South Korean Telecommunications Memo
by Joseph Laherran

I. Introduction

The relationship between supply and demand is one of the most elemental aspects of a market economy. Supply and demand work synergistically, where demand fosters supply and supply in turn fosters demand. When a market economy is successful, the supply is in equilibrium with the demand. When looking at the history of telecommunications in South Korea, this dynamic was understood, fostered, and the results have been breathtaking.

South Korea boasts the world's top Internet usage and access. Competing with global giants, this tiny nation is at the forefront of technological innovation. But how was this possible? How did a formerly developing war-torn nation achieve such an elite status? This memo attempts to answer that question by examining three factors that allowed South Korea to become the broadband nation that it is today. First, there are geographic and demographic advantages for deploying high-speed Internet. Second, concerted government and private actions in the late 1990s and early 2000s laid a foundation for supply and demand of high-speed Internet. Third, subsequent activity by both the private and public actors to leverage supply and demand for ever increasing Internet speeds.

II. Demographic Advantages

South Korea is a small nation sitting on the tiny Korean Peninsula. It lacks resources and is densely populated. South Korea is roughly the size of the distance between San Francisco and Los Angeles and has a population of 54 million. This gives rise to the first advantage: a lot of people living in a small area.

While the number of those living in urban centers in the United States is significantly larger than the number of those in South Korea, the percentage of the population in both countries that live in an urban environment is about the same. The United States has roughly 267 million individuals living in an urban environment, compared to the nearly 41 million in South Korea.[1] That 267 million makes up roughly 82 percent of the population as compared to the 81.5 percent of South Korea's population.[2]

However, the population advantages for deploying high-speed networks per square kilometer of land weighs heavily in South Korea's favor. As compared to the 35 people living per square km. in the United States, almost 528 people live per square kilometer in South Korea.[3] Viewing these statistics in their totality shows that South Korea has a definite advantage because connecting everyone is less expensive where universal, or near-universal, connection entails significantly less manpower, construction hours, and material. Korean ISPs also have more uniformity in infrastructure regulation and do not contend with crossing multiple state lines and differing state rules.

However, these advantages are minimal and not dispositive as to why South Korea has such a faster and more universal broadband network. Although, at the surface level, the density looks determinative, there is a simple response that weakens that number's importance. The answer being that America has more uninhabited land than South Korea and more densely populated cities. By looking at population density of the major cities in America, there is a similar opportunity as in Korea to deploy a fiber network that connects a lot of people that live in

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[1] World Bank Group, *World Development Indicators* (Nov. 11, 2018) <https://databank.worldbank.org/data/reports.aspx?source=2&type=metadata&series=SP.URB.TOTL.IN.ZS#>
[2] *Id.*
[3] *Id.*

a tiny space.[4] In other words, major U.S. cities should be on par or ahead of Seoul because a greater number of people live in an even more compact space. Geographical scale only truly factors into the analysis when the goal is to deploy a network to rural American communities.

While those living in rural areas might inevitably never have the same broadband access as those in South Korea, those living in urban areas should be able to enjoy comparatively fast speeds because cities in both South Korea and the U.S. have the same urban geographical advantages. However, geographical advantages are only one piece of the puzzle. South Korea has also demographical advantages that enable them to have the fastest network.

The International Telecommunications Union (ITU) is an agency of the United Nations. Since 2009, the ITU publishes an index that combines eleven indicators which is used to monitor and compare developments and trends in information and communication technology amongst the members of the United Nations. These indicators show how South Korea's population is more predisposed to making greater use of high-speed networks.

For example, the ITU's Skill Subs Index measures the level of education and skill that individuals of that nation possess. The ITU measures the mean years of school and the percentage of individuals enrolled in secondary and tertiary education. The United States only has greater mean years of schooling (13.20 as opposed to 12.20 in Korea).[5] South Korea, though, boasts a higher percentage of those enrolled in both secondary and tertiary education levels. Most importantly, Korea's tertiary (college equivalent) enrollment is almost ten points higher than the United States' (95.3% as opposed to the United States 85.8%).[6]

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[4] New York City's Population Density sits at almost 10,500 people per square kilometer. San Francisco's density has more than 6,200 people per square kilometer. Even Los Angeles, as spread out as it is, has more than 2,900 people per square kilometer. Data From U.S. Census Bureau
[5] International Telecommunications Union, *ICT Development Index 2017*, (2017) <http://www.itu.int/net4/itu-d/idi/2017/index.html#idi2017comparison-tab>
[6] *Id.*

The ITU's Use Subs Index demonstrates this divide. The Use Subs Index is where the ITU measures the percentage of individuals using the Internet in addition to the fixed/wireless subscriptions per hundred individuals. It is here where South Korea shines, with almost 93% percent of individuals using the Internet as compared to 76% in the United States.[7] Moreover, there are 41 per one hundred fixed broadband subscriptions per people compared to 31 per one hundred in the United States.[8] The United States has higher mobile broadband subscriptions than Korea, with about 120 subscriptions per 100 people as compared to Korea's 111 subscriptions per 100 people.[9]

III. Laying the Foundation

South Korea's journey to telecommunications superpower can be traced back to the 1970s and 1980s. In the wake of the destruction of the Korean War, the war-torn nation desperately needed to rebuild its industry and infrastructure. Aggressive government policies in the 1970s and early 1980s facilitated industrial growth in the oil refining, steel, automobile, shipbuilding, manufacturing, and construction centers. This, in turn, fostered a restoration in their national infrastructure. Then when prepping for hosting the summer Olympic games in 1988, South Korea recognized the need for a national telecommunications infrastructure as well.[10] This was the genesis for their pursuit of the fastest, most accessible Internet.

Without an electronic switching device, the mass introduction of the landline telephone was progressing too slowly.[11] In order to facilitate a rapid expansion of a telecommunications network, developing electronic switching devices was essential. In recognition of this fact, Korea

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[7] See *supra* Note 5
[8] *Id.*
[9] *Id*.
[10] Karippacheril, Tina George, Soonhee Kim, Robert P. Beschel Jr., and Changyong Choi, editors, *Bringing Government into the 21st Century: The Korean Digital Governance Experience*, Directions in Development. Washington, DC: World Bank (2016). [hereinafter Korean Digital Governance Experience]
[11] *Id.*

decided to invest .9% of their annual GDP (US $60 Million) into their research and development

agencies to develop such a device.[12] To show just how small of an investment that is, the U.S.

GDP in 1980 was 2.8 Trillion dollars.[13] That investment would have represented a .002%

investment by the United States during this time. The end product of their investment and

research was the TDX, the Korean digital electronic switching device, which was launched in

1985. Paving the way for a high-speed network was not the only benefit of developing this

technology. Importing the devices would have cost almost ten times the price that developing

one would have and making a domestic switching device would also reduce operational costs,

such as replacement parts. Moreover, South Koreans gained invaluable knowledge in the ICT

sector through the development of the TDX because such a switching device required

capabilities in semiconductor, computer, and telecommunications technology. Their investment

paid off and by 1987, two years after TDX's deployment, telephone penetration rate reached

100% compared to only 35% of households in 1980.[14]

 Once this expansive network was deployed, the government utilized the newfound

knowledge that had led to the development of the TDX and pivoted their research and

development efforts towards engineering midsize computers. These efforts in particular resulted

in the TICOM, a midsize computer that was developed by using the open source Unix operating

system that was distributed to local governments and used to provide public services to citizens.

These two developments provided the perfect foundation for South Korea to build the impressive

telecommunications network they have now.

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[12] *Id.* at 43.
[13] World Bank National Accounts Data, *GDP*, (2019),
https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2015&locations=US-KR&start=1980
[14] *Id.*

IV. Building the Backbone

Korea's first democratically elected president Roh Tae-Woo wanted to bring South Korea to the forefront in their government's use of technology. When his party broadened their strength in the parliament in 1988's elections, President Roh saw an opportunity and initiated the National Basic Information System (NBIS).

The objective of NBIS was to focus on deploying national computer networks, IT applications and systems. This would be done by computerizing all administrative functions of the government and the development of interconnected systems. The first interconnected system was an administrative network for government and government funded institutions. The next was a financial network for banks, insurance companies, and the securities commission. Following this, NBIS set up an education and development network for universities and research institutions. Finally, the NBIS set up two security networks. One being a national defense network for defense-related organizations and the other being a public security network for security related organizations. The largest network was the administrative network which computerized paper records for managing different types of government related work such as: resident registration, customs clearance, real estate, employment, economic statistics, and automobile registration.[15]

In tandem with government initiatives to computerize the government in the late 1980s, government agencies were organized to complement and ensure that the policies were being carried out on schedule. Before implementation of the NBIS, the government designated the Board of Audit and Inspection to make sure that policies were proceeding in an orderly fashion. However, the board was ineffective because they did not possess any expertise on these projects.

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[15] Korean Digital Governance Experience at 45

Then the government established the National Computerization Agency (now called the National Information Society Agency) to inspect and provide technical support for the initiatives.

Once these major networks were finished in the early 1990s, the Korean government made the next major step in getting South Korea to where it is now through the Korean Information Infrastructure (KII). This was a response to the shortcomings of the NBIS, as there was little industry capability, and there was a failure to stimulate the domestic demand for ICT. The KII, divided into three parts, was meant to provide Korean companies the ability to compete at the global level. Those three parts can be summarized as: infrastructure, access, and testing. However, the third aspect of the policy, the KII testbed, just continued to fund research and development.

KII-G (Korean Information Infrastructure Government) was the first of the three parts of the KII and was aimed at constructing a backbone network connecting public institutions and buildings. During this part, the government invested 620 million US dollars (.1% of South Korea's GDP)[16] in constructing this backbone networks.[17] Copper lines were replaced with fiber lines which connected close to 237 call stations with fiber.[18] Fiber was further laid down to connect 524 call zones and was also laid at close to 2,000 heavy traffic buildings. This established a network with speeds of 155 Mbps in 144 major cities.[19] This first phase created the infrastructure for a highspeed network.

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[16] See *supra* Note 13

[17] Yong-Hwan Lee, *ICT as a key engine for development: good practices and lessons learned from Korea*, Information Solutions Group
<http://siteresources.worldbank.org/INTEGOVERNMENT/Resources/NoteKoreaICT.doc>

[18] Jukjon-Ri, Suji-Eub Yongin-Si, Gyonggi-Do, *Informatization White Paper 1998*, National Computerization Agency, Republic of Korea (1998) at 18

[19] Kim Chi-Dong, *Korea Information Infrastructure & Broadband Service*, Republic of Korea Ministry of Information and Communication (Jun. 2001)

V. Fostering Industry Demand

Once the infrastructure was in place to provide for a highspeed network, the next step was to facilitate access to that network. KII-P was this next phase in the KII plan, aimed at stimulating the private sector and providing individuals with access to that network. Fueled solely by investments from the private sector, fiber optic cable was laid to connect the public to this national backbone. As a means to stimulate competition, a certification policy was implemented in which a ranked list was published to show which buildings and apartments had the fastest Internet. Since a large majority of the Korean population lived in apartment buildings, this list stimulated competition, forcing land owners to equip their buildings with the fastest connection and forcing providers to provide cheaper options.

Once the KII was completed, the South Korean Assembly passed the National Framework Plan for Informatization and Promotion. This program established the Informatization Promotion Committee. This committee was tasked with creating annual government reports known as the "white pages." The white pages served as a means to document South Korea's progress and lay out future plans that aim to improve and utilize the interconnected network South Korea took so long to create.

Then an Asian financial crisis gripped South Korea in the late 90s. Due to increased debt and lowered ratings, the government initiated Cyber Korea 21. The goal was to combat this crisis by attempting to further enhance the role of the telecommunications industry in the South Korean economy. During this period, the government fostered growth in the IT industry by promoting Korean technology in foreign markets and promoting domestic competition through the passage of the Telecommunications Business Act and Monopoly Regulation and Fair Trade Act. The Telecommunications Business Act regulated the local market and restrained international

involvement in the local market. Specifically, the act prohibited foreign entities from owning

more than half of the stock of Korean telecommunication companies.[20] The act further restricted

the issuing of common business licenses to foreign entities, including both foreign national

governments and foreign private entities.[21] These provisions practically eliminated any sort of

foreign presence in the South Korean telecommunications markets. This fostered growth of the

Domestic Companies so that they could be able to compete in the global market.

The Monopoly Regulation and Fair Trade Act established extensive regulations of the

domestic telecommunications industry in two major ways.[22] The first is that it regulated the

business practices between domestic companies. Because the private companies from the KII-P

were so involved in providing infrastructure access and licensing rights, the act strictly regulated

business practices through not allowing private companies to engage in unfair practices.[23] In

particular, this law prevented companies who owned fiber lines to lease lines at unreasonable

rates. By requiring private companies to lease their lines fairly, South Koreans could now choose

between multiple service providers while preserving the connectivity speeds.

This leveled the playing the field so that already established companies were unable to

prevent new companies from entering the market. Secondly, the anti-trust regulations that

stemmed from the law would further promote growth and competition within the South Korean

market. The law limited the amount of market shares any one company may gain, it regulated

holding companies and how much control they may take.[24] The law further regulated mergers

and acquisitions between telecommunication companies if the resulting company would hamper

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[20] Telecommunications Business Act Art. 6 Section 1 (S.Kor.)
[21] Telecommunications Business Act. Art. 5-2 (S.Kor.)
[22] The Monopoly Regulation and Fair Trade Act sections analyzed here represent the amended 2004 version
[23] Included in unfair business practices as defined in the statute are practices such as setting unreasonable prices for competitors, unreasonably impeding the participation of new competitors, and actively excluding competitors. See *Id.* at Article 3-2(1)
[24] See *Id.* at Article 7

competition between other companies or would gain too much market control.[25] In these two

ways, the law's strict regulation of established companies allowed new companies to enter into

the market. The table below shows how the market share trend shifted during Cyber Korea 21.[26]
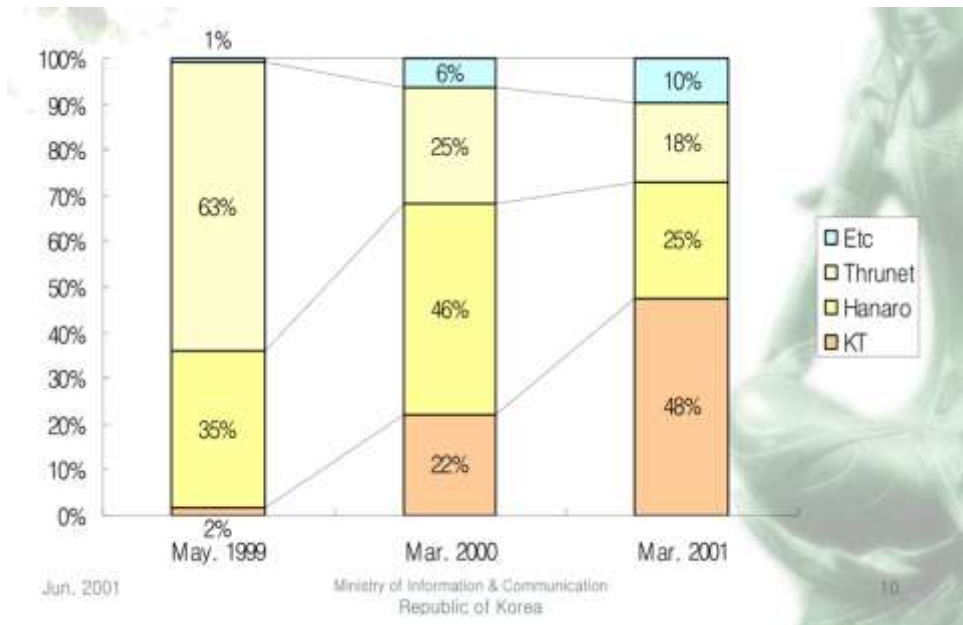
Cyber Korea 21 was a smashing success in both the domestic market and the

international market. On the domestic side, the increase competitiveness and regulation forced

the major telecom companies to improve their services as competition flourished. With the KII

establishing the network between 144 regions, the Cyber Korea 21 initiative utilized that

backbone and during the implementation connectivity speeds improved from 155 Mbps to 40

Gbps in capacity.[27] This was in 2001, only six years after the deployment of the KII.

The telecommunications utilization by the country grew extensively in the years that

followed. By 2003, the telecommunications industry contributed 41.9% to total economic growth

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[25] *Id.*

[26] See *supra* at Note 14

[27] Tim Kelly, Vanessa Gray and Michael Minges, *Broadband Korea: Internet Case Study,* International Telecommunications Union (March 2003)

and by 2004, IT exports accounted for almost 30% of the total exports leaving the country, totalling approximately 74.7 Billion U.S. Dollars.[28]

VI. Fostering Citizen Demand

When South Korea finally recovered from the Asian financial crisis, it was time for them to renovate and further improve the government's presence on the Internet. In March of 2001, the government passed the Electronic Government Act which laid out eleven initiatives to bring the South Korean government into the 21st century. While the eleven initiatives served as the immediate response, the South Korea's Vision for an E-Government is a multi-phase program that continues today. During the early enactment of the Electronic Government Act, however, the eleven initiatives focused on improving and developing systems critical to government operation.[29] The eleven initiatives can be separated into three groups: five systems provided a more productive and efficient government, four systems provided enhanced services to the public, and two improved the online infrastructure for the E-Government.

The five initiatives that provided a more productive and efficient government centered on operational support. A national education system established an online logistical connection of upwards of 10,000 schools that provided parents, teachers, and students with access to education-related information. A national finance system established a comprehensive system for citizens that not only created a finance database but connected that database to the Ministry of Finance and Economy. It was a one-stop shop for everything finance. A personal policy support system digitized all government human resources information including HR management, wage

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[28] Byoung Nam Lee, *Korean Government-Driven ICT Policy: IT 839 Strategy,* Electronic and Telecommunications Research Institute, Presentation Given at Regional Seminar on Costs and Tariffs for the TAS Group Member Countries Cyberjaya, Malaysia (May 31, 2005)
[29] See *supra* Note 10

management, recruitment, education, training, statistics, and internal services for government employees. An electronic document management system allowed the South Korean government to electronically manage the entire flow of government documents including document production, approval, delivery, and archiving. Finally, the Local E-Government Information system handled administrative functions related to rural affairs, environment and social welfare by connecting relevant agencies and systems. What these five systems created was a situation where if a citizen needed to do anything with the government, there was an easily accessible way to do it over the Internet.[30]

Moving from governmental operation support, four systems were employed to enhances services available to the public. An electronic home tax service was developed for the filing of personal income tax and value-added tax returns. Furthermore, the system was updated to include liquor tax, securities tax and a special excise task. A social insurance information system comprehensively linked pension, health, accident and unemployment databases. Now that these systems were connected inquiries, civil petitions, notices, and payments of those kinds of insurance could be processed online. A Korea Online E-Procurement System (KONEPS) created a two-way shopping mall that connected consumers to both private companies and public organizations. By 2012, 40,000 public organizations and 220,000 private companies interacted through KONEPS with a total of 64 billion US dollars in transactions over this platform.[31] The last system created a citizen service portal (G4C).[32] This system greatly simplified how South Koreans dealt with administrative matters by providing access to about 4,200 hundred

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[30] *Id.* at 67
[31] Public Procurement Service, *KONEPS: Korea's World Class e-Procurement System*, <https://www.g2b.go.kr/gov/koneps/pt/intro/file/4_KONEPS_eng.pdf>
[32] *See* Korean Digital Governance Experience.

government services without the need to visit different agencies.[33] G4C enabled citizens to use online filing, issuing, and identifying services integrated into the system.[34]

Finally, the E-Government Act continued to improve on their infrastructure through instituting two common requirements for all the newly integrated systems. An authentication system instituted a personal identification system across all the platform. Having a uniform authentication system greatly simplified access to all the systems now in place. The E-government Act also launched construction of a government data center which was completed by 2005. This data center hosted the systems of 24 ministries by 2006.[35]

What these eleven initiatives accomplished was profound. First, they created a uniform one-stop shop for everything in South Korea. Any citizen could now use the Internet for almost every aspect of their daily lives. These systems are ubiquitous, in the sense that they are all interconnected and easily accessible via the Internet. Paired with breathtaking speeds, this ubiquitous network also created a demand for South Koreans to constantly use the Internet because every aspect governing daily life is only available online. If a South Korean citizen did not have access to the Internet, they essentially could not be fully functional in South Korea.

However, such a high demand created a divide in Korea, where there was this extremely high need to access and be acclimated to the web, yet there was still this population that did not have both the requisite knowledge and access to properly function in the emerging South Korean society. As a means to address this problem, the Korean government enacted the Digital Divide Project to provide access to those who did not have access and education to students and the elderly. The South Korean government was primarily concerned with providing access to those

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[33] *Id.*
[34] *Id.*
[35] *Id.*

of low income and to those living in the rural areas under this project. With 144 cities already connected to South Korea's backbone network, the Digital Divide Project provided a loan of around 120 million USD to KT to provide network access to rural areas.[36] That loan allowed KT to provide network access to around 205 villages and 1,208 towns.[37] By the end of 2003, 93% of the homes in the rural and agrarian homes had Internet access.[38] The Digital Divide Project additionally aimed to provide access to low-income citizens. First, the South Korean government discounted service charges between 30%-50% for the disabled and low-incomes families.[39] The government also installed almost 3000 public access points at government offices and community centers to provide Internet access to those who did not have the means to own a PC.[40] Finally, 50,000 low-income students who qualified with good grades were also given computers free of charge.[41]

On the education side of the Digital Divide Project, the government focused on improving IT training in primary and secondary schools. In addition to providing low-income students with PCs as an incentive, the project also gave 500,000 primary and secondary school students extra-curricular computer courses starting in 2001.[42] The project also instituted a National IT program with the intention of providing general IT training to over 10 million people in addition to adding online contents for the elderly such as rehabilitation, health, social events, transportation, leisure and welfare.[43]

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[36] Yong-Hwan Chung, *Korean National Policies to Close the Digital Divide*, Ministry of Information and Communication, Republic of Korea (Aug. 6, 2002)
[37] Yeon-Gi Son, *Implementing Policy to Bridge Korea's Digital Divide*, Asia Pacific 19, (2005) <http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan046431.pdf.>
[38] *Id.*
[39] *Supra* Note 36
[40] *Supra* Note 37.
[41] *Id.*
[42] See *supra* Note 36
[43] See *supra* Note 37

When the first phase of the project wrapped up in 2002, it is estimated that a total of 13.8 million benefitted from that project, bringing the total population that had IT capabilities to nearly 39.5 million, which was just about 90% of the population.[44]

VII. Conclusion

In conclusion, South Korea's status as a technological powerhouse occurred through a steady policy of stimulating the supply of Internet capabilities with demand from the public. On the supply side, South Korea understood at a relatively early date that a strong backbone built by fiber-optic cable was the means for a fast and connected society. However fast speeds and interconnectedness does not facilitate IT usage nor industry growth. Once the network was established, the South Korean government transitioned daily services to the Internet by digitizing as many government functions as possible and providing as much access to all as possible to utilize those services.

As it relates to the United States and its current telecommunications situation, there are hurdles which make it difficult for the U.S. to replicate South Korea's progress. The first is that South Korea has a markedly different government structure than the United States. For example, the president of South Korea has more capability to act quickly on policy initiatives and has more authority in domestic policies than the president of the United States. For instance, the South Korea president has the power to initiate and execute an amendment to all laws and policies and is also the chairmen of all political committees. What this allows is for the South Korean president to be significantly more involved in the policy making and implementation. Combined with support from South Korea's Parliament, the government had the authority to

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[44] See *supra* Note 36.

quickly enact new national telecommunication policies. This allowed for decades of telecom

plans and policies to be regularly updated and re-implemented throughout the decades.

The second reason replicating these policies will be difficult in the United States is

simply that the U.S. has focused its efforts to improve competition through deregulation, whereas

South Korea believes that competition is actually improved through regulation. Until

policymakers recognize that the U.S. approach has not produced the results they seek on the

global stage, the complete divergence of policy will be impossible to reconcile.

However, the results speak for themselves. When the South Korean government passed a

series of regulations that basically outlawed any sort of unfair competitive practices within the

telecom industry it experienced massive growth. Decades of sustained government policies

focused on developing their telecommunications market formed the bedrock of what made South

Korea what it is today. From a war torn nation to a country with a fraction of the wealth of the

United States, it is now the global leader on broadband access with its IT industry being one of

its strongest markets.