

Indonesia

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Overview

The private sector and civil society together built, and now operate, the ICT infrastructure in Indonesia; the government made minimal contributions in this area. The infrastructure currently serves about 1–5 percent of the country's total population. There were approximately 7.1 million fixed telephone lines in 2002 and an equal number of cellular subscribers.

According to IDC, Indonesia spent in 2001 US\$752 million in ICT hardware, US\$124 million in software and US\$85 million in ICT services. The estimated total ICT expenditure for the year was US\$1,228 million. This total rose to US\$3,539 million when telecommunications expenditure is taken into account. The contribution of ICTs to GDP is about 2.2 percent or about US\$16.6 per capita. Software spending represents only 16.5 percent of hardware spending. The volume of e-commerce is very low at 0.1 percent of total commerce or about US\$2.1 per capita. Only 9.8 percent of ICT spending is on e-business technology.

In 2001, there were an estimated 2.3 million PCs in the country. Out of this total, 1.9 million were used in business and government. Only about 251,000 PCs were used in households. The 60,000 educational institutions were using only 58,000 PCs. In the same year, there were approximately 4 million Internet users and 600,000 Internet subscribers in the country. It was estimated that 60–70 percent of Internet access was provided by the approximately 1,500 Internet cafés. Thus, the Internet café appears to be the most common access point for Indonesian communities. Access is quite affordable at about US\$0.30 an hour. However, in popular tourist areas, such as Bali, the rate can be as high as US\$5–\$6 per hour. Internet cafés are distributed unevenly in the country, with an estimated 50 percent of them concentrated in Jakarta, the capital.

Many of the Internet cafés, as well as the private sector, have elected to bypass noisy telephone lines by using wireless fidelity (WiFi) 11 Mbps equipment running at 2.4 GHz. Some are currently using 5.8 GHz equipment to attain even higher speeds. Most of these wireless access points are in cities. A wireless infrastructure may be the way to go for deploying Internet in poor, rural and underserved neighbourhoods. However, the issue in rural areas is not simply about access and the regulations which govern access.

People in rural areas find little need for external information.

The Indonesian Linux community is struggling to grow. It is led by the Indonesia Linux User Group. A variety of Indonesian Linux mailing lists are hosted at its website. Face-to-face interaction is still the most effective way to build Linux knowledge in the country. There are about three to four seminars per week on the subject. The seminars are supplemented by talk shows and road shows, not to mention a significant number of magazines and Linux books.

Content

One of the more reliable ways of determining the content consumed by users is by analysing the log report of a Web proxy server, such as a Calamaris log report. An analysis of these log reports for the Institute of Technology Bandung (ITB) during the period of November–December 2001 and the reports for the Internet café InterNux in Makassar showed very similar content consumption patterns:

- Search engines and webmail are the most accessed sites.
- News and online media are the next most popular sites.
- Indonesian pornographic sites rank third.
- Quite a high percentage of users mistype URLs, making such mistakes rank fourth.
- Yahoo.com and its affiliated sites are most frequently accessed, accounting for 10–13 percent of all sites visited.

The author conducted a search on the search engine Google to gauge the amount of Indonesian-produced content on the Web. Indonesian content on different topics published in the Indonesian language as well as in English was evaluated. More than ten commonly used words were selected as keywords in the search.

The searches on Google found a large number of URLs. It is interesting to note that Indonesian content posted in the two languages is different. Indonesian language content emphasizes topics related to technology, news and current affairs, education, culture and literature. In contrast, Indonesian content in English, aimed at reaching a wider audience on the Internet, places more emphasis on commerce and tourism, industry and business, civil society and government. In both Indonesian and English, not much

content seems to have been produced on rural development and agriculture or on NGOs.

The ratio of content in the Indonesian language relative to English for the different sectors or topics is as follows:

Commerce and tourism	7.1 percent
Industry and business	11.6 percent
Civil society	12.1 percent
Government	15.7 percent
Culture and literature	16.9 percent
News and current affairs	22.0 percent
Education	18.9 percent
Technology	27.1 percent
Political groupings	11.2 percent
Health and nutrition	23.7 percent
Rural development	17.2 percent
NGOs	8.5 percent
Agriculture	9.7 percent

Indonesian content in the national language contributes about 15.3 percent of all content regarding the country. The ratio of Indonesian language content is highest at 27.1 percent in technology-related areas, followed by health and nutrition (23.7 percent) and then news and current affairs (22 percent).

Important local sources of content

The sources listed below are based mainly on the Calamaris log reports of the two large proxy servers mentioned earlier.

Yahoo <<http://www.yahoo.com>>

Surprisingly, the most popular Internet site in Indonesia is Yahoo, including Yahoo Mail, and Yahoogroups. For various reasons, Indonesian Internet users prefer Yahoo and its various services for most of their activities. As far as the author knows, Yahoo does not operate an Indonesian subsidiary service. There were more than 45,000 Indonesian mailing lists hosted at Groups.yahoo.com at the time of writing.

Google <<http://www.google.com>>

The second most popular search engine used by the Indonesian people is Google. This, together with Yahoo, seems to indicate that Indonesian users feel that international search engines meet their needs adequately.

The most frequently accessed Indonesian websites, as indicated by the log reports, are the news and current affairs websites. These include:

KOMPAS <<http://www.kompas.com>>

This is one of the two top news sites in Indonesia. The print version of KOMPAS enjoys a high circulation and this may account for the popularity of the Web version. It is published in the Indonesian language.

Indonesia facts

Total population: 228,437,870 (2001)^a

Key economic sectors: Petroleum and natural gas, textiles, apparel and footwear, mining, cement, chemical fertilisers, plywood, rubber, food, tourism.^b

Literacy in the national language(s): 89.92% (of population older than ten years)^a

Computer ownership per 100 inhabitants: 1.01 (2001)^c

Telephone lines per 100 inhabitants: 3.11 (2001)^d

Internet hosts per 10,000 inhabitants: 1.27 (2000)^d

Internet cafés/telecentres per 10,000 inhabitants: 0.07 (2002)^e

Internet users per 100 inhabitants: 1.82 (2002)^f

Cell phone subscribers per 100 inhabitants: 1.73 (2001)^d

National bandwidth within the country: 255.4 Mbps (2002)^g

National bandwidth to and from the country: 1 Gbps (2002 estimated)^g

Ratio of incoming and outgoing Internet traffic volume: 1:10 (2002 estimated)^g

Sources:

- (a) National Statistical Bureau <<http://www.bps.go.id>>.
- (b) CIA. *The World Factbook*.
- (c) IDC.
- (d) ITU.
- (e) NatnitNet <<http://www.natnit.net>>.
- (f) Indonesian ISP Association <<http://www.apjii.or.id>>.
- (g) Johar Alam, administrator of the Indonesia Internet Exchange <johar@the.net.id>.

DetikCom <<http://www.detik.com>>

This is the leading online news source in Indonesia. It does not rely on any printed versions to boost its popularity. It gained much of its reputation as being the most accurate breaking-news website during the 1998–99 riots when students in the country helped bring down Suharto’s regime. The news is in Indonesian.

Online news was started around 1997 by the *Republika* newspaper <<http://www.republika.co.id>>. News and current affairs may be one of the most active website categories in Indonesia as a significant number of the Indonesian print media operate their own websites. Some of the most active Indonesian language sites are <<http://www.bisnis.com>>, <<http://www.pikiran-rakyat.com>> and <<http://www.detik.com>>.

www.tempo.com>. The *Jakarta Post* <<http://www.jakartapost.com>> is one of the active English language Indonesian news sites.

BolehMail <<http://www.boleh.com>>

This may be one of the most commonly used Indonesian webmail services after Plasa.com. It is privately run and designed for young Indonesian Internet users to enable them to receive information via e-mail and mailing lists.

Geocities <<http://www.geocities.com>>

Also known as Geocities.yahoo.com, many Indonesians have their websites hosted here. This may be the main free web-hosting service preferred by Indonesians. Free web-hosting sites offer a great place for beginners, as well as advanced users, to publish their work and interest others to read it.

There are several major Indonesian web directory services. The Indonesian ICT business community can be explored through these directory services.

Indonesian Yellow Pages <<http://www.yellowpages.co.id>>

This may be one of the best Indonesian Internet directory services. It is operated by the Indonesian phone book company. A significant number of companies are listed accurately on the website. It is in English.

IndoPage <<http://www.indopage.com>>

IndoPage is an unofficial directory service of the Indonesian Chamber of Commerce. It is published in a combination of Indonesian and English.

Online services

E-government

There was a significant increase in website building by for the various counties, cities and regions in the country beginning in early 2002. The majority, if not all, of the government websites provide information describing the potential of each region as well as the rules and regulations. As far as the author is aware, no online public services were provided by the government at the time of writing.

Several departments within the government are competing to act as the principal e-government centre for the country:

Indonesian Government <<http://www.indonesia.go.id>>

This is one of the main government websites.

Indonesian Parliament <<http://www.mpr.go.id>>

This website provides information about the activities of Parliament. It gets busy and interesting during the plenary meetings of Parliament and during the period preceding an election when members of Parliament canvass for the votes of their electorate.

Indonesian House of Representatives

<<http://www.dpr.go.id>>

All members of the House have their own e-mail addresses. Thus, the public should be able to interact with party leaders and members of the House via e-mail. The online activities of this website are fairly similar to those on the Parliament websites.

The Indonesian ICT environment is influenced by two government bodies. They are the Directorate General of Post and Telecommunication, which controls the telecommunications and Internet infrastructure, and the Ministry of Industry and Trade, which controls the ICT industries.

Distance education and e-learning

Formal distance education and e-learning are rarities in Indonesia as current regulations prevent such services from being provided. Added to this difficulty is the uncertainty regarding the ability of students to transfer credits obtained on one course to another. As far as the author can ascertain, there were two major distance education programmes running in Indonesia at the time of writing. At the same time, plans were being finalised by the Directorate General of Higher Education at the Ministry of Education for establishing more distance learning programmes in some public universities.

Indonesian Open University <<http://www.ut.ac.id>>

This is the formal open university run by the government.

IBU Teledukasi <<http://www.ibuteledukasi.com>>

This organisation seems to be a new comer to distance learning. It also seems to be collaborating with many other institutions in conducting their programmes. Universiti Tun Abdul Razak in Malaysia is one such collaborator. IBU Teledukasi provides courses in high technologies, such as IT.

Information on formal non-distance learning institutions can be found on the Web. A total of more than 1,300 higher education institutions provide degrees. Detailed information on various tertiary education programmes can be found at the Directorate General of Higher Education website <<http://www.dikti.org>>.

There are many other distance learning and e-learning activities taking place in a very informal manner. These activities and informal programmes offer no certificates or accreditation. Most of the activities take place at Yahoogroups <<http://groups.yahoo.com>>. The site hosts hundreds of mailing lists such as Indoprolog, Indoprolog-vb and Javaid, each of which represents a virtual learning community where information and knowledge are rapidly exchanged. The sharing of knowledge is facilitated through discussions carried out via e-mail. It should be noted that a

lot of the discussions focus on highly current and practical knowledge. It would appear that no official permits are necessary for these distance learning and e-learning processes adopted by most of the Indonesian online communities.

E-commerce and e-business

A search on Google using the keywords “e-commerce Indonesia”, “Indonesia e-business”, “Indonesia e-trade” and “Indonesia commerce” resulted in half a million hits. These URLs lead to Indonesian language webpages, as well as a significant number of English pages. However, the use of only Indonesian language keywords, such as “usaha export import” (import and export business) and “dagang luar negeri” (foreign trade), in a similar search led to only 5,000 hits.

This seems to show that Indonesian e-commerce and e-business content on the Internet is quite extensive. A good example of such content can be found at <<http://www.indo.com>>. It is one of the most popular websites for tourism in Indonesia. It carries various tourism-related pages, such as information on the culture of the country, hotel reservations and local craft products.

However, webpages may not be reflective of all Indonesian e-commerce and e-business activities. Electronic mailing lists also proved to be useful for learning about interactions on this subject among Internet users. Yahoogroups was again the best place for tracking down such interactions. A search at website <<http://groups.yahoo.com>>, using the same Indonesian language keywords described in the Google search above, revealed about 150 Indonesian mailing lists related to e-commerce and e-business. However, only a few of them were active or enjoyed a significant number of subscribers. It should be noted that some e-commerce and e-business activities are not addressed in the general e-commerce mailing lists but rather on other lists dealing with specific topics.

Data obtained from *Digital Planet 2002* shows that e-commerce in Indonesia accounted for only 0.1 percent of the country’s commerce or about US\$2.1 per capita in 2001.

Telemedicine

A search was also conducted on Google for webpages related to Indonesian telemedicine. The keywords used included “Indonesia telemedicine”, “Indonesia kesehatan” (Indonesian health), “kesehatan” (health), “sehat” (healthy) and “konsultasi kesehatan” (health consultation). The searches revealed more than 264,000 pages related to Indonesian telemedicine. Just the keyword “kesehatan” revealed close to 50 percent of the tele-medicine pages.

Most of the telemedicine activities on the Web are related to simple community health consultations done over the Internet. The website <<http://www.infokes.com>> is a good

example of this. The site provides useful information and articles on health and enables users to interact online with physicians about specific health-related matters. Some Indonesian hospitals have also posted health information on their websites. These health-related websites have in turn triggered the development of websites on pharmaceutical topics. There are many such sites in Indonesia.

Prof. Dr Soegiardjo Soegidjoko, from the Electrical Engineering Department of ITB, is one of the leading Indonesian scientists in medical electronics and telemedicine research. Visit his website <<http://www.elka.ee.itb.ac.id>> for more information on the work being undertaken in this area.

A search at <<http://groups.yahoo.com>> using several keywords, such as “kesehatan”, “obat” (medicine), “sehat” and “konsultasi kesehatan”, revealed in excess of 400 health-related Indonesian mailing lists. Most of them have a small number of subscribers. Only a few dozen of them have ample subscribers, and these include <obat-traditional@yahoogroups.com> and <kesehatan-indonesia@yahoogroups.com>.

E-conferences and e-communities

The activities of Indonesia’s e-communities are best gauged through the various mailing lists operated by their members. The beginnings of these lists can be traced back to the early 1990s when some Indonesians started the first Indonesian mailing list at <Indonesians@jamus.berkeley.edu>. This list gradually led to the launch of many more mailing lists. By 1996, ITB was running two Pentium servers online to serve more than 200 mailing lists belonging to different groups of the Indonesian e-community. Currently, the major Indonesian mailing list servers are:

<<http://www.yahoogroups.com>> (also as <<http://groups.yahoo.com>>) may be the busiest mailing list server on the Internet serving more than 45,000 Indonesian mailing lists.

<<http://groups.plasa.com>> is managed by TelkomNet, the ISP of Telkom in Indonesia. According to a report by Luqman El Hakiem Syamlan <luke@telkom.co.id>, this server was helping to run 2,299 Indonesian mailing lists as of mid-February 2002.

The author conducted a study of the characteristics of the Indonesian e-community at <<http://groups.yahoo.com>> at the end of 2001. Using more than 100 keywords, more than 45,000 Indonesian mailing lists were found on this list server. Reviewing 30,000 of these lists, the author was able to obtain the names and descriptions of the mailing lists, the number of subscribers and the type of mailing lists (open or closed). He paid special attention to lists with more than 100 subscribers.

The author was also able to obtain information on each of the mailing lists by clicking on their names. The particulars

obtained in this way included total membership numbers, languages used, archives of messages, monthly statistics of messages posted, and the many administrative back-office utilities deployed to support the operation of the lists. The following is what the study discovered.

There were 1,278 mailing lists identified with more than 100 subscribers. They specialised in the following types of content and themes: social communication: 360 (28.2 percent); knowledge: 257 (20.1 percent); business: 224 (17.6 percent); religion: 158 (12.4 percent); hobbies: 110 (8.6 percent); politics: 96 (7.5 percent); and pornography: 73 (5.7 percent).

It is interesting to note that 28.2 percent of these lists were used for socialising and communicating, 20.1 percent for broadening knowledge and 17.6 percent for conducting business.

The total number of subscribers to the 1,278 mailing lists analysed was 465,749, with the following breakdown: business-related lists: 96,093 (20.6 percent); social communication: 89,372 (19.2 percent); knowledge: 83,648 (18.0 percent); pornography: 59,871 (12.9 percent); religion: 56,035 (12.0 percent); hobbies: 48,342 (10.4 percent); and politics: 32,388 (7.0 percent).

It is interesting to note that the total number of subscribers is significantly less than the four million Indonesian Internet users claimed by the Indonesian ISP Association (Asosiasi Penyelenggara Jasa Internet Indonesia, APJII). This may suggest that most Indonesian Internet users are beginners who do not know how to interact or join these mailing lists.

The author next analysed the total number of messages posted during 2001 at these mailing lists. The results reflected the same pattern of distribution. It is interesting to note that messages posted at pornography lists accounted for only 2.6 percent of all the messages.

The total number of messages posted during 2001 was 1,635,395 messages comprising the following: social communication: 376,604 (23.0 percent); business: 306,480 (18.7 percent); knowledge: 291,396 (17.8 percent); hobbies: 236,023 (14.4 percent); religion: 194,714 (11.9 percent); politics: 187,588 (11.5 percent); and pornography: 42,590 (2.6 percent).

The study also gauged the level of participation by the various groups of subscribers. This was done by calculating the average number of messages posted by each subscriber per month. The surprising fact that emerged was that subscribers to mailing lists on politics were the most active, averaging close to six messages per month. Hobbyists formed the next most active group. The following is how each group fared in terms of the average number of messages posted per subscriber: politics: 5.79; hobbies: 4.88; social communication: 4.21; knowledge: 3.48; religion: 3.47; business: 3.20; and pornography: 0.71.

The author looked at the bandwidth consumed as the last element in his study. It was assumed that each message

took up an average of 5 Kb on regular or text-based mailing lists and 30 Kb per message for pornographic or image-based mailing lists. The mailing lists were found to consume a total of 1.7 Mbps bandwidth based on this assumption. It was also estimated that pornographic postings accounted for 40.7 percent of this total.

The total bandwidth consumed was estimated to be 1,732 Kbps. This total was made up of pornography: 704 Kbps (40.7 percent); knowledge: 270 Kbps (15.6 percent); social communication: 237 Kbps (13.7 percent); business: 153 Kbps (8.8 percent); religion: 149 Kbps (8.6 percent); politics: 113 Kbps (6.6 percent); and hobbies: 103 Kbps (6.0 percent).

ICT industries and services

Useful and reliable data about the ICT industry can be found at the Indonesian Chamber of Commerce website <<http://www.kadin.net.id/businessnet>> and at the Indonesian Yellow Pages website <<http://www.yellowpages.co.id>>. A list of 574 ICT companies located across Indonesia was found at the Chamber of Commerce site. A total of 649 Indonesian ICT companies were listed by the Indonesian Yellow Pages, comprising the following types of companies:

Computer – consultants	53
Computer – Internet	59
Computer – programming consultants	52
Computer – software	68
Computer – total solution	27
Multimedia	13
Software	88
E-commerce	2
Information technology	24
Internet – services	133
Internet – data	13
Internet – portal	25
Internet – service providers	90
Web design	2

The above data seems to show that demand for Internet-related products and services is quite high. However, Yellow Pages data also shows that ICT companies are distributed unevenly across the country. More than 60 percent of them are located in Jakarta, followed by Bandung, which is only four hours' drive away from Jakarta. Only a few companies are located outside the main island of Java.

According to *Digital Planet 2002*, Indonesian ICT expenditure in 2001 totalled US\$1,228 million. This was made up of hardware (US\$752 million), software (US\$124 million) services (US\$85 million) and other types of office equipment (US\$68 million). This total was significantly less than telecommunications spending at US\$2,311 million. ICT expenditure peaked in 1997. The economic problems which surfaced after that year led to a decline in ICT expenditures.

Internet infrastructure

Details about the Indonesian Internet infrastructure can be obtained from APJII's website <<http://www.apjii.or.id>>. According to APJII, as of mid-2001, there were more than 170 principal ISP licence holders, 125 APJII members and more than 50 active ISPs operating in more than 100 cities located across all the provinces. APJII provides common facilities, such as the APJII Indonesia Internet Exchange (IIX), APJII IDNIC, domain registration and National Internet Registry (NIR) (APNIC). The first commercial ISP was launched in 1994 by IndoInternet, also known as IndoNet <<http://www.indo.net.id>>.

It should be noted that 60–70 percent of all Indonesian Internet users access from Internet cafés. Also, most of the Internet activities are privately driven; there is no government funding for the sector.

The annual report of APJII can be downloaded from its website. The report estimated that at the end of 2002 there were eight million Internet users and one million subscribers in Indonesia. Young, educated males aged 25–35 years make up the bulk of the users.

Indonesians seem to prefer to register their Internet addresses under the international domains of “.com” and “.org” because of the convenience of making registrations at these domains. In spite of this, the number of people registering under the Indonesian top-level domain has been growing. In 2001, 3,945 new registrations were recorded under this domain, bringing the total to 12,413. In 1998, there was a total of only 2,526 registered domains (<<http://www.idnic.net.id>>). Budi Rahardjo, the country domain administrator noted that, in spite of the higher total in 2001, the number of registrations had actually declined. He felt that the reduction was mainly due to the dotcom crash.

The number of allocated public IP addresses and AS numbers in Indonesia has been growing. Accumulative IP blocks rose from 256 in 1999 to 1,649 in April 2002. AS numbers grew from 3 in 1999 to 34 in 2002.

APJII has established two IIXs in Jakarta to minimise international Internet traffic. The two IIXs are interconnected, and they in turn help to connect all the ISPs in Jakarta at no interconnection charges. The same arrangements are being explored in various cities in Indonesia.

The Multi Router Traffic Graph reports administered by Johar Alam <johar@the.net.id>, the IIX administrator, show significant increases in peak bandwidth at the IIX. The peak in February 1999 was measured at 2.05 Mbps. This rose dramatically to 255.4 Mbps in September 2002, more than 250-fold in just five years. (<<http://www.iix.net.id>>).

An analysis of the increase in traffic shows that it is due mainly to the expanding numbers of corporate subscribers, who are connected via 2,500 dedicated lines. At the same time, regular Internet users have also discovered new and interesting Internet applications that require higher bandwidth, such as transferring MP3 files, multimedia content and online gaming.

Peak Indonesian international bandwidth is estimated at about 800 Mbps. This estimate is based on the assumption that international traffic is three times that of domestic bandwidth. As peak bandwidth is normally about 80 percent of the maximum bandwidth, it is quite safe to estimate that the maximum bandwidth from Indonesia to the Internet is 1 Gbps. The ratio of incoming to outgoing Internet traffic volume is estimated at 1:10 as Indonesians consume more information than they produce.

In theory, the government issues two categories of licences, through the Directorate General of Post and Telecommunications:

Principal licence: This permits the applicant to establish a company within one year from the date of approval.

Operational licence: This is issued only when the applicant passes a screening process and it allows the licensee to provide services to the public.

There are several types of licensed services: ISP; network access provider (NAP), who runs the local Internet backbone; and multimedia provider, who provides content. No licences are required for providing reseller services, such as Internet cafés.

APJII reports show that in 1994 there were two ISPs, no NAPs and no multimedia providers. The number of providers increased to 179 ISPs, 16 NAPs and 24 multimedia providers in the first quarter of 2002. The numbers seem to show that the government is very open to the issuing of ISP licences.

Only some of the above licensed companies apply for APJII membership. APJII had about 125 members in the first quarter of 2002, comprising 112 ISPs, 5 NAPs, 6 multimedia providers, and 2 in the “miscellaneous” category (involved in wireless Internet and Internet educational research services). Not all the APJII members required services such as IP address allocation and interconnection to the IIX. Out of the 125 members, only 54 were connected to the IIX.

The Indonesian Internet Body was established in October 2002. It plays a role fairly similar to that of ICANN and IANA. It also acts as the NIR and allocates IP addresses and provides domain names. The body is supported by several groups:

- At Large Membership
- Government Advisory Committee
- Non-Government Advisory Committee
- Address Support Organisation
- Domain Name Supporting Organisation
- Protocol Supporting Organisation

This new body was interacting at <internet-id@yahoogroups.com> at the time writing.

Examples of innovative and key initiatives

Overview of Internet initiatives

The human factor is the most important element required for building the Indonesian Internet infrastructure and community. Free access to education on various aspects of the Internet is paramount for changing the mindset of Indonesians and building the skills required for developing of the Internet infrastructure at virtually no cost to the government or donor agencies.

Most Indonesian Internet activists prefer to place their contributions in the public domain, free of copyright. This free sharing of information is what the author terms as “copyleft”. Internet activists who have shared their information free of copyright include I Made Wiryana (based in Germany), Michael Sunggiardi (Bogor), Adi Nugroho (Makassar), Irwin Day (Makassar), Ismail Fahmi (Bandung) and R.M.S. Ibrahim (Jakarta). Their work is freely available from the Indonesian Digital Knowledge Foundation <<http://www.bogor.net/idkf>>, Pandu Team <<http://www.pandu.org>> and VLISM <<http://bebas.vlsm.org>>. These sites contain more than 5,000 articles and references on various aspects of the Internet. The Indonesian School Information Network (Jaringan Informasi Sekolah) <<http://www.jis.or.id>> also hosts free seminars in schools as part of this sharing of information.

Community-based Internet infrastructure

The Indonesian Internet network topology in early 1993 was fairly simple. It connected four institutions: Ministry of Research and Technology, University of Indonesia, Indonesian Space Institute and ITB. The connections were established via a radio network running at very high frequency 144 MHz, and ultra-high frequency 430 MHz. The network linked these institutions at the painfully slow speed of 1,200 bps.

As Internet cafés became more common in later years, it spurred the use of old 486 machines as Internet terminals, using the open source software Linux Terminal Server Program (<<http://www.lts.org>> or <<http://www.lts.or.id>>). The free software helped operators get around both cost and copyright issues.

There were more than 2,000 Internet cafés in Indonesia at the time of writing. There are about 1,489 Internet cafés listed at <<http://www.natnit.net/warnet>>. Unfortunately, the Internet cafés are unevenly distributed across Indonesia. More than 50 percent of them are located in Jakarta and its surrounding areas. About 87 percent are found in Java. The rest of Indonesia has access to only 200 Internet cafés, of which 25 percent are located in Bali and another large number in Sumatra.

Most of the Internet cafés are run with private funds and no government funding. The investment of US\$5,000–\$10,000 required to set up an Internet café is easily recouped within one to two years. Thus, it is not surprising to see many small and medium enterprises and schools investing in their own Internet infrastructure. The Internet café is an affordable solution for Indonesians to access the Internet.

The operators of Internet cafés are organised under the Indonesian Internet Café Association (AWARI). AWARI was founded in May 2000 and was led by Judith M.S. <me@judithms.com>, Michael Sunggiardi <michael@batutulis.com> and Abdullah Koro at the time of writing. The association has a mailing list at <asosiasi-warnet@yahoo.com>, which averages about 50–100 new postings per day.

An analysis of the cash flow of these Internet cafés showed that a big chunk of their revenue goes to the Indonesian telephone company for the rental of telecommunications lines. To make matters worst, the tariffs for these lines were recently increased. This state of affairs has driven the community to seek alternative ways of building their own network without having to rely on the telephone company (telco). Low-cost WiFi equipment has emerged as the favourite tool for bypassing the telco. Operators can easily build a low-cost gateway or router with a modest investment of US\$150 for each piece of equipment and a good mastery of Linux software. This combination permits operators to integrate a LAN or a community to connect to the Internet at 11 Mbps. Access points located 5–12 kilometres away can be easily reached by installing sufficient gain external antennae.

Having found the solution for an alternative high-speed local access network, operators now need to find a way to build regional networks. The only liberalised infrastructure for regional networks is via the satellite. Most of the Internet cafés in Bandung, Jogjakarta, Surabaya and Malang have adopted a hybrid satellite and wireless Internet infrastructure to build the community-based infrastructure without relying on the telco. High-speed wireless technology is used to share the bandwidth among these Internet cafés.

Satellite access is quite expensive, costing approximately US\$5,000 per Mbps per month. Thus, sharing this cost among 10–20 Internet cafés is a very logical way of reducing access fee to about US\$250–\$500 per month for each Internet café. The monthly cost of US\$500 per Internet café is quite affordable to the operators as they can easily earn about US\$50–\$100 per day from their customers.

Another emerging, but controversial, technology is Internet telephony. It can be used to build a community-based telephone network at very low costs. Interesting cases will emerge in the near future of the building of an Internet telephony infrastructure which bypasses the high-tariffed incumbent infrastructure. The government is expected to step in to protect the interests of the incumbent telco.

The Indonesian Digital Library Network

The Knowledge Management Research Group <kmrng@kmrng.itb.ac.id>, led by Ismail Fahmi <ismail@itb.ac.id>, has developed an open source software program for setting up digital libraries. The software has been used in establishing the Indonesia Digital Library linking 30 libraries in the country (<<http://www.indonesiadln.org>> <<http://gdllhub.indonesiadln.org>>). The International Development Research Centre <<http://www.idrc.ca>> and Yayasan Litbang Telekomunikasi Informatika <<http://www.ylti.or.id>> funded the group's initial research activities leading up to the development of the software.

The software is Ganesha Digital Library version 3.1, which can be run on a system operating on UNIX, Linux, Windows 98/NT/2000, and Windows 95 with Winsock32. More than 1,500 copies of the software had been downloaded from the Internet at the time of writing. This does not include users who received the software on CD-ROM. Interested users of the software come from all over the world. The team received an award from the American Society for Information Science and Technology in November 2001 and another award from the Indonesian Infocom Business Community in September 2002 for their work in this area.

Enabling policies

The government has established several national committees and provided funding for the development of ICTs in the country. The initiative was started in 1998 under the leadership of Jonathan Parapak. The first committee worked on developing the Nusantara 21 concept (see <<http://www.bogor.net/idkf>>). At that time, many nations were working on their national information infrastructure, inspired by Al Gore's global information infrastructure initiative.

The Nusantara 21 concept was later used as a reference by the National Coordinating Team for Telematics set up by the Indonesian President. The concept was adopted by BAPPENAS (National Development Coordinating Body) and was used for obtaining a World Bank investment loan <<http://www.worldbank.org/ict>>. The bank funded the US\$34.5 million Indonesian Information Infrastructure Development Programme (IIDP) in November 1997. The project was scheduled to be completed by 30 June 2003. IIDP consists of a number of smaller projects:

- **TATP:** a training programme for civil servants at the Ministry of Industry and Trade as well as for a small number of participants from selected small and medium enterprises
- **IPTEKnet:** at the Ministry of Research and Technology, for connecting government institutions to the Internet, which was to serve as the foundation for the e-government initiative

- **E-commerce:** at the Ministry of Tourism
- **Copyright law:** at the Ministry of Law and Legal Matters
- **National Information Technology Framework** at BAPPENAS

It now appears that most, if not all, of the funding has been spent on paying international consultants to prepare pages of concepts, working papers, laws and legal matters. To the best of the author's knowledge, no investment was ever made on infrastructure that will enable the people to access the Internet. The US\$34.5 million has unfortunately made very little impact on the Indonesian people.

In 2001, the Ministry of Research and Technology launched the Internet Café Technology project and the Science Technology CD. Since the government had a limited budget, the activities were funded mainly by the private sector. The Internet Café Technology project aims to build 9,000 Internet cafés with investments from members of the private sector, such as Myoh.com and Hewlett-Packard Indonesia. The plan called for the investments to be recouped from Internet café users via the payment of access fees. By early 2002, the project had succeeded in building a couple of these 9,000 Internet cafés.

The Science Technology CD contains research done under the Ministry of Research and Technology. It is distributed free to the public. Sekolah 2000 Foundation <<http://www.sekolah2000.or.id>> and Master Data were in charge of producing and distributing the CDs using contributions from many private sector organisations.

To the best of the author's knowledge, the only government-sponsored movement that managed to make a significant impact upon the Indonesian Internet society is the vocational schools' Internet movement <dikmenjur@yahoo.com>. Gatot H.P. <gatothp@aol.com>, the director of vocational schools at the Ministry of Education, led the movement. Unlike other bureaucrats, Gatot is very responsive on e-mail. During 2001, he worked closely with the Indonesian Internet community and succeeded in connecting more than 1,400 (out of a total of 4,000) vocational schools to the Internet. This is an impressive accomplishment.

Educational institutions provide some of the best opportunities for promoting the use of ICTs. There are more than 25,000 high schools in the country, reaching two to three million students, who stand to benefit from the Internet if their schools are connected. An additional 20 million Indonesians will be able to connect to the Internet during the next four to five years if conducive policies are set in place in the near future.

Regulatory environment

The following is a summary of laws and regulations affecting the ICT sector and their status at the time of writing:

Electronic transactions: The law for this area has been drafted by the University of Indonesia.

Cyber-crime: The law for this area has been drafted by Pajajaran University

Consumer laws for e-commerce and distance trading: There are no laws on this area, but, there is a general *Consumer Protection Act*

Data protection and privacy: There are no laws governing this area.

Broadcasting licensing and content regulation: Advocacy is underway to make the *Broadcasting Act* more people-oriented.

Internet-related licensing for ISPs, Internet cafés, telecentres, etc: The *Telecommunication Act* governs these. No licences are required for operating Internet cafés and telecentres.

Digital signature: An Act for this area has been drafted by the University of Indonesia.

Convergence and multimedia regulation: The *Telecommunication Act* regulates multimedia, but it does not address convergence issues.

Intellectual property rights: The *Intellectual Property Right Act* provides for this area.

WTO status, regional memberships, basic commitments related to telecommunications under WTO, foreign equity limits: Indonesia has acceded to WTO.

Telecommunications: This is regulated by the *Telecommunication Act*.

Local domain name registry and dispute resolution: The *Ministerial Decree on Telecommunication Services* governs this area.

Most of these laws and regulations can be found on the following websites:

<<http://www.internews.or.id>> posts broadcasting laws and telecommunications policy and law. It provides English translations for some of these laws.

<<http://www.hukumonline.com>> publishes various laws and regulations as well as news related to them.

<<http://www.postel.go.id>> Policies and regulations relating to the telecommunications sector are available here.

<<http://www.dprin.go.id>> Data, policies and regulations concerning various industries, including ICT.

Theoretically, drafts for new laws and regulations can be submitted by anyone and must be approved by the House of Representatives prior to their formal approval by the President. In reality, government agencies submit most of the draft laws as ordinary people have no interest and no resources to do this. In the ICT sector, the drafts were prepared by:

- Directorate General of Copyright and Patent
- Directorate General of Post and Telecommunication
- Ministry of Industry and Trade

Within the ICT sector, it is the economic affairs investigator within the police force <<http://www.polri.go.id>> who enforces the laws. Unfortunately, not many investigators are equipped with the necessary knowledge to undertake the enforcement and, in some unfortunate cases, money has got in the way of enforcement. In some cases, it may be better to raise enforcement issues via the media, such as Majalah Forum, Hukum Online and Internews, as they are often able to generate more rapid responses to such complaints than the official channels.

Open source movement

The Indonesian open source movement is very active. Education and discussion about Linux are carried out very frequently and intensely. Many local and international companies actively organise community-based seminars, talk shows and workshops on the subject. The Indonesian Linux User Group, Kelompok Pengguna Linux Indonesia (KPLI) <<http://www.linux.or.id>>, drives a significant portion of Indonesian Linux activities.

Indonesian Linux users interact and network through several mailing lists and websites. The most active Linux mailing lists are located at <<http://linux.or.id>>, <linux-admin@linux.or.id> and <linux-setup@linux.or.id>. There are also some lists hosted at Yahoogroups, such as <majalahneotek@yahoogroups.com> and <linux-heboh@yahoogroups.com>. The Indonesian Linux users tracking project is carried out at <<http://www.linux.web.id>>.

At the time of writing, there were at least three Indonesian Linux versions:

- Trustix Merdeka <<http://www.trustix.web.id>>
- Bijax; written by students at the University Bina Nusantara <<http://www.binus.ac.id>>
- WinBI which is adapted from Trustix Merdeka and supported by the Ministry of Research and Technology

The Linux Terminal Server Program (LTSP) <<http://www.ltsp.org>> is making a significant impact in the country as it provides a low-cost solution for many Internet cafés and school-based networks.

Most of the popular Linux websites are associated with Linux magazines, such as *InfoLinux* <<http://www.infolinux.web.id>> and <<http://www.infolinux.co.id>>, and *Neotek* <<http://www.neotek.co.id>> which focuses more on hacking techniques.

A significant number of Linux, Internet and IT books written by Indonesians have been published over the past four to five years. Companies such as Elexmedia Komputindo <<http://www.elexmedia.co.id>> in Jakarta and Andi Offset in Yogyakarta are the most active Indonesian IT book publishers.

User polls conducted at <<http://www.linux.web.id>>, <<http://www.infolinux.co.id>> and <<http://Jakarta.linux.or.id>> clearly show that RedHat, Mandrake, Slackware and SuSE are the favourites in Indonesia. The “militancy” of Indonesian Linux users is fairly high. When polled at <<http://www.linux.or.id>> on the question if Microsoft will win its “war” against open source, only 13.0 percent of the people polled answered “yes”, while the over-whelming majority of 80.8 percent answered “no”. The balance 6.1 percent said they did not know.

Some important insights into the Linux communities can be found in several polls conducted at various websites. The polls at <<http://www.infolinux.co.id>> show that MySQL is the favourite database software among Indonesian Linux users, KDE seems to be their favourite graphic user interface and, interestingly, a significant number of them actually use AMD as their processor of choice!

Research into ICTs

The Ministry of Research and Technology and the Ministry of Education have invested in excess of US\$3 million on more than 110 research projects in ICTs over the past ten years. In addition to government-funded research, a smaller number of research projects are undertaken via private sector contracts. Unfortunately, not much information is available on these private sector research projects.

The Indonesian National Research Council at the Ministry of Research and Technology has funded 88 ICT research projects under five themes: electronic components, telecommunications technology, software, signal processing, and power. Electronic components and telecommunications

technology make up 65 percent of the research activities. Less than 20 percent are on software. More than 40 percent of ICT research funded by this ministry is carried out at ITB <<http://www.it.ac.id>>.

The Directorate General of Higher Education is supporting more than 36 research projects in ICTs. About 44 percent of the research is on electronic systems, followed by 25 percent on software. The rest is on telecommunications technology, signal processing and power.

Some of the private sector research activities can be gleaned from university websites, such as the Inter-University Centre on Microelectronics <<http://www.paume.itb.ac.id>>, the Computer Science Department at the University of Indonesia <<http://www.cs.ui.ac.id>> and the Electrical Engineering Department at the same university <<http://www.ee.ui.ac.id>>.

Future trends

The private sector and the academia may be the most influential players in the Indonesian ICT sector. The private sector enjoys the benefits of free market competition in the ICT marketplace. The policy and regulatory framework seems to aim at building a non-monopolistic telecommunications industry, but in reality this industry is “strongly” regulated. It is hoped that a more egalitarian policy and regulatory regime can be implemented.

The academia is driven by young, energetic and educated Indonesians. They are rapidly adopting new technologies from the Web and various Internet mailing lists. Some of them are influencing their communities by building and running Internet cafés and writing articles and books in the Indonesian language.

On the technology front, significant progress can be expected in low-cost wireless 11 Mbps WiFi as well as low-cost systems running LTSP which provides appropriate solutions for Internet cafés, school networks as well as neighbourhood points-of-presence. Internet telephony will grow to pose a threat to the Indonesian telco.

It is hoped that the high-speed and transparent channels provided by the Internet to carry information and knowledge among the Indonesian people will help in the evolution of an Indonesian civil society, as well as a knowledge-based society, as more and more Indonesians gain access to the Internet. Unfortunately, it will probably take several generations to reach the rate of 80–90 percent Internet penetration in Indonesia.

The youth will be the main agent of change in the Indonesian knowledge-based society. For this reason, education for the young is the crucial factor for success. Accountable leaders will be the key catalyst of this evolutionary process. Unfortunately, it will not be easy to find such leaders.

Useful online sources of information on Indonesia

- <<http://www.bps.go.id>> National Statistical Bureau
- <<http://groups.yahoo.com>> hosts most of the Indonesian mailing lists
- <<http://www.yellowpages.co.id>> Indonesian Yellow Pages
- <<http://www.indopage.com>> An Indonesian directory service
- <<http://www.kadin.net.id/businessnet>> Indonesian Chamber of Commerce
- <<http://www.hukumonline.com>> a website about Indonesian laws and legal matters
- <<http://www.internews.or.id>> a non-profit organisation dealing with news and media issues
- <<http://www.linux.or.id>> Indonesian Linux User Group portal.
- <<http://www.apjii.or.id>> Indonesian ISP Association
- <<http://www.iix.net.id>> Indonesian Internet Exchange
- <<http://www.mastel.or.id>> Indonesian Telecommunication Society
- <<http://www.natnit.net/warnet>> Indonesian Internet café network
- <<http://www.postel.go.id>> Directorate General of Post and Telecommunication
- <<http://www.dikti.org>> Directorate General of Higher Education
- <<http://www.ristek.go.id>> Ministry of Research and Technology
- <<http://www.indonesia.go.id>> Indonesian government portal
- <<http://www.dprin.go.id>> Ministry of Industry and Trade
- <<http://www.kompas.com>> a popular source of Indonesian news
- <<http://www.detik.com>> DetikCom is the leading Indonesian online media organisation
- <<http://www.bogor.net/idkf>> Indonesian Digital Knowledge Foundation's large Indonesian ICT knowledge website.
- <<http://www.pandu.org>> a website with Linux articles and publications
- <<http://bebas.vlsm.org>> a large ICT knowledge website

Reference

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