Government Computer Policies and Their Impacts in Korea

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A. Areas of Government Intervention.

1. Necessity of government intervention.

The government is the largest user of computers in Korea. The computer-related budget of 1986 is estimated to be 43 billion won. It was increased rapidly in recent years. As the budget increases, so do the areas of government intervention.

Wide government involvement in the computer field may stem from the great difference in the characteristics of computer systems from those of other types of equipment (Ahn, 1982). Some of these characteristics can be summarized as follows;

a. A computer is an expensive machine. Normal and smooth operation usually entails large expenditures on the part of computer users.

b. One has to prepare software and data bases before installing and beginning operation of hardware.

c. Once a computer is used for processing data, it is extremely difficult for a user to return to a manual system, even if it is discovered that the computer uses are inappropriate. It is also difficult to switch from one model of computer to another.

d. Computer packages may act as an intermediary of technological transfer from developed countries to developing countries.

e. Computers show rapid technological progress. Special knowledge of computers is required if we wish to incorporate the benefits of technological progress into our computer-buying policy.

The above discussion leads us to conclude that *dispersion of relevant knowledge and experience of computers* can be one of the main themes of government intervention.

The second theme of government intervention in computer systems is related to *government's defining and protection of private property rights.* As we

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know, computers are composed of two main components, hardware and software. Software in particular has two features which can be called "public good" and "externality", and which invite government to interfere in market affairs.

The "privacy" problem represents the third topic of government action.

The fourth area of government intervention deals with *the industrial policy point of view.*

2. Information and computer industry in Korea.

At this point, it would be useful for us to elaborate the importance of the information industry, including the computer industry, in Korea.

Following Porat's categorization of the information industry (Porat, 1975), we can derive the following table which is shown the ratio of the total product of the information industry to the gross national product.

Table 1. (unit : million won)

	Production of Infor. Ind.	Ratio to GNP(%)
1970	612, 803. 5	12. 19
1973	1, 280, 470. 8	12. 56
1975	2, 009, 238. 5	9. 57
1978	53, 403. 3	10. 07

During the 1970s, 11. 3% of the GNP was produced by the information industry in Korea. Comparing the figures with those of Japan, we may conclude that the information industry in Korea is a little behind that of Japan.[1] It also means that the information industry in Korea has a great potential for future development.

Turning *to the computer industry* (including the manufacturing of calculators and electronic data processing systems), we can draw the following table by using the 1983 Input-Output Table of Korea.

(1)

	Infor. Ind.	% to GNP
1970	25, 199, 961	15. 60
1975	53, 566, 068	16. 12
1979	87, 106, 068	17. 57

Source: Korea Advanced Institute of Science and Technology (KAIST), *A Long-run Perspective on Information Society in Korea*, 1982.

Table 2.

	Amount (billion won)
Computer Ind. (A)	190.569
GNP (B)	150,241.9
A/B	0.0012684

The computer industry (domestic production) makes up less than 1% of the gross national product. The following table shows the production activities of relevant industries connected with the computer industry.

Table 3.

	Input	Output
No. of Industries Related to Computer Industry (A)	136	123
Total No. of Industrial Sectors (B)	369	369
A/B	0.3686	0.3333

As for input, 136 industries out of 369 (36.86%) provide materials to the computer industry; as for output, 33.33% of the industries receive goods and services from the computer industry.

Table 4. (unit : million won)

Intermediate Demand	Final Demand	Total Demand (import included)
88,375	373,489	461,864
19.13	80.87	100(%)

The ratio of contribution of the computer industry to other industries is 19.13%, which is slightly below the level of the entire information industry.[2]

(2)

Year	Ratio of Contribution of Information Industry (%)
1970	20.52
1973	18.83
1975	21.76
1978	21.53
average	20.66

Source: KAIST, *A Long-run Perspective on the Information Industry in Korea*, 1982.

Table 5. (unit : million won)

Total Demand of Computer Ind.	Domestic Products	Imports
461, 846	190, 569	271, 295
100(%)	41. 26	58. 74

The ratio of domestic production to the total demand of computer industry is 41. 26% (see Table 5) and the value added ratio is 13. 08% (see Table 6). Considering the figures for the information industry as a whole,[3] we may say that the ratio of value-added for the computer industry is considerably low.

Table 6. (unit : million won)

Total Input of Computer Ind.	Intermediate Input	Value Added
190, 569	165, 640	24, 929
100(%)	86. 92	13. 08

Of the total intermediate input, only 34. 81% is supplied domestically.

Table 7. (unit : million won)

Intermediate Input of Computer Ind.	Domestic Products	Imports
165, 640	57, 667	107, 973
100(%)	34. 81	65. 19

In sum, the computer industry of Korea is in an infant state, even though it has tremendous potential for the future. The goverment is expected to try to realize the full potential of that industry.

(3)

Year	Ratio of Value Added (information ind.)	Ratio of Value Added (non-information ind.)
1970	73. 57%	51. 59%
1973	66. 01	48. 32
1975	69. 99	53. 33
1978	68. 35	43. 97
average	69. 47	49. 30

Source: KAIST, *A Long-run Perspective on the Information Industry in Korea*, 1982.

3. Areas of government intervention.

The four main areas of government intervention mentioned above can be summarized in the following table with policies and relevant agencies (Ahn, 1983).

Table 8.

Areas	Policies	Agencies
· Dispersion of information & experience to the public	· to provide checklists for potential users · to give educational & training opportunities · to run a model computer center	· Ministry of Science & Technology (MOST)
· Defining & protecting private property rights	· to enact a special law on computers	· MOST · Ministry of Trade & Industry (MTI)
· Protection of privacy & prevention of computer crimes	· to enact a special law on computers	· Ministry of Justice (MOJ)
· Industry policy	· to create demand in the public sector	· MTI · MOST · Ministry of Communication (MOC)

The above table is signification for us to understand the government policy change in the computer field.

Until 1980, the main policy of government was focused on the area of dispersion of information and experience. The Ministry of Science and Technology (MOST) took the lead in implementing the policy with the help of the Economic Planning Board (EPB) and the Ministry of Government Administration.

Beginning in 1981, the focus of goverment policy shifted to the development of the domestic computer industry. MOST ordered 5, 000 personal computers from five potential domestic suppliers.

This action is believed to have triggered the subsequent boom in domestic production of personal computers and computer parts.

As the number of computers increased, more delicate and complex problems related to privacy and computer crimes arose.

Since 1984, the government has been trying to find solutions by passing relevant laws and regulations.

As for the government's computer industry policy, five national computer networks[4] are expected to create a large demand which will stimulate domestic computer manufacturers.

B. Changes of Government Computer Policies.

1. The government computer policies mentioned above were believed to be closely related to *the government's computerization programs* in which the government itself became a user.

The Bureau of Statistics of the Economic Planning Board is considered to have become the first user of computers both in the government and the private sector in 1967. But the impact of this computer operation on government computerization was minimal because the computer was small and closed to other uses.

In 1967, a computer department was opened at the Korea Institute of Science and Technology (KIST). Even though the main function of the department was to assist with the computations of researchers of KIST, the manager expanded the operation beyond the boundary of the institute, which brought a tremendous impact on the government and the private sector up though the present.

In 1969, the first "big" computer (CDC 3300) which could use high level languages such as FORTRAN and COBOL was installed at the department. The department began to give instruction of computer concepts, FORTRAN and COBOL to government officials as well as business people. People began to realize that computers are easy to understand and to use. Such feelings helped the department expand contracts with government and business.

The first government organization to realize the importance of computers was the Bureau of Budget (BOB) of the Economic Planning Board (EPB). BOB was about to launch a new budget system, the Planning-Programming-

(4) Five National Computer Networks are as follows:
- Administrative Network
- Education and Research Network
- Banking Network
- Defense Network
- National Security Network.

Budgeting System (PPBS), at that time.

The bureau director was enthusiastic about implementing the PPB System. For example, his budget staff required government organizations to use the PERT technique in submitting budget requests for large construction projects. Operations Research (OR) techniques were widely accepted by the Bureau of Budget for screening the budget requests.

It was quite natural for the bureau to turn its attention to computers at that moment.

One section chief of the bureau contacted the computer department of KIST and made a research contract for computerization of the budget screening and evaluating system. The KIST staff in cooperation with the bureau personnel developed a computerized budget system and installed a remote batch terminal connected to the host computer at the institute for the first time in Korea.

It was a big event. The President of the Republic of Korea attended the opening ceremony of the terminal room. The President instructed his cabinet members to learn and use computers in their work.

For three years, there was a rush of government officials visiting KIST, and many big projects were undertaken.

This period may be called *the Demand Creation Period* (*1970～1976*).

During the period, the most frequently used languages were FORTRAN and COBOL. There was also a big rush among users to have computers of their own installed at their own sites. Computers replaced the abacus and commercial high schools changed their curriculum, replacing abacus courses with computer language courses.

Realizing the enormous potential demand for hardware from government organizations, the Bureau of Budget persuaded the Ministry of Science and Technology (MOST) to operate a large computer center (GCC) to accomodate most of the government's computing demands. The bureau hoped the idea would reduce the hardware budgets requested by government agencies.

2. Next came *the Set-Back Period* (*1977～1980*). The voice of the critics of computer usage began to be heard. The Ministry of Government Administration (MOGA) prepared procedures and regulations governing the computerization of government agencies. The second oil shock began to be felt at the Bureau of Budget at that time.

During the Demand Creation Period, Korea experienced a fast growing

economy, and the cost of computers was still tolerable, as far as the computer was able to solve problems which the manual system could not deal with. The policy goal of computer usage was to achieve efficiency in administration. Waste that might have existed in computers was largely ignored by the government.

But the second energy crisis brought a different story to the Korean economy. The growth rate of exports slowed down. and the inflation rate hit a record high. The Economic Planning Board strongly recommended that potential computer users in the government seek ways to share the existing computing capabilities. The Ministry of Government Administration also prepared a ten-year government computerization plan which was supposed to coordinate the government agencies in installing and using computers. The plan was criticized as having failed to reflect the demands of the government organizations, and the impact of the plan on government computerization was said to have been minimal.

For the agencies which already had computers, that period was horrible. Surveys and evaluations of computer utilization continued to project a negative image of computer utilzation to the public and the government decision makers.

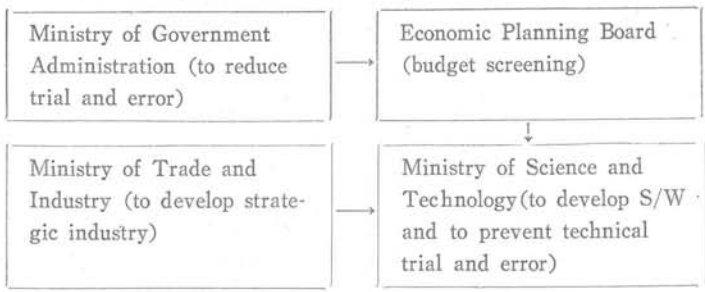
Tax-related administrations had been the main target among government units for computerization until that time. In order to enhance the utilization level, the Bureau of Budget initiated a new plan in which computers could be used to reduce the cost of government services for the benefit of the public.

That approach required that appropriate data bases and extensive computer networks be built. Ironically, it increased the amount of the budget requested by the agencies that had been criticized for their loose management and waste in computer operations.

There seemed to exist a deep disparity between the computer user group and the budget officials in searching for the causes of the inefficiency of computer operations. The user group attributed the low level of computer utilization to "inappropriate" hardware capabilities, while the budget staff attributed it to the low productivity of the government.

The computer committee of MOST, which was activated to give technical advice to potential users, tried to help the bureau block the installation of "unnecessary" computers in the government sector. But the result fell short of expectations.

Since the Second Phase, four main government bodies were designated to have control over the computerization processes of the public sector. The following figure (Ahn, 1983) shows the relevant agencies and their main functions:



During the Set-Back Period, the above agencies tried to reflect the general feeling of the public about computers and discourage new installations. But the increased demand for computer usage triggered during the first stage of the computer policy overshadowed the pressure from the control agencies, this reducing the impact of government policy to a minimum.

3. In 1981, the government entered the third stage of computer policy, *the industrial policy stage.* The policy goal was shifted to promote domestic production of computers. At the same time, the performance of the control agencies, including the Ministry of Government Administration and the Ministry of Science and Technology, came under heavy attack from high level government policy makers.

A higher level coordinating committee was established at the Blue House, the Korean White House. The committee has taken a key role in formulating and directing computer matters ever since.

As stated above, in 1982 the Ministry of Science and Technology (MOST) ordered 5 thousand personal computers from five potential computer manufacturers.

Half of the personal computers were distributed to commercial and engineering high schools throughout the country. The other half went to government training institutes and research intitutes. We already mentioned that the domestic production boom in personal computers which started at 1982 was largely attributed to this purchase of personal computers.

The computer policy of the time was founded on the premise that the poor skill of computer personnel and inadequate management were the main

causes of the low level of utilization of computers in the public sector.

Many policy makers thought that efficient management together with well-trained personnel would be enough to cope with the ever increasing demand for computers without expanding hardware for several of years to come.

On the contrary, despite the tight control over the public sector, the private sector enjoyed relative freedom in the computer field because of the government's deregulatory policy prevailing in that period.

To give further momentum to the computer industry, the government designed five national computer networks for the government sector. They believed that the aggregate demand for computers from the network's users would be large enough to give sufficient stimuli to the industry. They hoped the networks would eliminate the waste that might otherwise have resulted from a duplication of investments in hardware and data bases among government organizations.

Businesses in the computer industry were encouraged to participate actively in the networks by developing relevant software and manufacturing hardware.

In the later stage of the third period, conflicts with foreign countries occurred in the field of software, even though Korea paid $ 12 million in 1984 alone.

The following table shows the amount of money paid to foreign countries for the use of software.

It is apparent that software conflicts did not exist in computers larger than minilevel. The disagreements existed mainly in the personal computer field. Such problems are expected to be solved by a law soon to be prepared.

Table 9.

Countries	Quantity of Software	Amount of Imports(US $)
U.S.A.	1, 204	3, 734, 867(67. 6%)
Japan	134	727, 557(13. 1%)
U.K.	43	295, 342 (5. 3%)
Norway	13	266, 597 (4. 8%)
Swiss	7	177, 751 (3. 2%)
Australia	1	131, 788 (2. 3%)
Belgium	4	122, 558 (2. 2%)

· Period: Jan. 1985 - June 1985

· Source: Ministry of Science and Technology, *Lists of Software Imported*, 1986.

Measures for the protection of privacy, prevention of computer abuses and computer crimes are almost certain to be included in the law.

Korea is now leaving the third phase and entering the fourth stage of the computer age where more sophisticated problems may await government policy makers.

Table 10. The four stages of computer policy can be summarized as below.

Period	Economic Conditions	Budgeting Strategies	Leading Government Organizations	Name of Stage
The first stage (1970~1976)	· fast growing economy · take-off stage · expanding government functions	· PPBS	· Economic Planning Board (EPB)	· Demand Creation Period
The second stage (1977~1980)	· the second oil shock · high inflation rate · government leading economy	· modified PPBS	· EPB · MOST · Ministry of Government Adm. (MOGA) · Ministry of Trade and Industry (MTI) · Board of Audit and Inspection (BAI)	· Set-back Period
The third stage (1981~1984)	· slow economic growth · low inflation rate · relatively high unemployment rate · market driven economy	· ZBB · Sun-set concept partially introduced	· EPB · MOST · MOGA · MTI · the Blue House	· Industrial Policy Period
The fourth stage (1985~	· moderate economic growth · high protectionism from abroad · bottlenecks in technological transfer	· Cut-back management	· MOTI · Ministry of Communications (MOC) · MOGA · MOST · EPB	· National Network Period

C. Brief Case Studies.

1. In this part, a few instances of computer related projects completed in Korea will be presented. The first instance concerns the assignment of resident registration numbers to all Korean people. A registration number automatically issued to a person when his or her birth is reported to a local government office. The number consists of 13 digits which represent the date of birth, sex and place of issue. And the last digit is what may be called a check digit prepared by the computer. The computer of the Police Headquarter was used to make the check digit. The check digit enables the data managers to check for any input errors that may have occurred during the input process.

The computerization of people-related tasks is judged successful largely because of this computer-issued registration number system.

2. The Linear Programming technique was the first optimization tool used by the government in their daily operation. The Office of Monopoly computerized the transportation planning system by using the LP technique. The LP system was estimated to save 300 million won at the 1971 price.

The LP technique was again used in 1978 for deriving a new algorithm for assigning students to schools. Until that time, the Board of Education of Seoul Special City assigned students randomly to schools within a certain artificial boundary. The boundary was drawn wide in order to ensure an equal distribution of students in terms of the academic performance.

By 1977, the so called "equalization policy of middle and high schools" was achieved. But it caused another problem for policy makers: traffic congestion in Seoul.

The prime policy goal was shifted from the equalization of the schools to the reduction of traffic congestion. Minimization of the traveling distances of students became the objective of the Seoul City government. Transportation Linear Programming constituted the main component of the new assignment system.

Under the new system, the nearer a student lived a "good" school, the higher the probability of that student being assigned to that "good school".

It changed the residential patterns of Seoulites. The following table shows the difference in apartment premiums for different regions. The premium

Table 11.

School District	Value of Bonds Purchased(10,000 won)
1	—
2	5.4
3	17.1
4	29.3
5	2.3
6	10.5
7	15.2
8	30.2
9	18.0
others	10.8

Source: Yong-Sup Song, "A Study on Apartment Allotment System in Seoul." *Housing Finance Monthly Review*, Aug., 1985, p. 30

consists of a housing bond which the buyer of a new apartment is required to purchase.

(Economically, the value of the housing bond is equivalent to the consumer surpluse of each individual.)

The high price of apartment bonds in the 8th district was generally attributed to the fact that the district contains most of the so called first-class high schools. (The assignment regulation stipulates that the district in which a student lives with his or her parents during the third year of middle school should determine the boundary of the high school to which he or she is assigned after passing the comprehensive examination conducted by the Seoul Education Board. This is believed to be the main reason for the high demand of apartments in the 8th district of Seoul.)

The residential patterns of Seoul, in fact, were affected by the use of computers. Many computer experts believe that the new system could not have been implemented without the aid of computers combined with the Linear Programming Program.

3. The building of the land registration data base is the third instance. At the second stage of the computer policy mentioned above, the high inflation rate induced many speculators to invest heavily in land. As one of the measures to cope with land speculation, computers were used to help to locate habitual speculators.

One method recommended by the experts was to computerize the land

registration administration so that the land buyers could be identified. The Ministry of Home Affars, taking charge of the land administration, computerized one province, Chungchong Puk-do, as an experimental base with the help of the Economic Planning Board (EPB) and a research team from the Korea Institute of Science and Technology (KIST).

Technical problems as well as budgetary constraints prevented the computerization system from being expanded nationwide. But the mere existence of a computerized system together with a model province project was thought to be effective in and of itself in cooling down the overheated activities of land speculators from time to time.

The full scale implementation of the idea was postponed to the third stage in which the stabilization of the economy became one of the top policy goals. A nationwide data base for land registration became one of the top priority projects in the Administrative Computer Network, one of the five national computer networks. About six billion won was spent to build the data base initially, and 30 percent of the initial investment is needed to update it annually.

It is predicted that wide variety of hardware will be required to operate the data bases. The government seems to be encouraging domestic computer makers to participate in supplying the hardware. Many economists believe that the government's purchase of hardware will give another (and probably bigger) boost to the computer industry in Korea.

Looking back at the data in part 1 of this paper, we find that the direct contribution of the computer industry to the Korean economy was not so impressive. The massive ordering of domestically-made equipment by the government is expected to have a favorable effect upon the economic status of the computer industry in Korea.

4. The above instances are just a few of the examples we have witnessed over the last two decades.

We can also see an extensive on-line banking system covering the whole Korean peninsular. A computerized reservation system is used when we buy tickets at the ticket offices of the Korea National Railroad. The medical insurance administration is so fully computerized that detail results of our medical check-ups are delivered to our employers when we use the insurance.

The computerized college entrance examination system conducted by the Ministry of Education was so well operated that it deprived universities the

right of giving their own entrance examinations. The computerized system resulted in a "casino type" assignment of colleges to students, and it antagonized virtually everyone in the country.

In a word, we live in a world in which computers have a great influence on us.

All these events remind us of the Simon-Boguslaw debate (N. Henry, 1980) on the impact of computers on society.

The debates are yet to be formulated in Korea. But it is almost certain that we will experience unprecedented challenges in using computers in the coming years.

The battle for privacy, prevention of computer-related crime and sabotage, changes in the educational system and revision of laws and regulations will be the keywords in the future.

D. Conclusion and Perspectives of the National Computer Networks

A public administrator working in the computer field cannot be knowledgeable of all the problems around him. If we assume public administrators as generalists, or, more broadly, ordinary people, the policy changes discussed so far could be explained from an attribution theoretical point of view (L. Ross, 1977).

Following the theory, we may hypothesize the following:

Insiders may attribute any inefficiencies in utilization of computers uses to environmental factors which they consider uncontrollable. On the other hand, outsiders may attribute them to human factors, i.e., the insider's lack of ability to develop and manage the computer systems.

In the computer world in Korea, the insiders can be assumed to be the computer managers and staffs working at the ministerial level. The outsiders would be the budget officers at the Bureau of Budget, auditors of the Board of Audit and Inspection, and the policy secretariats at the Blue House.

It is this author's belief that the distrust between the insiders and the outsiders has characterized the computer policy changes in the public sector until now.

The concept of the five national computer networks can also be explained along this line.

Distrusting the insider's ability to run the expensive computer systems, the higher level policy makers, that is, the outsiders, present the network idea, in which the new "expert" computer centers are established to direct the entire computerization process as an alternative to the insider's ever increasing computer budget demands.

The network idea is characterized by a top-down approach where the opinions of the experts dominate the policy making process. It was expected that the initiators of the ideas would receive complaints from the insiders whose behavior would be inclined towards incrementalism and to favor the so called bottom-up policy approach.

Even though the network idea is widely expected to boost domestic production of computers, efficient implementation of the computerized public administration, the primary goal of the network concept, may not have a bright future. Unless the network organizers orchestrate the interests and conflicts of the existing computer centers smoothly, and computerize from the people's point of view, the "revolt", hidden so far may unexpectedly errupt so strongly as to jeopardize the whole network concept in the future.

Recently, the Korean Parliament passed a special law containing the basic idea of the network and other privacy-related matters.

Once the law is enforced, the scenario will be reversed: the current outsiders will become the future insiders.

If we follow our hypothesis of attribution, the future insiders would attribute the possible malfunctions of the networks to environmental factors, that is, hardware.

It will probably result in heavy investments in hardware, for which the future insiders have criticized the current insiders until now. This heavy investment may be good for the domestic computer manufacturers but there are worries that it may produce another monster in the public sector.

At that time, the decentralized and incrementalistic decision making policy which has so far prevailed and been attacked by the future insiders may regain vitality.

We hope the attribution hypothesis of this paper proves untrue in Korea.

But reality reminds us of the following proverb: To help a player from the outside is one thing, and to play oneself is quite another.

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