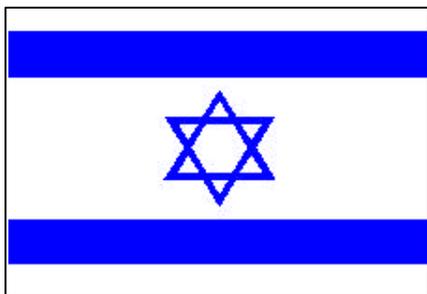**The Global Diffusion of the Internet Project**

THE STATE OF ISRAEL

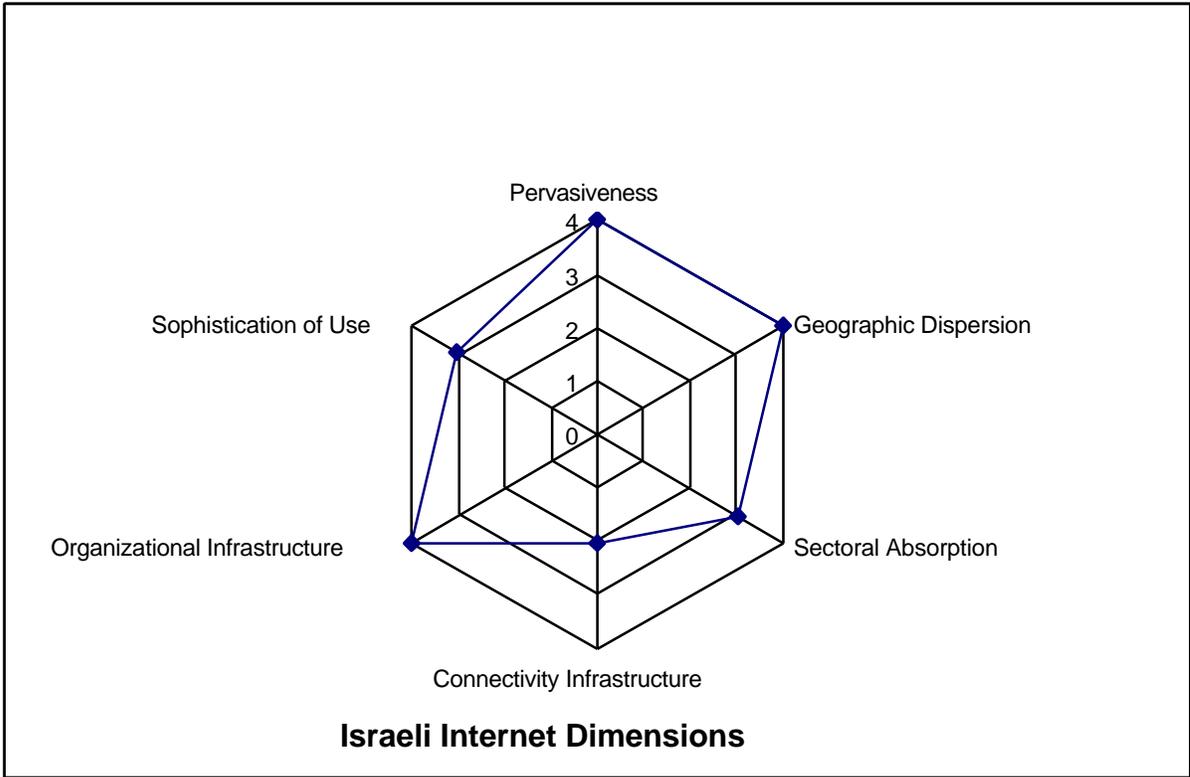November 1999

Phillip Ein-Dor

Seymour Goodman

Peter Wolcott

Executive Summary

Dimension	Level	Explanation
Pervasiveness	*(4)* PERVASIVE	The number of Internet users in Israel currently constitutes about 13% of the population. This is comfortably beyond the 10% criterion for Level 4 pervasiveness. The number of users is predicted to grow to 26% by 2002.
Geographic Dispersion	(4) *Nationwide*	ISPs have points of presence in all major cities and many smaller ones. A number of points of presence are accessible by local area dialup in all area codes. Thus, accessibility is universal.
Sectoral Absorption	(3) *Common*	Absorption is rated moderate in all four sectors defining this dimension. This leads to a rating of Level 3 overall. The level of absorption seems to be very similar in all four sectors. This is true when each sector is taken as a whole; however, there are sometimes wide differences within sectors, as for example between higher education and K12.
Connectivity Infrastructure	(2)	In terms of local and international connectivity, Israeli bandwidth rates as Level 1. In terms of Internet exchanges it rates Levels 2-3 and in access methods, it rates Levels 4. The overall rating has been set at Level 2.
Organizational Infrastructure	(4) *Robust*	Telecommunications in Israel are competitive except for landlines, and that infrastructure is about to be opened to competition. There are numerous ISPs; although a license is necessary to offer leased line or international service, many ISPs operate without one, by dialup only. In general, the organizational infrastructure is competitive and not heavily controlled.
Sophistication of Use	*(3)* TRANSFORMING	The most common use of the Internet in Israel is for e-mail. Not many sites offer transaction-processing possibilities and e-commerce is in its infancy. These aspects of use in Israel fit the Level 2 rating – Conventional. However, the very sophisticated application development of the Israeli software industry rates Level 4 – Innovative. Consequently, this dimension was rated in between – at Level 3.

Table 1. Internet Dimensions for Israel

Israeli Internet Dimensions

Radar chart showing Israeli Internet Dimensions across six axes (scale 0–4): Pervasiveness (4), Geographic Dispersion (4), Sectoral Absorption (3), Connectivity Infrastructure (2), Organizational Infrastructure (3), Sophistication of Use (3).

Introduction

The State of Israel, generally referred to simply as Israel, is a small, densely populated country on the southwestern edge of Asia. It occupies a narrow strip of land on the eastern shore of the Mediterranean Sea and shares borders with Lebanon, Syria, Jordan and Egypt. The capital and largest city is Jerusalem while Tel-Aviv – Yafo is the commercial and cultural center.

Israel was founded as an independent state in 1948. The formative events of Israel's history since then have been a number of wars with neighbouring states, a constant threat of terrorism, and mass immigration.

Figure 1. Map of Israel. territories that are home to more than 1 million Palestinian Arabs. Israel's occupation of these territories further inflamed Arab-Israeli tensions. The Yom Kippur War of 1973 ended in a political stalemate which was broken by the peace agreement with Egypt (1979) and with Jordan (1994). In 1994, Israeli troops withdrew from the Gaza Strip, and by 1996, they had withdrawn from most cities and towns of the West Bank. The withdrawals were part of 1993 and 1995 agreements with the Palestine Liberation Organization (PLO), which represents Palestinian Arabs. The agreements with the Palestine National Authority are temporary and the status of the Occupied Territories is to be determined in a Final Status agreement, negotiations over which are due to begin. Israel still has no peace agreements with Lebanon or Syria and is subject to ongoing terrorist

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attacks by radical Palestinian groups opposed to compromise.

When Israel was founded in 1948, the Jewish population numbered some 650,000. Since then, the population has grown almost tenfold to about 6 million. This includes an Arab minority of about 1 million. Much of the population growth is attributable to immigration which has continued, albeit at varying levels, throughout the period. The rest of the growth is due to natural increase.

Israel has few natural resources and imports more goods than it exports. Still, it has achieved a relatively high standard of living. The economy has undergone a transformation from largely agricultural and low-tech industry to the point where hi-tech industries are now the dominant factor driving the economy.

The State of Israel is a democratic, parliamentary republic. There is a single elected house – the Knesset - with 120 members. The government is headed by the Prime Minister, who is directly elected by the populace. There is also a President who is the official Head of State, a largely ceremonial post with no executive authority

Table 1: Israel in Statistics

Metric	Value	year	source
Population	6,104,000	VII 1999	1
Area	22,145 sq. km.		1
Population density	265 per sq. km.	XII 1997	1
GDP	US$101.9b est.	1998	4
GDP per capita at PPP	US$18.100 est.	1998	4
Telephones	2,800,000	1999	2
Teledensity	45.9 per 100	1999	2
Cellular subscribers	2,500,000	1999	2
Cellular density	41 per 100 population	1999	2
PCs	1,100,000	1997	3
PC density	18.0 per 100 population	1997	computed
Television receivers	1,900,000	1997	3
Television density	30.9 per 100 population	1997	computed
Life expectancy at birth (females)	79.9 years	1996	1
Life expectancy at birth (males)	76.3 years	1996	1
Literacy	95%	1998	4
Infant mortality	6.9 per 1000 live births	1997	1

Sources:

- Central Bureau of Statistics. *Monthly Bulletin of Statistics* Vol. 50, August 1999, http://www.cbs.gov.il

- Daniel Rosenne. Director General, Ministry of Communications. Presentation on Sept. 6, 1999. http://www.moc.gov.il/moc/dows/Serve/item/English/1.2.14.1.html/ (accessed Sept. 24, 1999)

- International Telecommunication Union http://www.itu.int/ti/industryoverview/at_glance/basic98.pdf 17-Jun-99
- Central Intelligence Agency. *The World Fact Book 1999* http://www.odci.gov/cia/publications/factbook/index.html/ "In general, information available as of 1 January 1999 was used in the preparation of this edition." (accessed October 9, 1999)

Background

The diffusion of the Internet in Israel has taken place against a rich background of developments in related areas. In particular, economic growth and privatization of telecommunications have played a substantial role.

A period of rapid economic growth began in about 1990 together with the mass influx of well-trained immigrants from the former Soviet Union. The large number of scientists and engineers among the immigrants, together with an expansion of the higher education system energized a transformation in the structure of the economy, which was already in progress. The structural transformation was one from an economy dependent largely on agriculture and manufacturing to one that has become oriented on high tech industries. Two indications of this transformation are 1) a growth of 146% in exports of high tech products[8] between 1990 and 1997 compared to 78% growth for total exports in the same period and 2) the large number of IPOs of Israeli high tech companies, mainly on NASDAQ. Over 70 Israeli shares are listed on NASDAQ, second only to Canada among foreign countries.

First we present a short history of the Internet in Israel followed by a discussion of the factors which influenced it.[9] The Internet was initiated in 1984 and reached its peak to date with the connection of Israel to Internet 2. Developments throughout this period are presented as a timeline.

Internet Timeline for Israel

1984	Aug 13	IUCC (Inter University Computation Center) connects to EARN - the European counterpart of Bitnet - via a 9.6kb line.
1985	Q1	A 9.6kb link to CSNet became operational from Hebrew University
1987	Aug 23	Zvi Amid, Director General of Bezeq indicates that he views the existing academic network as illegal. Based on Amid's letter, IUCC decides to apply for a special license from the Ministry of Communications to operate an academic network.
1988	Nov 8	IUCC receives a special license from the Ministry of

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[8] Office and accounting machinery and computers, electronic components, electronic communication equipment, industrial equipment for control and supervision, medical and scientific equipment, and software services.

[9] This history is based on the timeline prepared by Hank Nussbacher of the Israel Chapter of the Internet Society.

Communications to run an academic and research network on a legal basis. This took a year and half, during which Bezeq refused to issue new telecommunication lines for the universities.

	Dec 21	IUCC meets with the marketing people of Bezeq. At this meeting IUCC is informed that Sifranet is no longer available and in its place is a new digital leased line service.
1989	Jan 8	IUCC orders its first 64kb lines from Bezeq (Tel Aviv to Jerusalem and Tel Aviv to Haifa). These two lines are ordered "on faith" since Bezeq cannot state what the new price is to be.
	Jul 12	IUCC orders a 56kb link from Weizmann to Nysernet in the United States - the first international Internet circuit from Israel.
	Sep 13	Bezeq informs IUCC that 56kb service to USA is not available for at least the next 10 months and therefore IUCC immediately places an order for a 9.6kb line to USA.
1990	Feb 15	First national 64kb link (TAU-Technion) becomes operational, 11 months after having been ordered. Rest of lines are connected during February and March - total delay 11-12 months from time of order.
	Mar 3	IUCC becomes a registered Israel Non-Profit Organization.
	Jun 26	First international Internet link becomes operational at 9.6kb to USA. Haifa-Technion 64kb link is still not operational.
	Oct 2	A 64kb link is ordered from IDB to Nysernet and Bezeq is informed of our choice. Bezeq claims 60-90 days to get the line operational.
1991	Mar 11	International 64kb Internet link to USA made operational (5 month delay - best record so far for Bezeq).
	Mar 19	Bezeq gets order for 64kb line to Europe from TAU.
	Jun 6	Meeting with Ministry of Industry and Trade, Ministry of Science and Ministry of Communications. The three ministries request IUCC to alter its telecom license to allow companies to connect to the Internet via IUCC.
	Jul 23	BGU-HUJI 64kb is operational (16 months delay)
	Oct 14	HUJI-Weizmann 64kb line installed (19 months delay)
	Oct 21	First European Internet link to CERN (Ebone) operational at 64kb (7 month delay)
	Nov 27	Haifa University finally connected at 64kb after 2.5 years wait.
1992	Jan 1	BIU-Weizmann 64kb link installed (21 months delay). Haifa-Jerusalem 64kb link still not installed.

	Feb 20	IUCC turns down the government request to be a nationwide ISP. IUCC agrees to be a leased line Internet Service Provider but not a dial-up service provider. Based on this meeting Actcom, Dataserv and Netmanage (later renamed Netvision) receive approval from the Ministry of Communication to become dialup Internet service providers by the end of the year.
	Mar 21	128kb upgrade ordered to USA
	Apr 10	IUCC license altered to allow companies to connect via leased lines. The decision as to who is allowed to connect is handed over to an inter-Ministry committee.
	Nov 17	1st 128kb national line installed, 15 months after being ordered. The other 9 lines were still not upgraded.
	Dec 15	First Israeli ISP - Trendline (Kav Manche) - is operational via a 9.6kb line to IUCC.
1993	Jan 25	9 out of 10 128kb lines have been installed. The Technion-Jerusalem line has been installed after 2 years and 10 months of delay.
	Jan 26	The line to the USA has been upgraded to 128kb. The delay was 10 months from time of order. This line was not via Bezeq but was ordered from Israsat.
1994	Jan 19	Line to USA upgraded to 256kb via Israsat.
	Feb 24	3 MAN connections started operation at 10Mb/sec
	Apr 12	First of the existing Sifranet lines removed
	May 22	Ministry of Communications grants full Internet licenses to 3 companies: Elron, Darcom and Netmanage (which later buys out Elron).
	Nov 15	Line to Europe upgraded to 128kb
1995	Jan 1	Last of the 7 universities connected to the MAN network
	Mar 10	Netvision is formed from parts of Netmanage
	Sep 20	Internet Society of Israel forms under ILA
	Oct 1	IUCC disconnects from PSI (256kb) and connects via T1 (1.5Mb/sec) to IBM Israel.
	Dec 17	Internet Society of Israel decides to create Israeli Internet Exchange after IUCC told to remove all commercial organizations from its network
	Dec 20	IUCC disconnects its 256kb to Europe.
1996	Mar 21	1st Israeli ISP bankruptcy - Dataserve

	Jun 27	Last Israeli ISP disconnects from IUCC as per Ministry of Communications request
	Jul 2	The Israeli Internet Exchange (IIX) is operational
	Nov 12	Bezeq starts 135 Internet service, offering Internet connectivity without an ISP via its 135 number
1998	Jan 11	2nd Israeli ISP bankruptcy - Starnet
	Oct 21	3rd Israeli ISP bankruptcy - Shani
1999	Apr 20	IIX begins connecting ISPs via Bezeqcom ATM network
	May 21	First Internet-2 connection operational - E3 (34Mb/sec) from Bar-Ilan University to London.
	July 2	Six universities connected to Magnet (155Mb/sec) and Bezeqcom (10Mb/sec) ATM national networks
	August 2	Second Internet-2 link operational - T3 (45Mb/sec) from Tel-Aviv University to Chicago

Perusing this time line, one senses the major factors affecting Internet development in Israel – the triangle of forces between Internet service providers, both academic and commercial, Bezeq, The Israel Telecommunication Corporation Limited and the government, represented by the Ministry of Communications. Each of these stakeholders has different interests, and the interplay between them determines the nature and speed of developments. The functions of the stakeholders, in a nutshell, are as follows:

Ministry of Communications

The role of the Ministry of Communications is a regulatory one. There has been a separation between regulation and operation since the establishment of Bezeq in 1984. Until then, telecommunications services were provided by the Ministry of Posts and Communications, which later became the Ministry of Communications. The responsibility for the country's communications was divided between the Ministry of Communications and Bezeq. As a result, regulatory responsibility now resides in the Ministry of Communications, while Bezeq performs operations.

Those of the Ministry's activities which are relevant to this study include setting telecommunications policy, regulating telecommunications activities, developing telecommunications infrastructures, supervising Bezeq and other telecommunications service providers, setting & auditing Bezeq tariffs, managing spectrum allocation, regulating and supervising cable television services and tariffs, and approving usage of telecommunications equipment.[10]

The major policy orientation of the Ministry at present is one of liberalization, privatization, and encouraging competition among telecommunication service providers.

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[10] For more details on activities of the Ministry of Communications, see http://www/moc.gov.il.

This policy is based on the recommendations of the Peled Commission on Extending and Reforming of Broadcasting Choice.[11] Bezeq is currently 54% government owned with 12.7% of the shares held by Cable and Wireless and the rest publicly held and traded on the Tel-Aviv Stock Exchange. An additional 14% of the government's shares are due to be sold in 1999, reducing the Government's holding to 40%. However, The Minister of Communications has accused the Ministry of Finance of obstructing further privatization; this is presumably because Bezeq is profitable and its profits accrue to the Government.

There is currently competition in international telephony with three operators, one of them, Bezeq International, a subsidiary of Bezeq. Cellular telephone service is also provided by three operators, as is cable television service. In 1999, licenses are due to be granted to domestic telecommunications operators, after Bezeq lost its exclusive rights in the domestic fixed services market as of June 1, 1999.

Bezeq, the three cellular operators, and the three facility-based international telecommunications service providers are issued general operating licenses. In addition, the Ministry of Communications issues special licenses, which cover other activities.

The most recent development is an announcement by the Minister of Communications that licenses for data services will soon be issued to the cable television operators, who have been providing such services on a restricted, experimental basis for some time.[12] In fact, the decision is more far-reaching and will permit granting Internet service licenses to any firm with communications infrastructure in Israel. At present, only Bezeq and the cable operators possess such infrastructure. The cable operators are partly ready to serve as ISPs and should complete their preparations in the first quarter of 2000.

Bezeq

As a commercial undertaking, Bezeq is obviously interested in expanding its service offerings and its user base. As the CEO of Bezeq notes on the company's web site:

> "Our strategy is not limited to the expansion of value-added services. Bezeq International has acquired ISDN-NET and Trendline, two popular ISPs, which will serve as a springboard for growth in Internet services. Bezeq International aims to become one of the largest ISPs in Israel. Furthermore, Bezeq has an option to buy into Walla, the largest Hebrew portal, and has acquired Infogate, a content provider. A consortium in which Bezeq is the major shareholder (30 percent) has been awarded a license for the introduction of DBS services in Israel. At the turn of the century, Bezeq will introduce public pay phones working on Smart Cards. Plans for the future also include cooperation in the supply of broad bandwidth content, and a position in e-commerce."[13]

Thus, Bezeq is in competition with other communications services providers on the one hand, and striving for maximal freedom from the regulator on the other. This has been

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[11] http://www.moc.gov.il/new/documents/peled/peled.pdf
[12] Sagi Chametz. "The Ministry of Communications Will Issue Licences to Provide Internet Services by Cable Within a Few Weeks." *Ha'aretz.* October 12, 1999.
[13] http://www.bezeq.co.il/newsite/eng/about_bezeq/index.html

realized, for example, in attempts to avoid or defer competition in local telephony and aggressive sales of Internet services.

ISPs

The ISPs are for the most part, commercial organizations. Thus, they are interested in high revenue and low costs. In terms of technology, the ISPs are interested primarily in the ready availability of reliable connectivity infrastructure, of sufficient bandwidth. To lower costs, they require that the infrastructure be made available at reasonable and competitive cost. To raise revenue, they need as many subscribers as possible. In particular, the ISPs demand a level playing field in which the as yet monopolistic infrastructure provider, Bezeq, does not exploit that status in competition over Internet service provision.

However, Bezeq International, the international phone subsidiary of Bezeq is entering the Internet access market. The company targets new surfers, many who have heard about the Internet but have never tried it, or who are afraid of the complexity of the new technology. In order to attract this audience, the company has instituted a 1.5 million dollar advertising campaign that will include television, radio, newspaper and billboard coverage.

Bezeq International offers two connection deals: one deal allows five hours of surfing a month for NIS 10 (about US$2.50), with NIS 5 (about US$1.25) for every additional hour. The second package allows unlimited surfing for NIS 140 (US$34) per month. [14] Bezeq, the local phone company, also offers Internet connectivity without an ISP via its 135 number.

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[14] Benny Run. "Bezeq International enters the Internet Arena." InternetNews.com. http://www.internetnews.com/intl-news/article/0,1087,archive_6_137821,00.html June 14, 1999.

Dimension Determinants

The Government

The Government of Israel has played a somewhat ambivalent role in connection with Internet development. On the one hand, it has made a number of statements as to the importance it sees in the role of the Internet in Israel's economy. It has also put in place a number of initiatives to encourage Internet use and to expand its own use. On the other hand, it has so far been unable to bring Bezeq, the landline monopoly holder, into full compliance with such a policy. Following are some details and indications.

In 1996, then Minister of Science Michael Eitan appointed eleven committees to make recommendations concerning Israel's preparation for the Information Age (HILA in Hebrew). The committees' reports became available in May 1997. The committees of most relevance here included:[15]

- Government organization

- Accessible government

- Communications infrastructure and regulation

- Electronic commerce

- Data bases

- Data security

The recommendations were approved by the government, including the establishment of a unit within the Prime Minister's Office (HILA) to implement the recommendations. In fact, the unit was established but given low priority by the then Prime Minister and so achieved little. This in spite of the humbling news that Israel, which considers itself a technology leader, placed only twelfth in 1998 in Internet penetration.[16] The main reason given was the high cost of Internet use in Israel.

This exercise indicated that although aware of the importance of the issue, the government was unwilling to make the effort required to make the major changes necessary. Of particular interest here are the recommendations concerning the telecommunications infrastructure. These included:

- to open the telecommunications market to free competition

- to allow private initiatives to operate independent regional networks

- to open the data communications market to all suppliers, especially existing communication providers already reaching subscribers' homes

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[15] The reports are available, in Hebrew, on the Knesset web site at
http://www.knesset.gov.il/knesset/docs/infocom/visual/final101.htm
[16] Matthew Broersma. "Israel set to duble its Net population." July 6, 1998.
http://www.zdnet.com/zdnn/stories/news/0,4586,2117745,00.html

- to issue licenses to provide wireless data communications in order to increase competition with an additional infrastructure and under different costing assumptions from the present ones.

While not yet particularly successful in imposing its will on Bezeq with respect to local phone service, advances are being made in advancing the use of the Internet for conducting Government business. Thus, it was recently announced that the Ministry of the Interior is developing a system to issue identity cards and passports via the Internet. In February 1999, the government took out full page advertisements in the daily newspapers in which it published e-mail addresses of a number of functions in each ministry and various other government units; these include: Offices of the Minister and Vice-Minister, Office of the Director General, The Spokesperson's Unit, The Unit for Petitions from The Public.

Bezeq

As mentioned above, a major impediment to greater Internet diffusion in Israel is exploitation of the monopoly in landlines enjoyed by Bezeq. This has been expressed in a number of ways. Some examples:

- When Internet use started to take off, Bezeq reverted to charge by unit of time for local calls rather than the previous charge per call.

- Competition in land lines was supposed to have begun in January 1999. Bezeq has managed to obtain deferments until the time of writing, in November 1999. While the Minister of Communications has declared that competition will be initiated shortly, it is still not clear when this will happen.

Bezeq's activities are not due to any misunderstanding on its part of the importance and future of the Internet. On the contrary, Bezeq recently reported its estimates that 14% of its revenue at the end of 1999 will be from Internet time.[17] The contribution of Internet time to Bezeq's revenue has grown from 9% at the end of 1997, to 12% at the end of 1998, to the current 14%. This estimate is based on the fact that the number of Internet minutes will reach 2.8 billion in 1999 compared to a total of 20.5 billion minutes in each of 1997 and 1998.

Moreover, Bezeq is not waiting passively for its Internet revenues to increase; it is actively becoming an ISP through its Bezeq International subsidiary.

Connectivity cost

The cost of connectivity is considered very high and so is a deterrent to more widespread use. A recent study by the International Telecommunications Union indicated that of 45 countries whose tariffs were examined, Israel was 33rd in terms of connectivity costs including fixed payment to the phone company and 36th without the fixed cost. An attempt by Bezeq to raise Internet connection costs this year (1999) was met by a threatened strike of Internet users and a debate in the Knesset; Bezeq eventually backed down and promised to lower Internet connection costs.[18]

Examples of ISP tariffs are exhibited in Table 2.

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[17] Sagi Chemetz. "14% of Bezeq call minutes – from Internet surfing." *Ha'aret*, September 1, 1999.

[18] Amir Etzioni. "A Hi-Tech Superpower with Bezeq Rates: The Real Internet Strike Is The Strike By The General Public That Does Not Use The Internet Because Of The High Prices." *Ha'aretz*, August 18, 1999.

Table 2: Examples of Internet Connectivity Tariffs

ISP	monthly cost for 10 hours	monthly cost for unlimited use	comments
Aquanet	$9.50[a]	$25.00	a. quoted as NIS10.00 per month + NIS 3.00 per hour
Barak	$8.40[b]	$13.00 for 16 hours + $1.39 per additional hour	b. rate for 6 hours at $1.49/hour; first four hours free
Bezeq International	$11.25[c]	$34.00	c. quoted as NIS 10 for first five hours & NIS5 each additional hour
Canaan Surfing	$9.50	$21.00	
Gezernet	$10.00	$24.00	
Infomall	[d]	$25.00	d. no hourly program
Internet Gold	$15.90[e]	$34.00	e. $12.90 for 8 hours + $1.50 each additional hour
Netvision	$15.00	$35.00	

The ISPs are competitive and their rates do not seem exorbitant. Thus the main cost factor diminishing Internet use is the cost of telephone service for dialup users.

Hi-Tech Industry

Not all dimension determinants are negative. There are also a number of positive factors. Perhaps the most relevant is the changing nature of the Israeli economy. Many sources refer to the transformation of the economy to one based on hi-tech industry and to Israel's leading role in global research and development. For example:

> "… the place emerging as California's most likely rival in innovation is Israel, with its close-knit society that networks ceaselessly, deals daily with risks, reveres learning, and is blessed with a torrent of well-educated immigrants from the former Soviet Union."[19]

The Internet is the lifeline for much of this activity, from coordinating R&D and software development globally, through coordinating far-flung business operations, to providing service for overseas customers. Thus, more and more pressure will be brought to bear to lower costs and to upgrade services both for businesses and individuals who become acquainted with the Internet through their jobs.

Willingness to Innovate

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[19] "A Survey of Innovation in Industry." *The Economnist*, February 20, 1999.p. 27.

Part of Israel's success in hi-tech is a willingness to experiment with new technologies. Thus, the deployment of ATMs and cellular phones in Israel was among the fastest in any country.[20] In the Internet context, two examples are:

- Internet Gold, one of the larger ISPs is to launch a portal for children.[21] The significance of this step is that it indicates the existence of a market for this age group and augurs well for increasing use in the future.

- A recent survey found that only 42% of Israeli Internet users have visited e-commerce sites and only 40% of those actually purchased – i.e. 17% of all users. However, 74% of those questioned indicated that they would be willing to make purchases over the Internet in the future.[22]

Another indication of the willingness to innovate is the impressive number of hi-tech startups. A November 1999 report noted that some 1,500 startups have been registered since the beginning of 1999. The big six accounting firms all report 1-1.5 new startups applying for their services every business day. Thus, shares of more than 70 Israeli firms are traded on NASDAQ, nearly all of them engaged in hi-tech, and a larger number than from any other country outside the US except Canada.[23]

Inevitability

In a sense, the Internet has become inevitable, and it is only a question of what the rate of penetration will be. An anecdote to demonstrate this is provided by the ultra orthodox Jewish religious community. One year ago the ultra Orthodox Community's (Eida Hareidit) Rabbinical Council announced its total opposition to Internet use, both at work and in the home. Even purchasing a personal computer was forbidden. The Belzer Rabbi joined the opposition to computer use. However, the opposition was short-lived, and computers and the Internet have become acceptable in the ultra orthodox home and office. Last week the same Rabbinical Court met and decided to remove their traditional, strong opposition to the Internet. The decision was reached after a stormy debate. If the Internet overcomes such staunch conservative opposition, its future development appears certain.

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[20] Matthew Broersma. *op cit.*

[21] Mark Klein. "Internet Gold to Launch Children's Portal." InternetNews.com. http://israel.internet.com/oct99/igold.html. October 20, 1999.

[22] Lilach Segan. "The Israelis Like Amazon.com." *Ha'aretz* September 1, 1999.

[23] NASDAQ. NASDAQ International Companies. http://www.nasdaq.com/about/NonUSoutput_I0.stm. July 19, 1999 update.

<u>Internet-2</u>

Israel is one of the early joiners of Internet-2. This network is dedicated to academia and industrial R&D. Its use may further increase dependence on Internet technologies for economic purposes and should also encourage increased use of the conventional Internet.

Finally, the efforts to increase competition in telecommunications services are continuing and it seems that they will eventually be crowned with success.

Networks in Israel

Computers

Use of PCs is well established in Israel with penetration in 1997 of about 18 per 100 population. This is considerably less than the most heavily computerized countries with about 40 per 100 population (e.g. Singapore (40.9), USA (40.7), and Switzerland (39.5)). But it is also somewhat more than the less computerized European countries (e.g. Spain (12.2) and Italy (11.3) and about the same as France (17.4) and Japan (20.2)).[24]

Communications Networks

As outlined above, Bezeq is currently the monopoly provider of landlines under regulatory supervision of the Ministry of Communications. The degree of telephone penetration is such (47 per 100 population[25]) that virtually every household has at least one telephone. To this should be added an equivalent level of cellular phone penetration, which will become highly significant for Internet diffusion once Internet access from mobile phones is readily and cheaply available. A similar effect will arise when data communications via TV cable become available; at present, the three cable operators cover 90% of households with 70% of those subscribing.[26] All three TV cable service providers have been conducting experiments on the provision of high speed Internet connectivity under license from the Ministry of Communications.[27]

As the current landline monopolist, Bezeq offers a variety of services. These include:

- ISDN services

- Frame Relay lines

- Isranet – a public communication network for switching dose technology data transmission. It is possible to connect to a personal computer or office terminal in Israel and around the world without the need for a point-to-point connection.

- Sifranet network, claimed to be amongst the most advanced in the world, and based on high bandwidth multiplexers using TDM technology. It enables secured and controlled digital data communication and employs multiplexing technology that enables the

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[24] Source: population and number of PCs, International Telecommunication Union
http://www.itu.int/ti/industryoverview/at_glance/basic98.pdf 17-Jun-99; penetration computed as number of PCs/(population/100)

[25] Rosenne, Daniel. "Israel's Telecommunications: Towards Competitive Advantage." Presentation at the German-Israeli NGI Workshop, Neve Ilan, September 6-7, 1999. http://www.moc.gov.il/moc/dows/Serve/item/English/1.2.14.1.html

[26] *ibid*

[27] Efi Landau? "Golden Channels Conducting Internet Via Cables Trial." *Globes,* Feb 7, 1999. http://www.globes.co.il/cgibin/Serve_Archive_Arena/pages/English/1.3.2.2/19990204/1

transfer of several point-to-point lines on one digital line. This is done by the allocation of resources to each line separately on a time basis.

International connections are by submarine optical cable and satellite. Israel currently has about 11 Gb/s bandwidth in undersea cables, as exhibited in Figure 2 and Table 3. In addition, satellite links are utilized for Internet connections. In particular, Israel's Internet-2 connection to StarTap in the US is via satellite – the first such connection.

Cable	Links	RFCS	Capacity
EMOS	Israel-Italy	1990	280 Mb/s
CIOS	Cyprus-Israel	1994	622 Mb/s
LEV	Israel-Cyprus-Italy	1998	5 Gb/s
FLAG	global	1999	5 Gb/s

Table 3: Submarine Optical Cables

Bezeq and Elbit Simulation are reported to be making a major investment in the Oxygen global submarine communications network linking some 75 countries. As a result, the first phase of the project will be to lay an optical fibre link between Israel and the US via Europe.[28]

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[28] Sagi Chemetz and Yoram Gavison. "Bezeq Int'l, Elbit buy 40% of Project Oxygen" *Haartetz,* Monday, October 25, 1999

Figure 2: Submarine Optical Cables Infrastructure

Internet Service Providers

There are currently 8 licensed and active ISPs in Israel and about another 15 unlicensed.[29] The unlicensed providers are permitted to offer service, but only by dialup and cannot offer leased lines. For small ISPs, the cost and administrative overhead of obtaining a license apparently render it unattractive. Many of the unlicensed ISPs have only a single POP in one area code or POPs in only a small number of area codes.

Appendix 1 contains a list of the ISPs identified, some of their characteristics, and number of subscribers, where known. Connectivity maps for the major ISPs and for the Israel Internet Exchange (IIX) are available from iGuide at http://www.iguide.co.il/maps.htm.

Number and Domains of Servers

Domain names in Israel are administered by the Israel Chapter of the Internet Society, which has been delegated the authority by IANA to allocate Domain Names in Israel under the IL Top Level Domain. A list of registered names is provided by iGuide. This list comprised 13,953 sites when accessed (September 30, 1999 update). Of these sites, 2,439 were not .il iTLD names; these tend to be either Palestinian sites connected to the Israeli backbone or commercial sites with heavy international involvement and/or a need for a US presence. For example, of the five .edu sites, four are affiliated with Palestinian institutions. Some examples of Israeli .com sites are Aladdin Software (www.aks.com), MED-1 Submarine Cables Ltd. (http://www.med-1.com/), and Teva Pharmaceuticals USA (www.tevausa.com). Most of the sites of this type are served by Israeli ISPs. the breakdown of domain name servers is exhibited in Table 4.

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[29] It is difficult to determine the exact number of ISPs in Israel at any given time. A scan of five lists found on the Internet gave very different results. Even in what appears to be the most complete list (http://harel.org.il/~nyh/israel/english/562.html) there were problems as one of the ISPs listed had gone out of business but still had a site which directed viewers to another ISP. Several were Palestinian ISPs that utilize the Israeli network, and some ISPs appearing in other lists were not listed here. Furthermore, some Internet service companies – site developers, etc. - are listed as ISPs when in fact they do not provide connectivity.

iTLD	TLD	Domain Name Servers
.il	.co	10,279
.il	.ac	68
.il	k12	64
.il	.gov	81
.il	.muni	24
.il	.net	50
.il	.org	948
.il	**all**	**11,514**
	.com	2232
	.net	147
	.edu	5
	.israel.net	55
	total	**13,953**

Table 4. Breakdown of Domain Name Servers in Israel

Source: iGuide - http://www.iguide.co.il/sites/sites.htm. Sept. 30, 1999 update.

Internet dimensions for Israel

Pervasiveness

Triangulation from a number of sources puts the number of users at about 800,000[30]. These users come from a base of 300,000 dial-up and 2,000 directly connected customers[23] representing a little over 14,000 sites[31] with some 20,000 domains.[24] The assumption here that the user/customer ratio is less than 3 to 1 and is quite conservative. In any case, the number of users relative to total population is about 13%. This puts Israel, with more than 10% of the population as Internet users, at Level 4 in term of pervasiveness.

Growth has been quite rapid. Perhaps the most accurate estimate of growth rates is provided by the iGuide monthly table of domains by zones (http://www.iguide.co.il/stats.htm). A summary of these data is exhibited in Table 5.

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[30] Rosenne, Daniel. *op cit.*

[31] iGuide. http://www.iguide.co.il/sites/sites.htm (November 1999)

Table 5: Growth in number of Internet Domains in Israel

Date*	Number of Domains	Growth relative to previous year
Sep-96	1821	
Sep-97	5056	176%
Sep-98	11619	129%
Sep-99	20757	78%

* The most recent data available are for Sept. 1999.

A report presented to Prime Minister Netanyahu by Science Minister Michael Eitan indicated that Iceland had the highest rate of Internet penetration with 40% online, US was fifth with 24.2 and Israel twelfth with 500,00 users (10%).[32]

A study performed for Bezeq by Monitor, a UK consultancy, indicated 198,000 account holders in August 1998 and 300,000 in May 1999 – 26% of households in Israel. This study predicted a doubling in private sector users to 750,000. Monitor predicts 324,000 private subscribers by the end of 1999 and 433,000 by the end of 2001. A market penetration rate of 26 per cent is forecast for 2002. By comparison, the USA and UK are predicted to have rates of 34 per cent and 33 per cent respectively in 2002.[33] Barak, an international telephone service provider, recently became an ISP and predicted 1,000,000 users within two years.

Geographic Dispersion

Geographic dispersion is measured by spread of points of presence and number of cities from which international IP links are available. In Israel, there are physical points of presence in all large cities and many smaller ones. Local dial-up service is available in Israel in all area codes; Internet access is virtually universal, as any user can connect via local dialup. A full listing of ISPs and coverage is exhibited in Appendix 1.

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[32] ZDNet. http://www.zdnet.com/zdnn/stories/zdnn_display/0,3440,2117745,00.html (July 6, 1998)
[33] Europemedia. "Internet usage set to grow in 1999" http://www.europemedia.com/emisrael/26_Jan_1999.shtml "1,000,000 Internet Users in Two Years?" *Israel High-Tech & Investment Report* (May 1999)

International links originate mainly in Tel-Aviv, but there are such links in a number of other cities. Table 6 lists those cities and the ISPs with international connections originating there.

Table 6 Points of Origin of International Connections of Israeli ISPs

Haifa	Actcom, NetVision
Herzliya	Trendline
Pardess Hanna	IsraCom
Ramat Gan	Internet Gold
Rehovot	Barak
Rosh Ha'ayin	Barak, Internet Gold, NetVision
Tel-Aviv	Aquanet, Barak, IBM, ILAN, NetVision

Thus, in terms of geographic dispersion, the Internet in Israel is at level 4, nationwide.

SECTORAL ABSORPTION

Academic sector.

The Internet is particularly well developed in the higher education sector in Israel. All universities have Internet links and are served by ILAN – The Israeli Academic Network – a backbone established and operated by the Israel Inter University Computation Center (IUCC; Machba in Hebrew), a consortium of the eight public universities. Furthermore, Israeli academics are connected to Internet-2 via IUCC along with other advanced networks in the Asian-Pacific area, Canada, CERN, Russia, the Nordic countries, France, Singapore, the Netherlands, Taiwan and the US. Figure 3 exhibits the map of Internet-2 in Israel.
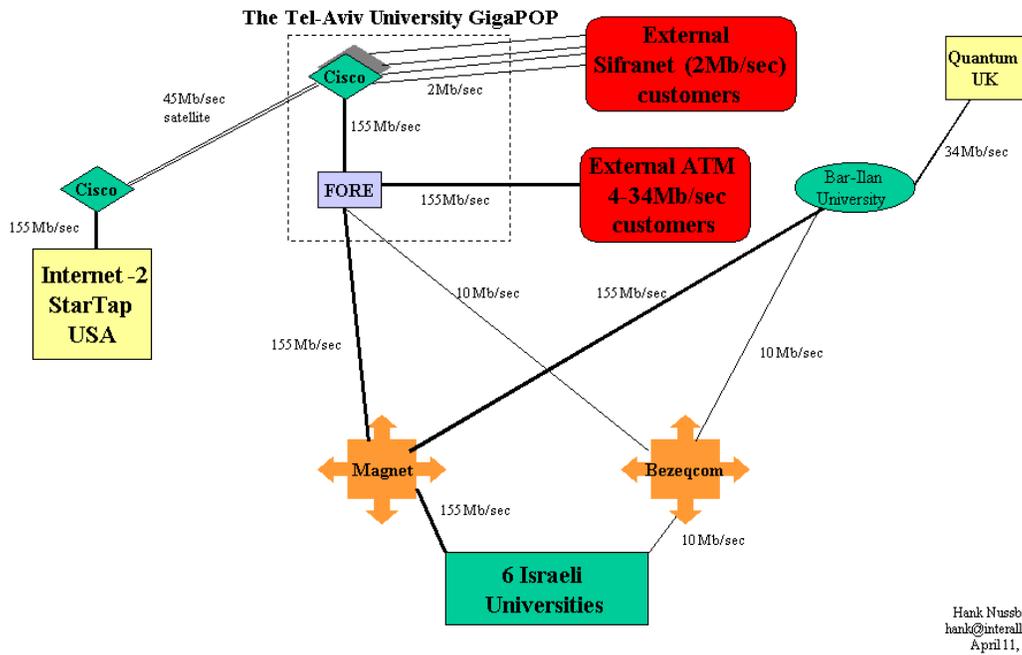
Figure 3

In the Israeli public education system, there are1,286,400 pupils in 3825 institutions at the elementary, junior high, and high school levels.[34] Adding private schools, non-public networks, and other institutions outside the public sector, the total number of schools is probably about 4500. It is rather difficult to establish the number of schools with Internet connections. The .k12 domain contains only 64 sites[35]. However, an examination of lists of schools in several portals indicates that many schools have sites in the .org, .com, and even the .ac domains. Furthermore, for some schools belonging to networks, especially the ORT and Amal networks, only the network home pages are listed rather than every school; thus, an attempt was made to synthesize a more complete listing from several portals and school networks. This synthesis yielded a total of about 240 schools with Internet sites. Thus, about 6% of schools have their own Internet sites.

The Ministry of Education has undertaken a project to connect all schools both administratively and pedagogically, including Internet access. This effort seems, however, to be still in its infancy and it will be some time before high levels of Internet access are

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[34] Ministry of Education. http://www.education.gov.il/moe/uvdot/data_1.htm

[35] iGuide. http://www.iguide.co.il/sites/sites.htm. Sept. 22, 1999.

achieved at the primary and secondary school levels. An associated project is to provide home computers to all economically disadvantaged children.

Given the very high adoption of the Internet at the higher education level and the rather low level of adoption in primary and secondary schools, it would seem that level 3 - "moderate" - is the appropriate rating for Internet absorption in the Israeli academic sector.

Commercial sector.

The criterion here is adoption by firms with more than 100 employees. No direct data were found for this criterion and we resorted to sampling. The sample was developed as follows:

1. The Dun & Bradstreet Israel database[36] was adopted as the source. This database contains information on 85,000 Israeli organizations, not all of them commercial.

2. From this database, all those with more than 100 employees were extracted, yielding 2513 organizations.

3. Every 50th organization in the alphabetically sorted list was chosen for the sample, yielding 50 organizations in all. In those cases in which a non-commercial organization was selected, it was replaced by the nearest commercial organization in the list.

4. An attempt was made to find an Internet site for each of the 50 firms.

This procedure found sites for 23 of the 50 firms looked for, i.e. 46%. This is clearly a lower limit, as it is quite possible that we were unable to find sites in some cases where they actually do exist. However, the number found is very close to the middle of the 10-90% range, which defines moderate adoption. It is also very unlikely that, even if all extant sites were found, that the 90% point would be exceeded. Therefore, adoption has been determined as level 3 – moderate.

HEALTH SECTOR

The situation with respect to Internet adoption in the Israeli health sector is rather mixed. On the one hand, nearly all government and publicly owned hospitals have their own sites.[37] However, there is one glaring exception, the Sheba Medical Center - the country's largest, in which only a very small number of departments and institutes have their own sites. Interestingly, all these sites have the same format; this could indicate either that there

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[36] Dun & Bradstret Israel. "Duns Disc 85000." Accessed November 2, 1999.

[37] For a list of most government hospital sites see http://www.health.gov.il/code/kishur.html. For a list of sites operated by the largest health care provider, KUPAT HOLIM CLALIT, see http://www.clalit.co.il/english/englishsite.htm#hospitals.

is some directed activity, or that later sites adopted the format of the first one established. The content of these sites varies tremendously from very full and informative (e.g. The Department of Anesthesiology and Intensive Care – http://www.shebanest.org) to a single link to the department head's list of publications (e.g. Dept. of Medicine 'B' - http://members.tripod.com/idave/yehuda1.htm)

When it comes to private hospitals, however, very few have web sites. This may be because most of the private hospitals are quite small and are not directed as in the case of those operated by the government or public organizations.

A search of the Dun & Bradstreet 85,000 database yielded only 13 medial clinics. A search of three portals yielded 23 institutions associated with the term "clinic". Interestingly, only one clinic appeared in both the portals and the D&B data base. Apparently the term "clinic" is not widely used in Israel since it does not appear as a category in the Yellow Pages.

In view of the above, it appears that absorption of the Internet in the health sector is well above 10%, and well below 90%. It is probably at about the same as level as in commercial institutions – i.e. something less than 50%. Thus absorption in this sector is rated level 3 – moderate.

GOVERNMENT AND PUBLIC SECTOR

Until it was recently expanded to 23 ministries, the Government of Israel comprised 18 ministries. Of these, about 60% have their own sites that are listed in the page maintained by the Prime Minister's Office.[38] Pages are maintained for all 255 cities and local councils in Israel by the Center For Local Government.[39] In addition, about another 30 municipalities and local authorities have their own sites. Thus here too, Internet absorption in government is at Level 3 - moderate.

A summary of the scores for the four sectors, in Table 7, indicates that the total score is 8. This is defined as common use – Level 3. Of particular interest is the fact that the degree of Internet absorption seems to be quite similar, at least quantitatively, among the various sectors defined in this study.

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[38] http://www.pmo.gov.il/english/websites/index.html
[39] http://www.cityindex.co.il/city_sys/index.asp

Table 7: Summary of Sector Ratings

Sector	absorption level	score
Academic-primary and secondary schools, universities	moderate	2
Commercial-businesses with more than 100 employees	moderate	2
Health-hospitals and clinics	moderate	2
Public-top and second tier government entities	moderate	2

Connectivity Infrastructure

The levels of connectivity infrastructure in Israel are somewhat mixed. There are essentially two backbones, those operated by Bezeq and the IUCC network. The Bezeq network is based on 2Mb/s E2 lines and the Inter University network, until recently, on 10 Mb/s T2 lines. In both cases, this puts the domestic backbone at Level 1 – less than T-3. The academic network was recently upgraded to Internet-2 with a 155 Mb/s backbone, but this does not change the level rating.

The total of international links is about 131 Mb/s – again Level 1. An additional 78Mb/s are available to Israel's Internet-2 connection. However, this bandwidth is available only to academic institutions and commercial R&D and so is not here considered part of the general connectivity. In any case, adding the Internet-2 connections does not change the rating.

In terms of Internet Exchanges, there is one formal exchange The Israel Internet Exchange[40]. There is also the IUCC, which effectively acts as an Internet exchange between the universities.[41] Thus, depending on the definition, Israel could be classified Level 2 or 3 on this dimension.

A recent survey of 2700 users conducted by Modus and the Rotem Institute for Marketing Research and Forecasting[42] indicated that the majority of users (65.6 percent) surveyed access the Internet via a 33kbps modem. 9.4 percent had an ISDN connection, 7.5 percent use Frame Relay, with 5.1 percent using 54kbps modem. 12.4 percent of users did not know how they were connected. As less than 90% of users connect by modem and ISDN

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[40] For FAQs see http://www.isoc.org.il/iix.html.
[41] For FAQs last update at the end of 1995 see http://www.tau.ac.il:81/israel-faq/.
[42] Beny Run. Internetnews.com. "Survey Examines Internet Use in Israel." Feb 26 1999. http://www.internetnews.com/intl-news/article/0,1087,6_71991,00.html

lines and other leased lines over 64 Kb/s are fairly common, this puts Israel at level 4 in terms of access methods. Figure X exhibits a map of the major Internet lines in Israel.

The values of Connectivity infrastructure levels for Israel are summarized in Table 8. In view of the levels listed, the overall evaluation for Israel would seem to be best rated as Level 2.

Table 8. Dimensions of Internet Diffusion: Connectivity Infrastructure

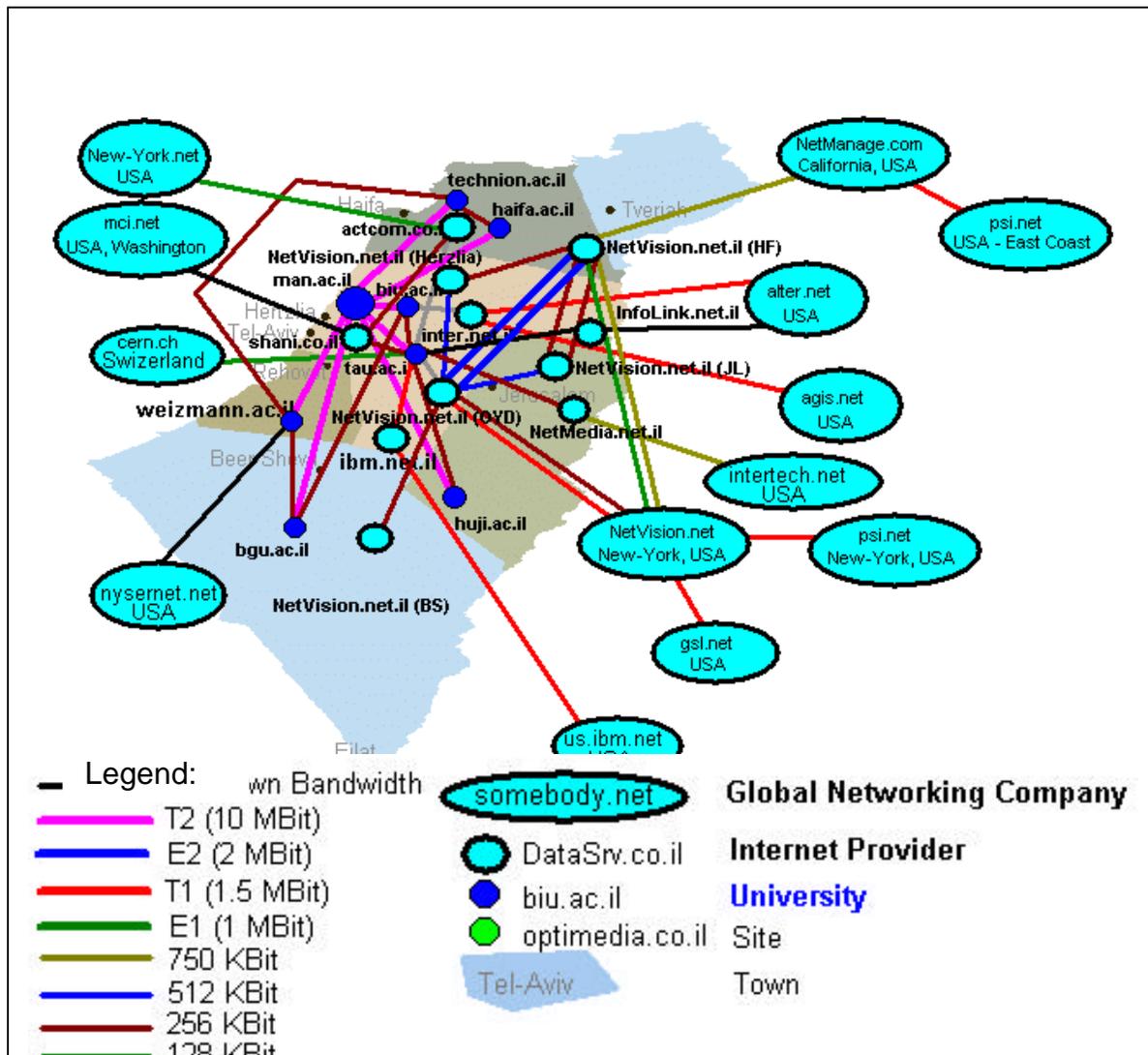| Domestic Back-bone	Level 1
International Link	Level 1
Internet Exchanges (IX)	Level 2-3
Access Methods	Level 4

Figure 4. Map of Israel Internet Connections

Organizational Infrastructure

The Internet in Israel has clearly reached the robust Level 4. As indicated earlier, there are many ISPs. Although a license is required to provide leased-line service, many small ISPs operate without being licensed and the barriers to market entry are merely those for any new business – start up capital and establishing a market presence.

The government, through the Ministry of Communications, is committed to establishing competition in infrastructure provision. There are currently three international operators, all providing international connectivity. In addition, satellite links are available.

The landlines infrastructure is still controlled by Bezeq, but alternative forms of access are developing rapidly, including cellular phone Internet connections, cable TV connections, offshore domestic optical fiber links and possible land line provision by possessors of right-of-way such as the Israel Electric Company and Israel Railways.

Sophistication of use

On this dimension also, Israel is a somewhat special case. In a nutshell, that is because there is much innovation, but from developers rather than from users. Israel is well known for its intensive activity in developing Internet applications of various types; Vocaltec, Alladin, Checkpoint, and Mirabilis' ICQ are just a few of the better known examples. In that sense, the country is at the Level 4 – Innovating – stage.

The user community, however, has not reached that level of sophistication and is essentially in the transforming level, although there is considerable talk of increasing the level of sophistication of Internet use. A few indicators of the sophistication of use:

- The major banks provide services by Internet to interested customers, but transactions are limited to transfers between the accounts of a single customer. The banks are prepared to allow transfers between accounts but this is still not permitted by the Comptroller of Banks, who is proceeding very cautiously.
- A recent survey by the Manufacturer's Association found that 11% of Israeli firms sell over the Internet.[43] Their sales amount to $2-4 million annually and constitute about 7% of their revenue. Ninety percent of the firms not yet trading on the Internet intend to begin doing so in the next few years. Anticipated growth in e-commerce by sectors

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[43] Keren Zuriel. "The manufacturer: 11% of Israeli firms sell on the Internet." *Globes*, November 1, 1999.

is exhibited in Table 9; the Table indicates that sales are expected to reach more than 30% of revenue in most sectors by 2001.[44] Firms with over 300 employees are more active in e-commerce than smaller firms – 55% versus 15% of firms. 65% of the firms surveyed intend to invest at most $50,000 in e-commerce; 17% will invest $50-100,000; only 3% plan to invest more than $1,000,000. Thus, e-commerce is not very well developed yet.

Table 9. Forecast of Sales by E-commerce: Percentage of total sales

Sector	1999	2000	2001
Textiles & fashion	15.4	30.0	36.0
Plastics, furniture & cosmetics	7.5	21.5	32.0
Metal and electrical	2.2	10.8	14.6
Food	0.8	16.2	32.0
Electronics & software	17.9	23.7	31.1
Chemicals & pharmaceuticals	3.9	11.4	23.4

- Most web sites are largely informational and virtually all provide e-mail points of contact. We found no transaction sites in government ministries, although some are under construction. Even the Department of Customs and V.A.T. which has worked on-line with customs clearers for many years now, continues with the conventional network and has not yet moved its operation to the Internet. Of the 50 commercial firms we examined as described above, we found 23 with web sites and 9 whose sites permitted some form of transaction processing. This puts the number of firms that offer transaction processing at about 18%. While by no means accurate, this evaluation provides some indication of the level of sophistication of Internet use.

- The major use of the Internet in Israel is for e-mail. This emerged from the Modus and Rotem survey of 2700 users quoted above. Using a scale of 1 to 5, respondents were asked to rate different uses of the Internet. Email was top of the list, with an average score of 4.2. Accessing general information and information for work followed, each with a score of 3.9. At the bottom end of the scale were e-commerce with a 2.3 rating and games with a rating of 2.0.

In view of the above, sophistication of Internet use in Israel has been rated transforming – Level 3.

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[44] It is interesting, and perhaps significant, that the electronics and software sector – currently the most experienced in e-commerce – is relatively conservative in its forecast.

Israel Glossary

Bezeq	The Israel Telecommunication Corporation Limited. (http://www.bezeq.co.il/)
BGU	Ben-Gurion University of The Negev
BIU	Bar-Ilan University
BITNET	"Because its Time Network" established by IBM (1979)
CIOS	Cyprus-Israel Optical System
CSNET	National Science Foundation created, 56 Kbps backbone network for institutions without access to ARPANET. (1981)
EARN	European Academic and Research Network – established 1983. Very similar to BITNET.
Ebone	European Internet backbone – equivalent to the NSF Internet backbone
EMOS	Eastern Mediterranean Optical System-1 (EMOS-1)
FLAG	Fiberoptic Link Around the Globe
GigaPoP	"giga"bit (1 billion bits per second) PoP (Point of Presence)
HILA	*Hearchut Israel Le'edan Hameidah* – Preparation of Israel for the Information Age
HUJI	Hebrew University of Jerusalem
IANA	Internet Assigned Numbers Authority (http://www.iana.org/)
IIX	Israel Internet Exchange
ILA	Information Technology Association of Israel (formerly Information Processing Association of Israel)
iTLD	International Top Level Domain Name
Israsat	Israsat International Communications, a wholly owned subsidiary of Gilat Communications provides point-to-point international satellite communications.
IUCC	The Inter-University Computing Center (Machba)
Knesset	The parliament of Israel
LEV	Israel-Cyprus-Italy submarine fibreoptic cable
M-o-C	Ministry of Communications (Misrad Hatikshoret)
MAN	Metropolitan Area Network - falls between a Local Area Network (LAN) and a Wide Area Network(WAN) and has some of the features of each. A MAN aims to serve a geographic area beyond the scope of LAN

technologies, yet is restricted by some well defined community of interest, often a city.

NASDAQ
National Association of Securities Dealers Automated Quotation System. This electronic stock trading system opened in 1971 as a partnership of the National Association of Securities Dealers and the American Stock Exchange (AMEX).

NYSERNet
In the mid-1980's, a group of educators, researchers, and entrepreneurs from fifteen major New York State universities and corporations recognized the potential for a regional high speed network. NYSERNet was formed as a not-for-profit corporation to serve the remote networking needs of these organizations. This group included: Educators City University of New York, Clarkson University, Columbia University, Cornell University, New York University, Polytechnic University, Rensselaer Polytechnic Institute, University of Rochester, Rockefeller University, the four university centers of the State University of New York (Albany, Binghamton, Buffalo, Stony Brook), Syracuse University

OSI
Open Systems Interconnection, a set of standard protocol grouped into seven layers: the physical, data link, network, transport, session, presentation, and application layers.

PPP
Purchasing power parity (not to be confused with the PPP communication protocol)

TAU
Tel-Aviv University

TDM
Time Dimension Multilexer

Technion
Technion, Israel Institute of Technology

Weizmann
The Weizmann Institute, Rehovot, not far from Tel-Aviv

Appendix 1. Characteristics of Israeli Internet Service Providers

Provider	URL	Special features	International Capacity	IIX connection	IIX Connection	sites connected (30 Sep 1999)	area codes served and POPs*
ACTCOM	http://www.actcom.co.il/	service begun 1993 frame relay for home users	• 1.5 MB to New-York.net NY.USA • 1Mb to Barak		yes	1007	02 Jerusalem; 03 Tel-Aviv; 04 Haifa, Karmiel; 06 Kiryat Shmona; 07 Beer Sheba, Eilat 08 Rehovot; 09 Herzliya, Netanya
AcTVnet	http://www.actvnet.co.il/						
Adamnet	http://www.adamnet.co.il/						09
Apelker	http://www.apelker.co.il/						
AquaNet	http://www.aquanet.co.il/	frame relay for home users	• 512Kb to Barak w. 1.5 Mb one way Simplex line USA ➔ Israel		yes	67	02 Jerusalem 03 Tel-Aviv04 Haifa 06 Tiberias 07 Arad 08 Rehovot 09 Netanya 135
Barak	http://www.barak.net.il/	leased line clients only	• 2Mb to sprint.net, New Jersey • 2Mb to gsl.net, New Jersey • 2Mb to gsl.net, London, UK		yes	611	03 Tel-Aviv, Rosh Ha'ayin
Bezeq International	http://www.bezeqint.net/				yes		
Canaan	http://www.canaan.co.il/						06
Gezernet	http://www.gezernet.co.il						02, 04, 08
Graphnet, Israel	http://www.graphnet.com	subsidiary of Graphnet Inc. in 03 area for business					03

		users					
IBM Israel	http://www.ibm.net.il/ http://www.att.com/globalnetwork/country_israel.html	IBM's network services were recently acquired by AT&T Global Network Services			yes	654	
ILAN – Israeli Academic Network		academic use only	• connections via IBM: • 2Mb to us.ibm.net, New York, NY • 1.85 Mb to de.ibm.net, Germany • 2.8Mb to uk.ibm.net, UK		yes		02 Jerusalem 03 Tel-Aviv 04 Haifa 07 Beer Sheba 08 Rehovot
Infolink	http://www.infolink.net.il/					8	via Bezeqnet135. all area codes as local call
Infomall	http://www.infomall.co.il						03
Internet Gold	http://www.inter.net.il/		• 1.5 Mb to EuroCom, New Jersey, USA w. 1.5 Mb one way Simplex line USA ➔ Israel • 8Mb to EuroCom, Boston, USA w. 18Mb one way Simplex line USA ➔ Israel		yes	1678	02 Jerusalem 03 Ramat Gan, Rosh-Haayin, Tel-Aviv 04 Haifa 06 Mizra 07 Beer Sheba 08 Rehovot 09 Herzliya, Netanya
IsraCom	http://www.isracom.co.il		• 512Kb to gip.net, Paris, France • 2Mb to AlterNet, New York, NY		yes	133	02 Jerusalem 03 Tel-Aviv 04 Haifa 06 Pardes Hanna 08 Yavne
Israserv	http://www.israsrv.net.il/				yes		09, 135
Lahavnet	http://lahavnet.co.il/index.html						07 southern region of Israel
Kinneret	http://www.kinneret.co.il		•				06
Luckynet	http://www.luckynet.co.il/		•				06
Netvision	http://new.netvision.net.il/		• 512Kb to digisle.net, Hawaii		yes	5739	02 Jerusalem 03 Tel-Aviv, Petach-

			• 768Kb to NetManage.com, Cupertino, CA. • 57Mb t0 Netvision.net Pennsauken, NJ • 44Mb to NetVision.net, New York, NY					Tiqva, Rishon le-Zion 04 Haifa 06 Hadera, Kiryat Shemona 07 Beer Sheba 08 Rehovot09
Trendline	http://www.trendline.co.il		• 1.5Mb to AltterNet, New York, NY			161		02 Jerusalem 06 Kiryat Shmona 09 Herzliya, Netanya

* The 05x area codes occupied by cellular telephone service providers.

This list was compiled from the following sources:

- internet.com http://thelist.internet.com/countrycode/972/

- Jacob Richman's Hot Sites - Israel - Internet Providers (http://www.jr.co.il/hotsites/i-isp.htm). July 6, 1999.

- The (almost) Complete Guide to WWW in Israel. (http://harel.org.il/~nyh/israel/english/562.html)

- The Jewish Internet Portal (http://www.hareshima.com/israel/Business/internet.asp)

- thedirectory - Country code 972 - Internet Access Providers (http://www.thedirectory.org/for/acc/972.htm)

- Tripod: The Israeli ISP List Web Site (http://members.tripod.com/israeli_isp/isplist.htm)

- Yahoo (http://dir.yahoo.com/Business_and_Economy/Companies/Internet_Services/Access_Providers/By_Region/Countries/Israel/Complete_Listing/)