

Is Japan's Technology in Decline: The Telecom Case

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The Revolutionary Development in Telecom

Convergence of the telecommunications and information technology sectors occurred with the emergence of the World Wide Web; the browser linked the existing capital stock of computers and communications systems in an open network that significantly increased their utility.

Table 2

Telecommunication Equipment Exports (1990-2000)

(Value in millions of current USD)

Exports	Region	1990	1995	2000	Average Annual Growth in % (2000/95)
Communications Equipment	U.S.	4,063	10,933	20,680	13.6
	Japan	5,614	6,904	8,106	3.3
	EU	9,541	26,440	69,179	21.2

Source: OECD, ITS database, January 2002. Cited in Nezu (2002).

Deregulation of Telecom in U.S.

- ▶ Americans took lead in deregulation with 1982 antitrust settlement
- ▶ Led to entry of thousands of new competitors in communications sector
- ▶ AT&T loses its way: Creative destruction
- ▶ Rise of Internet as key element in communications
- ▶ Unmetered local communication charges key to promotion of mass usage of Internet Yes in U.S. Sweden, Finland etc.

The Japanese Case

- ▶ Japan consistent outlier
- ▶ Breakup of NTT late, Terms not announced until 1997 -15 years after AT&T breakup
- ▶ Breakup incomplete and preserved much of NTT's structure and pricing power
- ▶ Electronic companies supported NTT's position
- ▶ MPT after 1997 switched from pro-competition to more protective NTT stance-discouraged new entries
- ▶ As a consequence, Internet slow to take hold

Powerful Institutional Rigidities Slowed NTT's Acceptance of Emergent Networking Technologies

- ▶ Ingrained focus on need for high reliability systems for provision of domestic universal service
- ▶ Internet is “best effort network”
- ▶ Internet relies on retransmission of dropped messages
- ▶ Disruptive technologies can get better
- ▶ NTT preferred alternative technology, ATM, that used existing telephone lines

Japan Outside the Information Loop

- ▶ Few Japanese students populated the leading American research universities where much of Internet technology was developed
- ▶ UCB EECS Graduate students 2003: China 77, India 47, Taiwan 14, Korea 7 Japan 2

Key Developments

- ▶ NTT accustomed to taking lead in advance of equipment vendors in developing complex new technologies
- ▶ NTT focused resources on making ATM credible networking option. Did not give up until late 1990s
- ▶ Led equipment vendors (Fujitsu, NEC, Oki) to take passive dependent approach

NEC Story

- ▶ Messages from Silicon Valley ignored
- ▶ Believed in ATM delivering ISDN solutions
- ▶ Took to 1997-98 to realize that everything should be changed-ATM not the solution
- ▶ By then Cisco products had spread out to market and hard for NEC to differentiate their products
- ▶ Hardware and especially software had become complex.
- ▶ Cisco had proprietary IOS IP so couldn't just copy
- ▶ Mobile phone market growing rapidly so NEC shifted human resources to 2nd generation phones

The Fujitsu Story

- ▶ Two Key Groups: Communications Systems Group and Computer and Information Processing Group
- ▶ Communications Systems Group Focused on selling to telecom sector. NTT major customer. Followed NTT's lead
- ▶ Computer and Information Processing Group more open to Internet but investment decisions made at a higher level by officials who did not appreciate revolutionary nature of Internet

The Telecom Model for Standard Setting

- ▶ Telecom carriers accustomed to working through ITU –standard setting by committee model
- ▶ NTT worked with ITU to get each ATM standard set
- ▶ A slow laborious approach

The Internet Model for Standard Setting

- ▶ Used new Internet Engineering Task Force (IETF) to develop new Internet standard specifications
- ▶ Communication through e-mail and policies through rough consensus and “running code”
- ▶ Researchers submit draft version of IETF standard, posted for about 6 months with request for comment (RFC)
- ▶ Typically does not become a standard unless implemented and widely used
- ▶ Relatively few people involved and speedy
- ▶ Very responsive to real time market forces
- ▶ Balanced between committee based system and de facto standard setting

Consequences

- ▶ Japanese electronic firms lagged in introduction of cutting edge products and services. Not a factor in global market for networking equipment (routers, Network Interface Cards, related software)
- ▶ NTT not alone. AT&T, Alcatel, Siemens and later Lucent also slow to appreciate Internet
- ▶ But in U.S. new start ups took lead and pushed technology forward
- ▶ In Japan this alternative didn't exist. Poor environment for venture firms and incumbent electronic firms followed lead of NTT
- ▶ Downside of relationship contracting is that it makes rapid change to take advantage of new opportunities difficult

2nd Generation Phones

- ▶ NTT choose closed digital standard for 2nd generation phones known as Personal Digital Cellular (PDC)
- ▶ Global mobile communication standards typically created in open standard setting process (e.g., European GSM standard-120 countries)
- ▶ NTT worked with exclusive set of Japanese handset makers
 - provided phones based on NTT specs
- ▶ Government failure to open standard setting process and provide full and detailed public disclosure of specs
- ▶ Gave NTT great advantage over other domestic service providers

Compare to Korean Strategy

- ▶ Early licensee of CDMA
- ▶ Evolved the technology as it grew
- ▶ Companies like Samsung prospered with growth of market and building on their consumer electronics expertise
- ▶ Virtue of open innovation
- ▶ Too much pride in one's own innovative capabilities can be dangerous

Consequences

- ▶ By NTT's failure to consider consequences of developing a proprietary standard, 2nd generation phone exports were devastated
- ▶ Reflects insularity of NTT whose historic mandate was to serve domestic market
- ▶ Domestic handset makers kept busy meeting NTT's specs for upgraded phone. Few resources to work on meeting foreign standards

Further Developments and Scenarios

- ▶ DoCoMo learned some lessons; recently worked with Nokia and Ericsson on standards for 3rd generation phones
- ▶ Agreement involves acceptance of Japan's W-CDMA technology for outdoor applications in exchange for accepting GSM network interface
- ▶ But Japan can not simply return to former powerhouse role. Too much has changed.
- ▶ For mobile phones: new competitors like Samsung. Brand now more important
- ▶ For network equipment, worldwide customer acceptance of Cisco's technology makes it hard for Japanese producers to get traction in international markets.

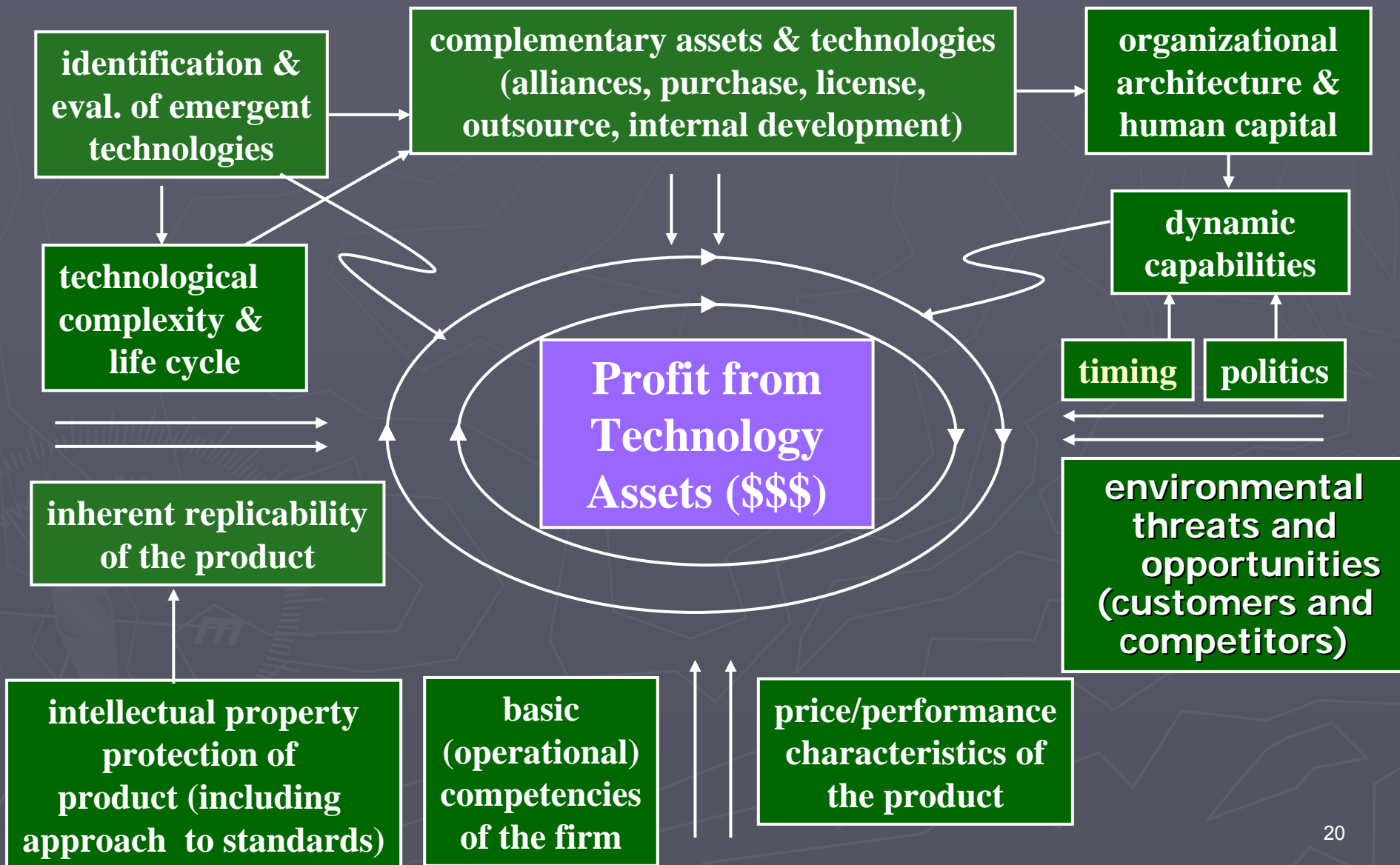
Larger Trends

- ▶ U.S. superior in conventional PC centered Internet and related technologies of content production and security
- ▶ Emergent ubiquitous networks favor mobile communications technology-requires terminal technology for overcoming restrictions of receiving devices and of terminals; also requires optical technology for overcoming communication performance problems. These are strong points of Japan's R&D activities.

Implications for Managing Technology

- ▶ Regulation can distort market forces and inhibit innovation: NTT case
- ▶ Not always advantageous to develop own technology and own standards; vs. open innovation
- ▶ Must be in information loop to profit from discontinuous technology
- ▶ Relationship contracting can have adverse consequences when faced with new technology
- ▶ Quality focus can inhibit openness to new technology
- ▶ Need strategic approach to setting standards
- ▶ New ventures excellent vehicle for picking up signals on promising directions for new technology

Capturing Value From Technology Assets



Innovation Principles

Closed Innovation

- ▶ The smart people in our field work for us
- ▶ To profit from R&D, we must discover, develop and ship it
- ▶ If we discover it, we will get to market first
- ▶ Co. that gets to market first wins
- ▶ If we create most and best ideas, we will win
- ▶ Must control our own IP so competitors don't profit from our ideas
- ▶ Must train own employees

Open Innovation

- ▶ Need to work with smart people outside co. as well
- ▶ External R&D can create value for us
- ▶ Don't have to originate research to profit from it
- ▶ Building better business model wins
- ▶ Winners make best use of internal and external ideas
- ▶ Can profit from others use of our IP; Can buy others IP if it advances our business model
- ▶ Can benefit from hiring those with skills acquired from others