Local Government Information Technology Capacity: An Exploratory Theory

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Abstract

Local government has made use of information technology for a long time, but the level of information technology capacity varies tremendously across local governments. While web-based E-government applications development becomes more prevalent, applying newly developed IT continues to depend on the general ability of government to obtain, manage and utilize IT. This paper starts by providing a comprehensive definition of IT capacity, which incorporates both human aspect and non-human aspect of IT capacity. Next, we propose a theoretical model to identify and knit together the crucial factors affecting the achievement of IT capacity in local governments. Managerial capability of IT manager affects the level of IT capacity of a local government through the interactions with support from administrative authorities and financial supports available for IT innovation. A series of cases from New Jersey municipalities illustrate the proposed theory and enrich it by revealing the relationships between the factors not identified in the theory.

1. Introduction

Local governments have, for a long time, made use of information technology (IT) to manage public services. Applying IT to government has prompted ample research about the relationships between IT and organizational and environmental factors, for example the effect of environmental and organizational factors on IT adoption [6], the impacts of IT on organizational structures [18], the economic impact of IT investment [20], the effects of partnerships with private entities for IT innovation [5]. More recently research on IT use in local governments has extended to the discussion of E-government [8]. While new IT tools especially web-based applications are becoming more and more prevalent in local government, applying new IT continues to depend on the general ability of local governments to obtain, manages and effectively use IT, as a whole their capacity to manage IT. Hence, it is important to clarify the causal mechanism in which organizational and environmental factors affect the level of IT capacity.

For local governments, IT centered innovation must consider the unique factors influencing public organizations and the public policy process, such as a higher degree of control by external environment and administrative authorities–city mayor, city council, city manager and state government, and intensive formal and legal constraints [3]. Support for IT innovation from external environment and administrative authorities may enhance the effectiveness of IT innovation. Additionally, the capability of specific IT manager who plans, operates and maintains information systems and trains end-users, provides another critical consideration.

This paper attempts to knit together these distinctive forces in order to provide a preliminary theory on how environmental, organizational and managerial factors enhance or constrain a local government's IT capacity. This resulting theory is then illustrated, expanded, and possibly enriched through a series of case studies of local governments in New Jersey.

2. Information technology capacity

Organizational capacities or capabilities are typically defined as an ability of an organization to do something, for example technological capacity is the ability to change or innovate through technological

means [11]. Following this model our general concept of IT capacity for local governments is the ability of the local government to effectively apply IT to achieve desired ends. It is important to note that, the type and amount of IT varies significantly across local governments, even local governments of comparable size and character, but the amount and type of IT does not adequately capture variation in effective use of technology. One reason for this failure is that IT by itself does not accomplish anything without the appropriate human and managerial resources.

Over two decades ago, Kraemer and associates found that in order to understand how computers changed organizations, it was necessary to look at the entire "computer package" which encompasses 'technique' that is organizational structures and institutional arrangements for maintaining information system, as well as 'equipment' (e.g. hardware, software, network) and 'people' who operate, process and use the equipment [19]. Thus, IT must be coupled with human and managerial resources in-place to more accurately capture IT capacity as defined above.

Figure1. Level of IT capacity

	Level of Technological Development		
	First Order (IT infrastructure)	Second Order (Office Automation)	Third Order (Integration)
Non-Human Capacity	Hardware	Application development tool	Data Base Management System
	Network	Vendor provided applications	Web-site/ Portal-service
	Operating system	Applications developed in-house	Geographic Information System
	Network software		Intranet
Human Capacity	Analytical capacity of users for IT infrastructure	Analytical capacity of users for applications	Analytical capacity of users for integration
	Attitude of users to IT infra	Attitude of users to applications	Attitude of users to integration
	Training resources for IT infra	Training resources for applications	Training resources for integration

Figure 1 identifies the major elements of our operational approach to local government IT capacity. The first dimension for this model is the level of technology development and the second is human vs. non-human capacity corresponding to the technology level.

The first level of technology is core **infrastructure**. The next two levels reflect the historic development and current wisdom associated with IT management practices. The use of the technology to solve a specific problem or to perform a particular function is known as an **applications development** approach. The application development approach is often augmented by the existence of network integration of technology at least in the form of office automation. At this level specific problems can be solved and services enhanced, and solutions can be shared by multiple users, but the full capability of the technology remains unrealized due to the lack of integration across all uses and applications. The final level includes the development and use of **integrating tools** like databases and e-government webportals. At this level the technology has the greatest potential to deliver the highest capacity.

The human dimension of capacity captures the specialized human resources who work with IT directly, but also considers the non-specialized IT staff human resources which typically have little exposure or training in the use of IT. The principal dimensions of this human capacity are through both improved levels of specialized IT staff and increased capacity of non-IT staff at effective use of IT. Both of these group's capacity to use IT is related to analytic capacity and attitude. The third and in some sense most important element of human capacity though is the capacity to train, because training increase the number of specialized IT and non-IT staff's capability to utilize the potentials of IT. In almost every major study of IT in state and local government, it is this capacity that is typically sorely lacking [7, 14, 22].

Each lower level of technology is necessary but not sufficient for the next level to exist. Often the level of human capacity constrains the ability of a government to make the transition to the next level. Sometimes organizational and environmental constraints prevent transitions as well. The next section of the paper provides a more complete picture of how these other factors influence local government IT capacity.

3. An initial theory of local government information technology capacity

The factors found in innovation literature in general as well as IT innovation research may contribute to developing a model to explain what organizational factors are critical to the level of IT capacity. Based on Mohr [24], innovation is a function of the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles. In local governments, therefore, barriers to IT innovation can be resistance from end-users to new information system, top decision makers' lack of will and understanding about the IT innovation and insufficient support or inappropriate regulations from upper level government. On top of that, IT manager who is not capable of planning and implementing IT innovation projects may hinder the success of IT innovation.

Figure 2 provides an overall model of how various organizational and environmental forces promote or constrain a local government's IT capacity. The

control variables identified within figure 2 are the primary environmental forces, while the main internal organizational factors are varying forms of administrative support including, general administrative support directly and indirectly through financial support, as well as specialized managerial capability in information technology, or technical leadership.

Figure 2. Determinants of IT capacity level

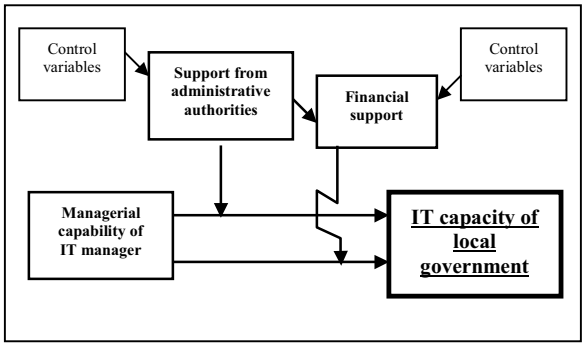

Figure 2 attempts to clarify that causal mechanism: *Managerial capability of IT manager* affects general *IT capacity* level of a local government through the *interaction* with the *support from administrative authorities* as well as with the *financial support for IT innovation*. This theory identifies three important factors affecting the level of IT capacity. Each factor is a necessary condition, but no one factor can be thought of as sufficient to achieve certain level of IT capacity.

3.1. Support from administrative authorities

Innovation would be more likely when the political environment to which an organization belongs has norms favoring the change [30]. According to Fountain [15], enacting technology is highly influenced by institutional and political arrangements. Hence, improving IT capacity of local governments depends on whether support from administrative authorities – elected or appointed top administrators (mayor or city manager), city council and also state government– is available for IT managers who are in charge of implementing IT adoption process and its utilization. Even in the case that IT managers initiate the adoption of new technology, support from administrative authorities may play a significant role in whether the innovation efforts are frustrated or completed.

Support from administrative authorities can be expressed in several ways. First, top administrators' innovativeness is important for mobilizing resources. IT innovation requires large amount of investments, and its effects are not realized in a short term. To implement IT innovation, top administrators are expected to take the risk of failure or delay of IT adoption [23]. Therefore, the top administrator has to have risk-taking propensity to support IT managers to design and implement IT adoption plan without worrying about the consequence [26]. Second, top administrators' knowledge of IT should be considered. Top administrators knowledgeable of the potentials of IT are more likely to have more positive attitude to IT innovation and to endorse the innovation initiatives raised by IT managers. Third, legislative body, i.e. city council, is as important as top administrators are, because budget allocation and other legislative supports are finally authorized by city councils. Like top administrators, city councils' IT innovativeness and knowledge form a crucial part of support from administrative authorities. Fourth, state governments' influence also needs to be considered. State governments make efforts for state-wide technology diffusion, such as providing information about innovations, financial support during development, and procedural facilitation [25].

3.2. Managerial capability of IT manager

The availability of individuals capable of producing new ideas is one of the significant factors promoting innovation [24], and innovations are likely to be proposed by individuals who have expertise in a particular area [10]. Especially, IT innovations tend to start from ingenious application devised by managers with a technical background [2]. Therefore, managerial capability of IT manager, which can be defined as the ability to identify problems of the current information system, and to develop and evaluate alternatives to improve the IT capacity of the organization appears to be a decisive factor affecting the IT capacity of local government [32]. This notion of managerial capability conforms to our early definition of capacity in general and IT capacity specifically, as the ability of the local government to effectively apply information technology.

In local governments, an IT manager is in the position of initiating and implementing IT innovation projects. An IT manager's managerial capability as a change agent can be thought to be composed of *knowledge of IT, innovativeness* and *motivation*. *Knowledge of IT* is an essential part of IT managerial capability. As previously noted, IT encompasses a broad range of technologies. As innovation capability is contingent upon the skill level of the staff [28], without the comprehensive expertise in IT, IT managers may neither design a plan appropriate to obtaining IT capacity nor gain trust from the administrative authorities whose political supports are essential for executing innovation ideas.

While *Knowledge* is a objective condition necessary for IT innovation, an IT manager is also expected to have the personalities necessary for initiating and implementing an innovative plan aimed at achieving a higher level IT capacity. *Innovativeness* and *Motivation* for innovation also comprise managerial capability of IT manager. *Innovativeness* of the IT manager is defined as the propensity to search any problems in the current system and seek out solutions for improvement, and *Motivation* of the IT manager is conceptualized as initiative attempts actually made to design innovation plans and the ability to obtain political and financial supports for such plans, for example, securing budget for new hardware, software, network equipments and training resources.

3.3. Financial support

The availability of financial resources is one of the strongest predictors of innovation [24]. For organizational innovation, especially for adopting advanced IT, *financial support* is indispensable for procuring and developing adequate levels of hardware and software, and training end-users as needed. Therefore, we can expect that a large variation in IT innovation among city governments can be explained by the amount of budget available to adopting new IT. However, as the size of total budget differs from government to government, the relative proportion of the IT budget in the budget structure could be considered as the criteria to judge the level of financial support.

3.4. Environmental and organizational control variables

According to Bingham [1], the socioeconomic status of citizens gives a positive effect on innovation in a local government. For this research, it is likely that the general *IT literacy* of citizens within a jurisdiction sets a level of expectation of citizens for delivery of local services through the IT means. Thus the level of IT literacy of citizens can be considered as an important environmental variable to explain IT capacity. Depending on the level of understanding of the potentials that IT may create, citizens' support for government IT project may vary. If more citizens use computer for their daily lives, they are more likely to expect that the government should provide services utilizing IT or utilize IT for the internal management innovation.

Several important organizational variables must also be considered. Prior work on innovation, IT innovation and organizational change have consistently identified a series of key variables related to organizational size, formalization and structure as important controls. Typical operational measures for these concepts have been applied in numerous empirical pieces such as 'size of government' [4] and 'type of government' [27]. 'Size of government' represents general organizational size effects [12] including complexity of task environment, economy of scales and requisite variety. Size has many potential effects some of which are contradictory. It typically has a statistically significant effect though complex directional impact. Although every researcher does not agree to the idea that there is a positive relationship between size and innovation, many organization scholars have noticed that large organizational size is a facilitator of innovation [1, 6, 24, 29].

'Type of government' is the last variable. Although some scholars have found the tendency that two distinctive types of local government – either 'mayor-council' type or 'council-manager' type– are adapting each other's characteristics [16], research still shows that the managerial difference between two types generates a difference in the level of information system. For instance, a recent empirical study shows that the 'council-manager' type of local government is more likely to achieve more advanced IT level [33]. So 'type of government' can be believed to have an effect of structure on IT adoption and included as a control variable which implies the effect of officially proclaimed structure of city governments.

Two control variables affect 'financial support'. Compared to small-size city, large municipalities would be more likely to need large investment on IT to solve the complexity of management and realize the potentials of IT. Also, a municipal government under the pressure from fiscal distress may have a limited capability to invest for IT innovation which requires large amount of budget. In order to control these effects on 'financial support', we include 'size of city' and 'fiscal distress level' as the control variables.

3.5. Interaction effects among the variables

Interaction effect exists when the impact of one independent variable depends on the value of another independent variable [21]. First, the interaction of 'managerial capability of IT managers' with 'support from administrative authorities for IT innovation' affects the outcome–i.e. the level of IT capacity. This interaction manifests in a number of ways. For example, the effect of a state government policy could have either a negative or positive influence on a local government's IT capacity. The difference may depend on the managerial capability of IT managers who are

responsible for responding to the state policy. For the IT managers with higher level capability, the effect of state government programs are more likely to constrain the local government's own development plan, while for the IT managers with less capability, it is likely to provide good guidelines for growth in IT capacity. Hence the effect of administrative support via the state government must be interacted with current IT managerial capability to adequately explain its influence.

Second, 'Financial support for IT innovation' itself cannot guarantee achieving the intended level of IT capacity. Like administrative authorities' support, 'availability of financial supports' is a necessary condition. However, only when a local government has a qualified IT manager who has professional knowledge on IT, innovative ideas to improve the IT capacity, and motivation to implement the IT innovation plan overcoming barriers, financial support can make positive effects on IT capacity. Therefore, the way that IT managerial capability affects IT capacity depends on the level of financial support and similarly the effect from financial support on IT capacity depends on the level of IT managerial capability.

4. Data collection

In order to illustrate the viability of this approach for understanding and explaining IT capacity in local government, data collected as part of the *New Jersey Initiative* (NJI) [22] will be used. The *NJI* was a pilot project aimed at assessing management capacity for seven municipalities in New Jersey in the areas of financial management, capital management, human resources management, IT management, and managing for results.

The analysis of IT management capacity was based on data collected across the seven New Jersey Municipalities from three sources. Table 1 summarizes the basic demographics for each of the seven study municipalities. First, the most important source was a series of on-site interviews with IT managers based on a semi-structured interview protocol. The interviewer also requested the IT managers to provide formal documents associated with planning, hardware and software inventories, network architecture, and policies and procedures. Finally, each municipality was provided with end-user survey questionnaires to be distributed to the employees who actually made use of IT applications in their daily work. The survey questions included type of applications the employee used, training opportunities for the applications and availability of technical help. Since surveys were administered locally by the officials of the municipality, they cannot be considered a random sample. Nevertheless, the surveys do provide some insights into the actual use and user of IT beyond the technical developers.

Table 1. Characteristics of New Jersey Municipalities

Municipality	Population (year 2000)	Descriptor	Fiscal distress
A	76,119	Developing Suburban	no
B	120,568	Urban	no
C	50,903	Mature Suburban	no
D	60,695	Urban Distressed	yes
E	60,456	Mature Suburban	no
F	149,222	Urban Distressed	yes
G	85,403	Urban Distressed	yes

5. Empirical analysis of IT capacity

This section of the paper is divided into two parts. First we will examine how the operational approach to measuring IT capacity holds up to the detailed reality of the seven New Jersey Municipalities. Next we will focus on how well the explanatory theory is predicting variation in IT capacity across the study sites.

5.1. IT capacity

Based on the interviews with the IT department directors and managers, we found that the IT capacity level varies by government. All the municipalities have reached some level beyond the first order technology capacity or infrastructure. There was a lot of variation across the study sites as to the form and nature of the technology infrastructure. Some of the larger municipalities, for example Municipality G had wireless elements to their network architecture, while in the smaller cities older but functional wire based network systems prevailed.

However, we observed variation in the extent to which individual municipalities had attained second or third order technology capacity. All municipalities used personal computers (PCs) for running general office applications (e.g. Microsoft Office) and varying amounts of task specific applications (e.g. payroll applications, human resource management applications). Although Microsoft Windows systems were the standard operating systems for most municipalities, especially for office automation, one municipality still relied on DOS based applications in several key task specific situations.

Five of the seven municipalities tended to purchase applications from vendors rather than to develop applications in-house using internal staff. Often their choice of vendor and application derived directly from

state sanctioned lists. IT managers who use off-the-shelf applications perceive the problems of using vendor supplied applications that vendor solutions are piecemeal and compartmental, and as a result cannot satisfy all different functions and needs. The lack of qualified staff to develop and operate in-house applications and train the end-users is the major constraint to developing applications internally. Two municipalities, which also made use of vendor-supplied applications, maintained a significant internal application development capacity. These municipalities generally exhibit the up-to-date level of IT. In both of these municipalities, database software and/or Geographic Information System (GIS) software were in use. Both of these software tools constitute a capacity to integrate across functional areas. Although neither of these two municipalities had completely integrated system, they had elements of integration. For example one municipality started its database development from property tax data on the basis of land parcel and then extended the database of which unit of record is individuals living in the district. Even more, this municipality augmented standard assessment data for multi-family units. As a result, the municipality attainted the capacity to use the same database for multiple new applications. This approach effectively integrated property tax data, land use information and a variety of citizen level service delivery systems. The other municipality was also making use of GIS to integrate multiple systems. These two municipalities had begun to initiate integrated applications and had moved into the early stages of level three technology, i.e the level of integration. The other five municipalities were at varying points in level two, applications.

Six municipalities have completely networked information systems. They have shifted old systems run by mainframe computers and terminals to the network of PCs operated by servers. Advanced networking is a critical infrastructure (level one) for the further development of integrated systems that enable organizations to reduce data redundancy and enhance information sharing across multiple applications, work units, functional departments, and citizens. Three of the less developed municipalities identified GIS as a future direction necessary to move toward more integrated applications. One of these municipalities has made significant progress and demonstrated several GIS applications that integrated data across multiple uses. While this municipality was successfully implementing GIS applications, each new use of GIS required its own cobbled together data files and was not directly integrated with previous applications. Unlike the GIS applications in the more advanced municipality, this municipality did not solve the problem of data duplications and failed in fully utilizing the potentials of GIS based integration.

Interestingly, one municipality that is still in the process of networking is implementing GIS and wireless networking projects which belong to the third order technology. Since the state government requires tax maps, which are a part of the GIS, they started the GIS project. Considering this municipality is one of the fiscally distressed cities and it has not established a completely wired network, wireless networking may be an efficient way. This case shows that the requirements imposed by the state government may affect local governments to accelerate their IT innovation and that a government's fiscal status can be one of the conditions influencing the direction of information system development.

The second dimension of IT capacity is human resources which are composed of 'analytical capacity of users,' 'attitude of users' and 'training resources.' One of the interesting results from the semi-structured interviews came from the question asking for the major constraints in the management of IT. Five IT managers pointed to end-users' lack of skills and end-users' negative attitude towards change, as the major problems facing IT management. Interestingly, in one municipality that viewed citizens as part of the IT end-user community, this finding applied as well. This city's IT manager indicated that citizens did not like to use new services available through the municipal website. Clearly, variation in IT skill of end-users (even citizens) and their attitudes toward use and change in IT applications effects is a part of the cities IT capacity.

Training end-users is another aspect of human IT capacity. There are three primary resources for training. As noted earlier, the majority of the municipalities purchase vendor-provided applications rather develop them in house. Those municipalities heavily relied on vendor-provided training especially for common applications (e.g. MS Office). For the municipalities whose applications developed mostly in-house, both the IT departments and the functional departments share the responsibility of training. For instance, in one municipality the IT department provides training on specific functions of database software and the functional agencies teach general data entry procedures. Alternatively, another municipality assigns the training responsibility for particular applications to the functional department. The IT manager of that municipality stated that training demand for core applications, such as MS Word, is diminishing, because new employees are proficient in using that application. Moreover, they were planning to provide training for new applications through the web. In this context, the city was trying to improve training

resources in order to enhance their overall IT capacity. This same municipality was using an advanced website to provide training for citizens especially for the senior citizens on the use of web based public services.

From the findings above, we note that end user's capacity, attitude and corresponding training resources to affect end user capacity and attitude vary according to the technological level. In the less-developed municipality, end-users need help mostly for common applications like word processing and email. However, municipalities with higher IT capacity experience requests from end-users on applications for particular functional purpose, Internet usage, and citizens.

Based on the above analyses, we attempted to assess IT capacity of each municipality as shown in Table 2. For technology capacity, the scores reflect the current level of technology. All of the municipalities are beyond level one but only two are beyond level 2. The human capacity score similarly attempts to reflect the extent to which end-users' capacities at using IT, attitudes and general training resources. Once again there were two municipalities that had attained higher human capacity and not surprisingly they were the ones that had also achieved some level three technology capacity. It is hard to disentangle the level of technology capacity from the level of human capacity since more technology is driven by better human resources. The municipality that identifies citizens as end-users provides more training resources but this is partly driven by the existence of their integrated property-citizen database application. The other advanced city had extensive in-house application staff and thus generated applications that had to be explained to the end-users. They essentially generated increased demands for in-house training and had to provide more in-house training resources. For these reasons it is not surprising that the technology and human capacity components are highly correlated. It does raise the question of what a municipality with high technology and low human capacity would imply or vice versa.

Table 2. Assessed IT capacity level

Municipality	Technology Capacity	Human capacity	Average
A	1.5	1.5	1.5
B	2.5	2.5	2.5
C	1.5	1.5	1.5
D	1.3	1.3	1.3
E	2.5	2.5	2.5
F	1.5	1.5	1.5
G	1.8	2	1.9

The higher score for municipality G, especially in human capacity comes from their end-user survey responses. As noted previously, only three municipalities provided more than one or two survey responses for analysis: the two most advanced cities and municipality G. Analysis of the end user surveys from municipality G indicated that their end-users were between the other two city end users on almost all dimensions of satisfaction with IT systems (e.g. ease of use, reliability timeliness, quality of information and usefulness) and training (quality, easiness of getting help, etc.). While selection issues are highly likely in any interpretation of these data, the ability to work with end users to get surveys, and the results of semi-structured interviewing tend to provide some support to this higher score on human capacity.

5.2. Explanatory theory for IT capacity

Our basic explanation for variation in IT capacity as put forth in figure one identifies three immediate factors (managerial capability of IT manager, financial support, administrative support) and several indirect factors (gross fiscal capacity, citizen's IT literacy, size and type of government). Along with these variables, the interaction among the three direct factors is critically important.

Managerial capability of IT manager – knowledge of IT, innovativeness and motivation– does not affect IT capacity independently of administrative support and financial support. From the cases of three top municipalities, interactions between the IT manager and the supports from administrative authorities were observed in two distinct ways, one structural and the other interpersonal. The structural interaction picks up the IT manager's position in the formal organizational structure. We observed that there were many different ways that cities formally organize the role of the IT manager. The strongest effect due to IT manager's capability interacted with structural administrative support occurred when the role was integrated directly with other roles at the highest levels of administration. In Municipality G for example, the IT manager role was part of the job description of the assistant business manager. In another city the Business Administrator had a great deal of IT expertise, and he had a formal network and a IT manager reporting directly to him. The business administrator in a real sense provided the vision and leadership in IT, and thus this municipality integrated IT manager role with the high level administrative role.

The second type of administrative support interacting with the IT manager was the nature of the interpersonal relationships between the IT manager and the administrative and political leadership of the municipality. For example, in one city an external

consultant provided the IT management leadership role including vision, innovativeness and expertise. The consultant who acted as the IT manager had direct access to the top political and administrative levels of the city government in ways not open to the formal IT director.

In another municipality, the assistant business manager who combined that role with IT manager had strong long term relationships with the business administrator. In fact they had been a team working in another city earlier and when the administrator was recruited away he successfully recruited his former assistant to the new site. Strong interpersonal relationships were observed between the business administrator who acted as an IT manager and his network director. We also observed similar positive relationships in other cities but clearly this interaction, though important, appeared to require some pre-existing structural interaction first.

A second important interaction we observed was between managerial capability of IT manager and financial support. The consultant IT manager was able to sustain increases in financial support over time through successful delivery of enhanced services. In one application of GIS, this manager simply organized fire alarm reports and crime report by political geographic units representing ward as represented by city council instead of by standard service delivery units. This type of information led to both increasing administrative and financial support. The integration of IT manager with business administrator and assistant business administrator also led to consistent levels of financial support. In both of these cases there was an on-going consistent introduction of new applications and/or enhancements in infrastructure that required fiscal resources.

We also observed in some other setting financial support interacted with IT managerial capability without strong on-going administrative support. In one city, the mayor had provided a one time large financial boost to support IT. As part of that initial grant, the city newly established an IT department with new leadership and staff drawn from functional department that had IT staff within them. At that time there was clear strong interaction of IT manager, administrative support and financial support. But at the time of the interview the IT staff was in their second year of operation and the level of administrative support seemed to be unclear. The unit had been and was successful at enhancing the hardware infrastructure as well as obtaining some new applications. They were also beginning to make use of GIS. Unfortunately, their future was unclear. When asked about future funding, the IT manager was uncertain and specifically did not know what would happen once the original outlays were depleted.

The final elements of our theory we must examine are the control variables or indirect factors that influence administrative and financial support. Financial capacity of the municipality and political environment provided the strongest examples of how these factors worked. The weakest of all the cities with regard to IT capacity was one of the three study cities that had been designated as fiscally stressed by the state. It was also one of the two cities to have on-going problems with political corruption as well. Surprisingly, however, one of the fiscally stressed cities was also one of the top three cities with regard to IT capacity. This suggests that while indirect environmental forces can constrain or enhance the direct effects of financial capacity, these effects can be overcome.

One last observation links two direct factors, IT managerial capability and administrative support, with an external control factor, state government's influence. We noted earlier that administrative support from state government can enhance IT capacity through grant, data and technology sharing and standard setting. We also observed a constraining effect of these same state administrative systems. In the top two cities, state standards and data sharing activities were viewed as constraints. In one city this occurred through state equalization of property tax rates and assessment because the property tax data was the basis for the cities core database. Each time the state set a data exchange requirement for property tax data it imposed cost on this city. This suggests that for high capacity cities the state environment constrains while for low capacity cities there is at least a potential for state action to enhance local capacity.

6. Synthesis of theory and empirical findings

This paper proposed a preliminary theory to identify and relate the organizational variables that may affect the IT capacity of local governments. In order to illustrate the theory, we analyzed the cases generated from the *New Jersey Initiative*. The findings from NJI may help us to refine the theory as follows.

In the theoretical model, we emphasized the interaction effects between the managerial capability of IT managers and the other two variables– support from administrative authorities and financial support. The empirical findings support this argument. However, it also gives us new intuitions about the nature of the interactions. First, the influence of state government on the IT capacity is not just made through the interaction

with IT managerial capability, but its influence can be viewed positive or negative depending on the current level of IT capacity. As already noted, the municipalities which have approached the level three of IT capacity perceived the guidelines and requirements from the state government as the biggest barrier to the further development. However, those municipalities at the lower level of IT capacity did not express such concerns and, instead, stated that they have been dependent upon the technical and financial guides from the state government. Thus, we need to refine the model by incorporating the feedback effect generated by the apparent relationship between the current IT capacity level and the views to the state government's influence.

Second, the cases show the interpersonal and structural relationships between IT managers and the top administrators may affect the depth and width of IT capacity. We have found that when an IT manager has built a personal tie with the top political or administrative leaders, the rapport formulated between them for the IT innovation can be stronger. Also, when the position of IT manager is formally located close to the higher administrator, stronger interaction effect between IT managerial capability and the administrative support may occur. Thus, our theory should incorporate the interpersonal and structural relationships between IT managers and top administrators into the model [9, 31].

Third, when the proposed theory explains about the interactions between the independent variables, it implicitly assumes that each variable is equally important and any one factor cannot be neglected. However, after observing the municipalities, we came to doubt this assumption. There can be variation among the variables in terms of the relative importance. We have seen that the capability level of IT managers do not vary so much from person to person or at the very least it is hard to capture the difference in knowledge, motivation and innovativeness. However, the study cases still show the large variation in the level of IT capacity. Therefore, the varying level of IT capacity may be more likely to be explained by other factors, such as financial support and administrative supports, and the IT managerial capability may be relatively less important. If this interpretation holds true, there may be a type of compensation effect: a weakness in IT managerial capability can be compensated by large financial and administrative supports, but the lack of such supports cannot be compensated for by an IT manager with relatively higher capability.

The task of integrating the findings from the case studies still remains. Future research will focus on incorporating the findings and test the theoretical model using another methodological tools, such as a survey method with a broad sample.

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