<table>
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<tr>
<th>Title</th>
<th>Infostructure development in southeast Asia : Singapore as a case study</th>
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<tbody>
<tr>
<td>Author(s)</td>
<td>Reid, Edna</td>
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<td>Date</td>
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<td>URL</td>
<td><a href="http://hdl.handle.net/10220/1242">http://hdl.handle.net/10220/1242</a></td>
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Infostructure Development in Southeast Asia

Singapore as a Case Study

Presented by
Dr Edna Reid
Independent Consultant
E-Mail: efreid@pobox.com
Infostructure Development in Southeast Asia: Using Singapore as a Case Study

Dr. Edna Reid
Independent Consultant, efreid@pobox.com

AGENDA

Provide an analysis of infostructure development process in a Southeast Asian country.

Outline some implications of the process.

** Research is under construction.**
Information Superhighway

Basic of Bandwidth

VOICE, DATA, VIDEO

BASEBAND

VOICE
DATA
VIDEO

BROADBAND
IT Plans

Library 2000
(1994 onwards)

IT2000
(1990 onwards)

National IT Plan
(NITP) 1986-1990

Civil Service
Computerisation Programme
(CSCP) 1980-1985

Dimensions - S’pore’s Info. Infrastructure

1970s -
Building physical, IT industry/culture & telecommunications infrastructure (NCB, NSTB, IT education).

Late 1980s -
Building communities of government, R & D, educ networks such as NUSNET, TRADENET, LAWNET.

1991 - 1994
Built Technet (Internet network) - R & D and educ communities (soft infrastructure). Designing information services.

1994 -
Building public & commercial Internet services (SingNet, Pacific Internet, CyberWay). Building online information services. Extending cable services of SCV.
Components for Internet support business

II. APPLICATION

ORGANIZATIONAL APPLICATIONS

INTERNET SERVICES  ENDUSER  MANAGERIAL SUPPORT

TECHNOLOGY/ACCESS

I. INFRASTRUCTURE

- modems
- Lease Lines
- PSTN
- NUS
- Internet Gateway
- Remote Routers
- Dialup Server

Small Users
Mac PC

INTERNET

Source
Archives

Technet
Internet Gateway

NUS
NUSNET
TECHNET Backbone

Architecture of Technet

* A DEC 5000/200
+ Kindly donated by DigitalEquipment Singapore
+ Public Switched Telephone Network
Diffusion process (E. Rogers)

Diffusion – process by which an innovation is communicated thru channels over time among members of social system

Innovation – Internet

Communicated – via channels (newspaper, tv, radio, pamphlets,...)

Over time (1991-1996 Mar)

Members of social system (friends, employees, supervisors,...)
INTERNET DIFFUSION in SINGAPORE (How?)

DIFFUSION PROCESS

Rogers’ Elements of Diffusion

Channel

Innovation

Time

SOG

Issues

Studies

Implications

(S’pore) Sectors

• Construction & Real Estate
• Educ. & Training
• Financial Serv.
• Government
• Healthcare
• IT Industry

• Manufacturing
• Media, Publi. & Info. Serv.
• Retail, Wholesale & Distr
• Tourist & Leisure Serv.
• Transportation

Characteristics of Innovation

Relative advantage:
(competitive adv. & become model)

Compatibility
(consistent with IT2000 vision)

Complexity
 Proj. decrease difficulty; design easy to use applications

Trialability
(S’pore Online Guide, Asia Online)

Observability
(soc.culture.sp)
11 Industry Sectors of IT2000 Plan

- Construction & real estate
- Education & training
- Financial services
- Government
- Healthcare
- IT industry
- Manufacturing
- Media, Publishing & Info Services

Building block approach in developing Internet Infrastructure

- Telecommunications & info infrastructure
- Internet Industry
- Internet Applications (local)
- Internet Manpower
- Coordination & cooperation
- Internet culture
After 1993, DIFFUSION PROCESS in S'PORE

SOG

NCB

Ministries

Change Agents

Mass Media

DISPERSION OF INFORMATION (1993 - 1996 MAR)

SPH newspaper articles = 1592
- 1993 = 24
- 1994 = 121
- 1995 = 1062
- 1996 = 385 (Jan-Mar)
Birth of Internet-related companies

Government's roles:

a) **making the selling of Internet access**
   technologically & economically feasible
   (ex: Pacific Internet)

b) **stimulating new businesses** by creating
   derived demands for new products & services
   (ex: SilkRoute Ventures)

c) **promoting creation of new**
   businesses within old ones (ex: SingNet)

ISPs connection outside of S'pore

Pacific Internet

- T1
- E1
- A.BONE
- JVNCnet
- USA
- Japan

The 768 Kbps is used by academic institutions
**S'PORE'S INTERNET SERVICE PROVIDERS (ISPs):**

**COMPARISON**

<table>
<thead>
<tr>
<th></th>
<th>Cyberway</th>
<th>Pacific Internet</th>
<th>SingNet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of operation</td>
<td>March 1996</td>
<td>Jan 1992 (as Technet for R &amp; D)</td>
<td>July 1994</td>
</tr>
<tr>
<td>Background: parent companies</td>
<td>SPH &amp; S'pore Technologies</td>
<td>Sembawang Media, S'pore Intl Media &amp; ST Computer System purchased Technet.</td>
<td>S'pore Telecom. (also offers Teleview-Internet, Dec 94)</td>
</tr>
<tr>
<td>Basic Dial-up Cost for off-peak (as of Apr 96)</td>
<td>$12.95 for 13 hrs $2.00/each hr beyond</td>
<td>$12.95 for 12 hrs $2.35/each hr beyond min 3 mths</td>
<td>$16.00 for 12 hrs $3.50/each hr beyond (incl. toll-free)</td>
</tr>
<tr>
<td>Electronic storefront</td>
<td>Asia One (launch 6/95)</td>
<td>Asia Online Sept 94 (former NCB project)</td>
<td>CommerceAsia</td>
</tr>
</tbody>
</table>

**Singapore Internet Backbone**

```
Pacific Internet (PI)

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyberway</td>
</tr>
<tr>
<td>Singnet</td>
</tr>
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</table>
```
ISP's connection outside of S'pore

SINGNET

Sembawang Corporation

Shipyard sector

Engineering sector

Maritime sector

Industries sector

Ventures

Sembawang Media
formed 3/95

70% purchased shares in
Silkroute Pte Ltd (4/95)

70% 50% 40%

International Frontiers Pte Ltd (4/95)

Pacific Internet (9/95)

Macroline Sdn Bhd (Malaysia)

SuperNET (5/96) (Hong Kong)
Internet-related Companies

System Integrator
- CONTACT SERVICE
- FOCUS (NCS)

Information Provider
- database: Career Mosaic Asia
- database: Straits Times Interactive

Internet Storefronts
- CommerceAsia
- Asia1
- Asia Online

User

Organization

Value-added service
- raw content
- presentation/user interface
- pointers/links
- file retrieval/downloading
- storefront

Electronic commerce
- diskette (brochure)
- presentation/user interface
- internal links
- file retrieval/downloading
- billing

Electronic Market (Internet)
**IMPLICATIONS**

According to Paul Foley and Doug Watts some implications of diffusion of new technology are:

a) skill shortages (for adopting firms is most acute at the skilled level)

b) adequate & systematic training programmes
Sample of Internet-related jobs advertised in Straits Times

Estimate: About 414 Internet-related jobs were advertised between Jan 95 - June 96 in Straits Times

<table>
<thead>
<tr>
<th>Some Job Titles</th>
<th>Internet Concept appeared in ad</th>
<th>Degree Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst programmer/Internet ***</td>
<td>Internet (in job title)</td>
<td>N</td>
</tr>
<tr>
<td>Associate customer engineer</td>
<td>TCP/IP</td>
<td>Y</td>
</tr>
<tr>
<td>Assistant manager</td>
<td>TCP/IP</td>
<td>N</td>
</tr>
<tr>
<td>Communication network engineer</td>
<td>TCP/IP</td>
<td>Y</td>
</tr>
<tr>
<td>Content producers</td>
<td>Internet</td>
<td>Y</td>
</tr>
<tr>
<td>Customer support executive</td>
<td>Internet</td>
<td>Y</td>
</tr>
<tr>
<td>Database administrator, UNIX</td>
<td>TCP/IP</td>
<td>Y</td>
</tr>
<tr>
<td>Graphic/Page Designer (Web) ***</td>
<td>Internet (Job description)</td>
<td>Y</td>
</tr>
<tr>
<td>Information systems specialist</td>
<td>Internet</td>
<td>Y</td>
</tr>
<tr>
<td>Internet information systems engineer ***</td>
<td>Internet (in job title)</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Internet-related Jobs**

Grouped into three levels:

Level 1 = Advertisement mentions Internet protocol (TCP/IP)

Level 2 = Advertisement mentions terms such as Internet, WWW, FTP, HTML, ...

Level 3 = Advertisement includes Internet in job title and/or job description explicitly described Internet tasks
Examples: levels of Internet intensity

Level 3: Analyst programmer: Internet (ST 16/3/96 - SPH)

The job:
"You will be involved in the development of Internet services & providing support to SPH users publishing on Internet".

Level 1: Customer support specialist (ST 6/1/96 - SAP Asia)

"Knowledge in database systems such as Oracle, PC software packages & TCP/IP protocol".

Levels of Intensity / Internet-related Jobs
## Main Forms of Training

<table>
<thead>
<tr>
<th>Training (Jul 1994-June 96)</th>
<th>No. of courses identified</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Off-site</strong></td>
<td></td>
</tr>
<tr>
<td>Conferences (networking, Internet, ...)</td>
<td>38</td>
</tr>
<tr>
<td>Educational institutions</td>
<td>68</td>
</tr>
<tr>
<td>ex: ISPs</td>
<td></td>
</tr>
<tr>
<td>Informatics</td>
<td></td>
</tr>
<tr>
<td>(Introduction to Internet)</td>
<td></td>
</tr>
<tr>
<td>Microsoft</td>
<td></td>
</tr>
<tr>
<td>(Internet/Intranet, May 96)</td>
<td></td>
</tr>
<tr>
<td>Ngee Ann Poly.</td>
<td></td>
</tr>
<tr>
<td>(Java Programming, Jun 96)</td>
<td></td>
</tr>
<tr>
<td>Technet Users Group (Feb 94)</td>
<td></td>
</tr>
<tr>
<td><strong>On-site</strong></td>
<td></td>
</tr>
<tr>
<td><strong>On-job</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Off-job</strong> - by firms, consultants</td>
<td></td>
</tr>
</tbody>
</table>

*New degree programmes* - info studies, library techn., multi-media & publishing.

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### Infostructure Developments - CSF

- **Shared Vision (Build Nil)**
- **Enduser, Service Provider** ...
- **Strategic Plans**
- **Technology, Mgmt & Policy**