

## An Analysis of Korean National Information Strategy of IT839

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### Abstract

*Recently, the Korean government launched the IT839 project with the objective of converting Korea into a ubiquitous information society. This study investigates the role of the Korean government in the development of the national information infrastructure and the realization of IT839 vision. This paper reviews the historic and individual data related to the infrastructure project, draws on the social construction of technology theory as a framework for interpreting such data, traces the transformations and translation of this data in the public, political, and social discourse, and discusses the next generation of information infrastructure. Findings imply that despite optimistic prospects and proactive drive, uncertainty still remains with respect to where IT839 will evolve and how it will impact the new information milieu.*

*Information Highway.* These NIIs are being designed to create an “electronic city” to link homes, schools, libraries, hospitals, and small businesses to this information superhighway. Just as electricity, streets, and water are core infrastructures that serve residents, businesses, and government alike, so too is the information infrastructure a community-wide need, such as education, human resources, health care and public services. According to the National Information Infrastructure Act of 1996 (Amended from 1993 of H.R. 3723), information infrastructure should “directly benefit all people,” provide “large economic and social benefits,” and be “designed to be accessible and usable by all, including historically and economically underserved populations and individuals with disabilities, in the fields of education, libraries, health care, the provision of government information, and other appropriate fields.”

### 1. Introduction

Building an effective national information infrastructure (NII) has become a high priority to governments around the world. Just as the telecommunications infrastructure provides the transport means for the information economy to develop, creating the infrastructure for information itself is becoming a key agenda, at national, regional and global levels. As the government initiative forms the foundations in creating an information infrastructure, governments initiate projects to improve telecommunications infrastructures and to construct new channels that are more advanced and accessible. Such projects include Singapore’s *Intelligent Island*, Malaysia’s the *Multimedia Super Corridor 2020*, U.S. the *Global/National Information Infrastructure*, and Canada’s the

Focusing on this underlying principle as a normative framework, this study investigates the role of the Korean government in helping Korea forge its path into the next generation of the information society. It focuses on the processes involved in the planning of the NII projects and evaluates its prospects by tracing various views from different stakeholders. It examines the direction, nature and future of IT839 by focusing on the political economy of informatization. Drawing on theoretical perspectives from the theory of Social Construction of Technology (SCOT), this study collected qualitative data primarily through in-depth interviews with diverse stakeholders: policy and regulation groups, user groups, industry, and research institutions. In addition to interviews, this research collected and analyzed archival

documents from various sources to triangulate research findings.

IT839 is one of milestone projects that Korea has initiated recently. Korean government has fully supported IT839 knowing that the magnitude and the scope of IT839 might impact. Extensive financial investment (over US \$70 billion) has been committed to IT839 and substantial regulatory support has been made to the industry involved in IT839. In society general, the public aspiration is so high enough to make people believe the IT839 makes a realization of ubiquitous information society. The findings, however, imply that the Korean NIIs fall short of the ontologically bounded accountability of serving as an information infrastructure. The NIIs in the present study tend to be designed primarily to serve the demands of major corporate suppliers and industry at the expense of public interests. In addition, the primary driving force to develop the NIIs has been primarily the arrangement or outlay of technological equipment to increase technical capability.

The objective of this research is to highlight the neglected aspect of Korean IT strategy to produce suggestions for better development. Indeed, extensive research has been conducted to highlight positive accomplishments, but there is very little research done in critical perspectives. Korean IT strategy and development have been often evaluated on the basis of its economic efficiency and physical growth leaving out important fundamental and social considerations. By being aware of the current problems of the development, governments can establish a precedent for further projects, such as next generation of information infrastructure. The findings provide policy-makers and regulators with ideas for the better practice of nationwide telecommunication implementation and development.

## 2. Theoretical Framework

In this research, theoretical framework was developed and expanded based on SCOT.

Such framework is used to describe the strategies that the various stakeholders implemented and to show how these strategies were used in relation to other stakeholder groups. The SCOT framework is particularly useful for this study as a framework focuses on diverse individual users. While many industry reports praise IT839, an emergent and the most fundamental question with IT839 is what benefits it gives to people. In this light, this research focuses on the people's response to IT839. Although there have been many reports looking at the impact of IT839 on industry at the industry level, little attention has been made on the individual level, such as people's views and perceptions. Since the primary goal of IT839 lies in user benefit, a fundamental and *a priori* question needs to address the people's actual responses. The present study aims to fill this gap by analyzing people's feedback on IT839 using the idea of interpretive flexibility in the SCOT theory.

As originally presented by [1], SCOT's conceptual framework consists of four related components: interpretive flexibility, relevant social groups, technological frames, and closure with stabilization. This study only takes the first two components of relevant social groups and interpretive flexibility, because the NIIs projects are still evolving and neither stabilized nor closed yet.

## 3. Study design

A variety of data collection methods were used in developing the case study. Qualitative and factual data were collected from multiple data collection methods – surveys, in-depth face-to-face interviews, telephone interviews and email exchanges – with people associated directly with the development of IT839 from the Ministry of Information and Communication (MIC), regulators, industry players, consumer

groups, professors, and researchers from research institutes.

The interviewees were thoughtfully selected and a total of 35 in-depth interviews were conducted either by telephone or face-to-face over a seven-month period. Due to constraints such as the scope and timeframe of this research, a sample of key stakeholders and participants, identified from background research of the case, were selected. All interviews used a combination of structured and unstructured stimulus items. Email exchanges were followed after the interviews. Particularly, valuable data were collected from two panel discussions on Information Technology Policies and Strategies of 2005 Symposium, held in Seoul, Korea. Subsequent interviews were conducted with key Korean IT leaders in the U.S. conference.

Using multiple sources of evidence increased the reliability and validity of the data in this study. Multiple sources of evidence increased confidence in findings, strengthened the validity of findings, and reduced methodological bias.

#### 4. Step 1: Findings from Relevant Social Groups

The first step is to identify relevant social groups and investigate their interpretive flexibility on government and IT839 respectively.

**Differing Views and Expectations on Government.** Most respondents interviewed by this study viewed the government as the single most influential body to help bring Korea into the Information Society, with its main responsibility in building and providing the means for either the NII or for a general information infrastructure in information technology. This study used the scheme of government role identified by [2]. This study provided respondents with the list of government roles, and asked respondents to describe the Korean government's role. As expected, respondents see the government's role quite differently. The six differentiated categories as set forth by this

group of respondents can be divided into two groups: (1) government being a direct intervener (strategist, builder, regulator, and producer); and, (2) government being an indirect facilitator (guider, leader, and integrator)

##### (1) Government being a direct intervener

- a *controller* – the government sets goals and guidelines for private industries to follow. The government maintains effective market conditions for industry players realizing effective competitions.
- a *builder* – the government is seen to provide the physical infrastructure that would provide the means for everyone to access information from around the world. At the same time, the government is also seen as the organization to develop overarching policies that would attract global information services and telecommunication players to invest and develop services.
- a *regulator* – the government creates a fair business competition ground without allowing fraudulent, undesirable businesses to thrive, and it has to create an environment for risk taking in business without encouraging rampant abuse of the system to occur.
- an *investor* – the government is a major producer and buyer of ICT (information and communication technology) and ICT-related product. Through tax incentives and special grants, the government can encourage local enterprises to invest in technology so as to exploit the new medium of trading.

##### (2) Government being an indirect facilitator

- a *strategist* – the government is seen as the main body of organization in developing a vision for the country, taking on a leadership role in defining Korea's future direction of growth and allocating appropriate resources in aid of realizing the information age for Korea.

- a *guider* – the government is to create the proper environment for innovation and growth in ICT, channeling and mobilizing financial and human resources to the ICT sector and related activities.
- a *leader* – the government is to establish ICT as a national priority, providing a national plan for ICT and networked readiness, launching large ICT projects, and accelerating adoption ICT by government departments and the public sector, for example, by promoting e-government.
- an *integrator* – the government ensures that the various programs and projects, such as Digital Cities, e-Korea, etc., that have been assigned towards the realization of the IT839 is well integrated, becoming a cohesive strategy in allowing Korea to thrive in the information age.

## 5. Differing Views on IT839

As various groups had differing views on the government's role, the different groups also had different perspectives on IT839. Respondents from government commonly expressed the view of the proactive role of government (government's intervening role). They were proud of the rapid rollout of broadband Internet in Korea and ascribed the high diffusion of broadband to the government's active and intervening policy. They expressed their confidence in applying the broadband success mechanism to the IT839 project. Korea's broadband approach has been paid attention by many other countries. Other respondents see the proactive role of government with economic impacts. One representative from a research institute points out, "IT839 is a bandwagon for very powerful economic interests, including telecommunications companies, cable television operators, computer manufacturers, software developers, acolytes of an emerging computer culture, and a wide variety of other people." They seem to rely more on NIIs as an opportunity for them to leapfrog to the information

economy. Most of the government interviewees view the IT839 as part of an overall economic development effort.

Respondents from industry support the government's role on the ICT. Respondents from industry point out the close relation between government and industry. As one business manager with a leading IT company commented, "It is part of our business culture to listen to the government." The guidance provided by the MIC has been turned into action by the different companies active in the sector. This implies that a little government intervention can go a lot further in achieving objectives in Korea than in other countries where there is a more adversarial relationship between government and the private sector. In the case of broadband deployment in Korea, government's influence and involvement in relation to the business sector have been significant. The government directives or guidelines have been effective ways to influence the private business sector. Although they were not official orders with binding authority, the private sector usually tried to follow what the government wanted it to do.

In answering the question of their strategy, one respondent from industry noted, "We know the importance of the First Mover Advantage in IT world. We are making our every effort to set our own technology as the internationally accepted standard." It is true that IT industries have witnessed the First Mover Advantages in the IT field, and industries want to maximize the benefits of network externality. The Korean government and industry are striving to make mobile broadcasting and Wireless Internet *de-facto* standard.

Respondents from telecom carriers explained that they regarded IT839 as an opportunity to develop their Blue Ocean strategy, a strategy to create uncontested market space. The interviewees said, "We should create a new market that does not yet exist, a Blue Ocean." He continued, "With a Blue Ocean strategy, we see DMB as a killer application." The respondents appeared to see the IT839 as a governmental support or

subsidy to develop new technologies and a way to commercialize them. He cited CDMA (code division multiple access), which was commercialized by Korea for the first time in the world, and from there Korea has been elevated from modest to a strong mobile communication power.

On the other hand, respondents from the academia and user groups expressed opinions of government being an indirect facilitator. They agreed the government-guided, but society-led framework. Respondents from the user group had a consensus that IT839 largely left users out of the loop and the user issues have been largely sidelined. One respondent warned of the disadvantages of Information Literacy gap, where the segregation of societies into the information literate and illiterate may have undesirable social consequences of feelings of alienation by the information illiterate. Similarly, many respondents raised concerns over a growing Korean version of Digital Divide. While typical Digital Divide refers to the gap that exists between those who have and those who do not have access to technology, Korean version of Digital Divide indicates the “polarization of public opinion” that may tear communities apart such as liberal vs. conservative and information-rich vs. information-poor. Internet-based political clubs easily manipulate public opinion to serve their own interests.

Similarly, user group also expressed the side effects of NIIs. One respondent indicated the fact that Korea accounts for 13.43% of the unsolicited, bulk email sent out worldwide [3]. This disgraceful data have placed Korea ranking two in the world to send out spam. Most respondents attribute their rise in the rankings to the fact that the majority of Koreans have home access to broadband Internet connections. In this regard, some respondents raised a question whether Korea is really a leader in broadband and IT. A well deployed broadband produce negative side-effect such as online gaming addictions, widespread of pornography, the distribution of undesirable information (i.e., instructions on how to

commit suicide) and infringing intellectual property by the illegal downloads. One respondent concerned the limited interoperability of Korean NII to a global information infrastructure. The Korean Internet is a huge Intranet filled with national content that is not understandable to non-Korean speakers. Such Walled Garden Korean NII may restrict global communication and create interoperability problems with other networks.

Summing up the respondents' responses, the group of industry and government tended to emphasize the supply side of NII: the capacity of a country to innovate, and hence produce and adapt new technologies, is largely influenced by the ability of governments to mobilize and attract both financial and human resources. On the other hand, the group of users and academia tended to stress the demand of NII: governments play facilitating roles in the emergence of markets for ICT, and in addressing social issues and in shaping cultural conditions that will influence the flows of ICT and ICT-related knowledge.

## **6. Step 2: Political economy of NII**

The findings from the step 1 and 2 support hypothesis that the IT839 project has been initiated by the government-push drive and sustained by the industry interests, neglecting demand-pull or user perspectives. The MIC has taken an industrial policy approach to IT service development, in which the IT service sector has often been used as a source of financing for the information market and equipment manufacturing sectors [4]. Much of the emphasis has been placed on promoting the development of Korean equipment manufacturers and other related high technology manufacturing industries. In part, this results from the fact that the MIC has responsibility for promoting the communication equipment industry, and the hardware industry. The emphasis on manufacturing promotion and on the supply side is reflected in the Korean NIIs. In particular, IT839 shows that its technologies

are relatively well addressed and developed, whereas other aspects of markets, users, and regulations are not addressed as much as technologies. This implies that IT839 has been developed with a tendency towards technology-push to market rather than market-pull. A centrally coordinated technology project has generated a supply-push strategy, which has led to the risk of misallocation of development resources when the character of domestic demand or export market potential is not profoundly considered [5]. Critics of the Korean IT project have long pointed out that the program's planning concentrated on the supply-side without sufficiently considering established or potential needs [6].

In Korea, the IT industry accounts for 30 percent of the nation's total exports, but the IT industry actually accounts for up to 50 percent, given some of the IT areas are missing in the calculation. The IT industry is gaining an increasing share of the nation's total export value. The rate is increasing as the government has given various types of subsidies such as mobile terminals. A slow IT growth in Korea could stifle much of the nation's economic growth. It is against this backdrop that the IT839 project was born to cope properly with this political economic reality. IT839 has satisfied the Korean telecom and IT companies who have been seeking new revenue sources such as VoIP, DMB, IPTV and Wi-Bro. IT839 largely reflects the industry providers' perspective such as when to provide these new services, what the economic and industrial impact would be, and how much profit is made. Many aspects of IT839 have focused on developing a path to commercialize emerging technologies and the driving factor is business. Based on the findings in this study, it may be reasonable to assert that Korean efforts in NIIs have been the collaborative outcome of aggressive industrial strategy and the Korean government's industrial policy. This argument is in line with [6] finding that Korea proactively adopted KII, because "if Korea did not...its industry might not be able to compete in the globalize economy,

and the nation might be left farther behind developed countries." Therefore, the success of NII efforts is evaluated on the basis of their contribution to national economic progress [7]. That is, the NII efforts may fade if they are not seen as contributors to economic process. In a desperate effort to create the next big market in the IT service industry, Korean IT industry has strategically developed DMB, IPTV, and wireless broadband technology. Through IT839, the Korean government provides industry with huge regulatory breaks to support such industry strategies. The real essential questions, however, are missing in IT839: what benefits will individual users get? How will it be brought to society? How, exactly, will it proceed to information society.

### **7. Critics of IT839: problems identified in the development of IT839**

The findings imply that the Korean NII projects seem to have all the necessary components for a positive development of an information society. In reality, however, there are more challenges ahead than prospects. The Korean IT839 is typically more prone to problems related to the lack of social infrastructure, market restrictions, political quagmires and vested financial interests. Such NIIs have been sought from the perspective of technical computing with an emphasis on supply-side IT, which has put in place advanced technologies with impressive budgets. However, through such a computing-driven approach, it appears that social and cultural aspects have been neglected and have been much absent from discussions of the design of the NIIs: which have emphasized physical aspects and industry portfolios and veered off from the idea of an information culture. NIIs, by their ontological nature, should be an array of "sociotechnical ensemble" ([1] p. 274) – infrastructure is embedded in social and cultural milieu – and its implementation process should be understood as a sociotechnical change.

It is the essence of SCOT theory to intervene in the process of social choice or social construction so that the range of interests and opinions participating in the discourse of choice is as broad as that to be conveyed, hopefully, by the networks themselves [1]. Together with the design and development of the national IT strategy, in terms of the SCOT perspective, several observations and suggestions can be drawn.

First, the planning and development of the IT839 shows a tendency of a top-down approach. A few elite groups planned, designed, and drove the projects with the scheme of central coordination. While effective coordination can take place centrally, as in the past, many more players could have been involved in policy making for the NII than were involved in setting policy for specific industries. In addition to being built from the top down, the project left general users out of the planning process. Initiated by the hyped government and industry, the roadmap of the project was drafted only through discussions between them at high levels behind a bureaucratic curtain. Korea is suggested to provide a visible and transparent strategic framework to support the furtherance of country's informational policies and projects. Such framework enables government and social entities to interact each other. Demands and needs are raised by various social entities and government's response to those needs should become transparent concomitantly.

Second, it appears that technological rationale has dominated the IT839 project. The project is trying to find the nation's new growth engines in newly emerging areas represented by eight services, nine equipment fields, and three infrastructures. These components comprise certain technological system, but they do not address social issues such as universal service and digital divide. IT839 is based on largely supply-push instead of demand-driven. The goal of IT839 is "to trigger IT production worth 498 trillion won in 2008" (MIC, 2005). The strategic people were more oriented to a technical perspective of IT development, which seeks to optimize

outcomes on conventional design criteria. [8] argue that IT strategic planners should avoid such trajectories by equally emphasizing technical elements and social issues and by effectively integrating the two dimensions. It is essential for designers to have a sociotechnical understanding in planning and developing future NIIs and not to be biased toward reckless technical preoccupations. As the technology push approach is currently championed, the Korean government may realize that technological rationales and social issues in NIIs are not contradictory but complementary. Future NIIs, as a socio-technical ensemble, cannot be explained purely on the basis of inherent technological feasibility.

Third, IT839 falls short of addressing negative effects of technical solutions such as security, privacy, and digital right management. Without adequate and timely policies for such areas, IT839 would not be successfully developed. For IT839 Strategy to be successful, it is imperative to have proper security policies to overcome the possible threats of the future. Such security policies not only include technical directives like cryptography and authentication policies, but also more importantly develop social programs and legal policies to prevent computer/cyber crimes. Such effort can be social enlightenment programs for information polity and literacy. Legal policies should be clearly detailed on the legality of computer crimes. For information security to be effective, IT839 should develop not only technical countermeasures, but also social and legal measures. In the same manner, digital right management should be addressed. Digital right management is the area where Korea has faced severe criticism by abetting copyright infringement and piracy for software, film, and digital content. Digital right management should be approached not only from technical measures (such as enforcing pre-defined policies for controlling access to digital data), but also more effectively, Korean policy maker should prepare social requirements for the digital right (such as

legal enforcement/procedure, copyright compensation mechanism, and public relation/education). For example, the European Community creates a Recommendation on Digital Right Management in 2006 before the rollout of the relevant technologies. In the IT839, these social requirements have not been discussed, which should have been prearranged before the relevant technologies implemented.

Fourth, Korean government in general has overhyped and rosy prediction for IT839. The difficulty is that this strategy was not clearly defined as informational approaches to achieving ends. The IT839 Strategy addresses technical, economic, and political impact, but does not provide any substantial effort to instill an information campaign into the overall national strategy. Korea attempts to ensure that the country is able to take full advantage of the IT839 that are offered by technological change, while at the same time it should avoid the undesirable consequences that might arise from the IT 839 developments. In terms of information policy matrix, there are four levels of policy: individual, industrial, organizational and social. IT839 has predisposed toward industrial policy leaving individual, organizational, and social policy under-developed. Korean MIC may realize the value of non-industrial forces in shaping the development of the Korean information society. In the IT839, there are many subjects of “what,” but there are missing issues of “how.” The IT839 plan to implement a series of technologies, but the question is missing how such technologies will be actually used. For example, MIC describes the benefit and vision of IT839, “the creation of a successful IT839 could have as much impact on our society economically and culturally” [9]. While MIC keenly addresses many of the critical issues facing the emerging NII, it leaves more questions than answers. While we all agree with the benefits NII will bring to us, IT839 does not show a specific how such NII should be built, for example, how different services can be shared and

interoperable across the networks and how such information can be easily accessible to anyone. More importantly, IT839 does not address how NII can improve the quality of our life and what exact benefits we can get out of NII. In addition, it is missing how to foster the private and public sector to become more information-intensive so that they use information as a resource to raise productivity levels, to improve quality and to meet user needs more effectively. This task involves promoting more use of information technology but it is about facilitating the use of information as a management resource.

Finally, it is notable that there is no evaluation mechanism along the IT839 project. The success of IT839 is measured by traditional cost benefit analysis, return on investment (ROI). Korean policy makers should realize the inherent problems of ROI applying it to public sector and should think more about return of investment and less about return on investment. Application of ROI analysis is challenging in the public sector because most government organizations do not generate profit necessary for calculation of ROI in the manner in which it is done in the private sector. Similarly, society does not produce efficiency figures necessary for the calculation of ROI in the manner in which it is done in the industry sector. What is missing in IT839 is an evaluation tool of social accountability-oriented analysis. For example, the U.S., Federal Communication Commissions has various formal and informal channels, such as Notice of Proposed Rulemaking or Public Hearing for public comments, to receive public opinion and participations. In addition, the Office of Technology Assessment (OTA) of the U.S. conducted technology assessment that is not centralized around government but instead widely distributed through a society (Porte, 1997). Unlike the U.S. case, Korean MIC rarely has such evaluative mechanism and the Korean NIIs have been sought or approached from the perspective of build-and-fix. The infrastructures were constructed with minimal requirements and,



normally, with no specifications nor was there any attempt at design, and testing was often neglected. As a result, the cost for the projects was greater than initially planned and made maintenance extremely difficult because of the lack of specification and document design. Most importantly, the build-and-fix approach has left the users out of loop. Social and cultural aspects have been neglected and have been almost entirely absent from discussions of the design of the NIIs.

This study suggests Constructive Technology Assessment (CTA) as an alternative approach in the development of the next generation of NII. CTA is an attempt “to broaden the design of new technologies” through the “[f]eedback of TA activities into the actual construction of technology” ([10] p. 252). The key to these techniques in CTA is letting “societal aspects [of innovation] become additional design criteria” (*ibid*). A CTA has promise for promoting next generation of NIIs. Its timely communication and early warning component helps assure awareness about innovation among researchers and the public, and its technology assessment and choice component produces a mechanism for such awareness to be reflexively incorporated into development. As Korea continues its technology push, spending billions of dollars on the digital future, it is worthwhile to aware that there are many cases of large-scale technology development, which have spent exorbitant resources in developing a technology, where the users’ subscription is low, with substantial losses for the society as a consequence (Cordeiro et al., 2001; Ishida, 2000; Venkatesh et al., 2002). The recent advancement of CTA, “Real-time technology assessment” [11] is worthy of note.

## 8. Conclusion

This study proposes valuable suggestions to the government for future national IT strategy projects. First, in designing the future NIIs, technological

functions and rationales need to be translated through a contextual aboriginal language [12]. A contextual perspective should be taken heavily into account in all the stage of the development. Policy makers can seriously consider adopting a context-aware design in the future NIIs [13]. Lack of general and contextualized understandings in the planning and design of computing can lead to intrusive technology and an over-emphasis on infrastructure. Governments will need to put more effort into leveraging social forces and integrating such forces in technological arrangements when implementing a national information infrastructure as a strategy toward advanced development in the long haul.

Secondly, related to the first point, governments have to be more involved in the micro-managing level activities to form social culture for information society. As shown in the Korean version of Digital Divide, what matters in Korea is how well people use information properly, instead of whether one can go online or not. The success of bringing society into the Information Ecology depends as much on people’s attitudes and motivations towards NIIs. While the government can do so much to promote IT, people have to embrace such events and moves to want to make IT and information knowledge a part of their lives. People have to willingly allow the permeation of such ideologies to the core of their private domains, to have the IT ideology in the crux of their daily lives, affecting the manner in which they do things and in how they think. In future NII projects, governments have to specify certain provisions to make sure of mature information culture (such as Information Literacy program) along its developmental process. In this light, second suggestion can be metaphored using famous epigram: “Ask not what NIIs can do for society; ask how people can use and benefit out of NIIs.”

Finally, building NIIs can be seen from a long-term perspective. Since infrastructure is a social and technical construct, it is embedded in other structures, social arrangements, and technologies.

Infrastructures are evolving over time, constraining and being constrained in a reflexive way by the intricacy of the technologies, social relationships, and cultures. Therefore, infrastructure reaches beyond a single event or a single site of practice; therefore, it takes time to stabilize. In this point, [14] argue that the most important question to be asked when approaching information infrastructure is not “what is an infrastructure?” but rather “when is an infrastructure?” because information infrastructure occurs “when people use it in their routine life.” [15] further argues, infrastructure is “linked with conventions of practice of day-to-day work... Infrastructure is the *embodiment of standards*, so that other tools and infrastructures can interconnect in a standardized way” (p. 133). Other infrastructures, such as the growth of railroads, telephony and telegraphy, electricity and light, and banking, provided local services for years, or even decades, before reaching critical mass and reaching nationwide penetration. The means by which an integrated infrastructure evolved varied, and each project involved experimentation with different forms of technology, regulation, and social arrangements. NII is not built in a vacuum and building a NII is a continuous and iterative on-going system building “process” itself, rather than a one-off event.

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