The Effects of IT Technology on Structures of Central Government in Korea

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Abstract

The Korean government’s E-government initiative is recognized as the best in the world. Although the effects of IT use on public organizations have long been debated in the literature, actual impacts on internal structure have rarely been investigated. This study explores the impacts of IT in terms of longitudinal changes in organizational structures at the central government level. First, changes in the absolute numbers of personnel as a result of E-government are examined. Because of the Korean government’s particular way of controlling agency size, the qualitative changes of span of control and subordinates’ functional specialization are considered. Although the total personnel numbers have not been critically affected by E-government, comparison of the morphology of each organization indicates that qualitative changes have been incurred since 1989. Interestingly, although IT has increased middle managers’ span of control (the ratio of middle managers to subordinates), the number of middle managers has not changed radically and in some cases has steadily increased. This phenomenon can be explained by the rigidity of the Korean government in terms of organizational management. This study proposes that autonomy for each agency in making the organizational structure fit the real work situation is a necessary condition for seeing the full effects of E-government.
Introduction

Korea ranks 3rd in the world in Internet access, and the Korean government is a pioneer in E-government (National Information Society Agency, 2007). The Korean government has made E-government a priority since the early 1990s, but few studies have evaluated the effects on government organizations. In the United States, Kraemer and Dedrick (1997) found that although use of computers in government increased greatly in a 10-year period, research on governmental use of computing had declined precipitously. This observation is still true, especially with respect to studies on computing and organizational structure.

Traditional government is characterized by centralization of control and supervision, differentiation of functions, qualification for office, objectivity, precision, continuity, and secrecy—all of which are in fact features of bureaucracy in the weberian sense of the term. This study aims to clarify changes in the size and morphology of government organizations that have occurred since the introduction of IT to government operations. In this paper, the term organizational structure refers to the size and morphology of government organizations.

The Korean government has gained worldwide recognition for its implementation of E-government over the last decade; therefore it is important to clarify which changes have actually taken place. Attempts have been made to restructure public organizations in order to increase organizational performance in Korea. Because the introduction of IT is expensive, it is particularly important to explore the effects of IT on organizational structure. Few studies have been done on this important issue (Kraemer and Dedrick, 1997; Moon, 2002).

Theoretical Background

Government has been a typical example of the bureaucracy that Weber described as an ideal type of organization. Fountain (2002) argued for development of a theory of information-based bureaucracy, which she contrasted with Weberian bureaucracy. The new model emphasizes networking, partnerships, contracting, and control through system-embedded rules. In the same vein, Ho (2002) found that many cities are moving away from the traditional bureaucratic emphasis on standardization, departmentalization, and operational cost efficiency and toward the E-government paradigm. Local governments in the United States have evolved toward the so-called network organization. Unfortunately, Fountain’s and Ho’s studies did not explain clearly what kind of new organizational structure a network organization takes.
Governmental bureaucracy is not a homogeneous entity; in other words, a bureaucracy comprises several different components. Drake et al. (2004) built on Schein’s framework to identify three subcultures within the public sector (scientist, politician, and bureaucrat) and on Dawes’ three categories of benefits and barriers (technical, organizational, and political) associated with interagency information sharing. Drake et al. found that subcultures have different mandates, pressures, and goals, which in turn make data collection and analysis a political process. Each subculture develops its own understandings and wisdom. Drake et al. argued that for implementation to succeed, members of the three public sector subcultures can and must uphold the necessary balances between (a) technical and nontechnical approaches to information sharing, (b) the prerequisites for freedom and the needs of the collective, and (c) the mandates and contributions of each subculture with those of the others.

The introduction of IT to a bureaucracy affects organizational structure, especially the relative numbers of personnel working in each subculture. At the beginning of the 1990s there was a widespread view that as organizations continued to restructure, middle managers would face numerous challenges (Littler, Craig R., and Peter Innes, 2004). Moon and Bretschneider (2002) tested the hypotheses that top managers’ greater propensity for risk taking would increase IT innovativeness and that increased IT innovativeness would lower the level of red tape in an organization. The present study will address the question of which groups of employees in the bureaucracy are most affected by IT.

One aspect of red tape is slow decision making. It might be expected that the introduction of IT will eliminate red tape and that consequently decision making will take less time in an E-government. Differences in decision content may give rise to quite different decision processes, even after controlling for organizational and environmental contingencies (Bozeman, B., and S.K. Pandey, 2004). The Korean bureaucracy is especially notorious for its complicated and slow decision-making process, known as Pumyui (Im, 2004). Compared to budget cutback decisions, IT decisions tend not to employ cost effectiveness as a significant criterion, take longer to make, and are regarded as permanent and stable.

Outsourcing public service has become a popular way of enhancing efficiency. The Korean government has outsourced some categories of jobs, especially since the New Public Management of the 1990s. In addition, system maintenance and certain state-of-the-art IT
projects tend to be outsourced to private companies, because government employees generally do not have the necessary IT skills.¹

Haines (2003) explored how computerization can bring a new operational rationality involving a lateral alignment of technology, policy, labor, and management that avoids the limits of hierarchical and compartmentalized bureaucratic structures. In a case study of a state worker compensation agency, Haines found that management, particularly middle management, can be threatened by the lateralization of the organization and may react with counter strategies such as contracting out IT tasks to create an organizational buffer, even though contracting out can be more expensive.

**Organizational Size: Does IT Have a Downsizing Effect?**

Computerization is very expensive, but those who initiated the IT projects argued that E-government would result in a downsizing of the bureaucracy. When IT was first introduced, everyone expected that government would need less personnel. Therefore employees, especially unions, were opposed to computerization. However, few studies have examined the downsizing effect. In 2002, Moon argued that even though many municipal governments in the United States had adopted E-government, E-government was still at an early stage and had not obtained many of the expected outcomes—such as cost savings and downsizing—that the rhetoric had promised. Similarly, Kim and Lee (2002) discovered that in the Korean government, despite the introduction of electronic decision-making systems that did not require paper documents, bureaucrats continued using paper documents, resulting in redundancy of work.

In the context of these findings, the present study attempts a simple test. It is assumed that IT reduces the work volume of public employees and that this change in work volume directly influences the total number of full-time civil servants. Thus, if IT has a downsizing effect as hypothesized, the growth rate of the total number of bureaucrats should slow down from the mid-1990s onward. Because the Korean government implemented drastic decentralization in the 1990s, local governments have increased in size; however, this study is limited to central government.

¹ Chen and Perry (2003) argued that IT outsourcing success factors include taking a long-term strategic approach, looking on outsourcing as a managed relationship rather than traditional procurement, and using performance measures with service-level agreements.
Contrary to expectations, Figure 1 reveals that the size of the 10 stable ministries and agencies in this study gradually increased from 1990 to 1996 and from 2003 to 2006. Their size did decrease from 1997 to 2002, because the International Monetary Fund, which rescued Korea just after the 1997 financial crisis, demanded a significant level of downsizing and restructuring in exchange for aid. During this exceptional crisis period, some employees were fired and some administrations became privatized.

The size of the central government began increasing again in 2002, because unlike previous governments, the Roh Moo-Hyun Administration does not have a small government policy and instead focuses on better government as the reform goal. As Roh’s is a leftist government, ministries whose missions are related to welfare have had an opportunity to become bigger.

In sum, Korea’s central government does not show any signs of downsizing. This is because so many factors other than IT introduction affect government size. Especially as the Korean economy grows and the society is democratized, people expect the government to provide more and better public services, so each service category requires more staff. Therefore, to find the effects of downsizing, it is necessary to consider the growth of work volume.

Budget expenditure is an excellent indicator of work volume in the government, because almost every government activity requires money. It can be assumed that budget increase is one of the proxy variables for measuring a government’s work volume. As Figure 1 shows, total government expenditure has increased continually except in 1998, the year most affected by the
financial crisis. Therefore, the fact that government size has varied while the budget size has
continued to grow may mean that IT introduction has buffered the possible work overload,
especially between 1997 and 2002. Furthermore, it is plausible that the work volume for civil
servants has increased exponentially, especially as the social welfare system is institutionalized
and government continues to play the locomotive role in the economy. If this reasoning is true,
one can say that the size of the Korean government has increased moderately as a result of many
factors, one of which must be the introduction of IT.

However, this moderating effect on bureaucratic expansion cannot be totally attributed to the
introduction of IT. The Korean government has strict methods of managing and controlling the
personnel numbers of various administrations and agencies, although demands for staff increase
each year. Even though many criticize this method as too detailed and power oriented, this
central control plays a critical role in moderating the demands for governmental expansion (Im,
2004). Therefore, it is premature to conclude that IT has had a downsizing effect on Korean
central government.

**IT and Morphology**

In the mid-20th century, scholars of administrative science proposed certain principles of
organizational management (e.g., Fayol, 1949; Gulick and Urwick, 1937). The principles of
unity of command and span of control showed the typical bureaucracy in the form of an
organization pyramid (Cho, Suk-Choon. 1994). Span of control refers to how relations are
structured between leaders and subordinates in an organization (Meier, K.J., and J. Bohite, 2003).
This pyramidal form is considered unavoidable and, according to some scholars, most efficient
for a large organization.

**Basic Structure of a Ministry**

In a Korean ministry, hierarchical positions are filled with personnel from 1st grade (highest) to
9th grade (lowest). In the organizational chart, a minister and a deputy minister who are political
appointees are at the head, after which directors, bureau chiefs, and secretaries work as
subordinates. Third-grade personnel are systematically appointed to director positions, and in
the same way, 4th-grade personnel are bureau chiefs.

A strict rule of 3 is applied to span of control. The Ministry of General Affairs and
Decentralization (MGAD), which has the power to manage the size of each governmental
organization, does not allow an agency to add a superior position unless the position has more than 3 subordinates. These peculiar rules hinder an organization from realizing its original form. For instance, the 3 subordinates rule precludes a steep organization with only 2 as a span of control.

**Hypothesis**

The introduction of IT technology has alleviated workload in government agencies in various aspects. For example, it has facilitated communication among employees, and the fact that managers can easily monitor what their subordinates have done necessarily enlarges the managers’ span of control.

**Proposition 1:** Average span of control at each level has increased thanks to IT use.

An IT-supported decision-making system facilitates vertical communication in a hierarchical organization. Thus managers need less time to collect data, and subordinates need less time to report to their superiors; in fact, these activities may require no time at all because communication can take place in real time. Along with the span of control effect mentioned previously, this communication effect changes a bureaucracy’s structure from relatively steep to more flat.

**Proposition 2:** The pyramidal form of the organizations has flattened thanks to IT.

Subordinates, especially street-level bureaucrats, do not need as much time as their superiors for collecting and analyzing data from the field, because in many cases raw data collecting is done automatically and in real time whenever a transaction or a service takes place. Also it is important to note that the Korean government has declared a paperless office policy, which means paperwork-related work volume has decreased. For example, typist jobs have disappeared.

**Proposition 3:** The numbers of lower-level personnel in the hierarchy have been significantly reduced thanks to IT.

The jobs of certain categories of personnel working in a ministry are more affected by IT use. The capability of IT to perform much more than humans in repeated tasks such as storing, transferring, copying, and editing documents leads to the elimination of staff doing these kinds of jobs. Most lower-level personnel work at routine tasks. The more IT is introduced, the more these routine jobs will be reduced. Therefore, the number of employees at lower levels in the hierarchy might have been significantly reduced as a result of IT.
**Overall Structure of the Government**

The Korean government changes its structure often, especially whenever a new president creates a new ministry or merges two ministries into one. To control for these changes, 10 ministries and agencies that are organizationally stable have been chosen for the analysis. These are the Ministry of Forest and Agriculture, Ministry of Information and Communication, Ministry of Labor, Korea Tax Administration, Korea Procurement Service, Korea Forest Administration, Korea Statistics Administration, Korea Patent Administration, Korea Customs Service, and Korea Conscription Service.

Figure 2 shows the changes in organizational morphology that have taken place in these 10 entities from 1989 to 2005. First of all, it is clear that the Korean government does not take a pyramid form; the morphology of both years resembles a rocket. The graphs reveal that the middle level (5th and 6th grades) has increased while the lower level has decreased.

To begin with, the average span of control of the high levels has increased, while that of the middle levels has decreased. In addition, all of the 10 bureaucracies have decreased the average span of control at the middle level. Therefore, proposition 3 that the average span of control has increased thanks to IT, cannot be supported.

The proportion of middle level employees has increased 0.948% between 1989 and 2005, and the lower level has increased 3.020%, while the proportion of technical officials has decreased 4.017%. This means that span of control has increased in the 10 agencies. However, the height of the pyramid stays unchanged, because the rank system, which is mandated by law, has not changed. Therefore not only has the pyramidal form of the organizations not flattened, but also the lower level of personnel in the hierarchy has not been significantly reduced despite the introduction of IT. It is worth noting that the technical and clerical support group, comprising mostly unskilled and manual workers, has been completely eliminated at the central government level.
However this tentative conclusion requires cautious interpretation, because many factors other than E-government have affected this morphological change.

Agency Mission

Some may argue that certain ministries are more affected by the introduction of IT than others, in accordance with the core technology that the agency relies on. For example, Forest Administration needs a certain number of rangers despite IT introduction, because patrolling of the forested area cannot be done by a computer. Conversely, Procurement Service can operate with a smaller staff if IT replaces manual work by simplifying or automatizing internal operations.

Korea Procurement Service (KPS)

Korea Procurement Service (KPS) is one of the most advanced Korean agencies, to the extent that it was awarded a UN Public Service Award in 2002 for introducing the electronic
procurement process (GePS). It was expected that automatic processing and online information sharing in real time would elevate the transparency of government procurement, increase corporate productivity, and reduce transaction costs significantly. For example, bidders for public procurement no longer need to visit government offices and submit the same documents over and over again. Since the introduction of the GePS, companies can not only bid and build documents for contracts online but also apply for certificates and submit annexed documents electronically.

The Internet has enabled better, faster, and cheaper business operations in KPS, resulting in spectacular benefits, for example, a reduction of up to 66.684 million work hours per year. The GePS has realized annual transaction cost savings of $2.7 billion as a result of electronic processes and integrated information. In particular, companies saved more than 90% in time and travel costs. Public organizations saved $281 million, primarily because of the reduced burden of information acquisition and reduced travel costs to public offices (Im and Shin, 2007).

These benefits in timesaving led to staff reductions. Between 1989 and 2005 the total number of KPS employees decreased from 1138 to 945, a reduction of 193 employees. In terms of morphology, the pyramidal form has changed into something resembling a diamond. The ratio of middle level staff to total employees has increased 4.195% during this period, and the ratio of lower level staff has decreased 8.727%.
The span of control for grade 3 (director level) personnel was 17.0 in 1989 and 12.66 in 2005. At the bureau chief level, the span of control was 2.78 in 1989 and 4.18 in 2005. Thus, contrary to our expectation, the span of control at the director level has decreased, while that at the bureau chief level has increased.

*Korea Statistics Office*

As administration is democratized, government relies more on statistics for decision making. In accordance with the National Statistics Law, the Korea Statistics Office regularly produces many statistics regarding such areas as census, agriculture, industry, and labor. Before the introduction of IT, surveyors collected basic data through personal visits to the field and produced meaningful statistics by making manual calculations. Now, aside from household visits during the census, most data can be collected electronically from government files. Thus there are two opposing forces concerning the necessary number of personnel: downsizing in the case of data transmission, analysis, and coding; and upsizing in the case of street-level data collection.
As shown in Figure 4, the number of lower level personnel has increased 23.928% in the last decade. The span of control for the middle level has been reduced; this means that IT use in the Statistics Office has resulted in upsizing middle level employees and downsizing low skill employees. In terms of span of control, a director had on average 6.0 immediate subordinates in 1989, and only 4.17 in 2005. The span of control at the bureau chief level was 4.17 in 1989 and 7.48 in 2005. As in the KPS, the change of morphology of the Korea Statistics Office reveals that the span of control at the director level has decreased while that at the bureau chief level has increased.

Some may argue that this IT effect is limited to agencies whose missions include service or administration rather than policy making only. However, this study also examines changes in ministries that are mainly engaged in policy making.
Ministry Level

It is possible that ministries whose internal operations are more linked with IT have changed their morphologies. Whereas the Ministry of Agriculture and Forestry (MAF) might typify a ministry less affected by IT use, the Ministry of Communication and Telecommunication (MCT) might serve as an example of ministries more affected by IT use, because the MTC’s mission is to promote IT use across the whole government.

Ministry of Agriculture and Forestry (MAF)

One aim of MAF is to develop Korean agriculture as a sustainable industry and turn rural society into a pleasant lifestyle. In addition to handling traditional agriculture issues such as rice production, the Ministry is expanding to new missions such as bioagriculture and environmental protection in rural regions. MAF is a typical ministry in terms of bureaucratic operation. Thus the Ministry was evaluated as being lower than KPS with regard to IT use (Office for Government Policy Coordination, 2005).

In 1989, MAF had 6335 employees. In 2005 after numerous administrative structure reforms, the Ministry had 3665 employees. Similar to KPS, MAF has increased its number of middle level employees by 2.644% and lower level employees by 3.757%. In terms of span of control, a director had on average 15.0 subordinates in 1989 and 13.17 in 2005. The number of subordinates at the bureau chief level increased from 3.6 to 4.71. Thus it appears that the introduction of IT brought similar changes to both KPS and MAF.
Ministry of Communication and Information (MCI)

The Ministry of Communication and Information (MCI), originally the Ministry of Post and Telecommunication, acquired the mission of coordinating and promoting E-government in 1994. In addition, MCI elaborated the Basic Law of Informatization, which includes the principles of promoting the IT industry, E-government, and Internet in Korea. To achieve its missions, this Ministry develops mid- and long-term plans for informatization, sets norms, and allocates huge budgets (e.g., Special Fund for Informatization) to other ministries or companies. In addition, MCI was responsible for the building of expensive Internet fiber highways in the late 1990s, ensuring Korea’s place as one of the most advanced information societies in the world.

MCI’s mission suggests that the Ministry plays a locomotive role in the government with regard to IT use. For example, Ministers of Communication and Information are individuals known for their innovative leadership, such as CEO’s of IT-related companies. Consequently, one may expect the morphology of this Ministry to reflect full IT use.
However, Figure 5 reveals that MCI’s morphology is close to a pyramid. The proportion of high managers increased from 0.001 to 0.02 between 1989 and 2005, and that of middle managers increased from 0.001 to 0.029. Thus there has not been a significant change in this respect. The span of control at the director level has increased significantly from 1.32 to 30.17, while the span of control at the bureau chief level has changed slightly from 3.75 to 3.86. Apart from the increase in the directors’ span of control, MCI does not show any strong features of morphological change attributable to IT introduction.

The lack of significant changes in the morphology of MCI can be explained by MGAD’s particular way of controlling organizational form. There is little opportunity or incentive for a ministry to adopt a different morphology or to reduce staff numbers. Another explanation is that jobs at the ministry level are generally not affected by IT introduction.

![Figure 6. Changes in Ministry of Communication and Information](image)

It will be informative to examine those agencies whose ordinary work is not strongly affected by IT, such as Korea Forestry Administration, Ministry of Labor, Korea Customs Service, and Korea Conscription Administration. In these agencies, the span of control at the director level
has changed variably from agency to agency, while that at the bureau chief level has increased. Therefore, a tentative conclusion is that IT introduction has contributed to increasing the span of control at the lower level.

Table 1. Changes in span of control

<table>
<thead>
<tr>
<th></th>
<th>Director 1989</th>
<th>Director 2005</th>
<th>Bureau Chief 1989</th>
<th>Bureau Chief 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Labor</td>
<td>4.37</td>
<td>5.04</td>
<td>6.3</td>
<td>18.5</td>
</tr>
<tr>
<td>Forestry Admin</td>
<td>13.5</td>
<td>3.0</td>
<td>2.59</td>
<td>5.38</td>
</tr>
<tr>
<td>Customs Service</td>
<td>9.17</td>
<td>16.33</td>
<td>3.65</td>
<td>4.25</td>
</tr>
<tr>
<td>Conscription Admin</td>
<td>3.25</td>
<td>3.29</td>
<td>3.69</td>
<td>4.83</td>
</tr>
</tbody>
</table>

Conclusion

This study found that bureaucracy in the Korean central government, despite its being notorious for having a hierarchical culture, does not take a pyramidal form. The typical form of an organization in the Korean government seems to be closer to a diamond with two vertical tails. This study explored the possible effects of IT on organizational structure. The empirical research has indicated that computing per se is neither a centralizing nor a decentralizing influence, but that computing tends to reinforce existing tendencies (King and George, 1991). Although it is too early to attribute the changes entirely to IT effects, this study found that despite tight constraints on organizational change, IT has influenced organizational morphology in Korean central government in a limited way. One of the most important findings is that the proportion of middle managers became larger relative to the upper and lower personnel levels. This change is even more clear in the cases of service delivery or commercial agencies such as KPS. In all the organizations studied, the span of control at the bureau chief level has increased since the introduction of IT.

However, it can not be said that IT introduction has significantly changed organizational morphology at the ministry level. The anticipated change from a steep pyramid to a flat one was not realized, except for the complete suppression of the lowest level, the technical support group. Nor can it be proved that this suppression is entirely due to IT, because of the effects of other factors such as increases in education levels throughout the population and democratization of the society.
The principal cause of this stability is the tight control of the organizational chart by MGAD versus the expansionism of each ministry. In other words, the government’s detailed and centralized way of managing staff numbers at every single agency prevents the organizational morphology from showing the full effects of IT introduction. Organizational change in the Korean government is a power game among ministries, rather than a managerial game (Im, 2007).

In addition, the formal organizational chart does not show total and real features of the organization. What is important is that each agency outsourced some particular tasks such as maintaining hardware and developing computer programs necessary to the agency’s mission. Because the organizational chart does not indicate these outsourced elements, the formal morphology is somewhat inaccurate.

Berman and Tettey (2001) found that computerization of African bureaucracies does not yield Western-style results because of the three bequests of the colonial state to postcolonial successors: limited technical capabilities of bureaucrats, authoritarian decision-making processes, and the predominance of patron-client relationships. Likewise, the present study does not confirm that the introduction of IT to Korean central government yielded the expected results in terms of downsizing and morphology.

This study is limited to organizational structure and focuses on morphology. But to understand the true effects of the introduction of IT on organizations, the behavior of organizational members will need to be examined. Bovens and Zouridis (2002) found that system analysts and software designers have significantly reduced the discretion of street-level bureaucrats. Therefore, institutional innovations are necessary to preserve due process and fairness in the face of this loss of street-level discretion. This change in bureaucrats’ discretion must reduce work volume, which in turn may mean reducing staff. This issue may be the subject of a future study.
References


Office for Government Policy Coordination. 2005. The evaluation chart for the IT level of Government in 2004