are a few examples to illustrate this:

[†] Editor’s note: This paper was presented as a contribution to the MELA-sponsored Roundtable “The Technology of Information: the Middle East” at the December, 1999, Annual Meeting the Middle East Studies Association in Washington.

To date digital technologies have not achieved stability in media acceptable for preservation of materials, if the digital version is intended to replace, rather than supplement, the analog version. We simply do not know how long digital information will remain stable. Change occurs so swiftly that already libraries are reporting that they have digital holdings they cannot read. A recent survey of 54 members of the Research Libraries Group, an international consortium of universities, libraries, and other research institutions, found that 36 had digital materials, and 15 said they lacked the ability to read some of those materials, including those stored on certain floppy disks.

Plain data has to be copied onto new media every 10 years to stay ahead of physical deterioration and the junking of machines that could have read outdated formats. Example: NASA used magnetic tape to gather data for years during the Viking Mars mission that began in 1976. Today, 10 to 20 percent of the tapes have significant errors because, as technicians at the Jet Propulsion Laboratory now say, magnetic tape is “a disaster for an archival storage medium.”

Federal law requires the Census Bureau to retain records on “permanent” storage media. Data for the 1960 census were recorded on magnetic tape. Sixteen years later, when the National Archives asked the Census Bureau to provide parts of the 1960 data that had “long-term historical value,” the Bureau took three years to furnish the records, because it no longer had machines capable of reading the data.

As part of an effort to build a massive digital library, the Bibliothèque Nationale in Paris is putting important French works on digital tape and then posting them online. Aware of the fragility of tape, the librarians are also making copies of digitized works on special glass-coated CD-ROMs, which they expect will last one hundred years or more—the typical life span of paper.

The Internet

It is perhaps Internet communication technologies, the medium intended for the widest distribution of knowledge, that will have the greatest impact on digital publishing. The World Wide Web and its standard protocols (including E-mail, FTP, etc.) offer some hope that publishers and archivists can format both old and new data in ways that will remain retrievable, and understandable, for a longer time. In fact, publication of materials on the Internet is rapidly becoming the medium of choice.

The Middle East stands today at a crucial point with respect to what the Internet can offer, and it has not yet fully delivered its potential to the region. With only about a million users online in the entire region of roughly 250 million, it ranks dead last in terms of Internet usage worldwide. Contrast that with 100 million Internet users in the United States, 24 million in Asia, and 5 million in South America. Technical, social, as well as political factors represent major hurdles to the Internet's expansion in the Middle East.

Infrastructure and Connectivity

The Internet is entirely dependent on telecommunications networks for data transmission. The type and quality of those networks determine the level of connectivity. In general, the quality of the underlying telecommunications infrastructure and bandwidth (i.e., transmission and carrying capacity) for international connections are the measures of quality. Other, more direct, measures of connectivity are the number of telephone lines per capita in a given country and the cost of computer hardware equipment and software.

In the Middle East and North Africa, the quality of online services and networked access varies widely from country to country according to the quality of the post, telegraph, and telephone (PTT) services. The PTTs, in most countries are the sole telecommunication providers, but remain strictly regulated, state-owned and controlled. While the majority of countries in the region are improving their telecommunications infrastructures, telephone systems by and large are still analog. In addition, the prevalent small capacity bandwidth imposes serious limitations on connection speed and data transmission. Therefore, newer modems (56K or faster) are less reliable there than older (9.600K) modems, because of modem connection failure at attempted higher speeds. The local phone switching systems cannot adequately support modems. Telephone bandwidth is low and congested, even in countries with relatively modern telephone systems. This causes slow Internet connections and downloads, which is especially problematic when browsing the Web. In Turkey for instance, it can take half an hour to receive 10 e-mails from an out-of-the country mailbox.

Internet Connectivity in the Middle East & North Africa Services & Costs

Country	Country code+	Account Setup fee++ (average)	Monthly rates/ Subs.++ (average)	Hours included (average)	Internet users (per 1,000 1995)*	Main tel. lines (per 1,000 1995)*	Personal computers (per 1,000 1995)*	GNP (per Capita 1995)*
Algeria	DZ	\$19	\$23	30	3.0	42	N/A	\$1,600
Bahrain	BH	\$66	\$27	N/A (\$3.98/hr.)	50.3	242	1.7	\$7,840
Egypt	EG	\$30	\$38	No limit	N/A	46	0.3	\$790
Iran	IR	\$50	\$238	60	N/A	76	N/A	\$2,300
Iraq	IQ		N/A			33	N/A	\$2,100
Israel	IL	\$30	\$35	35	100	418	53.5	\$15,920
Jordan	JO	\$70	\$31	15	8.0	73	0.2	\$1,510
Kuwait	KW	\$165	\$99	130	56.2	226	2.1	\$17,390
Lebanon	LB	\$75	\$25	N/A	12.5	82	0.6	\$2,660
Libya	LY		N/A			59	N/A	\$6,500
Mauritania	MR	\$471	\$565	No limit	N/A	N/A	N/A	\$460
Morocco	MA	\$52	\$42	20	1.7	43	0.1	\$1,110
Oman	OM	\$57	\$66	44	12.7	79	(1997)10.9	\$4,820
Palestine	PS	\$50	\$25	No limit	N/A	N/A	N/A	\$2,800
Qatar	QA	\$55	\$14	N/A	N/A	223	1.8	\$11,600
Saudi Arab	SA	\$54	\$27	N/A	(1997) 1.5	96	0.1	\$7,040
Sudan	SD	\$560	\$35	15	N/A	3	N/A	\$400
Syria	SY	\$105	\$100	N/A	0.1	63	N/A	\$1,120
Tunisia	TN	\$50	\$65	N/A	6.7	58	0.1	\$1,820
Turkey	TR	\$50	\$14	15	12.5	212	0.8	\$2,780
U.A. Emir	AE	\$82	\$27	5	48.4	283	1.1	\$17,400
Yemen	YE	\$34	\$27	6	N/A	12	N/A	\$260
USA	US	\$25	\$20	No limit	328	626	38.0	\$26,980

+ ISO 3166 Maintenance Agency. (Latest update: Thursday, 7 August, 1997).

++ Rates vary according to the type of access (dial-up; dial direct; Dedicated, etc.) and the status of the user (business; educational; residential, etc.). Figures here are for one standard educational/residential connection, as provided by an ISP for the country.

* *Human development report*. 1998. New York ; Oxford : Published for the United Nations Development Programme by Oxford University Press, (c)1998. United Nations Development Programme, 1 UN Plaza, New York, NY 10017 (pp. 166–167; 193)

* *World Development Indicators*. 1998. Washington, World Bank (pp. 12–14).

Until recently, Internet connections in several countries were provided only through a proxy server in a neighboring country, or even as far away as Europe. With the recent expansion of the Internet, the number of ISP's, Internet-related private companies, commercial ventures, and service providers is increasing steadily. And so is demand for those services, which includes e-mail, the Web, information servers, access to online databases, and Web site authoring and hosting.

Internet Users in Selected Arab Countries[†]

Internet Users in Arab World Close to One Million

A DIT survey shows that the number of surfers has increased to more than 920,000 by the end of last month, April [1999]. Growth rate—highest in Saudi Arabia and Lebanon—is expected to spur the development of e-business and other online services in the region.

By Fawaz Jarah, DIT Online Editor

Dubai: 30 May 1999

RANK	Country	Subscribers	Subscribers	Users	% Growth in 4 months
		Dec1998	April 1999	April 1999	Dec'98–April'99
1	UAE	61,200	81,700	204,300	33.5%
2	Lebanon & Syria*	30,700	52,900	132,200	72.3%
3	Egypt	36,400	51,800	207,200	42.3%
4	Saudi Arabia**	18,700	45,000	112,500	140.6%
5	Kuwait	22,000	25,100	62,800	14.1%
6	Jordan	16,600	20,100	50,300	21.1%
7	Oman	12,700	16,000	40,000	26.0%
8	Tunisia	4,700	6,000	15,000	27.7%
9	Morocco	11,200	14,100	32,5000	25.9%
10	Bahrain*	11,700	13,000	32,5000	11.1%
11	Qatar	8,500	11,000	27,500	29.4%
12	Yemen	2,200	2,500	6,300	13.6%
Total		236,000	338,200	923,100	

Statistics were rounded to the nearest 100. Margin of error: ± 5 .

* Syrian subscribers form a small portion of the combined statistic. They mostly have only e-mail connections.

** Saudi statistics are conservative and could rank much higher. Bahrain statistics include Saudi subscribers—excluded from the Saudi statistics.

[†] Figures based on the study *Internet Users and Subscribers in the Arab World*—May, 1999. Produced by Dabbagh Information Technology Group, Dubai, United Arab Emirates (<http://www.ditnet.co.ae>).

Residential access and use are clearly rising, despite difficulties in getting phone lines installed and affording services. Providers who lease lines are paying a high cost for international and satellite connections. These high tariffs result in high fees and surcharges that are passed on to the user. The result is that perhaps e-mail the only affordable Internet service for many.

Scripts and Languages Online

The dominance of English-language materials on the Internet is still a major factor in limiting the growth of the Internet in the region. Technically, the source of the problem was initially Arabic text on the Web. Because of the lack of Arabic script HTML editors—and browsers able to read the vernacular—text had to be rendered as large graphics files. As pages, these were extremely slow to load into a browser screen. The development of software specifically configured to process and display Arabic character sets for the Web and e-mail is helping to improve the Internet's capabilities and broaden its use by speakers and readers exclusively of Arabic. **Sakhr**, the oldest software company in the Arab world, has developed *Sindbad* Arabic browser and HTML editor, and **Microsoft** has released its *Arabic Office 97*—and later Arabic-capable versions—along with *Word Internet Assistant*. Both have made Web publishing and surfing the net in Arabic script a reality. Nevertheless, according to *Internet Arab World (IAW) Magazine*, 40% of users it surveyed are still not able to use Arabic characters online with their browsers. **Adobe Systems, Inc.**, the publishing and imaging software company, developed its *Adobe Acrobat® Reader 4.0 ME* (Middle Eastern), which allows reading of Portable Document Format (PDF) files that contain Arabic and Hebrew characters. In addition, *Reader 4.0 ME* allows copying Arabic and Hebrew text and searching within PDF files that contain Arabic and Hebrew text. In Israel, **Accent Software**, a leading producer and supplier of multilingual software, was a pioneer in developing a Hebrew-language word processor. It now offers an array of multilingual software, including Arabic script products.

Internet Access Control and Regulation

Internet use is heavily policed in most countries in the region, and there is clear caution and reluctance to make the medium available to the wider public. The degree and type of control vary from country to country. In Iran, for instance, users who are already monitored by Internet service providers (ISPs) must promise, among other things, that they will not contact parties and sites deemed offensive to Islamic moral values. The conservative Persian language monthly *Sobh* called for a ban on the Internet. Paradoxically, the Speaker of the Iranian Parliament called for exporting the Revolution

via the Internet and taking advantage of technological development to propagate the late Khomeiny's ideology. In Saudi Arabia, control over access is even more obtrusive. Under a system that took two years to develop, all Internet connections in the country have been routed through a hub outside the capital, Riyadh. High-speed government computers were set up to block access to thousands of sites cataloged on established blacklists: sites of hostile opposition groups, for instance, some types of chat rooms, gambling sites, etc. ISP's in Gulf states, by orders of the government, use, in addition to proxy servers and firewalls, commercial filtering software such as *Smart Filter*, a system that is updated every day by adding sites to the blacklist. In Tunisia, Internet-specific and detailed legislation was enacted in the middle of 1999.

An extreme case, described by the Arabic press as the "first Internet crime," consisted of the arrest of a man in Jordan on the charge of using the Internet to "defame the king." What is particularly unusual about the case is that the substance of the charge—defamation—is based on an act, a critical political opinion expressed by the accused that took place on the Internet, when he was in the United States. The Jordanian State Security Court was to decide the case. In some other countries, however, including Egypt, Jordan, Lebanon and Morocco, for financial and logistical reasons, authorities have given up on policing the Internet, which is now accessed with minimum restriction.

Intellectual property and Copyright

Ironically, while excessive effort is exerted to control contents and free online access, software pirating and copyright infringement are tolerated. These infractions have been major concerns of Western-based businesses involved in computer and Internet-related business with the Middle East. According to Business Software Alliance and Software Publisher Association, although these infringements are on the decline, the damage is estimated at \$92 million in 1997 alone, down from \$127 million in 1996. That represents 65% of the software and programs marketed in the region for 1997 and 74% for 1996. It will take more than the goodwill of national governments to reduce pirating, when software market prices are beyond the reach of the overwhelming majority of computer users in their respective countries.

Internet and related information technologies have significant economic consequences at all levels. In a case study about Tunisia, Clement Henry demonstrates how close state control of information impedes economic development and scares away foreign investment. Although information is but

one component in the general economic picture, he argues, it is becoming even more important with the globalization phenomenon and the increased interdependency of investment and financial institutions worldwide. Gaining access to accurate information about debtor nations, for instance, is crucial for investors. Middle Eastern and North African countries, where almost everything is politicized, are having a hard time separating what is considered purely economic information from the political. This, according to Henry, could lead to poor performance in many economic sectors by making the country less attractive to foreign investors.

Bibliography

- Adobe Acrobat Reader 4.0 ME (<http://www.adobe.com/prodindex/acrobat/acrmideast.html>).
- Business Software Alliance. *Software Piracy in the Middle East 1998*. (<http://www.bsa.org/middleeast/statistics/index.html>).
- Fantūkh, ‘Abd al-Qādir ibn ‘Abd Allāh. *al-Intirnit lil-mustakhdim al-‘Arabī*. – al-Ṭabāḥ 1. – al-Riyāḍ : al-‘Ubaykān, 1998.
- Goldstein, Eric. *The Internet in the Mideast and North Africa: Free expression and censorship*. – New York : Human Rights Watch, ©1999.
- al-Ḥayāh. – London : al-Ḥayāt, 1946– . *Awwal ‘jarīmat Intirnit’ fī al-Urdun baṭaluhā hāwin lil-siyāsah yantaqid al-tatbīr*. 30 Aug., 1999: p. 1.
- : *Ra’īs al-Barlamān al-Īrānī Ywayyid Taṣdīr al-thawrah bi-wāsiṭat al-Intirnit*. al-Ḥayāh, 19 Sept., 1999, p. 3.
- Henry, Clement M., 1937– *Challenges of global capital markets to information-shy regimes : the Case of Tunisia*. – Abu Dhabi : Emirates Center for Strategic Studies and Research, 1998. 53 p. ; 24 cm.—(The Emirates occasional papers ; no. 19)
- Intirnit al-‘Ālam al-‘Arabī = Internet Arab World (IAW)*. Dubai, United Arab Emirates, Dabbagh Information Technology : Nov. 1998, pp. 38–39.