Investigating IT leadership models in schools

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INVESTIGATING IT LEADERSHIP MODELS IN SCHOOLS

by

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ABSTRACT

The influence of technology in the school setting has grown dramatically in recent decades. It is critical that school leaders manage the influx of technology effectively and leverage it appropriately to benefit the operational and instructional aspects of the school.

The research literature describes the historical development of school IT leadership as a largely reactive response to the rapid influx of new technology over the past twenty-five years. Technology-related decision-making has migrated from computer lab assistants in the early 1990s to principals and then more recently to district level technology coordinators. There is no standard preparation or certification for these district technology coordinators. As technology has become increasingly ubiquitous in schools and society, there are calls from scholars and practitioners to distribute technology decision-making across a broader spectrum of stakeholders. There is very little published research on effective IT leadership structures.

The study examines the IT leadership structure and technology-related decision-making processes in three large suburban public school districts. The study employs an explanatory case study with a multi-case design. The case study describes the historical development of the IT leadership structure in each district. It explores roles and perceptions of individual actors within the current structure. It investigates how technology-related decisions are made within the district and the extent to which those decisions are distributed among stakeholders. It examines the degree to which each district implements technology-related best practice.

The analysis provides insight to policy makers and practitioners on the design of effective IT leadership structures. The research findings suggest that school district leadership structures are evolving toward a more distributed model. This evolution may be influenced by internal and external factors. The findings indicate that a district benefits from a district technology leader that possesses formal power within the district, champions technology use to benefit teaching and learning, commits to shared decision-making, and promotes high quality teacher-to-teacher professional development. Longevity in the position of district technology coordinator is also beneficial. The study also highlights the benefits of a specific certification for the district technology coordinator and the importance of specialized technology training in administrative graduate programs.
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Chapter 1

INTRODUCTION

Defining “IT Leadership”

It is important for educational leaders to recognize and effectively manage the growing role that Information Technology (IT) plays in the operation and pedagogy of the modern school district (Papert 1993; Prensky 2005; Collins and Halverson 2009; Prensky 2010; Christensen, Johnson, and Horn 2010). From 2000 to 2009, the National Center for Education Statistics estimated that the average number of students per available instructional computer with Internet access dropped from 6.6 to 1.9 (NCES 2000; Gray, Thomas, and Lewis 2010). This rapid increase in the number of computers available for student use has changed the way that technology supports instruction and increased the demand for technical support. The technological advances of the past twenty-five years have introduced new options for interpersonal communication, access to content, and instructional delivery.

The growing influence of IT extends beyond the classroom proper. By 2008, 92% of all U.S. public schools were connected to a district network. Nearly 100% of districts tracked attendance electronically, 89% reported keeping district-wide assessment results in their electronic data systems, and 80% reported using computers to track transportation information (Gray and Lewis 2009). New and ever-changing technological applications form the basis of student management systems, clerical duties, transportation departments, library media centers, school
security, public relations, parent-teacher communications, and grade reporting (Waxman et al 2013).

Schools have reacted to this influx of technology by developing and implementing policy and accepted best practices and by formally identifying individuals and structures to provide relevant IT expertise and leadership for implementation. IT influences both the operational and the instructional aspects of school districts. As indicated in Figure 1, this study will define “IT Leadership” (also referred to as “School Technology Leadership”) broadly enough to encompass both aspects of the organization.

![Figure 1: Broad working definition of “IT Leadership”](image)

The centrality and significance of IT leadership is further magnified as schools invest technological infrastructure and end-user technologies. In November of 2014, the State of New York put the Smart Schools Bond Act before voters. The ballot proposition asked voters to invest nearly $2 billion in technology in school districts across the state. The proposition was passed by voters with 62% support. Spending these funds in a manner that will improve technology infrastructure and
benefit student learning will require that each school district make a series of important decision at the local level. Thus, an examination of the IT leadership structure responsible for making these decisions in each district is a timely and appropriate undertaking for superintendents and school boards.

The Historical Development of IT Leadership

A historical review of approaches to school IT leadership over the past 25 years describes the migration of formal technology leadership power from school-based computer lab teachers to building principals and ultimately to various district wide personnel. Tearle (2003, 568) describes a state in which “the goal posts were moving at the same rate as practice,” emphasizing that school leaders were often forced into a position of reactivity with respect to the management of new technologies.

Although the approach settled upon by most districts in the 2000s included the designation of a full-time district technology coordinator, there is no consensus on a “best practice” for this role (Kowch 2005; Ely 2008; Davies 2010). In New York State, there is currently no certification, standard title, license, or specific training required for the position of District Technology Coordinator, a fact that supports Tearle’s claim that technology leadership has been largely reactive. The positions are filled by individuals with diverse qualifications. The scope and span of control of the position differs greatly from district to district and has changed over time. Responsibilities assigned to these positions are very often a hybrid of operational

The *ad hoc* approach to school technology leadership is notable given the importance of leadership to the successful integration of technology in schools. Anderson and Dexter (2005), one of the most widely cited studies on IT leadership, maintains that technology *leadership* plays a "very central, pivotal role" in technology related outcomes - more so than any other factor studied (e.g. access, density of resources, quality of resources, expenditures per student). The authors of that study note that rapid technological change and highly uneven distribution of expertise make technological leadership particularly challenging for schools. They suggest that it is critical that the approach to technological leadership mirror broader ideas in educational leadership such as the ability to cope with complex change (Fullan & Stiegelbauer 1991) and the need to build capacity for continuous learning (Senge et al 2000). Dexter (2008) asserts that attempts to study IT leadership ignore these more critical aspects of leadership and focus more on technical issues such as staffing or resource acquisition.

Dexter (2008) advocates for an overall approach to IT leadership that de-emphasizes the single formal leader in favor of a focus on technology leadership tasks being spread across multiple individuals—a recognition that the field is too large and too integral to be run by a single individual. She states that “the range of equally important yet different technical and instructional decisions, the rapid rate of technological change, and the general lack of IT leadership training among formal school leaders increases the likelihood that the functions of IT leadership be shared
or distributed across a group of staff members to collectively harness an appropriate level of expertise” (Dexter 2008, 549).

**A Snapshot of Current Practice**

In 2012, I conducted a survey of the IT leadership structure of the 24 component school districts of the Capital Region BOCES in New York State. The results reflect the diversity in approaches to IT leadership reported in the literature. The survey was completed by sitting superintendents in 20 (83%) of the BOCES component districts. While most districts (80%) employed a District Technology Coordinator, the background of this individual varied widely, with only 25% of the District Technology Coordinators having a background in education. 44% of District Technology Coordinators had a technical background in private sector IT and 31% reported a technical background in public sector organizations.

The survey showed that the reliance on principals as technology leaders in Capital Region BOCES school districts varied widely. Some districts reported that tasks such as “providing vision and direction for technology integration” and “making decisions about hardware and software acquisition” were required parts of the principal’s job description while others reported little to no expectation of principal leadership in any area of technology. Moreover, 78% of superintendents reported that they viewed “less than 50%” of their principals as strong technology leaders. The survey also revealed that the role of computer technicians, computer aides, and of superintendents themselves as technology leaders varied widely.
One consistent finding in the survey was the widespread presence of "district technology committees" (DTCs). All 20 responding districts (100%) reported the presence of a DTC. As indicated in Figure 2, the composition of these committees varied from district to district. However, all teams (100%) included teachers and 80% of the teams included principals. Other groups that were highly represented on these teams were District Technology Coordinators, central office administrators, and computer technicians. Groups that were underrepresented or not represented at all include students, teacher aides, clerical staff, building and grounds personnel, and transportation employees. The low representation of these groups is notable considering the extent to which decisions about technology affect all aspects of the organization. Student learning is the primary mission of the organization. Student input into technology decisions should prove valuable. Transportation personnel may have important input into bus routing software or on-board surveillance systems. Building and grounds employees have insight into a variety of technology-based tools including energy use monitoring systems, voice-over IP phones, alarms, and access control. Thus, the extent to which all stakeholders’ points of view are incorporated into IT decision-making is something worth investigating.
Just as with other formal structures, the scope and span of control of these DTCs varied widely from district to district. Table 1 below summarizes the role that the DTC played in vision, budget, technical support, and instruction:

<table>
<thead>
<tr>
<th>Role of District Wide Tech Committee</th>
<th>Vision</th>
<th>Budget</th>
<th>Technical</th>
<th>Instructional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes the majority of significant decisions</td>
<td>5 (25)</td>
<td>1 (5%)</td>
<td>2 (10%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>Makes some binding decisions</td>
<td>4 (20%)</td>
<td>3 (15%)</td>
<td>6 (30%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Serves in advisory/support capacity only</td>
<td><strong>11 (55%)</strong></td>
<td><strong>15 (75%)</strong></td>
<td><strong>11 (55%)</strong></td>
<td><strong>10 (50%)</strong></td>
</tr>
<tr>
<td>Plays no role in this area</td>
<td>0 (0%)</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

*Table 1: Role played by the District Technology Committee, McGrath (2012).*

While the majority of these teams tended to be advisory in nature, a number of districts reportedly utilized the teams more directly in decision-making. For example, 45% of the districts reported that their DTC made some or all of the
“binding decisions” in the areas of Setting an IT vision, and Instructional Integration. Perhaps more surprising, 20% of districts reported that the DTC makes some or all of the binding decisions with respect to technology Budget. Typically, decisions about spending in schools are made by individual actors within the formal administrative structure. These survey results hint at some sharing of these decisions among a broader spectrum of stakeholders.

The presence of true decision making power among some of these DTCs is notable in that their inclusion in the leadership structure mirrors the concept of distributed leadership being called for in the most recent literature on school IT leadership (Dexter 2008; Bennett 2008; Chen 2013; Harris et al 2013). Although the call for distributed leadership is growing, there is a lack of scholarly research on IT leadership in the public school sector (McCleod and Richardson 2011).

Policy Implementation as a Measure of Effective Leadership

The wide variation in structure of school IT leadership coupled with the lack of scholarly research in this important area presents an intriguing opportunity for study. In order to move from research that simply describes “what is” to something that helps to inform practitioners, we must define a useful lens through which to examine different approaches to school IT leadership. One manner (perhaps the most practical manner) in which to evaluate the effectiveness of a particular leadership structure is to study whether it is associated with robust policy and best practice implementation within the organization being studied.
Fowler (2012) holds that effective policy implementation is essentially synonymous with strong educational leadership. McLaughlin (1987) describes implementation of policy as largely dependent on the “street level” interactions between individuals. This framework stresses the leadership skills of bargaining and transformation, and “frames central implementation issues in terms of individual actors’ incentives, beliefs, and capacity” (McLaughlin 1987, p. 174). Recent research on policy implementation focuses on the way that the policies or standards are received, communicated and understood by the “street level” recipients. The research offers insight into the problems faced by those seeking to implement new policy. Effective leadership structures will be those structures that understand these problems and facilitate the translation of high-level standards and policies into meaningful “street-level” actions.

In the field of educational technology, the most widely accepted set of standards are the International Society for Technology in Education (ISTE) standards (previously the National Educational Technology Standards). The standards are designed to identify best practice for students, teachers, and educational leaders (ISTE 2009). They have been adopted by 29 states and are the most often referenced standards in the literature on IT leadership. A number of survey tools based on the ISTE Standards have been developed and validated. These instruments will be used in the present study to measure the extent to which IT leadership is successful in implementing IT-related best practice in the schools being studied.
RESEARCH QUESTIONS

This study examines the IT leadership structure and IT policy implementation in three different school districts, employing an explanatory case study with a multi-case design (Yin 2003). The study seeks a better understanding of IT leadership structures in school districts and how these structures might influence the implementation of technology-related best practice for students and teachers.

In particular, this study is interested in the extent to which the IT leadership in each district is distributed among stakeholders (as described Dexter 2008; Bennett 2008; Chen 2013; Harris et al 2013). The study will seek to examine the proposition that distributing technology leadership among a broad array of stakeholders will positively affect implementation of IT policy and best practice.

In order to test this proposition, the study will seek answers to the following questions:

1. **How is IT leadership structured in each of the districts and why?**

   1a. Are the IT leadership structures in these districts aligned with models represented in the research literature?

   1b. How did the structure in each district come to be the way that it is?

2. **What kinds of IT responsibilities are assigned to various individuals with formal roles within the district and why?**

   2a. If there is a District Technology Coordinator, what is that individual’s background and role?

   2b. What is expected of principals with respect to IT leadership? To what extent are principals viewed within the district as IT leaders?

   2c. Does the superintendent play a role in technology leadership?
2d. What is expected from other individuals in a school district with respect to IT leadership?

2e. Who takes responsibility for professional development in the area of technology?

3. Do the districts have a District Technology Committee? Do the districts have building level Technology Committees? Why or why not?

3a. Is there a typical structure for such committees in terms of membership? If so, what is it? If not, why not and how do the committees vary?

3b. What are the formal and informal roles of such committees?

3c. To what extent is the power to determine IT policy and implementation typically distributed among team members and the IT leader in school districts?

3d. How do IT leaders view the IT committees?

3e. How do IT committees view the IT leaders?

4. To what extent has the district implemented broadly accepted standards of best practice for technology integration (International Society for Technology in Education Standards)?

4a. Is there evidence of widespread adoption of the goals of the ISTE Standards among students? Among teachers?

4b. Are there differences between the implementation of the standards across the schools?

4c. What roles do the various IT leaders (both formal and informal) have in the implementation of IT plans and standards?

4d. Can any observations be made about the relationship between IT leadership structure and effective implementation?

The project fills a gap in the literature by examining an important aspect of educational leadership- the design of effective school IT leadership for both
operational and instructional purposes. The study provides insight that may help practitioners to transition from what has largely been a reactive response to the rapid influx of new technologies to a proactive design of an effective leadership structure.
Chapter 2

LITERATURE REVIEW

There is a dearth of scholarly literature on IT leadership in schools (Stuart et al. 2009; Davies 2010). McLeod and Richardson (2011) report that twenty-five leading research journals (identified as the twenty-five journals most often cited in Educational Administration Quarterly and The Journal of School Leadership) published a combined total of 43 peer-reviewed articles on the topic of school technology leadership between 1997 and 2009.

This review will examine the current body of knowledge in this field, limited as it may be. It will discuss general historical trends regarding IT leadership in K-12 education, review existing national survey data on IT leadership, and look specifically at some of the various models that schools have used to structure IT leadership. One of the goals of this study is to gain an understanding of where formal power for technology related decision-making exists within the school districts being studied and how the current structures came to be. A survey of research on the historical development of technology leadership in schools will assist in answering these questions.

The literature review will also provide an overview of scholarly research on policy implementation. As previously discussed, the effectiveness of leadership can be evaluated by the extent to which it successfully implements policy and best practice. Research on policy implementation suggests that implementation is affected by the will and capacity of the implementing agents and variables inherent
to the policy itself (Fowler 2012). Research focuses on two streams of thought. The concept of communities of practice emphasizes the social interactions of the community into which a new policy is being introduced (Coburn & Stein 2006). The concept of sense-making examines the way in which the local agents assimilate new policy (Spillane et al. 2002). The present study will use these two concepts as lenses through which to evaluate and explain the effectiveness of the various structures of IT leadership found in the cases studied.

Finally, the literature review will provide scholarly background on the International Society for Technology in Education (ISTE) Standards (formerly the National Educational Technology Standards (NETS) Standards). These standards are widely accepted as describing best practice in the integration of technology into teaching and learning from the perspective of students, teachers, and administrators. Several survey tools have been developed based upon these standards. Two of the ISTE-based survey tools will be used to help provide objective information on the implementation of technology best practice in the cases studied.

**General Trends**

The dearth of significant research into school technology leadership is consistent with a historical hesitancy on the part of schools to acknowledge the impact that technology would have on both the operational and instructional aspects of the organization. After initial predictions in the mid-eighties and early nineties that computer technology would “revolutionize” education, there were concerns raised in the early 2000s about the return on investment into technology
from a financial as well as a teaching and learning perspective (Twining et al. 2006). Many argued that computers were only a marginal force in the education of K-12 students (Cuban 2001; Robertson 2003; Hernandez-Ramos 2005).

As the state of the art of information technology progressed through the first decade of the twenty-first century, its effects upon schools grew stronger. Electronic mail, video conferencing, data warehouses, GPS tracking, digital surveillance, archived digital video, advances in projection technology, cloud computing, and GPS tracking of transportation are just a few of the technologies that became standard in the school environment over the course of just a few years. Technology was no longer confined to the periphery of school districts, but began to become more central to the day-to-day activities of many individuals within the organization. Schools responded cautiously to this steady influx of new technologies, changing the responsibilities of IT leaders as the environment changed (Frazier and Bailey 2004). Tearle (2003, 568) describes a state in which “the goal posts were moving at the same rate as practice,” emphasizing that school leaders were often forced into a position of reactivity with respect to the management of new technologies.

More recently, even greater advances in the availability of academic content, the wireless and cellular connectivity of a end-user devices, the speed and capability of new software packages, and the pervasiveness of internet connectivity in society at large have begun to have an impact on the most vital instructional and operational aspects of schooling. In fact, many researchers and scholars feel that these changes could represent a revolution for schools on par with the type of restructuring brought on by the Industrial Revolution in the late 19th century.
(Collins and Halverson 2009; Christensen, Johnson, and Horn 2010; Prensky, 2010; McLeod and Richardson 2011). They make the case that effective IT leadership in schools must become a research priority. McLeod and Richardson argue: “Schools are changing to meet the needs of a technologically driven innovation society. School leaders who do not learn to navigate these changes will be doing a great disservice to their schools and students” (McLeod and Richardson 2011, 236). General trends in how schools have sought to navigate such changes are reflected in a review of national survey data.

**National Survey Data**

There are a few questions on national surveys that provide some insight into historical trends in the structure of IT leadership. In 1999, 86% of teachers surveyed in a national data set reported the presence of a “technology coordinator” helping them in their schools (NCES 2000). The survey did not give respondents the opportunity to elaborate on the nature of the position. Ten years later, the NCES reported that 51% of US school districts had a full time person “responsible for educational technology leadership” while 32 percent had a part time person in that role. Seventeen percent of the districts reported no one specifically designated for technology leadership (Gray and Lewis 2009). This survey also found that wealthier and larger districts were more likely to have dedicated technology leadership.

Anderson and Dexter (2005) note that respondents to national surveys use the term “technology coordinator” inconsistently, referring to classroom, school-wide, and district-wide leadership interchangeably. However, IT leadership
structures may have become more centralized over time. This trend is suggested by the fact that the leadership questions in the national data set referenced “school-level” technology coordination in 1999 and then “district level” leadership in 2008. Thus large-scale surveys indicate the presence of dedicated technology leadership in a general sense, but they do not describe the real nature and structure of this leadership. For a more in-depth look at how schools have structured IT leadership, it is helpful to review the research on the various models employed by districts over the past two decades.

**Early School Technology Leaders**

The historical evolution of technology leadership in education over the past twenty-five years is marked by slow and non-uniform movement of the locus of control to various individuals within the organizations in reaction to changes in the environment. When formal technology leaders were established in the 1980s, they were most often building-level positions that focused solely on the installation and use of computers in classroom (Moursund 1992). These school technology leaders, who were primarily teachers and library media specialists, were encouraged to oversee resources and work with other teachers, students, and administration in order to encourage computer integration (Lai and Pratt 2004). Ronnkvist et al. (2000) reported that of the 1215 schools surveyed in 1998, 87% had a school-based technology coordinator, but only 19% of schools employed the individual in a full time capacity.
Principals as Technology Leaders

As the need to manage technological resources within schools grew, the role of technology leadership shifted largely to school principals. The literature on technology leadership of principals in the late 1990s and into the 2000s expresses widespread concern that principals were underprepared for this responsibility. Flanagan and Jacobsen (2003) note that very few principals had used computers in the classrooms themselves. They argued that principals lacked the pedagogical vision and experience to guide teachers. Schiller (2003) emphasized considerable variation in technological competency and use of information and communications technologies among principals. Brockmeier et al. (2005) found that a majority of principals did not feel that their level of expertise gave them credibility as the technology leader of the school. Hayes (2006) reported the difficulties faced by principals in leading technology integration in schools. This research emphasized that effective IT integration not only required leadership in technology per se, but also in a wide range of other areas including curriculum design, effective pedagogy, staff development, and long-range planning.

Researchers called for an increase in technological expertise among principals and the need for principals to develop a shared vision of technology use with their teachers. Principals were encouraged to model technology use, provide teachers with adequate resources for technology, and promote professional development (Brockmeier et al. 2005; Yee 2000; Telem 2001; Fullan 2007; Golden 2004; Shattuck 2010).
The extent to which principals have answered this call is unclear. However, some recent research has identified persistent obstacles to principal technology leadership such as lack of resources, resistance to innovation, and lack of professional development (Carr 2013; Sincar 2013). Conversely, a recent study by Waxman et al. (2013) provides evidence that principals have a positive view of technology, that they use technology themselves, and that they view the primary roles of technology as communication, instruction, data sharing, and management. The study reports differences in the importance of these perceived roles based on gender and years of experience of the principals in the sample (n=311). Waxman et al. assert that by using and modeling technology in their jobs, principals are seen as technology leaders “whether they realize it or not.” The authors note that there was no reference by the principals in the study to a vision of the role of educational technology in their schools. The authors conclude that principals need to take a leadership role in setting a technology vision and in planning for the purchase and implementation of new technology.

District Level Technology Coordinators

Davies(2010) holds that a real roadblock for principals as technology leaders is that they often lost the ability to become the ultimate managers of technological resources, as decision-making authority moved outside the school building. As technology expanded, schools looked to district level leadership to manage burgeoning infrastructure needs. Positions such as “district technology coordinator” became more common. This position was sometimes filled by a
teacher who had previously taken on an informal leadership role in technology integration and instruction (Hofer et al. 2004; Lai and Pratt 2004; Kowch 2005). In other situations, the position was filled by an individual with a strong technical and infrastructure background (Frazier and Bailey 2004).

There is a lack of consensus in the literature on how the role of district technology coordinator should be defined. As technology leadership moved from the building to the district level, the percentage of the job that was dedicated to instructional technology tended to decrease. The need to manage network infrastructure, district-wide budgets, data, and all of the operational software that ran the managerial aspects of school districts often competed with the instructional aspects of the position. This often resulted in school districts seeking a technology coordinator who functioned largely in the role of technical expert (Frazier and Bailey 2004; Devolder et al. 2010; Berrett et al. 2012 Strudler et al. 2005; Vanderlinde et al. 2009).

Other districts sought a technology coordinator who would serve as an innovative change agent rather than a technical expert (Hofer et al. 2004; Lai and Pratt 2004; Vanderlinde et al. 2009; Chen 2013). Bassillier et al. (2003) report studies that support a consistent body of business management literature highlighting the importance of “championing behavior” on the part of management. In a study examining the effect of leadership on technology acceptance and use in organizations in general, Neufeld et al. (2007) found that championing behavior was positively associated with increased performance expectancy and effort expectancy among end users of IT.
Stuart et al. (2009) attempted to apply the principle of championing behavior to educational organizations. While their work focused mostly on principals, it underscores the idea that school leaders must be more actively involved in technology integration projects within their schools if they intend to be seen as innovative “champions.” This research is supported by Afshari et al. (2012) who report a strong, positive correlation between computer use by principals and their ability to provide transformational leadership in IT implementation. This concept of transformational IT leadership was broadened to the district-wide technology coordinator by Vanderlinde et al. (2009) who called for district-wide coordinators to fill the role of “curriculum manager” and “change agent” in the area of instructional technologies. Chen (2013) reported that teachers viewed district technology leaders as exhibiting “championing behaviors” more often than their principals or their subject area administrators. Many of these “championing” concepts could apply to the superintendent as well.

Devolder (2010) uses four categories to describe the role of the district-wide technology coordinator: planner (sets vision for technology use), budgeter (expends funds and administers budget), educationalist (helps teachers to integrate technology), and technician (manages and maintains equipment). Interviews of 177 district-wide technology coordinators provided support for this categorization, although the study shows that the coordinator functions dominantly in the role of technician.
Although many school districts employ district-wide technology coordinators, there is little research on their background or the roles that they are expected to fill within the organization. There is insufficient research to determine how this position should be most effectively structured (Vanderline et al. 2009; Devolder 2010). In fact, Anderson and Dexter (2005) report that the presence of a “technology coordinator” is not a consistent predictor of positive technology outcomes.

**Distributed Leadership**

The most recent literature on technology leadership describes a distributed model in which leadership of technology is a characteristic of an entire organization rather than resting with a particular individual. Dexter (2008) advocates for an overall approach to IT leadership that de-emphasizes the single formal leader in favor of a focus on technology leadership tasks being spread across multiple individuals. She argues that the field is too large and too integral to be run by a single individual.

Dexter draws heavily upon Spillane (2005; 2006) as she describes this approach to IT Leadership. Spillane et al. (2004) emphasizes that the “distributed leadership” concept follows the tradition of Barnard, Katz & Khan, and Cyert & March who argue that understanding leadership requires moving beyond a study of the positional leader to the study of leadership as an organizational quality. Spillane further develops this concept, proposing that the distributed leadership perspective “shifts the unit of analysis from the individual actor or group of actors to the web of
leaders, followers, and situation that give the activity its form.” (Spillane et al. 2004, 10) He argues that in order to understand leadership, researchers should move beyond a focus on formal leaders to study the interactions among these formal leaders, other potential leaders, the followers, and the situation in which the leadership is occurring. (Spillane 2006)

Bennet (2008) emphasizes that both the power resources granted by position (formal) and the power resources granted by knowledge (often non-formal) can work together to inform decision making. He emphasizes that effective leaders will confidently broaden participation in leadership, as appropriate, to non-formal leaders—especially when there is significant power generated by their knowledge.

Dexter (2008) advocates a team-based technology leadership model in which a wide array of school leaders and teachers work together to lead technology across a district. This approach is typically manifested in practice as a “Technology Committee.” For example, effective IT integration in technology rich schools may involve a leadership model that includes a team approach situated in a professional learning community (Strudler and Harrington 2008). Davies (2010, 58) argues that given the wide variety in technology users and applications, “there need to be plural voices involved in planning effective technology integration.” Kowch (2009) describes the distributed leadership approach as IT leadership that is integrated throughout all levels of the educational organization.

It is important to note that the idea of distributed leadership does not conflict with the well-established role of formal power within an organization. Spillane
(2005, 149) addresses the conflict between formal lines of authority and the benefit of distributing aspects of that authority:

“Shared leadership, team leadership, and democratic leadership are not synonyms for distributed leadership. Depending on the situation, a distributed perspective allows for shared leadership…distributed leadership can be stretched over leaders in a school, but it is not necessarily democratic.”

In other words, formal lines of authority can exist but formal leaders may benefit from recognizing that other individuals within the organization, other leaders and the followers, can inform decisions in a significant way.

What situations might call for a distributed perspective on IT Leadership? As stated earlier, technology in schools supports both the operational and instructional aspects of the organization. If the focus of IT management is primarily to utilize technology to maintain efficient operations (e.g., infrastructure, end-user device maintenance, help-desk administration, software management, database administrator), formal authority exercised by an individual with extensive technical background may be sufficient to provide effective leadership. If, however, the mission of the organization involves the use of very specific technologies related to the core mission of the organization, someone with a purely technical background may lack the ability to make effective decisions without significant outside input. This concept is not unique to educational organizations.

For example, in a large polymer manufacturing company, an IT manager might be able to make most of the decisions regarding the company's email system, webpage, phone system, and inventory supply database. However, this management level IT specialist might need significant assistance in making a decision on the type
of high pressure liquid chromatography (HPLC) machines to purchase or in how to train technicians on new sampling methods for an updated infrared spectroscopy system. In much the same way, schools may benefit from the recognition that leadership in the operational side of technology requires a very different set of skills than leadership in the aspects of technology that are increasingly related to the core teaching and learning process.

Making the situation more complex, the technologies related to both sides of the educational enterprise (operational and instructional) are rapidly evolving. New technologies, such as inexpensive one-to-one devices, online collaborative software, and new learning management platforms continue to be introduced in the pedagogical landscape. Researchers emphasize that this rapid rate of technological change coupled with the lack of sufficient training among formal school leaders make it increasingly important that leadership decisions are made by a collective group with the appropriate level of expertise (Dexter 2008; Chen 2013; Harris et al. 2013).

Given the wide variations in structure of IT leadership in schools and the reactive manner in which many of these leadership roles were developed, a practical question arises- which structure is preferable? The present study will identify the IT leadership in the schools of two different large suburban public school districts. How is IT leadership currently structured in each district? How did it come to be that way? Once the leadership structure of each case in the study is described, the study will examine the effectiveness of each structure in
implementing technology-related best practice and achieving desired technology related outcomes.

Policy implementation

The historical development of IT leadership in school districts has been described as a winding and often reactive response to the ever-increasing role of technology in the operational and instructional aspects of the public school system. A more proactive approach to designing and structuring IT leadership might seek to determine the effectiveness of various structures and then promote and encourage the more effective models. This raises the question: How is the effectiveness of a given IT leadership model determined?

A major function of IT leadership is the effective implementation of new technologies throughout the school district. Whether the implementation involves a new computer use policy, a state-of-the-art disaster recovery solution, a differentiated reading software program for an elementary school, or a one-to-one computing initiative in a high school, the effectiveness of the IT leadership structure can be evaluated based on its ability to roll-out new ideas effectively.

Fowler (2012) maintains that the concept of policy implementation largely defines the role of educational leaders. In order to gain an idea of the effectiveness of a given leadership model, it would be helpful to ask specific questions about implementation. For example, is the district complying with state and federal policies regarding the development and use of a multi-year technology plan? Is the district implementing the local Board of Education policies related to computer use
with fidelity? To what extent does the district follow the expert recommendations of organizations such as the International Society for Technology in Education (ISTE)? Given the connection between leadership and implementation, it is helpful to review the research on policy implementation. The lessons learned from this research will provide a framework that can be used to analyze each of the schools in this study and compare them to one another.

**Early Implementation Research.** Since the advent of organized public schooling, scholars and practitioners have been looking for ways to make education more effective. Efforts to improve schools were accelerated in the post-Sputnik era of the late 1950s and the 1960s. The federal government invested large sums of money into curriculum reform measures only to find that the reforms had little to no effect on actual practice.

In the late 1960s and early 1970s, researchers began to document the failures of these policies to perform as expected. Putting ideas into practice was a far more complex idea than people realized (Fullan, 2007). This first generation of implementation studies was largely descriptive. Sarason (1971) described the process of implementing major initiatives from both the elementary (“new math”) and university level (student teaching reforms). Gross et al. (1971) presented an extensive case study on an elementary school (“Cambire School”) that was introducing a new model of pedagogy (catalytic teaching). Murphy (1971) examined the effectiveness of the 1965 Elementary and Secondary Education Act (ESEA) in stimulating innovation, linking research to schools, and making poverty a top education priority. Each of these case studies revealed that the degree to which the
intended reform was implemented was minimal. Fullan & Pomfret (1977) cataloged the widespread failure of the reform policies of that era.

Reasons for implementation failure suggested by first generation research include lack of understanding on the part of the implementers, lack of knowledge and skills necessary for implementation, and insufficient resources (training, materials, and time) for success (Gross et al. 1971).

First generation research documented the uncertain relationship between policies and implemented programs. The research identified and began to “sketch the parameters of the problem” (McLaughlin 1987). It established that “change is hard and that the status quo is comfortable” (Fowler 2009, 273). The early research highlighted the fact that there is a disconnect between large-scale reformers and the local school individuals who will put the policy into place.

Second Generation Research. The early studies raised many questions surrounding implementation of policy that second generation research sought to address. Did the planners take into account logistical issues involved with implementation? Did they understand the process of change and did that understanding help them to anticipate problems? Did they view the school as a closed system or one that interacts with many other agencies? Would the ground-level implementers of the new policies be resistant to the policy? If so, how far would they go to sabotage it? Are there external social issues that are being overlooked? Is it possible that the failure of the program or policy was related to a poor understanding of the problem it set out to fix?
As researchers sought to answer these questions, three important lessons emerged. First, the importance of the will of the local implementers cannot be overstated. Educational policies are not enacted in isolation. They are introduced into a complex milieu of actors, structures, and interests that varies from school to school. Their willingness to embrace the new policy will greatly affect the manner and extent to which it will be implemented (McLaughlin 1987).

The extensive Rand Change Agent study conducted by Berman & McLaughlin (1978) emphasizes the impact of local factors on implementation. Sponsored by the U.S. Office of Education, this study investigated the implementation of a number of programs that sought to spread educational innovation through the provision of temporary (3 to 5 year in duration) federal funds in amounts ranging from $10,000 to several hundred thousand dollars per year.

Berman & McLaughlin found that the acceptance of the funding did not ensure successful implementation and that when there was successful implementation, there was no guarantee of continuation once the funding was gone. Furthermore, the Rand studies found that success of the funded projects depended primarily on the methods used locally to implement the projects and not on the management and strategies proscribed by the federal policy. Berman and McLaughlin (1978, viii) reported:

“Three elements of a school’s organizational climate powerfully affected the project’s implementation and continuation- the quality of working relationships among teachers, the active support of principals, and the effectiveness of project directors. The importance of the principal to both short- and long-run effects of innovations can hardly be overstated.”
The importance of local factors surrounding implementation is reiterated throughout the literature. McLaughlin (1987) discusses how the early notions of implementation as a top-down, authoritative endeavor have been replaced by an understanding of implementation as a transactional process carried out at the individual level. Cohen and Spillane (1992) catalog the extensive power that the local school district has in shaping the implementation of state and federal policy. Weatherly and Lipsky (1977) go as far as to say that the local or “street-level bureaucrats” are, in fact, the policymakers.

A second lesson from the second generation of implementation studies involves the capacity of the implementing agents. Do the schools have the personnel, skills, knowledge, and other resources necessary to successfully implement the policy?

Huberman and Miles (1984) studied the implementation of significant instructional changes in twelve schools. Schools that were successful tended to have an overall philosophy that was consistent with the new policy, a central administration that supported and even pushed the new policy, and strong assistance in the form of resources, training, and outside consulting throughout the implementation.

Firestone (1989) associated successful implementation with three factors: the mobilization of key personnel, the performance of necessary functions, and district-school linkages. The mobilization of personnel involves identifying who will do the work and making it possible for them to do it. It may involve restructuring positions, putting off other ongoing tasks, or working longer hours. Personnel
should include technical experts, members of the dominant coalition, and representatives of key interest groups. The performance of *necessary functions* includes setting (and selling) a vision, obtaining resources, providing encouragement, adapting standard operating procedures, monitoring the reform effort, and handling disturbances. Important *district-school linkages* include the application of pressure by the district, the targeted district support tailored to the types of capacity issues that arise, and the willingness on the part of the district to allow teachers to have real influence and decision-making power.

Similarly, the Rand studies emphasized the importance of district level support, teacher seniority and teacher sense of efficacy as variables that affected successful implementation.

A third set of lessons pertaining to successful implementation focuses on the policy itself. How clear is the policy? Can implementation be measured and monitored? What types of incentives and/or penalties are built into the policy to encourage compliance? McLaughlin (1987) emphasizes that successful policies usually incorporate a balance of pressure and support. Pressure alone is typically not sufficient since most education policy seeks a change in attitudes and beliefs. Pressure cannot force compliance with the “spirit of the law.” Opportunities abound for non-compliance in the loosely structured world of schools. Support alone is also insufficient due to the competing opportunities and demands within the educational system. Without pressure, funding would tend to be diverted toward other priorities. Pressure can provide implementers with necessary legitimacy, while
support can provide the training, and resources necessary for successful implementation.

Policies that are built on existing structures are easier to implement. On the other hand, policies that differ drastically from the norm for an organization are very difficult to implement. Cohen and Spillane (1992) describe the chasm that exists between various educational reform initiatives of “astonishing” proportions and the weak capacity for policy change in the political and structural aspects of the educational system.

Policies that lend themselves to quantitative measurement are easier to implement. For example, Murphy (1990) describes the differences in design of the regulatory policies of the 1980s and the redistributive policies of the 1960s and 1970s. He proposed that the quantitative nature of the policies of the 1980s (increased graduation rates, improved test scores) made them easier to implement and measure.

The inherent difficulties of policy implementation require educational leaders to adopt strategies for effective implementation. The Rand studies suggested that implementers will change policies in an attempt to bridge the gap that exists between the policy and the organization’s capacity to enact it. Berman and McLaughlin (1978) identified effective strategies for promoting what they referred to as mutual adaptation, or the process by which a new project or policy is adapted to the reality of the particular school setting while at the same time, teachers and school leaders adapt their practices to in response to the policy. These strategies include “concrete, teacher-specific, and extended training; classroom assistance
from project leaders and other district staff; teacher observation of similar projects in other classrooms, schools, or districts; regular meetings devoted to the project and focused on practical problems; teacher participation in project decisions; local materials development, and principal participation in training” (Berman and McLaughlin 1978, viii).

**Third Generation Research.** Third generation research on policy implementation sought to understand the reasons for the problems faced by implementation efforts. These studies looked largely at how teachers learn new things. The focus of these studies tended to follow one of two strands- 1) cognitive learning theory, which focuses on how an individual processes new information and *makes sense* of it in the context of their own previous knowledge, beliefs, and experiences, and; 2) social learning theory and the idea that attention should be focused on the *community of practice* (Wenger 1998) into which a new policy is introduced. Each of these stands has implications for the implementation of IT policy in schools.

Early research into policy implementation relied heavily on rational choice theory, attributing the failure of implementation to a decision on the part of the implementer to either ignore or modify the policy. The *sense-making* perspective is informed by research on human cognition. It proposes that “new information is always interpreted in light of what is already understood” (Spillane et al. 2002, 394). “Street-level” policy implementers will always seek to understand new policy as supplementing rather than supplanting existing practice. For example, teachers
faced with a new policy directive will draw upon their existing schemas to interpret it. They will tend to interpret that policy as something much closer to what they already do than to what it is designed to be. They will assimilate it in such a way that they are comfortable with it and they will often reject portions that do not fit comfortably into their previous experience.

The sense-making perspective provides an explanation for many of the difficulties associated with policy implementation. Policy may be unequally implemented when different learners, each with different past experiences and frames of reference, tend to implement the new policy in different ways. Consider a policy that requires science teachers in a district to use computers in high school laboratory investigations. Once teacher may choose to use the technology to create spreadsheets in which students record data. Another may decide that implementation of the policy should include the use of probes to collect the data. A third teacher may follow-up the actual lab experience by providing students with software that models the experiment, allowing them to repeat the procedure virtually a large number of times in order to manipulate the variables in a manner that would not be practical in the confines of the physical lab. In each case, the policy of “integrating computers into lab experiences” had been implemented.

Policy may be superficially implemented when implementers make the error of assuming that a new policy is similar to an old policy in meaningful ways solely because it is similar in superficial ways. Teachers may think that they have implemented a new policy with fidelity, when, in reality, they have simply implemented the most superficial and concrete aspects of the policy. For example,
teachers may feel think they have implemented a policy calling for innovative integration of technology into their instruction because they have provided the course material in digital form. They have substituted the computer for the traditional textbook, but they have not fundamentally changed the nature of the learning process.

The sense-making perspective implies that it may be necessary for implementers to completely restructure the way that they understand something if new policies are to be implemented with fidelity. Leaders of the implementation process must be prepared to facilitate this restructuring. This can often be difficult because policies that require complex and novel changes require true expertise in the policy area, and few leaders may be experts on the changes in a given field (Spillane et al. 2002).

The community of practice perspective encourages researchers to look at how interactions of learners with colleagues encourage or constrain policy implementation. Wenger (1998) holds that individuals learn through active participation in social communities that are meaningful to them. She emphasizes that “people contribute to organizational goals by participating inventively in practices that can never be fully captured by institutionalize processes” (Wenger 1998, 10). Coburn & Stein (2006) contend that policy implementation can be understood in large part by examining these interactions. They recommend identifying the various communities of practice that exist and overlap within a school district. It is important to understand the history of learning within these communities in order to facilitate implementation of new policy. Regularly
occurring forums that span these various communities can identify implementation barriers and potential for successful implementation. Implementation is more successful when leaders recognize the importance of informal local networks and create organizational structures that support such networks (Coburn and Stein 2006).

In summary, implementation research has identified a number of important variables that impact policy implementation. The present study will look for connections between IT leadership structures and successful implementation of IT policy. My analysis of IT leadership in three school districts will include consideration of the following features of policy implementation:

1. The willingness of the local implementers (administrators and teachers) to embrace new policy;
2. The capacity of the implementing agent (the school district, specifically the IT leadership) to implement the change;
3. The components and clarity of the IT policies;
4. The identification of the communities of practice that exist across the district, and the attempts made to create structures that support and build upon these structures;
5. The centrality of the implementer’s sense-making to the implementation process. This includes the recognition that:
   a. implementation of new policy is very difficult and requires significant planning and expertise to be successful
b. policy that relates to, and builds upon the implementers’ prior knowledge is more likely to be successful

c. implementation can be superficial when the implementers misunderstand the reform efforts.

Policy Guiding IT in Schools

**Federal and State Policy.** There is currently little concrete IT integration “policy” imposed on school districts from the federal level. The closest thing to national policy on technology is the National Education Technology Plan (United States Department of Education 2010). The plan is a high-level document calling for “revolutionary transformation rather than evolutionary tinkering” with respect to technology in education. The document addresses five essential areas related to educational technology: learning, assessment, teaching, infrastructure, and productivity. For each of these areas, the USDOE makes a number of recommendations for states and school districts.

The US Education Department does not currently mandate that local school districts adhere to the recommendations called for in the National Educational Technology plan. Instead, they suggest ways in which the federal government can promote the attainment of each of the plan’s goals.

New York State has a slightly more proscriptive approach to defining the expectations of schools with respect to technology integration. The New York State Education Department (NYSED) contains an Office of Educational Design and Technology. This department provides school districts with guidance on creating
“technology literacy” in schools. This office also oversees a required Instructional Computer Technology Plan, which is the most direct technology related policy at the state level (New York State Education Department 2009). This plan is required in order for all New York State public school districts to receive state funding for computer hardware and software. The plan must include descriptions of the numbers and types of technologies to be used, how technologies will be applied to the instructional program, how technologies will be maintained and repaired, and how professional development on the use of these technologies will be provided to teachers.

In 2010, the University of the State of New York (USNY) and the NYS Board of Regents adopted a Statewide Learning Technology Plan (New York State Board of Regents 2010). The plan declares that “learning technologies will be seamlessly integrated into teaching and learning to increase student achievement.” The plan further states:

“Technology is a path for teaching and learning, but it is also a body of practices, skill, and knowledge to be learned. All New York State learners will develop technological literacy to enter college, become productive members of the workforce, and succeed as citizens. Students, teachers, and leaders will have clear standards for what students should know and be able to do with technology; when various elements of technology will be taught; and how to embed technology in learning throughout the curriculum. These standards will be visible to the public to drive the standards even higher.”
The plan outlines a number of specific policy and funding-related action steps that would serve to carry out this vision.

The $2 billion Smart Schools Bond Act, approved by New York State voters in November of 2014, provides each of the state’s 677 school districts with awards averaging between $1.5 and $3 million, largely designed to support technology. In order to receive the funding, schools will be required to submit a Smart School Investment Plan to the Office of Educational Design and Technology. This investment plan must be developed in consultation with parents, teachers, students, and other community members. The plan will detail how the school district will utilize the state funds.

The Smart Schools Investment Plan will provide current insight into a school district’s technology priorities and plans. The plans will follow a prescribed format that will address the full spectrum of technology integration including current infrastructure, numbers of end user devices, instructional technology initiatives, major planned purchases, professional development strategies, and responsible use considerations. The Smart Schools Investment Plan is the most definite formal policy for technology integration that schools have. For the purposes of this study, it will serve as a consistent baseline from which to compare districts.

*International Society for Technology in Education (ISTE) Standards.* In lieu of significant formal policy, guidance for best practice at the federal and state levels comes largely from nationally recognized standards. The most widely referenced benchmarks for best practices for integration of technology in schools
are the ISTE Standards (previously the National Educational Technology Standards (NETS)), published by the International Society for Technology in Education.

In 2001, a collaborative including the National Association of Secondary School Principals, the National Association of Elementary School Principals, the National School Boards Association, the North Central Regional Education Laboratory, the International Society for Technology in Education, two state departments of education and two universities recognized and promoted the idea that there were technology-related skills, knowledge, and practices that were essential to good educational leadership. This collaborative developed the National Educational Technology Standards for Administrators (NETS-A), a set of standards that focused on the areas of visionary leadership, learning and teaching, professional practice, support and improvement, assessment and evaluation, and promoting ethical and social use (Schrum et al, 2011).

In 2009, these standards were further refined and developed. They are now referred to as the ISTE•A Standards (ISTE, 2009). The ISTE•A standards are complemented by a similar set of standards for teachers (ISTE•T), students (ISTE•S), instructional technology coaches (ISTE•C), and computer science educators (ISTE•CSE). The ISTE standards have been adopted by 29 states. They are designed to be broad enough to cover the wide range of information technologies available to schools and “flexible enough to adapt as new technologies emerge” (Huggins et al 2014, 3). They are broadly accepted as the best current attempt at defining the technology-related skills, knowledge and practices that are important in the K-12 environment (Williamson and Redish 2009).
While the ISTE standards do not represent actual state or federal policy, they are held up as a model of best practice for IT integration in a majority of the states and at the federal level. The ISTE standards were “crosswalked” to the 2007 NYS Learning Standards (New York State Education Department 2008) and are referenced as model in the NYS Board of Regents Statewide Technology Plan (New York State Board of Regents 2010).

The ISTE standards supplement limited federal, state, and local technology-related policies and serve as a standard measuring stick for assessing and comparing the relative progress made by the school districts in this study.

The ISTE standards are referred to as benchmarks in many of the most comprehensive studies on the topic of IT leadership, including Anderson and Dexter (2005), Davies (2010), Richardson (2012), Hancock and Fulweiller (2014). The ISTE standards are used in the training of pre-service teachers and administrators. Richardson et al. (2013) found that a doctoral level course based on the ISTE-A standards was effective in influencing a group of 20 pre-service administrators to shift their vision for effective technology integration in schools. Table 2 provides a brief summary of the ISTE standards.
<table>
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<tr>
<th>ISTE Standards for Students (ISTE•S)</th>
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<tr>
<td><strong>Standard 1:</strong> Creativity and Innovation- Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.</td>
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<td><strong>Standard 2:</strong> Communication and Collaboration- Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.</td>
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<td><strong>Standard 3:</strong> Research and Information Fluency- Students apply digital tools to gather, evaluate, and use information.</td>
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<td><strong>Standard 4:</strong> Critical Thinking, Problem Solving, and Decision Making- Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.</td>
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<td><strong>Standard 5:</strong> Digital Citizenship- Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.</td>
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<tr>
<td><strong>Standard 6:</strong> Technology Operations and Concepts- Students demonstrate a sound understanding of technology concepts, systems, and operations.</td>
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<th>ISTE Standards for Teachers (ISTE•T)</th>
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<td><strong>Standard 1:</strong> Facilitate and Inspire Student Learning and Creativity Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.</td>
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<tr>
<td><strong>Standard 2:</strong> Design and Develop Digital Age Learning Experiences and Assessments- Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the ISTE•S Standards.</td>
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<td><strong>Standard 3:</strong> Model Digital Age Work and Learning- Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.</td>
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<td><strong>Standard 4:</strong> Promote and Model Digital Citizenship and Responsibility- Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.</td>
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<td><strong>Standard 5:</strong> Engage in Professional Growth and Leadership- Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.</td>
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<th>ISTE Standards for Administrators (ISTE•A)</th>
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<tr>
<td><strong>Standard 1:</strong> Visionary Leadership- Educational administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.</td>
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<td><strong>Standard 2:</strong> Digital Age Learning Culture- Educational administrators create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students.</td>
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<td><strong>Standard 3:</strong> Excellence in Professional Practice- Educational administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.</td>
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<td><strong>Standard 4:</strong> Systemic Improvement- Educational administrators provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources.</td>
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<tr>
<td><strong>Standard 5:</strong> Digital Citizenship- Educational administrators model and facilitate understanding of social, ethical and legal issues and responsibilities related to an evolving digital culture.</td>
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*Table 2: International Society for Technology in Education (ISTE) Standards for Students, Teachers, and Administrators (ISTE 2009).*
Assessment of Technology Literacy. Since the No Child Left Behind Act of 2001 mandated technological literacy for all children by 8th grade, there have been a number of tools developed for measuring IT literacy among students. Huggins et al (2014) catalogs the history of these assessments and notes that many of the commercial assessments are traditional survey items that focus on students reporting on their IT knowledge and skills. There is very little research published on the design, development, and validation of these commercial tools.

A more robust generation of assessments on student technology literacy is emerging. These tools are computer based and include interactive scenario based tasks in simulated software environments (Huggins et al 2014, 4). Two of the most promising of these new assessments are the NAEP’s Technology and Engineering Literacy (TEL) assessment and Florida’s Student Tool for Technology Literacy (ST2L). The TEL assessment is designed to measure technology literacy as part of a larger assessment of technical and engineering skills. It has been piloted with 8th graders and is slated for release in 2014. The ST2L is designed specifically to measure the IT Literacy of middle level students based upon the ISTE-S standards. Huggins et al (2014) provides validity and reliability evidence for the ST2L.

In addition to assessments that measure student technology literacy, tools are being developed that measure the IT literacy of teachers and administrators. A variety of assessments including the Learning with Technology Profile Tool, the enGuage Online Assessment Profile, and the commercially designed TAGLIT assessments are readily available to provide schools with a snapshot of their teachers’ comfort with technology and the extent to which they integrate technology.
into their lessons. However, there is little research on the reliability and validity of these tools. Since the ISTE Standards represent broad ideas about successful technology integration for students, teachers, and administrators, it is important that tools based upon these standards be further developed and validated for use in future research.

**Dearth of Scholarly Research**

McLeod and Richardson (2011) note that the literature on School IT Leadership offers thin coverage of a wide variety of sub-topics such as ethics, staff development, vision, international approaches, and specific tools as they relate to school leadership. They note several important underrepresented or missing themes including pre-service preparation of administrators, digital citizenship, recruiting tech-savvy teachers, and leading learning communities focused on innovation and creativity. They found that many of the articles published on the topic of IT Leadership on schools are not research articles, strictly speaking, but rather descriptions of projects.

McLeod and Richardson also reviewed the programs of the conference presentations for three major school leadership and administration organizations from 1997-2009. Their study revealed that 2.1% of the presentations at American Educational Research Association (AERA) conferences, 2.9% of presentations at University Council for Educational Administration (UCEA) conferences, and 7.4% of presentations at National Council of Professors of Educational Administration (NCPEA) dealt with issues related to school technology leadership (2011). They suggest that “although the number of school technology-related presentations at
three of the most common educational leadership conferences is greater than that of the peer-reviewed publication record, it is small compared to the overall educational leadership literature base. Thus, the pipeline from idea to presentation to scholarly publication needs to be strengthened and facilitated” (McLeod and Richardson 2011, 237).

Richardson et al. (2012) used the ISTE-A standards as a conceptual framework for reviewing scholarly research published between 1997 and 2010 on the topic IT leadership. They report a “glaring lack of in-depth research around the topic” (131). They observe that the ISTE-A standards and their accompanying indicators are general statements that serve as guides to educators. They note, however, that “the work of providing more detailed, contextualized information and evidence is left to scholars through their published research (133).” The dearth of research on school IT leadership was also reported by Uysal, Sengül, and Madenoğlu (2015).

Indeed, there are significant gaps in the research literature on IT leadership. In order to improve both knowledge and practice, it is important for researchers, policymakers, and school leaders to develop a better understanding of the emerging field of IT leadership in schools. This study of IT leadership in across three school districts will yield useful findings that can help to address these gaps.
Chapter 3

RESEARCH DESIGN AND METHODOLOGY

This chapter will discuss the methods used in carrying out this study. It will restate the research questions and describe the basic theoretical proposition that the study seeks to explore. The chapter will then provide a description and rationale for the research design and provide information on the context for the study. This will be followed by a discussion of the instruments used in the study and the general procedure to be followed. The chapter will conclude with details on how the data collected in the study will be analyzed.

Purpose and Objectives of Study

A survey of literature on IT leadership in the K-12 environment reveals a winding and often reactive approach to leading the management and integration of new technologies in schools. Over the past several decades, formal power for technology-related decision making has migrated from computer lab assistants in the early 1990s to principals and then to district level technology coordinators. As technology has become increasingly ubiquitous in schools and throughout society in general, there are calls from scholars and practitioners to distribute technology leadership across a broader spectrum of stakeholders. Advocates of distributed leadership hold that technology has become too specialized and too widespread to be managed by a single person. Instead, the collective expertise of a wider cross-
section of staff should be harnessed for effective technology related decision-making.

This study examined the IT leadership structure in three different school districts. It examined the extent to which leadership in four major areas of technology decision-making (vision, budget, instructional integration, and technical support) is distributed among stakeholders. It explored the theoretical proposition that schools with greater stakeholder input and participation in technology-related decisions will have greater success with (a) the implementation of technology-related best-practice and policy and (b) the achievement of desired technology-related outcomes.

**General Perspective of Study**

The study was structured as an explanatory case study with a multi-case design (Yin 2003). The multi-case structure, in which a number of individual case studies are considered, is desirable because it provides more robust information than could be provided by a single case study. The approach will improve the external validity and generalizability of the findings (Merriam 2009). The multi-case study is sometimes avoided due to the time and complexity involved. However, in this case, I had ample access to the three cases and full cooperation of the superintendents involved. This mitigated the difficulties associated with multiple cases. Each of the cases in the study was an individual school district. Within these districts, I gathered data from multiple embedded subunits including
administrators, teachers, and documents. Thus the resulting design is classified by Yin as a Type 4 multi-case embedded case study design.

Case study was the method of choice primarily due to the complexity of the phenomena being studied. Technology decision-making in schools exists in a highly complex context in which there are a multitude of variables that could affect the implementation of desired technology-related outcomes. It is difficult to separate these variables from the structure of IT leadership. In fact, variables related to the context in which the leadership exists may actually be an important factor in the effectiveness of the leadership model. Yin (2003) recommends the case study method for handling situations in which the boundaries between the phenomenon and the context are not clearly evident. “The most important [application of the case study] is to explain presumed causal links in real-life interventions that are too complex for survey or experimental strategies” (Yin 2003, 15, emphasis in original).

The case study was also the appropriate research method given the limited number of cases available to serve as samples. The case study provides the appropriate means to incorporate multiple sources of evidence (interview data, survey data, and document review) for a limited number of individual cases.

This case study investigated the general idea, suggested in recent literature, that distributed leadership of technology will lead to broader and more desirable implementation of technology best-practice in the educational setting. Several authors emphasize the value of theory development in case study design. The theory or proposition serves as “a [hypothetical] story about why acts, events, structure, and thoughts occur” (Sutton and Staw 1995, 378). Yin emphasizes that
the development of a proposition “provides surprisingly strong guidance in
determining what data to collect and the strategies for analyzing the data” (Yin
2003, 29). Furthermore, Yin states that theory development prior to case study
design increases external validity of the study by providing a structure that allows
the researcher to look for replication of the findings in each of the cases selected.

The study will involve multiple cases (three school districts). Yin (2003)
cautions that each of the cases should not be viewed as individual “samples” from
which some statistical generalization will be made to the larger population of
“school districts.” Rather, the separate study of each school district represents
opportunities to replicate the same investigation multiple times. Each case is an
opportunity to look replication- in the form of similar results across cases (Yin
terms this a literal replication) or contrasting results across cases for predictable
reasons (Yin terms this a theoretical replication).

Again, the statement of a research theory or proposition helps to frame the
work. For example, if a given case (district) with a leadership model emphasizing
high commitment to distributed leadership shows strong implementation of
technology best-practice, this could be said to support the initial proposition.
Further individual case studies would then look for a replication of this finding. If
additional case study research showed that other schools with high commitment to
distributed leadership had strong technology outcomes, this literal replication of the
initial case study would strengthen the initial proposition. Similarly, if additional
case studies showed that other schools with less commitment to distributed
leadership had weaker technology outcomes, this theoretical replication would also
lend support to the initial proposition, given the fact that this result was predicted by that proposition.

Yin emphasizes the importance of treating each case in a collective case study as an individual case. Both the individual cases and the multiple case results should be the focus of a summary report.

**Context of the Study**

The study involved three different school districts, each with similar features (combined wealth ratio, enrollment, geographic size and location). This homogeneity among the samples helps to limit the effect that technology funding may have on technology outcomes. The extent to which technology funding effects implementation is an open question. For example, Anderson and Dexter (2005) found that the amount of funding allocated toward technology was not a strong predictor of effective integration of technology. On the other hand, Machin et al. (2007) suggest increased spending on technology is at least associated with a positive impact on academic performance of elementary school students. Selecting schools with similar features and similar funding streams will help to mitigate the influence that variations in access to potential technology funding might play in the ability to implement technology-related policy. However, it is certainly the case that there may be variations in the allocation of funding among schools within school districts with similar resources. Variations in resource allocation within the districts being studied and the manner in which decisions are made to allocated
resources to the various schools is part of the data being collected and is discussed in Chapter 4.

The schools that were selected are public school districts located within the same region of New York State, subject to the same governmental oversight and regulations. This will serve to further limit variability among the cases being studied and will provide some common technology-related policies that the schools are required to implement. For example, all public schools in New York State are required to have an “Acceptable Use Policy” governing the use of computers and the internet as a part of their district policy manual. Furthermore, the New York State Education Department regulation P100.12 requires that all school districts in New York prepare and update an Instructional Computer Technology Plan (New York State Education Department, 2009). As previously noted, all schools that are seeking funding from the 2014 Smart Schools Bond proposition will be required to have an updated Instructional Computer Technology Plan before they are able to access the funding made available by the bond. The content of these local policies, the process in which they were developed, and the success with which they are being implemented helped to provide a means of comparing technology outcomes across the three districts.

Basic information about the districts that were studied is found in Table 3-1. These three districts are demographically similar in many ways. The districts are considered suburban districts with similar enrollment. Ethnicity and student economic indicators are similar across both. The percentage of students with
disabilities and limited English proficiency are also nearly identical across the districts.

Each district operates one high school (grades 9-12) and one middle school (grades 6-8). District A has four “neighborhood” elementary schools. District B has one centralized elementary school. District C has two centralized elementary schools, one for grades K-2 and a second for grades 3-5. Instructional expenditures in the districts are also similar.

<table>
<thead>
<tr>
<th></th>
<th>District A</th>
<th>District B</th>
<th>District C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Enrollment</td>
<td>2600</td>
<td>2000</td>
<td>3500</td>
</tr>
<tr>
<td><strong>Poverty</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Economically Disadvantaged</td>
<td>26%</td>
<td>27%</td>
<td>25%</td>
</tr>
<tr>
<td>- NYSED Designation</td>
<td>Average Need</td>
<td>Average Need</td>
<td>Average Need</td>
</tr>
<tr>
<td><strong>Instructional Expenditures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- General Education</td>
<td>$22,500,000</td>
<td>$19,500,000</td>
<td>$28,000,000</td>
</tr>
<tr>
<td>- Special Education</td>
<td>$11,000,000</td>
<td>$8,000,000</td>
<td>$9,000,000</td>
</tr>
<tr>
<td>- Total Instructional Expenditures</td>
<td>$33,500,000</td>
<td>$27,500,000</td>
<td>$37,000,000</td>
</tr>
<tr>
<td>- Total Inst. Expenditures/student</td>
<td>$12,885</td>
<td>$13,500</td>
<td>$10,570</td>
</tr>
<tr>
<td><strong>Ethnic Composition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>92%</td>
<td>90%</td>
<td>94%</td>
</tr>
<tr>
<td>Black/African American</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Aisan</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>LEP</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>SWD</td>
<td>15%</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>Schools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Elementary Schools</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Middle Schools</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>High Schools</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: NYSED.gov (2013-14 data)

Table 3: Demographic Information for Districts from which case studies were selected. Data is approximate to maintain confidentiality.

Research Design and Data Collection

**Overall Design.** Figure 3 diagrams the design of the multiple-case study. The researcher secured permission to conduct the study in each of the districts. The researcher had ample access to the district superintendent and the District Technology Coordinator in each of the districts and worked closely with the building principals in each of the districts.
Figure 3. Research Design: Explanatory Case Study with Multi-case design.
The study used several quantitative and qualitative instruments for data collection. These instruments were designed to provide information about one or both of the following areas of importance to this study:

- The structure of IT leadership in the district and in the individual schools, including the extent to which the IT leadership is distributed among stakeholders; and
- The extent to which technology related best-practice and desired technology-related outcomes have been implemented in the school.

In each district, one-on-one interviews were conducted with teachers and administrators following the guidelines presented by Creswell (2002, 207-8).

The study involved the administration an online survey instrument (entitled “Technology Use Survey”) and an online data gathering questionnaire (entitled “Administrative Questionnaire”). Completion of these instruments was encouraged from the administrative level in all three districts since the aggregate results for each school will provide all participants with inherently valuable information. This produced good to excellent participation rates for the surveys.

The study also involved collection of documents including the mandated NYSED 100.12 district technology plan, the required board of education’s “Acceptable Use Policy,” and any minutes or agendas from technology committees that exist at the building or district level.

For all data collected in this project, procedures to ensure security, privacy, and confidentiality were followed. Field notes and notes from the interviews were
coded and did not contain any personally identifiable information. All material was be confidentially maintained. Participants were informed in advance that confidentiality would be maintained and that the research would be used to write a dissertation. The study received IRB approval from the University at Albany and consent to make an audio recording of the interviews was obtained from all interviewees.

The use of multiple sources of evidence increased the construct validity of the study for two reasons. First, it allowed the researcher to gather a broader range of issues and perspectives from within the school and from the larger context of the school district. Second, it allowed the researcher to formulate what Yin (2003) refers to as “converging lines of inquiry” that have the potential to provide multiple measures of the same phenomena.

**Instruments for District Level Data Collection.** One important part of the data collection for each case (school district) is district-level data. The full study included an examination of multiple embedded subunits (documents, teachers, administrators, different individual schools). Much of the data collection occurred at the local school level. However, it is very difficult to separate the subunits from their larger context when considering the factors governing IT leadership and technology integration. Therefore, it is essential that the researcher gained an understanding of the IT Leadership structure from the overall district perspective.

**Superintendent & District Level IT Coordinator Interviews.** In order to gain this district perspective, separate individual interviews were scheduled with the Superintendent and the District Technology Coordinator in each district. These
interviews were based on Devolder’s (2010) four roles of a District Technology Coordinator. They were designed to establish an understanding of the IT leadership structure for the district, including its history and evolution, and the extent to which leadership is distributed in the school district. Questions for these interviews can be found in the District Interview Protocol (see Appendix A).

**Administrative Questionnaire.** District Technology Coordinators were asked to complete the Administrative Questionnaire prior to their interviews. This instrument was designed to facilitate the gathering of district documentation (acceptable use policies, district technology plans, minutes) from the District Technology Coordinators and to ensure that these documents would be discussed in the interview if needed. The Administrative Questionnaire can be found in Appendix D.

**Technology Plan Document Review.** There were a number of district level documents that were reviewed. Every school district in New York State is required to submit a Technology Plan in order to be eligible for state funding for computer hardware and software. In 2014, the New York State Education Department issued new guidelines for this technology plan and will be providing $2 billion in total funding to schools that successfully complete this plan. For the purposes of this study, each district’s plan was evaluated to provide information about the district’s technology-related plans and priorities. This information was used to gain insight into the district’s implementation of technology-related best practice.
Other District Level Data Collection. The researcher examined other documents and processes that were brought up in the district level interviews or referred to in the district technology plan. These included such things as technology-related Board of Education policy as well as minutes and agendas from district-level technology committees.

Instruments for Building Level Data Collection. While an understanding of the district and the overall IT leadership structure provides important context, there is essential data found within the schools themselves. The researcher spent the majority of the data collection time in the school buildings gathering data from the building principal and the faculty.

Building Principal and Teacher Interviews. For each district, separate individual interviews were scheduled with building principals and multiple teachers from schools across the district. In each district, the researcher visited elementary, middle, and high schools. As was the case in the superintendent and District Technology Coordinator interviews, these interviews were based on Devolder’s (2010) four roles of a District technology Coordinator. They were designed to establish an understanding of how technology-related decisions are made within the school and the extent to which leadership is distributed in the building. Questions for these interviews can be found in the Principal and Teacher Interview Protocol (see Appendix B).

Technology Use Survey. In addition to individual interviews, a broader cross section of the faculty was as included through the use of an online survey entitled
the “Technology Use Survey.” The survey, designed specifically for this study, asked a series of questions about the use of technology in the school and teacher perspective on technology leadership and technology decision-making in the district. The survey was not designed to provide precise quantitative analysis, but rather to give a qualitative sense of teacher opinions on matters related to technology best practice and leadership. A link to the online survey was provided to all faculty via email from the building principal. The survey was left open for two weeks, during which time two additional reminders were sent by the school administration. The survey was structured using Devolder's (2010) four roles of IT leadership. The survey can be found in Appendix C.

Other Building Level Data Collection. The researcher examined other documents and processes brought up in the building level interviews. Specifically, the researcher looked for evidence of local (building) technology-related policies. The researcher also conducted observations of specific technology-related initiatives in action.

Procedure for Data Collection. The researcher met with the Superintendent of each district at the beginning of the study to map out a plan for data collection and gain the superintendents support.

The researcher visited the districts one at a time over a period of 3-4 months in 2015, completing District A, then District B, and finally District C. As the case study began in each district, the researcher asked the District Technology Coordinator to complete the Administrative Questionnaire (see Appendix D) online.
The researcher scheduled interviews with the superintendent and the District Technology Coordinator (Appendix A).

Prior to visiting each school building within a given district, the researcher contacted the principal of the school and asked them to complete the Administrative Questionnaire online (Appendix D). The researcher also worked with each building principal to schedule three things: 1) time to sit together for the Building Principal Interview (Appendix A); 2) a plan for administering the Technology Use survey to the faculty (Appendix C); and 3) a plan for interviewing teachers from the building (Appendix B).

Because of the complexity created by a multiple-case study involving multiple sources of data, a carefully organized case study database was created and maintained as the data collection period proceeded. This data collection included the results from both instruments administered in the study, recordings and notes from all interviews conducted, documents collected, evaluations of documents, and any notes on observations from each of the six cases. The database was compiled, organized, and indexed as the evidence was collected so that the evidence in each case was preserved as accurately as possible. This careful preservation of evidence coupled with strict adherence to the design protocol served to increase both the construct validity and the reliability of the study.
Chapter 4

FINDINGS AND ANALYSIS

This chapter reports and analyzes interview, document, and survey data gathered from three large suburban public school districts in New York State. In each of these districts, district-level employees (superintendent and district technology coordinator) and building-level employees (teachers and principals) were interviewed. In each district, a survey on technology use was administered to the faculty. In each district, a questionnaire was given to administrators prior to their interviews in order to facilitate the interview and gather all of the necessary details about the district and each particular school. In each district, the NYS required 100.12 technology plan was examined. Data gathered from these sources were analyzed in order to address the study’s four primary research questions and their associated sub-questions.

The data gathering was carried out methodically in each district. Surveys were administered electronically as described in Chapter 3. The surveys had moderate to strong response rates across the three districts, ranging from 31% to 49%. Interviews were carried out at four levels (superintendent, district technology coordinator, principals and teachers) in all three districts. Interviewees seemed eager to discuss the topic and the interviews were replete with examples, perspectives, and insight. The documents examined were recently reviewed and updated in all three districts in response to a New York State mandated deadline for review of the 100.12 Technology Plan. Through these surveys, interviews, and
document examinations, a rich understanding of the IT leadership structure and the approach to technology integration and management in each of the districts was gathered. The data collected will be organized using the four research questions that the study set out to examine.

**Research Questions**

The interview and survey questions were sorted based upon the research questions they helped to answer. The first set of research questions centered on the structure of IT leadership in each district. (1. How is IT leadership structured in each of the districts and why? 1a. Are the IT leadership structures in these districts aligned with models represented in the research literature? 1b. How did the structure in each district come to be the way that it is?) The research questions were answered using:

- Responses to specific building level interview questions (Appendix A);
- Responses to specific district level interview questions (Appendix B);
- Responses to specific questions on the Technology Use Survey (Appendix X); and
- Information provided in specific questions on the Administrative Questionnaire (Appendix Y).

The specific items from each instrument used to answer the first set of research questions are detailed in Table 4-1 below.

<table>
<thead>
<tr>
<th>Source</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Level Interviews</td>
<td>3, 5, 6a, 6b, 6c, 6d</td>
</tr>
<tr>
<td>District Level Interviews</td>
<td>4, 5, 6a, 6b, 6c, 6d</td>
</tr>
<tr>
<td>Technology Survey</td>
<td>23, 24, 25, 26</td>
</tr>
<tr>
<td>Administrative Questionnaire</td>
<td>12, 21</td>
</tr>
</tbody>
</table>

*Table 4-1: Data Used to Answer Research Question Set 1*
The second set of research questions examined the characteristics and responsibilities of individuals involved in technology leadership. (2. What kinds of IT responsibilities are assigned to various individuals with formal roles within the district and why? 2a. If there is a District Technology Coordinator, what is that individual's background and role? 2b. What is expected of principals with respect to IT leadership? To what extent are principals viewed within the district as IT leaders? 2c. Does the superintendent play a role in technology leadership? 2d. What is expected from other individuals in a school district with respect to IT leadership? 2e. Who takes responsibility for professional development in the area of technology?) The specific items used to answer this set of questions are detailed in Table 4-2.

<table>
<thead>
<tr>
<th>Source</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Level Interviews</td>
<td>4</td>
</tr>
<tr>
<td>District Level Interviews</td>
<td>1</td>
</tr>
<tr>
<td>Technology Survey</td>
<td>3, 4, 6, 7, 14, 21</td>
</tr>
<tr>
<td>Administrative Questionnaire</td>
<td>10</td>
</tr>
</tbody>
</table>

*Table 4-2: Data Used to Answer Research Question Set 2*

The third set of research questions was related to the structure and function of IT Committees within the district. (3. Do the districts have a District Technology Committee? Do the districts have building level Technology Committees? Why or why not? 3a. Is there a typical structure for such committees in terms of membership? If so, what is it? If not, why not and how do the committees vary? 3b. What are the formal and informal roles of such committees? 3c. To what extent is
the power to determine IT policy and implementation typically distributed among team members and the IT leader in school districts? 3d. How do IT leaders view the IT committees? 3e. How do IT committees view the IT leaders?) The data used to answer these questions is listed in Table 4-3.

<table>
<thead>
<tr>
<th>Source</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Level Interviews</td>
<td>3</td>
</tr>
<tr>
<td>District Level Interviews</td>
<td>4</td>
</tr>
<tr>
<td>Technology Survey</td>
<td>7, 14, 21, 26</td>
</tr>
<tr>
<td>Administrative Questionnaire</td>
<td>5, 6, 13, 14</td>
</tr>
</tbody>
</table>

*Table 4-3: Data Used to Answer Research Question Set 3*

The fourth set of research questions involved the extent to which the district has implemented components of the ISTE standards across the district. (4. To what extent has the district implemented broadly accepted standards of best practice for technology integration (International Society for Technology in Education Standards)? 4a. Is there evidence of widespread adoption of the goals of the ISTE Standards among students? Among teachers? 4b. Are there differences between the implementation of the standards across the schools? 4c. What roles do the various IT leaders (both formal and informal) have in the implementation of IT plans and standards? ) This set of questions was answered using data from the items listed in Table 4-4 and from a review of each district’s required NYSED 100.12 Technology Plan.
### Table 4-4: Data Used to Answer Research Question Set 4

<table>
<thead>
<tr>
<th>Source</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Level Interviews</td>
<td>1, 2, 6a, 6c</td>
</tr>
<tr>
<td>District Level Interviews</td>
<td>2, 3, 6a, 6c</td>
</tr>
<tr>
<td>Technology Survey</td>
<td>2, 5, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20</td>
</tr>
<tr>
<td>Administrative Questionnaire</td>
<td>3, 4, 7, 8, 9, 11, 15, 16, 17, 18, 19, 20</td>
</tr>
</tbody>
</table>

Questions 8, 15, 22, and 27 on the Technology Survey as well as Question 22 on the administrative questionnaire were open ended and data obtained from these questions was assigned to research question(s) on a response-by-response basis.

Research question 4d.(Can any observations be made about the relationship between IT leadership structure and effective implementation?) will be the discussed in the next chapter.

### School District Information

In order to maintain confidentiality, the three school districts studied are identified as District A, District B, and District C. Demographic information on each district is found in Table 3-1. Data are approximate to maintain confidentiality of districts.

### District A

District A has approximately 2,600 students and 310 staff (including teachers, administrators, and paraprofessionals). The district has three neighborhood K-5 elementary schools, a middle school and a high school. The district has an annual instructional budget of about $33.5 million, which equates to
approximately $12,800 per student. The instructional survey was administered to the full faculty of 243 full and part-time teachers. The survey had 120 respondents for a response rate of 49%. All three building principals and the District Technology Coordinator in District A completed the Administrative Questionnaire.

Interviews were conducted with the following individuals in District A:

Superintendent (1)  
District Technology Coordinator (1)  
Elementary Principal (1)  
Middle School Principal (1)  
High School Principal (1)  
Elementary Teachers (2)  
Middle School Teachers (2)  
High School Teachers (3)  
**Total Interviews (12)**

**District B**

District B has approximately 2000 students and 222 staff (including teachers, administrators, and paraprofessionals). The district has one K-4 elementary school, a middle school (5-8) and a high school (9-12). The district has an annual instructional budget of about $27.5 million, which equates to approximately $13,500 per student. The instructional survey was administered to the full faculty of 188. The survey had 62 respondents for a response rate of 33%. One building principal and the District Technology Coordinator in District B completed the Administrative Questionnaire.

Interviews were conducted with the following individuals in District B:

Superintendent (1)  
District Technology Coordinator (1)  
Elementary Assistant Principal (1)  
Middle School Principal (1)  
District Level Interview  
Building Level Interview  
Building Level Interview  
Building Level Interview  
Building Level Interview  
**Total Interviews (12)**
District C

District C has approximately 3,500 students and 360 staff (including teachers, administrators, and paraprofessionals). The district has one primary elementary school (K-2), an intermediate elementary School (3-5), a middle school (6-8) and a high school (9-12). The district has an annual instructional budget of about $37 million, which equates to approximately $10,500 per student. The instructional survey was administered to the full faculty of 260 teachers. The survey had 80 respondents for a response rate of 31%. Three building principals and the District Technology Coordinator in District C completed the Administrative Questionnaire.

Interviews were conducted with the following individuals in District C:

- Superintendent (1)            District Level Interview
- District Technology Coordinator (1) District Level Interview
- Elementary Principal (1)      Building Level Interview
- Middle School Principal (1)   Building Level Interview
- High School Principal (1)     Building Level Interview
- Elementary Teachers (2)        Building Level Interview
- Middle School Teachers (2)     Building Level Interview
- High School Teachers (2)       Building Level Interview

Total Interviews (11)

Review of Research Questions

Each set of research questions will be answered for each district individually.

Question 1, including questions 1a-1b will be answered for District A and then this
same set of questions will be answered for District B and then for District C. The presentation of data from the individual cases will be followed by an analysis and summary of the responses to the Question 1 set. The other sets of questions (Question 2 including questions 2a-2e, Question 3 including questions 3a-3e, and Question 4 including questions 4a-4c) will be handled in a similar manner. Question 4d will be discussed in Chapter 5.

**Data Collected for Research Question Set 1**

Question 1 asks “**How is IT leadership structured in each of the districts and why?**”  
1a. Are the IT leadership structures in these districts aligned with models represented in the research literature? 1b. How did the structure in each district come to be the way that it is?

For each district, the *current structure* of the IT leadership will be described. This will be followed by a discussion of the evolution of the current structure in recent years, the perception of organizational structure across the district, the technology-related decision-making process in the district, and a discussion of the tech support in the current structure.

**District A**

*Current Structure.* IT leadership in District A is provided largely by a central office team including a teacher on special assignment (a certified library media specialist) serving as the DTC, a paid technical consultant that comes to the district
on a part-time basis on a contract from a private company, and the Assistant Superintendent for Curriculum and Instruction (ASCI).

There is one teacher in each building identified as a “technology specialist.” These teachers meet with the DTC four times per year as the District Technology Committee. These teachers are full-time teachers who are chosen by the building principal to perform technology-related duties for a stipend. Their role is to receive training and promote technology at the building level.

There are two part-time computer technicians that service the “break-and-fix” needs of the district. The services of these technicians are purchased through BOCES. BOCES also provides most of the district’s server and network administration from its centralized location in a Regional Information Center (RIC). Thus the individuals largely responsible for the purchase and integration of instructional technology are employed directly by the district and the individuals responsible for technical support come from BOCES and a private contract. The technology leadership structure of District A is described in Figure 4-1 below.
Evolution of structure in recent years. The current structure of IT leadership in District A is relatively new. Four years ago there was a certified administrator in the district who served as the DTC. There was a district technology committee that served as an advisory group to that DTC. The administrative DTC position was eliminated as a cost saving measure during budget cuts in 2010-11. At this point, the superintendent took on oversight of technology in the district. Technology support was provided by two district technical employees and some part-time BOCES technicians. After eighteen months with this set-up, the superintendent described what she called a “bit of a catastrophe” when a large amount of bus routing data from the previous year was mixed up with the current year and sent out to the public.
The mix-up was caused by a problem with one of the district’s servers. This prompted the superintendent to commission a full study of the district’s technology systems. The study showed that the district infrastructure was rapidly becoming outdated. It also showed that there was a need to provide support for technology integration in the district’s classrooms. The superintendent decided to hire a part-time consultant to handle the technological infrastructure and to place a library media specialist on special assignment in the position of “Lead Teacher for Instructional Technology.”

The result of the four-year evolution described above is the structure currently in place in District A. There is a teacher on special assignment overseeing instructional technology as the DTC. There is a paid consultant, in conjunction with the BOCES services, overseeing the technical aspects of the district technological infrastructure. Both of these individuals work directly with the ASCI under the oversight of the superintendent. The structure, in its current form, had been in place for just one year at the time of the interviews and data collection.

**Perceptions of organizational structure across the district.** The interviews revealed that the organizational structure of the IT leadership in District A is unclear to members of the organization. Most of the interviewees gave similar responses when asked about the IT Leadership structure. One teacher said, “It’s sad that I don’t know. I don’t really know…” Another said, “It would be a total guess. I don’t know.” When asked if he would be able to draw an organizational chart of the IT leadership structure, a teacher responded:
No. No- not even close. My feeling would be that the decision must lie with the principals and with [the DTC] and maybe administration above principals- the superintendent maybe?

The following responses were typical of the confusion shown by teachers in District C when asked who responded to their needs related to technology:

We can make requests- basically let [the DTC] know if we need something... but again- there is not a formal system for [teacher needs] and things fall through the cracks because of that.

- Teacher, District A

I guess I don’t know the answer to that at the moment. We’ve kind of changed... and we’re using BOCES as the facilitator if we have issues and problems...If I have a need I relay that need to the building tech coordinator who relays that to the district supervisor.

-Teacher, District A.

Technology related decision-making process. Major decisions regarding instructional technology in District A are made through a process called the TAC (Technology Acquisition for the Classroom) process. The goal of the program is to organize technology requests and initiatives in such a way that the district can support certain requests from the very beginning of the following school year. Teachers and administrators submit TAC requests to their building principal and/or department head using a district-designated form. The requests, which are due in December in order to fit into the budget planning process for the following year, are gathered by building principals and prioritized before sending them to the district office. Decisions about which projects to fund are made by a central office committee consisting of the DTC, the ASCI, the technology consultant, and the school business official. The superintendent also gives input at this point. Projects that are
funded are included in the school district budget. After the school budget vote in May, the TAC projects that are being funded for the subsequent school year are announced. Any necessary professional development is provided over the summer. Purchasing is carried out over the summer. The new technology is implemented in September, approximately 10 months from the time that the original proposal was submitted.

The TAC process has been in place in District A for two years. The process was described by the DTC as a way to avoid technology needs “springing up in the middle of the year.” She emphasized that it was important for the district to know what type of technology would be used in a given school year, stating:

It is about doing the advance planning for the upcoming year so that for what is in place instructionally, our staff has a guarantee that we will be able to support it.

-DTC, District A

The DTC described that the district takes several factors into account when deciding whether or not to support a TAC request. These include standardization (“What will be the easiest way to do this on a larger scale?”), instructional impact (“How will this support our [ISTE Standard 2] goal of increasing communication and collaboration?”), and financial sustainability (“What will we be able to support 3-5 years from now when we begin looking at replacement?”).

Two of the principals discussed this TAC process at length. They referred to the process as though they were entirely outside it. One principal described it as a very practical, cost-driven way for the central office to make decisions:
There is a review process that... obviously goes to money. They say ‘you can have this, you cannot have this.’ We get an email from [the DTC] with all of our proposals on it saying these are the ones that you are good to go for the following year. These are the ones that are going to have to be on hold maybe for a year. These are the ones we want to maybe roll into a capital project or look at funding a different way. It typically... it comes down to money- what can we afford.

-Principal, District A

A second principal concurred. He described the TAC decision making process as one that was separate from building administration, stating: “They review all of those requests they then tell us if we are able to secure them or not. It comes down to money.”

Teachers seemed to be even further removed from the technology decision-making process. One teacher described the difficulties posed by the process taking place only once a year:

I know that they have a process now- the TAC process- I couldn’t even tell you what that stands for- but I was just talking with [teacher technology specialist] about it yesterday- she said that she wanted something but ultimately- and it doesn’t sound very responsive- you could request something now but it wouldn’t come in until the end of next year. I said ‘am I hearing that correctly? That doesn’t seem to be very...’ It’s not something that I understand.

-Teacher, District A

Another teacher was asked if she had a sense of how the decisions on the TAC requests were made. She responded: “No- not really- as a teacher- no. We would probably be told ‘yes’ or ‘no’... maybe with a justification- but as to who made the decision, we probably wouldn’t be aware of it.”

*Tech Support in the Current Structure.* Part of understanding the IT organizational structure involves understanding the manner in which technology
users are supported. In District A, 62% of the respondents to the Technology Use Survey indicated that they “agreed” (54%) or “strongly agreed” (8%) that teachers have timely and ample access to technical support. Respondents indicated that the most common available methods for accessing support in District A were submitting a formal ticket (87%), asking a colleague for help (70%), and emailing tech support.

However, when asked what one method they most preferred, 43% preferred asking a tech person in the building for help followed by 18% who preferred submitting a formal “help ticket” and 16% who preferred asking a colleague for help. The idea that getting help from experts on site was preferable to the more widely available method of submitting a formal “help-ticket” was reinforced by many comments in the free response question (#27) pertaining to tech support. Typical responses included:

It was better to get technological help when buildings had tech support on site. Now things take longer to get done. It got rid of the personal one on one support.

-Survey Response, District A

I miss the days when we could easily get in touch with our technician. He was spread very thinly throughout the district, but he could always be counted on. Now, with the Help Desk, it just seems rather impersonal. Maybe I’m just an old dog, but one on one interaction, to me, is key.

-Survey Response, District A

The survey asked about the extent of teacher input into tech support models. 71% of respondents “disagreed” (39%) or “strongly disagreed” (33%) with the statement “In my school building, teachers help design how technical support is provided.” 25% had no opinion and only 4% agreed.

District B
**Current structure.** The IT leadership structure of District B is very different from that of District A. All final technology-related decisions in District B are overseen directly by the superintendent. The interviews in District B consistently made it clear that the superintendent is interested in technology and plays an active role in technology leadership. The district also has a District Technology Coordinator (DTC). The DTC is an individual with a technical background who has been in the district for more than 15 years.

A district-wide committee called the “Tech Cabinet” plays a significant role in the technology leadership structure of District B. The Tech Cabinet is chaired by the superintendent and includes the school business official, the district’s Chief Information Officer, teachers from all levels of the district (called “technology teacher-leaders”), a technology integrator, the elementary, middle, and high school principals, several high school students, and several community members. The Tech Cabinet is empowered by the superintendent with shared decision-making power. The Tech Cabinet meets once or twice per month. There are also monthly meetings between smaller building level technology committees (principal and technology teacher-leaders), the school business official, and the DTC.

There are teachers in the district informally identified as “power-users” who are not direct committee members, but are tech-savvy individuals who pilot hardware and software and advise the technology teacher-leaders and the principals.

Network administration and high level technical support is provided by the DTC. District B also has two technicians who work on “break-and-fix” tech support.
At the time of the study, this leadership structure had been in its current form for one year. The technology leadership structure of District B is described in Figure 4-2 below.

![Figure 4-2: Structure of IT Leadership in District B](image)

**Evolution of structure in recent years.** The current superintendent was in her third year as superintendent in District B at the time of this study. When she was hired, she was instructed by the school board to focus on improving the infrastructure and use of technology in the district.

The superintendent described several challenges she faced upon entering the district. The first was that there was no real technology plan.
“The plan that existed was your typical plan,” she explained. “It listed the standards and the things that would be purchased- but that’s about it. It sat on a shelf and I don’t think anyone had any clue that it even existed,”

A second challenge faced by the superintendent upon her arrival was that technology was very tightly guarded by the technical support personnel in the district. “We were highly secure with technology- almost to the point of ‘Why have it?’ - because no one could access it,” she recalled. “You had minimum availability of devices and wireless. Technology was really on the back burner.”

As a result, the superintendent convened a large stakeholder committee that she described as “probably the greatest strength in what we have done.” This group, which included teachers, students, administrators, community members, and “technology gurus” developed a comprehensive long-range district technology plan. The superintendent emphasized that this was a very important step in the development of the current leadership model.

In developing the plan, the superintendent insisted that it was critical to determine what types of experiences they wanted students to have and then to “back in” the technology to help provide these experiences.

Once the plan was complete, the large stakeholder committee that developed the plan was whittled down to become a shared decision-making group described as the district’s “Tech Cabinet” above.

An assistant principal who was a part of the stakeholder committee described the entire evolution from his point of view:

When [the current superintendent] came, our district was all over the place. People who were interested in technology advocated for what they thought
was important and good for kids. Whoever advocated loudest won the day and would get something to push forward with. Then we did a backward design. We stopped and said- “What do we want kids to walk away with? After first grade? After second grade? After high school?” Our greatest strength is that we now have a technology plan that looks at the vertical alignment of the district. We have a tech committee that is there to support the plan. We ask, “If we want this particular thing to happen, what do we need to make this happen?”

Assistant Principal, District B

The position of the District Technology Coordinator changed significantly as the new Tech Cabinet took over the leadership responsibilities of District B. Prior to the new superintendent’s administration, the DTC, an individual with a strong technical background and little classroom experience, made most of the decisions related to technology in the district. Under the model adopted by the new superintendent, the same individual who had served previously as the DTC retained that position, but her role was changed to that of an “operations manager.” She is an important part of the Tech Cabinet, but she is no longer the sole decision-maker in technology-related matters. It is now her responsibility to ensure that the decisions of the Tech Cabinet are efficiently carried out.

In the earlier model, tech-support was provided by a number of part-time BOCES technicians. In the new model, the district has hired its own full-time technicians.

Principals played very little role in technology leadership in the earlier model. Their primary function in the structure was to mediate between teachers and the DTC. Under the newer model, principals are expected to work as part of the Tech Cabinet to make decisions and oversee their implementation.
Perceptions of organizational structure across the district. There was a general awareness among the interviewees in District B that the technology leadership structure had changed significantly over the past several years. Responses to questions about the technology leadership structure were largely positive and enthusiastic. Most of the interviewees were consistent in articulating both the role of the superintendent in bringing about change to the technology leadership structure and the prominent role of the Tech Cabinet in decisions.

A great strength is the new leadership we have. They have shown an incredible dedication to stepping in front of tech integration in the classroom rather than being pulled along... as well as teachers that are on board with this.

-Teacher, District B

Prior to [this superintendent], the District Tech Coordinator made all the decisions- now it’s more like: “As a committee, we want to look at going to a one-to-one model...” Realistically, [the superintendent] sits there at the head of the table but there are many others... it’s a big committee... building administrators, the teachers, experts from outside, from BOCES, and we’ve got students.

-Principal, District B

One of the teachers attributed the respect that the Tech Cabinet has earned within the district to two factors:

First of all, some of the people serving on the district committee are from our building. They are people who use technology on a regular basis so there is a respect...they are the people that teachers go to on the side and ask for help, so there is a respect level. Second, there is a sense that the committee went outside- they went to experts in the field as they were developing the tech plan- they didn't just make independent decisions.

-Teacher, District B

A teacher who is part of the Tech Cabinet described the process by which she was able to bring the requests of several of her colleagues for a new type of projector to the Tech Cabinet. She encouraged the colleagues to write up a
request and document their needs. She went to a conference and learned more about the new type of projector. She brought this request to the Tech Cabinet. “Because we had this background work done the committee supported it. Now we have 70 new projectors— one for every classroom in our building.” The teacher concluded, “As an elementary teacher I can sit side by side with the high school principal and argue for things for my school. It's a good committee.”

It should be noted that some of the teachers interviewed in District B were more confused about the new approach to IT leadership than others. While some praised the Tech Cabinet approach, others indicated that they did not exactly understand the role of the technology teacher-leaders or how the Tech Cabinet reached decisions. These teachers often referred to the technology teacher-leaders or the Tech Cabinet by a variety of different names.

**Technology related decision-making process.** The Tech Cabinet makes the major technology-related decisions in the district. The cabinet made several important decisions in its first year. These included the introduction of centralized “cloud” printing across the district, the selection of a new learning management system, and the rollout of a one-to-one student-to-laptop initiative in the high school. Interviewees indicated that the Tech Cabinet evolved in its visibility and stature as a true “decision making” group.

Early decisions like the plan to move from individual printers in teacher classrooms to cloud printing were largely driven by administration, but were implemented through the Tech Cabinet. A principal explained that individual classroom printers were dying and were very expensive to replace. In the mean
time, most teachers had begun moving to laptops rather than desktops. The superintendent and business official decided that the district would benefit from a model of centralized cloud printing at multiple points around the building. They asked the Tech Cabinet to figure out how to operationalize the conversion. For the next couple of months, the Tech Cabinet worked with teachers in the buildings to figure out the areas where staff would need to do a lot of printing. They published a draft map of where the printers would go and asked if there was anything we were missing. The principal reported that as a result of all of the work by the Tech Cabinet the rollout went very smoothly.

The principal was asked who he believed the average teacher in his building would say made the decision to move to cloud printing? “That’s a great question,” he said. “I’m not sure- I think they would have attributed it to the business official, the superintendent, and myself- but they would say that the Tech Cabinet became the face of it. And now this is happening even more so... This is a great committee-teachers, parents, students- they make the decision.”

Over the course of its first year, District B’s Tech Cabinet has gradually taken on a larger role. Useful insight into the way that the committee works is provided in a pair of comments about the selection of a new learning management system for the district- one from the perspective of the superintendent and the other from a teacher:

We had to decide upon a learning management system and we went around and around. We did a lot of research. There were camps that wanted one and camps that wanted a different one. I remember someone saying at one meeting- ‘Well [Superintendent], you are going to have to just decide.’ I said, ‘No. I am not going to decide. This is a cabinet. This is not going to be my thing- this is going to be our thing. We said this from the beginning- this
decision-making body is just that. As ugly as this is, we are going to have to work through this until we come out with a decision that we can all live with. And we did.

-Superintendent, District B

It’s interesting because, even though we have the superintendent on the committee, we were trying to make a decision on a new Learning Management System for the district. The middle school teacher leader was really pushing [one particular brand] and the high school people disagreed. We had quite a back-and forth. It was a really active conversation. One of the teachers said to [the superintendent], “well- ultimately this is going to come down to you” and the superintendent said: “No, no, no, no. This is a cabinet- we are making the decision together.”

-Teacher, District B

Interviewees gave similar descriptions of the committee’s decision to begin distributing laptops to all high school students.

**Tech Support in the Current Structure.** In District B, 66% of the respondents to the Technology Use Survey indicated that they “agreed” (55%) or “strongly agreed” (7%) that teachers have timely and ample access to technical support. Respondents indicated that the most common available methods for accessing support in District B were *e-mailing tech support* (98%), *calling tech support on the phone* (94%), and *asking a colleague for help* (84%).

When asked what one method they most preferred, 45% preferred *calling tech support on the phone* and 23% preferred *e-mailing tech support*. Only 10% of respondents indicated that they preferred *asking a colleague for help* despite the fact that the district’s technology leadership model involves the building technology teacher-leaders providing the first level of support for minor issues. Some respondents expressed a “haves and have-nots” mentality with respect to the
technology teacher-leaders. The following comment from survey question #27 reflected this frustration:

It is uncomfortable to approach a colleague for help and to be dismissed or made to feel as if the help is a bother. ‘Tech teachers’ should not assume that colleagues have and understand the systems on the same level they might.

-Survey Respondent, District B

Only 19% of respondents agreed (16%) or strongly agreed (3%) with the statement: “Teachers help design how technical support is provided.” Thirty-two percent disagree and 29% strongly disagree with this statement.

**District C**

*Current structure.* The IT leadership in District C differs from both Districts A and B. All technology-related decisions are overseen by a District Technology Coordinator (DTC). The DTC has a background in education and is a certified administrator. He has been in this specific role for eleven years. The DTC reports directly to the ASCI and through her to the Superintendent.

The DTC has identified a “lighthouse-teacher” in each building in the district. This lighthouse-teacher is a classroom teacher who receives a stipend to be the building leader for technology integration. In addition to the lighthouse-teacher, each building has a team of 4-8 “bullpen-teachers.” The bullpen-teachers are also full-time classroom teachers who have an interest in technology integration. They receive a stipend and some release time from supervisory duties in exchange for being available on a regularly scheduled basis to help teachers in their building with technology integration. The work of the bullpen teachers is overseen by the lighthouse teacher who, in turn, reports to the DTC. The lighthouse-teacher and the
bullpen-teachers in each building meet regularly with the DTC for training and planning. The lighthouse and bullpen teachers provide all of the technology-related professional development for the teachers in the building. (By contract, all teachers must participate in at least ten hours of professional development per year.) One of the teachers described the value of this lighthouse-bullpen team:

When the classroom teachers have technology questions, they can come to a peer- rather than an administrator- for their answers. People are much more likely to seek help and ask questions when they can go to a peer.

-Teacher, District C

There is a building-level technology committee in each building. This committee is chaired by the building lighthouse-teacher and includes the bullpen teachers for that building, the building principal, the DTC, and any building teachers that are interested in attending. These building level committees discuss a wide variety of technology-related issues and were consistently identified in the interviews as committees that were vested with authentic decision-making authority.

There is also a district-level technology committee, which consists of the DTC, all of the lighthouse and bullpen teachers from across the district, the ASCI, and all of the building principals. This committee is largely advisory in nature and meets four times per year. The technology leadership structure of District C is described in Figure 4-3 below.
Evolution of structure in recent years. In contrast to Districts A and B, where the IT leadership structures have existed for one year, the current structure of IT leadership in District C has been in place for the past 6 years.

During the 2008-2010 fiscal crisis that faced New York state schools, District C made two cost-saving decisions that were broadly perceived by the faculty as being difficult but, ultimately, positive for technology integration in District C. Prior to the fiscal crisis, the lighthouse-teacher and bullpen-teacher positions did not exist. Instead, each building had a dedicated educational technologist (a full-time teacher specializing in technology integration) and a full-time computer lab-teaching assistant. Serious budget cuts eliminated these full-time positions. The
roles of lighthouse and bullpen teachers were created as the role of technology integration was distributed among stipended classroom teachers.

One teacher explained that teachers were frustrated, at first, with the loss of the dedicated educational technologist. However he reported that the creation of the lighthouse-bullpen structure actually turned out to be an improvement “because it has become more of a peer-to-peer sharing of ideas... there isn’t a technology expert that comes and pushes into the classroom- there is a lot more of teachers working with other teachers, talking and sharing.”

In addition to the cuts in full-time technology integration and support positions, District C made a move from district-owned servers and Microsoft Office products to a cloud-based server and the Google Apps suite of tools. This transition led to a uniform collaborative platform across the district. It also laid the groundwork for the one-to-one laptop-to-student initiative that the district is currently implementing. This move from server-based Microsoft products to cloud-based Google products was a consistent theme in the interviews across the district. The superintendent explained:

We eliminated our servers in our move to Google Drive. We said “we can save $80,000 a year by moving to cloud-based services rather than maintaining our own servers- that’s the cost of a teacher. We can provide comparable or better service and save significant money.” It was a no brainer. So the transition was quite challenging, but ultimately successful.

-Superintendent, District C

Teachers emphasized that the district wide move to Google Apps and away from all Microsoft Office products was not without its difficulties. One teacher stated, “Google was free and Microsoft Office was expensive. It was a hassle, but
people saw it as a way to save money. It was an administrative decision. To teachers it was a hassle.” However the move was eventually accepted and even applauded:

Am I ok with it now? Sure. We are a “Google school” and it’s a wonderful thing. But it took time.”

-Teacher, District C

Streamlining to Google Apps from Office has done a lot. I am a big fan of Google. It makes things so easy. It works.

-Teacher, District C

**Perceptions of organizational structure across the district.** The IT leadership structure that has been in place in District C for the past six years was clearly and consistently described by all of the interviewees. The value of the building level technology teams was referenced often. The terms “lighthouse teacher” and “bullpen teachers” were used by all interviewees, without exception. The value that this structure provided in terms of peer-to-peer professional development was also a consistent theme.

One principal described the structure, the idea of “teachers-teaching-teachers” as being “at the heart of why the infusion, the pervasive use of educational technology is strong in our district.” He went on to talk about the value of distributed leadership in the district and the importance of empowering teachers. “When you have that core group that gets all that extra training,” he said, “they become the ones that can answer questions and help teachers implement technology.”

Administrators and teachers each gave nearly identical descriptions of the role of the lighthouse-bullpen structure and the monthly building technology committee meetings between the DTC, the lighthouse and bullpen teacher, and the
The following three statements came from individuals in different buildings. The consistency in describing the role of the teacher leaders is noteworthy.

Each building has a lighthouse teacher who is stipended to oversee technology in the building and a group of teachers who give up one period per 4 day rotation to support and help other teachers with technology initiatives. The lighthouse teacher, bullpen teachers, [the DTC], and the principal have monthly building technology meetings.

-Principal, District C

We have a building technology committee and a district committee. But we also have, within our buildings, lighthouse teachers and 'bullpens'-which I am part of... These are the “go-to” teachers in terms of technology.

-Teacher, District C

This building technology committee meets once a month- different from the quarterly bullpen meetings- made up of lighthouse, bullpen, and classroom teachers that just want to know what is going on.

-Teacher, District C

The Superintendent also emphasized the peer-to-peer aspect of the IT leadership model in District C, stating, “A great strength of the district is peer leadership- lighthouse and bullpen teachers are trained regularly in the latest and greatest,” he said. “They are working in their own buildings with their peers.”

One teacher commented that the structure has been built in such a way that individuals can go to a variety of people and get a response. “The DTC is very responsive,” he said. “Anybody can email him... they will get a real response and get it quickly. However, there are also any number of other individuals who can help as well. Even though they know they can go straight to [the DTC], they often use the structure instead. They understand it,” the teacher said. “They like it because it is
peer to peer. And the bullpen team is trained quarterly for a half-day- so they know how to help.”

The role of the DTC, which will be discussed in detail in research question set #2, was also consistently defined by the interviewees. There was a general sense among the interviewees that the IT Leadership structure is deliberate, consistent, and effective.

_technology related decision-making process._ Throughout the interviews in District C, there was a consistent theme related to technology decision-making. Almost all of the interviewees alluded to or directly expressed the idea that technology related decision-making was a balance between “top down and bottom up.” Respondents described a strong, visionary DTC who sees technology as a tool to improve teaching and learning. As such, there were high expectations for the use of technology across the district.

The superintendent was unapologetic in his explanation that some things had to come from the “top-down.” He used the standardization on the Google platform as an example: “We believe in systems thinking and systems leadership,” he said. “If you are thinking in terms of systems, you are not going to have Microsoft in this classroom, Google in this classroom, and something else in this classroom... you can’t have different forms all over the place. We are not that eclectic with technology. We can’t support all of that. But we can support a single platform.”

Another “top-down” decision mentioned by a principal was the requirement that teachers and principals begin using data analysis software to look for weaknesses in student skills and performance. This requirement was put in place by
the district office and the DTC. A “top-down” initiative referred to by a teacher was the requirement for keeping an electronic grade book.

In describing each of these directives, teachers used such terms as “implemented by the DTC,” “came from the top down,” and “it was forced upon us.” Interestingly however, these examples of centralized decisions were not spoken of in a negative manner by the interviewees. They were typically followed up by phrases such as “you had a few years to get used to the idea,” “collaboration among teachers helped to roll it out,” and “frankly, things are better since we started doing it this way.” One teacher summed up the DTC’s style this way:

He is not a push-over though- he’s kind of a stickler. He holds us accountable- For example, he wasn’t willing to buy more computers for this building until he saw more use. When people said that they couldn’t use them in the younger levels, he pushed back. He said he really thought they could. And they could. As he saw the use go up, he bought more. But it was a little bit of tough love, at first.

-Teacher, District C

While there were these consistent themes of high expectations from the District and the DTC, it was clear that all decisions were not “top down.” Day-to-day decisions for teachers were not micromanaged. There was a general sense that teachers could make most decisions regarding instruction and would find strong support from the District. When asked how quickly a teacher could get an idea implemented for their classroom, a teacher responded: “They would go to the lighthouse... maybe someone on the bullpen. They could usually get what they needed. For example, software- the district doesn’t get into what people can and can’t have. Teachers know that if they want a specific piece of software they just buy it as a department.”
Several teachers indicated that the DTC actively sought out teacher opinions and needs. One teacher described how a survey put out by the district discovered that teachers were purchasing a number of different software subscriptions out of their own pocket. She stated that the DTC immediately purchased premium subscriptions to many of these software packages so that they would be freely accessible to all teachers as needed. “By tapping into best practices of teachers and then supporting these practices at the organizational level, great things are coming into our classrooms,” she said.

Teachers also commented on the freedom they had to use technology with their students. The following statements are representative of this sentiment among the interviewees:

We have nothing locked down. Filtered, but not locked-down. It’s awesome. And it’s pretty much the same for the kids. Some games are locked down. Not social media, though. We are given the slack. I think it is a great mentality, personally.

Teacher, District C

There is definitely a support network, a lot of freedom. There is not a micromanaging. If you see an interest, you go with it- you do have to get it approved, but generally speaking, if you have a plan, they are approving it. This leads to a lot of feeling of ownership. It’s not so much “this is the technology we want you to use” but rather “Use something. Have a digital footprint. We will support you.”

Teacher, District C

A principal described how he tries to take a similar approach with the teachers at the building level. He recounted a recent situation in which he attended a department meeting and a teacher there was very excited about a particular piece of software. He showed it to the group and asked the principal if there was any way he could purchase it for the department. The principal was excited to describe how
he went to the district and lobbied for the funding for the software. “This type of thing comes from the teachers,” he said.

Interviews indicate that in District C, big-picture, systems-level decisions seem to come from the DTC and the district administration while day-to-day decisions are left up to individual teachers. Between these two ends of the decision-making spectrum are many major operational decisions such as implementation of new initiatives, distribution of resources, and delivery of professional development. These decisions are made in a shared manner, most often at the building-level technology committees.

A great example of this was the decision on how to roll out one-to-one laptops for middle school students:

Lighthouse and the bullpen teachers expressed concerns with the plan—primarily that we were in favor of the concept, but that there were teachers who were unprepared. We were essentially expecting them to go to a blended learning model/environment very quickly. This is a big shift. Our concerns were that people would not adopt. So [the DTC] agreed to push it off a year so that we could work with people to adopt it more gradually. The administration also agreed to allow a small backpack—backpacks are currently not allowed in the school for students. We had concerns. They listened, and addressed them. The leadership does listen to the concerns.

-Teacher, District C

A teacher described the acquisition of classroom sets of laptops at grades 2 and 3 as an example of another major decision reached in a shared manner. Teachers tracked data on laptop cart usage and made the case that they should switch from the cart model to a one-to-one classroom based model. Although this transition would require significant expenditure, the DTC supported it and facilitated the request.
A third example of shared decision-making was provided by one of the District C principals. He described how his building-level technology committee felt the need to change the way technology-related professional development was delivered. They asked for dedicated release time to develop professional development around the great new ideas that were being presented to them in the lighthouse-bullpen trainings. The DTC and the principal agreed.

In summary, technology-related decisions in District C are made at numerous levels. Multiple examples were found of decisions systems-level that were decidedly “top-down.” At the same time, there was consistent evidence that the individual classroom teacher has considerable freedom to make day-to-day decisions. Finally, there were also descriptions of many operational decisions that are made in a shared fashion.

**Tech Support in the Current Structure.** In District C, 86% of the respondents to the Technology Use Survey indicated that they “agreed” (46%) or “strongly agreed” (40%) that teachers have timely and ample access to technical support. This strong endorsement of the tech support system in District C was borne out in the interviews and survey comments as well. For example:

Tech Support is really fast- we have one break-and-fix guy. You send in an email to “help desk” and he shows up.

-Survey Respondent, District C

Most of our tech support goes to help desk. Bullpen and lighthouse help out when they can, but most goes to the help desk. They are responsive. It’s a same day fix. Most of the time it’s a “same-hour” type fix.”

-Survey Respondent, District C
Any problems I have had are easy to report via a help ticket/e-mail and are usually addressed in less than a half a day and are often remedied before the next school day. Kudo's to [the DTC] and his staff.  
-Survey Respondent, District C

The preferred methods for accessing tech support were submitting a formal help ticket (36%) and asking a colleague for help (29%). This supports the interviewees descriptions of a responsive tech support system and accessible bullpen teachers in each building.

Part of the reason for District C’s success with tech support is likely related to the decision by the district to streamline to one operating system. One teacher explained, “Part of the success of tech support is that we have this singular operating system across the district that is really good.” In fact, the teacher described how a student-run “helpdesk” was essentially “put out of business” because there were so few problems. “For the first month they were busy but then the tickets just stopped coming in,” he said. “I really think it is because we streamlined to one system. Everything just works.”

When asked to respond to the statement: “In my school building, teachers help design how technical support is provided, only 29% “disagreed” (24%) or “strongly disagreed” (5%). This stands in contrast with the other districts where there the same statement recorded 71% disagreement in District A and 61% disagreement in District B.

Summary and Analysis for Question Set 1

Question Set 1 examines at the structure of technology leadership in each of the three districts. This summary and analysis will first discuss the superficial
differences in the formal organizational structure of the three districts. The discussion will then identify certain basic elements that exist in all three districts. The analysis will take a deeper look at the underlying philosophical approach to IT leadership in the three districts and argue that, from this perspective, District B and District C are similar in nature and the both differ markedly from District A. Finally, the discussion will propose the idea that the IT leadership structures of the three districts can be viewed as being in three different stages of progression toward a distributed model of leadership.

**Formal organizational structure.** In District A, most decisions are made at the district office level by the DTC in collaboration with the Assistant Superintendent and a consultant. The principals and teachers are largely consumers of the technology provided by the central administration. There is a formal process for making requests related to technology. Decisions regarding those requests are made by the central administrative team and communicated to the buildings. Teacher-leadership is limited to serving as a one-way bridge from the central administration to the classroom teacher. Decisions and trainings are shared with designated teachers at quarterly district technology committee meetings. There are no building-level technology committees.

In District B, the superintendent is clearly the most visible technology leader. However, most major technology-related decisions are made through a district-level stakeholder committee (Tech Cabinet). The role of the DTC in District B is that of an operations manager who makes sure that the decisions of the district-level committee are carried out. Principals and teachers serve on the district-level
committee and help to make major decisions. Smaller decisions are made at the building level by a team consisting of the building principal, designated teachers, the DTC, and the school business official.

In District C, there is a DTC with an educational and administrative background who is clearly seen as the central technology leader. A district-level technology committee meets quarterly. This district level committee is open to anyone within the organization and serves largely as an advisory, rather than a decision-making, committee. Technology-related decisions are made by the DTC in collaboration with building-level committees. The building level teams consist of specially designated teachers (“lighthouse” and “bullpen”), the building principal, and the DTC.

**Common elements among all three districts.** Despite the differences among the three districts, there are some notable commonalities. Each district has a designated DTC. Each district has committees that are in some way involved with technology. Each district has designated full-time teachers who receive a stipend for playing a role in technology integration. Each district has a number of individuals whose job is limited to technical support. The similarities and differences in the actual district-specific roles of these common elements will be discussed further in the analysis of question set #2.

**Similarities in Districts B & C.** At first glance, District B & District C differ significantly in the structure of their IT leadership. In District B, technology is led by the superintendent with the DTC playing a technical support role in the district. In District C, the Superintendent has delegated broad technology-leadership
responsibility to the DTC. District B has a district-level technology committee that is charged as a shared decision-making body. Building-level committees in District B are largely logistical. Conversely, the district-level committee in District C is advisory in nature, with shared decision-making taking place in the building-level committee.

Despite these formal differences, it can be argued that the two districts have a relatively consistent philosophical approach to technology leadership. Both districts have a strong, charismatic individual who views technology as having transformational potential in the teaching and learning process. In District B it is the superintendent who is consistently identified by interviewees as the strongest singular motivating force for technology progress. In District C the interviewees assign this role to the 11-year veteran DTC.

Both districts invest heavily in the professional development of the groups of teacher-leaders. The two districts expect that these teachers will in-turn work with and train their colleagues, broadening the reach and effectiveness of professional development efforts. Both districts have formally empowered groups of teachers in their buildings to serve as peer-to-peer technology leaders. District C has formally identified 4-6 teachers in every district building as Lighthouse/Bullpen teachers. District B has formally identified 1-2 teacher technology leaders in each building. (They further report that technology “super-users” are beginning to emerge informally.)

Both District B and District C have also empowered groups of teachers in each building with genuine decision-making power. Both districts use this
distributed model of leadership to make decisions about the operational and the instructional aspects of the organization. The gray box denoting the nexus of IT decision-making authority in District B and District C (Figures 4-2 and 4-3, respectively) shows that each district incorporates the input from a broad spectrum of stakeholders for major IT decision-making.

District A differs from District B and District C in key areas. While District A has a well-respected teacher on special assignment as the DTC, her visibility across the district is limited and her role is not well understood district-wide. It certainly does not rise to the level of the Superintendent in District B or the DTC in District C.

District A has chosen to identify only one teacher per building, rather than groups of teachers, as key technology representatives. Thus, efforts to provide this selected group of teachers with professional development is likely not as far-reaching it would be if the professional development efforts were invested in larger groups of teachers.

Decisions related to technology are made by a small group of individuals at the highest levels of the organization rather than shared broadly among stakeholders. Figure 4-1 shows the limited number of individuals in District A with decision-making power. Notably, the District Technology Committee falls outside the decision-making level in District A.

**Stages of Progression toward Distributed Leadership Model.** As discussed in Chapter 2, much of the recent literature on technology leadership advocates for a distributed model in which leadership of technology is a characteristic of an entire organization rather than the sole responsibility of a
particular individual (Spillane 2005; Dexter 2008; Bennett 2008; Davies 2010). Such an organization, it is argued, would demonstrate positive outcomes such as high levels of technology integration, creativity, peer-leadership in technology-related professional development and openness to innovation. Spillane (2005) emphasizes that in a distributed perspective, formal lines of authority can and do exist but formal leaders benefit from recognizing that other individuals within the organization can inform decisions in a significant way. Dexter (2008) advocates a team-based technology leadership model in which a wide array of school leaders and teachers work together to lead technology across a district.

From the data presented so far in this section, it seems that District B and District C each have a philosophical approach that promotes this type of distributed leadership model. The current structure of District A does not seem to fit well with the distributed perspective, although the presence of common structures (technology committee, respected DTC, teacher-leaders) indicate that a similar approach could eventually evolve in this district.

While District B and District C show a structure that is congruent with a distributed leadership perspective, there are significant differences between these two districts. The data presented in the next several sections of this chapter will show that District B and District C are indeed different. District B has made some significant changes in structure. However, changes in the leadership structure have not yet become widely understood and embraced by the entire district. District C has come significantly further in developing an organization in which effective technology leadership is pervasive across all levels of the organization.
If we accept the premise that school districts will benefit when technology leadership is distributed across all levels of the district then it is natural to ask “Why do school district not adopt this model immediately?” and “Can a district move toward such a model?” An understanding of the historical development of the current model of IT leadership in each district as well as the presence of certain commonalities among the three districts suggests that the three districts may each be at a different stages in the progression of IT leadership within a district toward a distributed model.

**Stage I- Reactive and Stabilizing**

Five years ago, District A lost its DTC. Fiscal hardship prevented the district from rehiring that position. IT leadership was forced to take a backseat to other educational priorities. A series of near-disasters related to technology occurred within the district. Server errors led to erroneous information going out to the community. The district infrastructure and hardware fell out of date to the point that there were significant day-to-day issues. These issues forced the superintendent to begin the process of recreating a technology leadership structure.

Recognizing the need for operational and instructional expertise, she identified two individuals- one with expertise in academic and classroom technology and the other with experience in technology infrastructure. She gave these individuals broad authority to make all IT-related decisions under the guidance of her Assistant Superintendent for Curriculum and Instruction. The goal was to recover and react to the deficiencies identified within the district. In this
stage, this district is seeking concrete, efficient solutions to serious problems. It is making clear, organization-wide decisions that move the district forward as a cohesive group. It is difficult to divest decision-making power too broadly given the district’s instability. It is likely that a centralized leadership will bring significant progress to the most pressing problems facing the district.

This centralized structure allows District A to quickly address issues with the technology infrastructure and network security. It enables the district to provide widespread internet connectivity and to develop an efficient plan for end-user hardware and software. It provides the ability for teachers and principals to make requests (i.e. TAC process) in a manner assures that these requests are only granted if they fit into a sustainable, stable long-term plan for the district. Recognizing the value of teacher involvement, the Superintendent of District A identified a teacher in each building to serve as a building technology leader. While these teacher technology specialists do not have any formal power to make decisions, they are trusted faculty members who can help to stabilize the district by communicating district priorities and help to roll-out professional development.

While the district is able to recover and stabilize in this stage, there is very little involvement with technology at the grassroots level of the organization. Much of the second and third generation research surrounding policy implementation discussed in Chapter 2 helps explain why technology policies and procedures given from the central level of the organization have difficulty flourishing in the classrooms in a reactive/stabilizing district like District A.
Second generation research emphasized the importance of the will of the local implementers (Weatherly and Lipsky 1977; Berman & McLaughlin 1978; McLaughlin 1987). District A’s lack of authentic involvement of teachers and principals makes it difficult for implementers at the central level to earn the necessary support of “street-level” members of the organization. Second generation policy-implementation research also stressed building the capacity of the implementing agents (Huberman and Miles 1984). For example, Berman and McLaughlin (1978) associated strong implementation with, among other things, classroom assistance from project leaders and other district staff as well as teacher and principal involvement in project decisions. This type of involvement is missing in District A.

**Stage II: Visionary and Shared**

District B could be described as being in a visionary stage in which sharing has begun to permeate the organization. In many ways, District B’s previous superintendent had achieved the goals currently being sought in District A. District B had shown the ability to react adequately to changes in the technology landscape and had achieved stability with respect to technology over the prior several years. There were no glaring problems. Interviewees described District B as “locked down.” It was a place where technology was very tightly controlled. There were no technology-related crises nor were there any significant innovations. Technology was essentially stabilized and compartmentalized.
It was in this environment that the school district hired a new superintendent. The new superintendent began by insisting upon a 5-year plan for technology integration that was to be written by a broad group of school and community stakeholders. The sharing began. She brought in experts in technology integration to meet with the group and with the faculty at large. She supported visits to other schools. She consistently emphasized the importance of technology as a tool for improving teaching and learning. Once the 5-year plan was written, the new superintendent formed the District Tech Cabinet to provide authentic shared decision-making in the area of IT leadership. The superintendent also made a strong commitment to professional development in technology.

It is worthwhile to note that District B has a technology leader with a number of important characteristics: 1) the person has the formal power to effect significant change with in the organization; 2) the person has a strong student-centered focus and expertise in championing technology as a tool for improving teaching and learning and shares that focus in a positive and inspiring manner; 3) the individual incorporates authentic input and shared decision-making for teachers, administrators, and other stakeholders into the IT leadership process; and 4) the individual has a strong commitment to providing meaningful professional development.

The four leadership characteristics identified above are consistently supported by the literature as necessary for effective implementation. For example, McLaughlin (1987) underscores the importance of both pressure and support when implementing a new policy. An individual with strong formal power within an
organization is positioned to provide both. Cohen and Spillane (1992) discuss a chasm that exists between reform initiatives the weak capacity for change in the educational system. An individual with a level of technical expertise and a positive and inspiring vision for teaching and learning is necessary to help bridge that chasm. Firestone (1989) indicates that successful implementation is more likely with a willingness on the part of the district to allow teachers to have real influence and decision-making power. A leader with a commitment to shared decision-making will allow such influence. Huberman and Miles (1984) call for strong assistance in the form of resources, training, and outside consulting throughout the implementation process. A leader with a commitment to meaningful professional development will provide this assistance (Mwawasi 2013).

The presence of the transformational leader with formal power, a student-centered focus on teaching and learning, an incorporation of authentic shared decision-making, and an infusion of rich professional development are all qualities present in District B. However, this structure had only been in place for about a year at the time that this research was conducted. While the superintendent was widely recognized as the driver of change in the district’s approach to technology, it was clear that this was still very new. The formal names of the various positions were not widely known or consistently used by interviewees. For example, the Tech Cabinet was referred to alternatively as the Technology Committee by several interviewees. The Technology Teacher Leaders were referred to by various titles such as Technology Specialists, Technology Integrators, and Technology Coordinators. Some of the principals were not viewed as tech-savvy or technology
leaders. Teachers who were not on the Tech Cabinet had difficulty describing how decisions related to technology were made. It was very clear that things were changing in the district with respect to technology and technology leadership, but it was not completely clear to many individuals in the district how this was happening or what their individual role in the change was expected to be.

**Stage III: Engaged and Local**

As noted earlier, District B and District C have many of the same characteristics. The clear technology leader in District C, the DTC, exhibits the same qualities as the superintendent of District B. He has formal leadership power—having the complete support of that district’s superintendent. He has technology expertise and a student-centered approach that focuses on technology integration as a tool to support instruction. He has a commitment to sharing decision-making and working alongside teachers in a collaborative and positive manner.

It can be hypothesized that the difference between District B and District C is related to the amount of time that this leadership model has been allowed to take root and grow and what happened during that time of growth. The interviewees of District B were uncertain of aspects of the new IT leadership model and their role in it. There was no such uncertainty in District C. The model had been essentially unchanged for the past 6 years. Every interviewee used the exact same terminology and similar descriptions with respect to the technology leadership structure. Each interviewee was confident of their personal role in overall organization. Discussions of the role of technology in the learning process were consistent and well
articulated. Interviewees gave many concrete examples of technology-related decisions that they took ownership and pride in. The overall sense from the interviews was that this was not simply the vision of a small group of individuals, but rather was a description of the way that IT leadership was approached across the district.

In addition to a longer experience with the leadership model, District C showed engaged larger teams of local actors who shared decision-making at the building level, rather than at the district level. Furthermore, these building-level teams developed a deep commitment to peer-to-peer professional development.

Third generation research on policy implementation focuses on how teachers learn and make sense of new things. Typically, teachers will seek to understand new policy as supplementing rather than supplanting existing practice (Spillane et al. 2002). They tend to assimilate the policy into their existing practices. This sense-making perspective views policy implementation as challenging because it requires implementers to completely restructure the way they understand something if new policies are to be implemented with fidelity. This can often be difficult because policies that require significant and novel changes, such as the integration of technology into the teaching and learning process, require true expertise in the policy area readily available at the point of implementation. The IT leadership model in District C- with a strong DTC and a team of credible “street-level” teachers who are given local decision-making power to assist in the implementation of IT policy- helps to counter the tendency to supplement rather than supplant. The local
teams of teacher-leaders bring the expertise necessary to restructure understanding and implement complex policy.

More support for the effectiveness of a structure involving local teams of teacher-leaders can be found in third generation policy implementation research that focuses on communities of practice (Wenger 1998; Coburn and Stein 2006). As discussed in Chapter 2, this perspective emphasizes that interactions of learners with colleagues can encourage policy implementation. It holds that implementation is more successful when leaders recognize the value of local networks and tap into these networks. The building level teams in District C, made up of lighthouse and bullpen teachers, do exactly that.

This progression of technology leadership toward distributed leadership is a helpful lens through which to analyze the remaining Research Question sets. If a district that distributes technology leadership across all levels of the organization can be shown to be achieving more positive outcomes with respect to implementation of effective IT policy, then there are some useful lessons that can be taken from studying this progression.

**Data Collected for Research Question Set 2**

Question 2 asks: **What kinds of IT responsibilities are assigned to various individuals with formal roles within the district and why?** 2a. If there is a District Technology Coordinator, what is that individual’s background and role? 2b. What is expected of principals with respect to IT leadership? To what extent are principals viewed within the district as IT leaders? 2c. Does the superintendent play
a role in technology leadership? 2d. What is expected from other individuals in a school district with respect to IT leadership? 2e. Who takes responsibility for professional development in the area of technology? For each district the data collected will be organized into the following categories: district technology coordinator, principals, superintendent, teachers, and professional development.

**District A**

**District Technology Coordinator.** The DTC in District A is a certified Library Media Specialist who has been placed in the role of DTC for the past year. Before being appointed to serve as the DTC, this individual was the high school library media specialist in the District A High School for many years. For the three years prior to the appointment of the current DTC, the position was left vacant. The superintendent expressed support for the position of the DTC as she discussed the period of time when that position was vacant. “Our infrastructure was very weak. I had no idea how weak it was,” she commented. “Data back-up... server capacity... troubleshooting, security... We were headed in many different directions that in the end were not going to come together.”

The current DTC is viewed by teachers and building-level administrators as knowledgeable in the field of IT integration. The DTC was referred to in most of the interviews as the central person in technology related decision-making, although her exact role was unclear to several of the interviewees. One principals said “I think this is her full time job, I’m really not sure.” When asked about her background, he answered that he was not sure if she was a certified administrator.
Teacher comments consistently revealed doubts about what the DTC’s exact role in the district was. In referring to the DTC, one teacher mentioned that there was a person “who seems to be the disseminator of tech emails and updates” but that he thinks she is also a librarian “pulling double duty.”

Because the current DTC does not have a technical background, she works with an outside technology consultant on hardware and network issues.

**Principals.** The extent to which they were involved in technology leadership varied from building to building in District A. The role of the principal was not discussed to any great extent in the interviews. Some comments indicated that the principals were supportive of technology but there was no clear consensus. One principals was described by teachers a person who “liked to know what was going on in tech” and who “wants to be sure that our district is “as well-equipped with technology as it could be.” When asked what the principals role with respect to technology was in the district, another teacher answered, “I don’t know the answer to that, it could really vary from building to building.”

The principal’s formal role in the technology leadership process in District A is that of an advocate for their building as a consumer of technology. They seem to have very little role in actually making technology-related decisions. The superintendent was asked how much input the principals have in decisions about technology spending. She answered:

Well- they have the same opportunity as anyone else in terms of making requests through the TAC process. They can make requests. I do ask that any request from a teacher in a school goes first to the principal- not for an
approval/disapproval- but so they can see it and know what the committee is going to see.

-Superintendent, District A

Teachers also stated that requests for technology went through the principals before they were sent to District Office for decisions. The principals were consistent in stating that they were not part of the decision making regarding technology. This is made clear in the responses given by each principal:

Once they review all of those requests they then tell us if we are able to secure them or not.”

-Principal, District A

They say ‘you can have this, you cannot have this.’ We get an email from [the DTC] with all of our proposals on it saying these are the ones that you are good to go for the following year.

-Principal, District A

There’s not much movement on the [TAC] requests. When they say ‘you are not getting this... you are getting this,’ that’s it. I kind of just get a list. If there was something I really disagreed with I would go plead my case in front of the superintendent, but there hasn’t been too much need for that.

-Principal, District A

**Superintendent.** Discussion of the role of the Superintendent in technology in District A was limited. The superintendent discussed the time in which she was taking direct charge of IT in the district as a result of a budget cut. She emphasized that the lesson learned from this period of time was that there needed to be someone “at the helm” of the IT department.

**Teachers.** There was a consistent theme in the interviews that other teachers, not formal technology leaders, were the district’s greatest technology assets. The role of
individual teachers as supporters and trainers for technology was consistently emphasized. For example, when a teacher was asked what he viewed as the district’s greatest strength, he responded, “The greatest strengths are the individual teachers themselves. These are people who are willing to go above and beyond to learn new technologies. These are the people I would go to— not necessarily a designated tech person.” Another teacher specifically referenced the tech-specialist teachers, describing them as “a support that has been really useful in our district— someone you would go to if you needed to troubleshoot something or if you needed help learning how to use a certain tool.”

Survey data on the roles of teachers and administrators in District A is presented in Table 4-5.

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. In my school building, administrators model effective uses of technology and promote technology integration.</td>
<td>5%</td>
<td>47%</td>
<td>25%</td>
<td>19%</td>
<td>3%</td>
</tr>
<tr>
<td>3. In my school building, teachers who are technology innovators are seen as leaders:</td>
<td>11%</td>
<td>53%</td>
<td>22%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>6. In my school building, teachers have significant input in setting the direction for technology integration.</td>
<td>2%</td>
<td>26%</td>
<td>29%</td>
<td>36%</td>
<td>7%</td>
</tr>
<tr>
<td>7. In my school building, teachers are part of the decision-making process regarding technology integration.</td>
<td>2%</td>
<td>29%</td>
<td>19%</td>
<td>42%</td>
<td>8%</td>
</tr>
<tr>
<td>14. In my school building, teachers play an active role in making decisions about hardware and software purchases.</td>
<td>3%</td>
<td>24%</td>
<td>27%</td>
<td>41%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*Table 4-5 Perceptions of Roles of Administrators and Teachers in District A*

Opinions were split on whether administrators model effective use of technology, with 52% expressing agreement. 64% agreed that teachers who are innovative
through technology are seen as leaders. Only 31% of respondents agreed (and 50% disagreed) with the idea that teachers were “involved in the decision-making process regarding technology integration. Similarly, just 27% agreed (and 47% disagreed) with the idea that “teachers play an active role in making decisions about hardware and software purchases.” Roughly one quarter of those surveyed responded “no opinion” to each of these questions. This is consistent with the lack of understanding of the technology leadership structure and decision-making process expressed by the interviewees.

**Professional Development.** There was a general sense that professional development in the area of technology was readily available in District A. 65% of respondents agreed (52%) or strongly agreed (13%) that there was “ample access to professional development in the area of technology integration.” However, only 43% indicated that they felt that teachers were involved in the planning and conducting of such professional development. Survey responses related to professional development in District A are listed in Table 4-6.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. In my school building, teachers have ample access to professional development in the area of technology integration.</td>
<td>13%</td>
<td>52%</td>
<td>16%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>21. In my school building, teachers are involved in planning and conducting professional development in the area of technology integration.</td>
<td>1%</td>
<td>42%</td>
<td>24%</td>
<td>28%</td>
<td>5%</td>
</tr>
</tbody>
</table>

*Table 4-6*  Technology-related Professional Development in District A
Technology professional development in District A is most often provided by the DTC, the stipended teacher technology specialists, and a BOCES service. The teacher technology specialists in each building are trained by the DTC and asked to bring the information back to their colleagues. Professional development takes place in workshops, superintendent conference days, and informally within each school building. The BOCES service provides technology workshops in both an online format and through afterschool sessions.

**District B**

*District Technology Coordinator.* In District B, the District Technology Coordinator is a person with a strong technical background. The DTC is not an educator. The DTC serves as the “operations manager.” The decision-making power of the DTC is limited to technical issues. Decision involving larger technology related issues on both the operational side (i.e. printing) and the academic side (i.e. learning management system) of the district are made by the Tech Cabinet.

The role of the DTC in District B changed significantly with the arrival of the current superintendent. Prior to this superintendent, the DTC (the same individual-with no educational background-that is currently in the role) was ultimately responsible for all technology related decisions. Under the current structure, the role of the DTC is to see that the decisions of the Tech Cabinet are implemented efficiently and effectively. This transition was noted by the superintendent:

> When I came, everything technology- anything to do with technology- was put on [the DTC]. All decisions were made by her. I don't think that she actually wanted to make those decisions- nor was she always the right person to make those decisions. They made her the “heavy.”... There was a
real fear- a stranglehold on technology. So when people would ask [the DTC] for things, the answer would often be “no.” It caused real problems between the DTC and teachers.

-Superintendent, District B

A principal echoed these sentiments. He described how, in the past, the technology leader was in control of technology. She was the final arbiter of what was approved or disapproved. He continued, “Now she is being pushed to deliver on the educational component. She is being told by the committee, ‘This is what needs to happen- how are we going to make it happen?’”

**Principals.** In District B, the principals are asked to be technology leaders. According to the Superintendent, they are all expected to serve on the District Tech Cabinet. They are expected to champion decisions made by the Cabinet to their faculties. They are expected to chair monthly meetings with the School Business Official, the DTC, and the building technology coordinators (teachers) in their buildings.

Although the district hired a new superintendent several years ago, the principals of the district’s three buildings did not change. The expectations of the new superintendent with respect to technology were very different from those of her predecessor. The first principal to change over under the new superintendent was the high school principal. The new high school principal described how the previous principal had worked hard to keep technology out of the school as a way to keep the building safe and orderly. He described himself as “the polar opposite of that.”

The elementary principal and the middle school principal in District B are the same individuals who served under the prior superintendent and the previous IT
leadership structure. Under the previous administration, they were never expected
to be technology leaders. The new structure demands that they be actively involved
with technology. To help with this transition, both principals have newly hired
assistant principals who are active technology leaders. Both of these assistant
principals sat in on their respective principal interviews at the request of their
principals.

Superintendent. The superintendent was recognized in almost all of the
interviews as a very positive and enthusiastic force in the technology leadership
structure of District B. Some examples of how she is perceived are represented in
the following comments:

The biggest strength that this district has is a superintendent who has a
vision for technology and is interested in pushing the idea of using
technology to leverage the resources we have, in a smart way.
-Principal, District B

We have a new superintendent who is very “gung ho” on the whole
technology issue...she is very dynamic with regard to [technology]. It comes
from the top...
-Teacher, District B

[The superintendent] is very good. She has a plan. We have committees. We
are a little more advanced than [other local districts].
-Teacher, District B

The superintendent has a strong background in teaching and in curricular
leadership. In the interview, she emphasized the role that technology plays in
supporting and improving instruction. “The real underlying purpose is to get
teachers to change the way they teach,” she said. “They have to get away from the
lecture. That is not where teachers add value. The students can access the content.
Students need to interact with the content, connect the content, and build on the
content. That is the invaluable role of the teacher and they can use technology to help them get there.”

The superintendent in District B has taken methodical steps over the first several years of her superintendency help a team of stakeholders to develop a vision for the appropriate role of technology in a school district. She has created a structure that allows these stakeholders to have input into important decisions in both the instructional (i.e. one-to-one laptop initiative) and the operational (i.e. cloud printing) aspects of the district.

**Teachers.** Several teachers in the district have been identified as “Technology Teacher Leaders.” These teachers serve on the District Tech Cabinet and participate in monthly building-level meetings regarding technology. They are a liaison between the Tech Cabinet and the classroom teacher. The role of the teacher-leader was discussed in several interviews. They emphasized the fact that they “had a seat at the table.” They described how the technology teacher-leaders make announcements at faculty meetings and email the faculty with requests for input. One teacher said that the teacher-leaders work hard to talk with teachers and bring that feedback to the District Tech Cabinet.

In addition to the Technology Teacher-Leaders, there are emerging within the district a group of teachers referred to as “power-users.” These are teachers who have expressed and openness to trying new technologies and individuals who are viewed by their colleagues as technology leaders. Although the do not yet have a role within the formal structure, they are viewed as very helpful in implementing technology-related decisions. In exchange for their eagerness to try out new
technologies and help others, they are given opportunities to attend trainings and pilot new hardware and software. One teacher who was identified as a “power-user” described her experience in the following way:

When I need something in technology, I email the superintendent. She will get back to me and then the technology administrator will get it done. Everything is happening fast and it is happening new. I am just not sure how decisions are being made- but I do know that [the district] is supportive- whenever I ask for something they provide it- they really go beyond.

Teacher, District B

The comment made by the teacher above that she was “not sure how decisions were being made” was echoed by some of the other classroom teachers who had less involvement with the Tech Cabinet. Survey data on the roles of teachers and administrators in District B is presented in Table 4-7.

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. In my school building, <strong>administrators model</strong> effective uses of technology and promote technology integration.</td>
<td>11%</td>
<td>45%</td>
<td>21%</td>
<td>18%</td>
<td>5%</td>
</tr>
<tr>
<td>3. In my school building, <strong>teachers who are technology innovators are seen as leaders:</strong></td>
<td>23%</td>
<td>56%</td>
<td>8%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>6. In my school building, <strong>teachers have significant input</strong> in setting the direction for technology integration.</td>
<td>15%</td>
<td>27%</td>
<td>21%</td>
<td>27%</td>
<td>10%</td>
</tr>
<tr>
<td>7. In my school building, <strong>teachers are part of the decision-making process</strong> regarding technology integration.</td>
<td>11%</td>
<td>37%</td>
<td>18%</td>
<td>21%</td>
<td>13%</td>
</tr>
<tr>
<td>14. In my school building, <strong>teachers</strong> play an active role in <strong>making decisions</strong> about hardware and software purchases.</td>
<td>3%</td>
<td>32%</td>
<td>21%</td>
<td>31%</td>
<td>13%</td>
</tr>
</tbody>
</table>

*Table 4-7 Perceptions of Roles of Administrators and Teachers in District B*
The majority of respondents agreed (45%) and strongly agreed (11%) with the idea that administrators were promoters of technology. 79% of respondents agreed (23%) or strongly agreed (56%) that “teachers who are technology innovators are seen as leaders.” However, less than half of the respondents felt that teachers had “significant input” into technology integration. 37% of respondents disagreed. Only 35% of respondents agreed or strongly agreed that teachers played an active role in making decisions about hardware and software acquisitions. 44% of respondents disagreed with this statement. The percentage of respondents expressing “no opinion” was lower overall than in District A.

**Professional Development.** Professional development in District B has been largely focused on the teacher-leaders and super-users. The district supports conferences and trainings for these tech savvy teachers. The superintendent expects that this training will filter into the classroom through colleague-to-colleague training. The district has also identified a teacher on special assignment whose time is dedicated to technology integration for teachers. In general, there seemed to be satisfaction with the level of availability of technology-related professional development. Survey responses related to professional development in District B are listed in Table 4-6.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. In my school building, teachers have ample access to professional development in the area of technology integration.</td>
<td>24%</td>
<td>42%</td>
<td>13%</td>
<td>19%</td>
<td>2%</td>
</tr>
<tr>
<td>21. In my school building, teachers are</td>
<td>16%</td>
<td>36%</td>
<td>24%</td>
<td>15%</td>
<td>8%</td>
</tr>
</tbody>
</table>
involved in planning and conducting professional development in the area of technology integration.

Table 4-8 Technology-related Professional Development in District B

District C

*District Technology Coordinator.* The DTC was consistently referred to as the single greatest driving force behind technology in District C. The individual has an educational background with both teaching and administrative certification. He has been in the current position for eleven years. It was clear that he was viewed as a positive, charismatic leader at all levels of the organization. The fact that the DTC had a teaching background was mentioned repeatedly in the interviews. One respondent said, “He is absolutely unique. He is very good at what he does... He is a teacher. He's been in the classroom and he understands the needs teachers have. He has insight into how to make instruction more engaging through the use of technology.”

Other descriptors of the DTC that came out of the interviews were visionary, student-centered, a listener, a change-agent, fun, brilliant, and an instructional leader.

His fellow administrators spoke about why they believe the DTC is successful in this position:

He does get some pushback, but he is very organized and very structured. His committee structure is strong. He gets a lot of real input. It’s very powerful. The participants are quite candid and he responds to that.

-Principal, District C

Superintendent: “[The DTC] is the catalyst. He is responsible for the technology plan, for the implementation of the plan, and for making sure it
fits within our mission and vision. He is a teacher and administrator. He has a lot to bring to the table. He understands instruction. He knows that technology isn’t the answer. He is here to help kids learn the best way they can learn. He tries to provide the most effective technology as a tool. It’s all about the kids learning. That’s what drives technology here in this district.

-Superintendent, District C

**Principals.** The principals were included in the technology decision-making process at all levels within the district. In interviews, principals clearly articulated the role of technology within the educational environment of their school. Principals were comfortable discussing technology and gave multiple examples of technology integration projects that they were personally involved in. Principals meet regularly with the DTC, the building Lighthouse teacher and the Bullpen teachers.

The principals also serve on a “data team” with the DTC and the Assistant Superintendent for Curriculum and Instruction. In this role they are asked to use testing and demographic data to inform instructional decisions.

**Superintendent.** The superintendent was not mentioned by interviewees as being involved in technology to a great extent. Several interviewees mentioned the superintendent’s desire to move the district to a singular platform as a cost-saving measure. Interviewees also mentioned the positive impact of the superintendent’s decision (again as a cost-saving measure) to eliminate technology integrators and teaching assistants in favor of the lighthouse/bullpen model. The superintendent described his role in the district as improving student learning in all areas. For technology-related initiatives he stated that he leans heavily on the DTC.

**Teachers.** Although there is clearly a strong DTC in District C, the teachers seemed to have a great deal of input into the process of technology integration.
Throughout the interviews, examples of teacher-led initiatives that were supported by administration were shared.

One such example was the switch from a commercial software package for curriculum mapping to a teacher-designed collaborative document. Even though the commercial curriculum mapping software was a district initiative, teachers succeed in convincing the administration that the home grown software was more likely to be used by teachers and to ultimately achieve the district’s objective.

As discussed in the data collected for question set #1, teachers have a great deal of latitude in day-to-day decisions in District C. Even thought he district has a strong DTC, many decisions are made by teachers. One teacher described that teachers emphasized that the DTC “helps us to realize that it is our job to make those decisions and to help promote those decisions within the building. He does rely on individuals to push and promote within our departments.”

The views expressed in the interviews on the roles of teachers and administrators in District C were largely supported by the survey results (Table 4-9).

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. In my school building, <strong>administrators model</strong> effective uses of technology and promote technology integration.</td>
<td>29%</td>
<td>53%</td>
<td>13%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>3. In my school building, <strong>teachers who are technology innovators are seen as leaders:</strong></td>
<td>39%</td>
<td>43%</td>
<td>15%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>6. In my school building, <strong>teachers have significant input</strong> in setting the direction for technology integration.</td>
<td>21%</td>
<td>56%</td>
<td>13%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>7. In my school building, <strong>teachers are part of the decision-making process</strong> regarding technology integration.</td>
<td>21%</td>
<td>56%</td>
<td>11%</td>
<td>11%</td>
<td>0%</td>
</tr>
</tbody>
</table>
In my school building, teachers play an active role in making decisions about hardware and software purchases.

<table>
<thead>
<tr>
<th></th>
<th>10%</th>
<th>51%</th>
<th>20%</th>
<th>18%</th>
<th>1%</th>
</tr>
</thead>
</table>

Table 4-9 Perceptions of Roles of Administrators and Teachers in District C

82% of respondents agreed that administrators model and promote technology use. 82% viewed teachers who were technology innovators as leaders. 77% agreed and only 10% disagreed that teachers had “significant input in setting the direction for technology integration.” Similarly, 77% agreed and 11% disagreed that “teachers are a part of the decision making process regarding technology integration.” Slightly less, but still a majority of respondents (61%) agreed that “teachers play an active role in making decisions about hardware and software purchases” in their school building.” The number of respondents expressing “no opinion” for these questions was lower than in either of the other districts.

**Professional Development.** Professional development in District C was described with a variety of terms like “peer-to-peer,” “organic,” and “teacher-driven.” There is a contractual requirement in the district that all teachers participate in ten hours of professional development annually. Interviews indicated that much of the technology-related training was organized by both the administration the building level technology committees and largely taught by teachers. One of the principals explained: “We have teachers who have a technology focus and a desire to use technology because they see the benefits of it. Their passion shows through to their peers, too... much better than any one person trying
to give a direct down. We try to cultivate that networking of technology from peer to peer.”

One example of teacher leadership of professional development that was repeatedly referred to by interviewees was a summer technology conference held on the district campus. All of the sessions in this “tech camp” were taught by teachers. Teachers who attended were given in-service credit. Several interviewees gave examples of how the summer conference generates a great deal of excitement. Lighthouse and bullpen teachers explained that they view it as their role to capitalize on that excitement and help teachers throughout the school year. One such example is described below:

Just yesterday I helped an ELA teacher. Two of her colleagues in seventh grade ELA had gone to [the summer in-house technology conference] and learned about a software called ‘Pear Deck’. They told this particular teacher about it. She said to me “oh- this is so cool- I hope [the Tech Director] will give another PD on it.’ I answered, ‘No- that’s my job as a bullpen teacher, as a lighthouse. Let’s make a time and I will show it to you.’ It was kind of neat because these teachers went to [the conference], saw the software and learned about something new. They showed it to a colleague who now wants to learn about it. It’s very organic in that way.

-Teacher, District C

Survey responses related to professional development in District C (Table 4-10) supported the sentiments expressed by interviewees.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. In my school building, teachers have ample access to professional development in the area of technology integration.</td>
<td>59%</td>
<td>33%</td>
<td>3%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>21. In my school building, teachers are involved in planning and conducting</td>
<td>43%</td>
<td>46%</td>
<td>6%</td>
<td>5%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Survey respondents overwhelmingly agreed with the idea that teachers have ample access to technology-related professional development, with 59% strongly agreeing to the item. 92% of respondents also expressed strong agreement (43%) or agreement (46%) with idea that teachers in District C are “involved in planning and conducting professional development in the area of technology integration.”

**Summary and Analysis for Question Set 2**

In the analysis of Question Set 1, the three districts in this study were described as being in three different stages of development. It was suggested that these stages could be referred to as 1) reactive and stabilizing (District A); 2) visionary and shared (District B); and 3) engaged and local (District C). The questions in Question Set 2 focus on the roles of various individuals in the IT Leadership structures of the three districts. It is helpful to analyze these roles using the stages of development lens provided in the last section.

**District Technology Coordinator.** In District A, the DTC is a Library Media Specialist on special assignment. She is a highly respected individual with a long history of working in District A. In collaboration with an outside technical consultant, the DTC has been given broad discretion and decision-making power with respect to technology. Given the difficulties the district has faced in recent years with respect to technology, it is understandable that the superintendent wants
to consolidate decisions to a small experienced team of leaders in order to stabilize the district.

In District B, the DTC plays a much smaller role than in either of the other two districts. In the visionary stage, District B is seeking to cast aside its image as a tightly controlled, compartmentalized environment. The new superintendent is the visionary leader of the district focused on the benefits of technology integration for instruction. It is important to the superintendent that the DTC, a person with a purely technical background, be seen as a supporter and a manager of the technological assets. In the visionary environment, it is important that teachers feel free to experiment and explore all of the various technologies available without the restrictions of an overly controlling DTC or a highly technical bureaucracy.

It is not hard to imagine that District B could easily be progressing toward a structure such as the one found in District C. In the future there is no reason that the Superintendent of District B could not hand off the mantle of formal technology leadership to a DTC, just as has been done in District C. It seems that it would be critical, however, that the individual chosen would have a focus on teaching and learning and an ability to collaborate and share decision-making with teachers and principals. These qualities are a big part of the success of the DTC in District C.

**Principals.** Figure 4-4 compares the views that survey respondents have of their administrators as leaders who model and promote technology integration in Districts A, B, and C.
The involvement of the principals in the three districts can also be understood through the lens of the three stages of development suggested above. In District A, the principals have largely been removed from the technology decision-making process. In an attempt to stabilize the district, even the building leaders play only a small role in technology leadership. Although they may value technology, they are currently not given the opportunity to take a strong leadership role in this area. As such, they are recognized as promoters of technology by only slightly over 50% of their faculty.

In District B, a district undergoing transition, only one of the principals has been hired by the current Superintendent. Not surprisingly, this principal has a strong focus on technology integration. The other principals in District B are much less involved with technology decision-making, although participation in IT leadership is expected by the Superintendent. The district has recently hired
assistant principals who have shown an interest in technology integration and leadership. Given this transitioning, it is not surprising that the view of principals as technology leaders in District B is also mixed.

Principals in District C are expected to play an active role in technology leadership. This is reflected by 82% of survey respondents indicating that they “strongly agree” (53%) or “agree” (29%) with the idea that their building administrators model and promote technology.

Superintendents. The three case studies indicate that the superintendent has a variety of possible roles and influences with respect to technology. The superintendent must assess the current condition of the district and either hire the appropriate personnel to address the situation or take a personal leadership role. In District A, the superintendent has chosen to hire a DTC and consultant to stabilize the district in the near term. In District B the superintendent has chosen to take on a visionary leadership role herself. In District C, the superintendent has given broad authority to a DTC who has engaged the district by embracing a visionary and distributed style of leadership.

Teachers. A commonality among all three districts studied was the importance placed by teachers on the technology leadership of their colleagues. Figure 4-5 shows how teachers in each of the three districts responded when asked if they agreed that, in their building, teachers who are technology innovators are seen as leaders.
As discussed earlier, interviewees in each district emphasized the value of the technological leadership of other teachers. These sentiments are supported by the survey data, especially in District B and District C. It is this sentiment that likely encourages superintendents to design opportunities for teacher leadership in IT leadership structures. All three of the districts in this study made provisions for formal participation of full-time teachers in the IT leadership infrastructure. This was done by providing full-time teachers with stipends, additional training, and newer equipment.

Figure 4-6 and 4-7 compare the responses among the three districts to questions that examined the extent to which teachers felt that they had involvement in decision-making regarding technology integration and hardware/software purchasing.
This comparison reaffirms the input received from the interviewees that the majority of the teachers in District A are not part of the IT decision-making process while District C teachers are offered authentic decision-making input. Opinions of
teachers in District B fall in between the other two districts. This is consistent with the idea of a district that is transitioning to a new IT leadership structure that engages a broader group of stakeholders in the decision-making process.

**Professional Development.** Figure 4-8 compares the survey results of the three districts when respondents were asked if their district provides ample access to professional development in the area of technology integration.

![Bar graph showing teacher access to professional development](chart.png)

**Figure 4-8: Teacher access to technology-related professional development.**

Figure 4-9 compares the three districts on the extent to which respondents feel that teachers are involved in the planning and conducting of professional development in the area of technology integration.
Figure 4-9: Teacher Involvement in planning and conducting professional development.

These results parallel the interview data. A majority of respondents in all three districts felt that there was “ample access” to professional development. District C showed notably high levels of total agreement (92%) and “strong” agreement (59%). The number of respondents expressing agreement with the idea that “teachers are involved in the planning and conducting” of professional development gradually increased in progression from District A to District B to District C. These results fit with the idea being proposed herein that these districts could represent different stages of development of an effective IT leadership structural model.

Again, the level of total agreement (89%) and “strong” agreement (43%) in District C is noteworthy. Teacher access to high quality training and teacher involvement in the planning and conducting of professional development are desirable for effective policy implementation. This is widely supported by policy implementation research (Firestone 1989; Wenger 1998; Spillane et al. 2002;
Coburn and Stein 2006). The IT leadership structure in District C provides teachers with ample access to high quality professional development that is often times planned and led by colleagues.

**Data Collected for Research Question Set 3**

Question 3 asks: **Do the districts have a District Technology Committee?**

**Do the districts have building level Technology Committees? Why or why not?**

3a. Is there a typical structure for such committees in terms of membership? If so, what is it? If not, why not and how do the committees vary? 3b. What are the formal and informal roles of such committees? 3c. To what extent is the power to determine IT policy and implementation typically distributed among team members and the IT leader in school districts? 3d. How do IT leaders view the IT committees? 3e. How do IT committees view the IT leaders?

**District A**

In the administrative questionnaire, two principals report having a building level technology committee but both reported that there was no record of agendas or minutes for these groups. Neither of these principals elaborated on the structure or function of these building-level committees. Two principals reported that their buildings did not have building-level committees. The DTC reported that the district did have a district-level technology committee. There is a district level group that consists of the DTC and the four teachers stipended as the building technology specialists. This group meets quarterly. This group is used largely for turn-key
training at which tech-specialists learn new software and integration ideas that are brought back to the building. They are used to help “roll-out” district technology initiatives. Several of the teachers reported a “district technology committee” but it was unclear whether they were referring to the central office team of technology decision-makers or the quarterly meetings in which the DTC trained the teacher technology specialists. Other than some passing references in a few of the interviews, there was no evidence of any type of shared decision-making technology committee at the building or district level.

**District B**

Both of the administrators that responded to the administrative questionnaire indicated the presence of district-level and building-level technology committees in District B. Agendas and minutes from the district level committee are posted online. Most of the interviewees in District B talked about the large district-level technology shared decision-making committee established by the superintendent (referred to as Tech Cabinet). The structure and scope of this committee was discussed in detail earlier in the chapter. There was significant evidence that the district had vested authentic decision-making authority in this committee. Examples of decisions on IT policy and implementation that have been distributed among members of this committee include the selection of a new learning management system and the decision to begin a large scale roll-out of one-to-one student laptops in the high school. Interviewees also referenced a building-level technology committee that met monthly. This committee consisted of the
building principal, the DTC, the building technology specialist(s) and the district business official. The building level committees in District B were largely logistical, looking to implement decisions of the larger district committee.

**District C**

Where the district-level technology committee in District B was designed as a shared-decision-making body, the District level committee in District C is largely advisory. Meetings are held quarterly and chaired by the DTC. There is no formal committee make-up. The meeting is open to all members of the organization. It is typically attended by all building principals, lighthouse teachers, many of the bullpen teachers, and teachers at large who are interested in agenda items. The DTC describes the District-level committee as “a large representative group designed to provide input and feedback on a variety of major technology related decisions.” Examples of these district-level decisions are the move away from Microsoft Office products to Google Apps, the move away from local servers to cloud storage, and the relative distribution of hardware across the district.

The DTC in District C emphasized that he feels that shared decision-making is most effective at the local (building) level. Each school in District C has a building-level technology committee that meets monthly. It is comprised of the DTC, the building principal, the lighthouse teacher, and the full compliment of bullpen teachers. The scope of this committee includes technology integration, implementation of district-wide initiatives, tech support, accessibility of hardware, and acquisition of software. Interviewees gave examples of the types of decisions
made by the building level committees in District C. These included the switch to a new system for curriculum mapping, changes to the roll-out of a one-to-one Chromebook initiative in the middle school, and the widespread implementation of a reading support software in the middle school.

Summary and Analysis for Question Set 3

Table 4-11 compares the function of technology committees cross the three districts.

<table>
<thead>
<tr>
<th></th>
<th>Building-Level Technology Committee</th>
<th>District-level Technology Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>District A</td>
<td>Unclear</td>
<td>Informational</td>
</tr>
<tr>
<td>District B</td>
<td>Logistical</td>
<td>Decision-making</td>
</tr>
<tr>
<td>District C</td>
<td>Decision-making</td>
<td>Advisory</td>
</tr>
</tbody>
</table>

*Table 4-11: Function of Technology Committees in Districts A, B, and C.*

Not surprisingly, the degree to which teachers felt involved in decision making regarding technology was lowest in District A. As reported earlier, only 31% of teachers reported feeling that they have significant input in setting direction for technology in the district and just 27% agreed that teachers play an active role in making decisions about hardware and software purchases. This lack of involvement was reflected in survey comments as well. When asked to comment in the survey on technology vision and leadership in the district, several teachers made comments such as “I have never been asked by an administrator for input on technology decisions” and “technology is typically something teachers are asked very little about.” The district is operating in a reactive and stabilizing mode and most
decision-making is centralized. As discussed earlier, this centralized structure ignores the input of the “street-level” implementers and makes policy implementation difficult.

District B has demonstrated a commitment to a distributed leadership model at the highest level of the district. In her interview, the superintendent gave several examples in which she asked the large stakeholder committee to make significant decisions about the direction of technology in the district. The district-level committee structure in District B supports visionary leadership that is broadly shared. There is evidence that a large number of teachers feel involved in the technology decision-making process. For example, 48% agree that “teachers are part of the decision-making process regarding technology integration.” However, the fact that more than half of respondents could not express agreement with the previous statement or that only 34% of respondents agreed that teachers play an active role in decisions about hardware and software purchases indicates that sense of distributed leadership has not permeated to deeper levels of the organization. This could be linked to the structure of the building level committees. The building level committees in District B are purely logistical and do not have any substantial teacher representation. While visionary leadership and a district-level shared decision making committee may be very effective in “spreading the message” to those who are eager to hear it, more teacher involvement at the local level may be necessary to reach additional teachers in the organization. This idea of the “haves and the have-nots” came out in many of the survey comments. One respondent
wrote: “[District] Technology committee members seek little or no input from teachers.” Another wrote:

Teachers have the opportunity to lead technology integration and input their opinions regarding technology in our district. However, the general classroom teacher who doesn’t serve on the technology committee does not often feel part of the process.

-Teacher, District B

Involving more teachers at a deeper could yield benefits such as a more widespread commitment to technology integration and greater technology-related peer-to-peer leadership as noted in the research on policy implementation discussed above.

While the District-level committee in District C is not a formal shared decision-making committee it provides significant guidance to the DTC as he makes organization-wide decisions. In addition to stakeholder input at the district-level, District C has significant involvement of teachers at the building-level committee. Each building has between 5-10 teachers formally recognized in some way as technology leaders. These teachers meet monthly with the principal and DTC. This small building-level committee has both the formal power to make decisions for the building and the ability to effectively support implementation (McLaughlin 1987). The teachers serve as credible street-level actors given the local decision-making power to assist in the implementation of IT policy (Spillane et al. 2002).

Data Collected for Research Question Set 4

Question 4 asks: To what extent has the district implemented broadly accepted standards of best practice for technology integration (International
Society for Technology in Education Standards)? 4a. Is there evidence of widespread adoption of the goals of the ISTE Standards among students? Among teachers? 4b. Are there differences between the implementation of the standards across the schools? 4c. What roles do the various IT leaders (both formal and informal) have in the implementation of IT plans and standards?

There were several pieces of data gathered in the study that give insight into the extent to which broadly accepted standards of best practice have been implemented in each district. These include survey questions on vision (#2 & #5), financial support for technology (#9 & #12), and internet connectivity (#10). In addition, there were a number of questions probing the prevalence of a series of technology-related pedagogies (#16a-e & #17a-f). Data was also gathered from the administrative survey, interviews, and the district’s current district technology plan.

**District A**

Results for the relevant items in District A are shown in Table 4-12.

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. In my school building, there is a <strong>technology plan</strong> or a commonly understood <strong>vision</strong> for technology use.</td>
<td>5%</td>
<td>65%</td>
<td>11%</td>
<td>18%</td>
<td>2%</td>
</tr>
<tr>
<td>5. In my school building, teachers and other staff members <strong>support a common vision</strong> for technology in the school.</td>
<td>3%</td>
<td>43%</td>
<td>21%</td>
<td>31%</td>
<td>2%</td>
</tr>
<tr>
<td>9. In my school building, the amount of <strong>money allocated for technology</strong> is sufficient.</td>
<td>1%</td>
<td>27%</td>
<td>22%</td>
<td>44%</td>
<td>6%</td>
</tr>
<tr>
<td>10. In my school building, reliability and <strong>speed of internet connections</strong> are sufficient (e.g. wireless connections, streaming speed, etc.)</td>
<td>6%</td>
<td>43%</td>
<td>4%</td>
<td>37%</td>
<td>10%</td>
</tr>
</tbody>
</table>
12. In my school building, teachers and students have **ample access to hardware** (computer, projectors, cameras, etc.) and use hardware regularly.

<table>
<thead>
<tr>
<th>Technology-Related Pedagogies in District A</th>
<th>Sometimes Used</th>
<th>Widely Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications Software</td>
<td>56%</td>
<td>17%</td>
</tr>
<tr>
<td>Collaborative Software</td>
<td>65%</td>
<td>3%</td>
</tr>
<tr>
<td>Learning Management System</td>
<td>37%</td>
<td>18%</td>
</tr>
<tr>
<td>Online Tutorials</td>
<td>38%</td>
<td>30%</td>
</tr>
<tr>
<td>Art and Graphics Software</td>
<td>47%</td>
<td>9%</td>
</tr>
<tr>
<td>Flipped Classroom</td>
<td>34%</td>
<td>2%</td>
</tr>
<tr>
<td>STEM Specific Software</td>
<td>25%</td>
<td>0%</td>
</tr>
<tr>
<td>Game Based Learning</td>
<td>34%</td>
<td>7%</td>
</tr>
</tbody>
</table>

*Table 4-13: Prevalence of various technology-related pedagogies in District A*
There is no consensus among the respondents that any of the technologies are in high use in District A. The most widely used technology in the list is “online tutorials” with 30% of respondents indicating wide use and 38% reporting some use. Each of the technology-related pedagogies is indicated as being present at some level by a minimum of 24% of respondents (STEM specific software- robotics, probes, etc.). This indicates that each of these technologies are at least present in the district, even if not being widely used.

Responses to the administrative questionnaire indicate that the district has spent approximately $3,000,000 on technology over the past 3 years. This was focused on purchase of desktop computers and Chromebooks, technology staffing, and security camera replacement.

District A’s technology plan was reviewed. The plan was written within the past year. It was not available on the district website. The plan was written by the DTC with input “garnered from the technology requests of teachers and administrators” and “community input on the district’s program gathered at the annual budget vote.” The District’s technology mission statement emphasizes acquiring and applying computer literacy as a tool for success in a modern society. District A’s technology plan does not provide any indication of the extent to which the technology-related best practice already exists across the district but it does set goals that are organizes using the 2009 ISTE Standards for Students. The plan reports that there are approximately 1,600 computers in the district that are less than five years old and 175 peripheral devices (cameras, projectors, whiteboards, etc.) that are less than 5 years old.
The plan goes on to discuss a plan for upgrading the wireless infrastructure and the need for a better security camera system. The plan discusses the district’s desire to increase the use of tutorial software, distance learning, and a learning management system. The plan details a strategy for improving technology-related professional development over the upcoming three years.

**District B**

The results for the items related to technology integration in District B are shown in Table 4-14.

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. In my school building, there is a <strong>technology plan</strong> or a commonly understood <strong>vision</strong> for technology use.</td>
<td>23%</td>
<td>56%</td>
<td>8%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>5. In my school building, teachers and other staff members <strong>support a common vision</strong> for technology in the school.</td>
<td>8%</td>
<td>48%</td>
<td>16%</td>
<td>23%</td>
<td>5%</td>
</tr>
<tr>
<td>9. In my school building, the amount of <strong>money allocated for technology</strong> is sufficient.</td>
<td>11%</td>
<td>47%</td>
<td>26%</td>
<td>13%</td>
<td>3%</td>
</tr>
<tr>
<td>10. In my school building, reliability and <strong>speed of internet connections</strong> are sufficient (e.g. wireless connections, streaming speed, etc.)</td>
<td>2%</td>
<td>40%</td>
<td>3%</td>
<td>39%</td>
<td>16%</td>
</tr>
<tr>
<td>12. In my school building, teachers and students have <strong>ample access to hardware</strong> (computer, projectors, cameras, etc.) and use hardware regularly.</td>
<td>18%</td>
<td>60%</td>
<td>8%</td>
<td>11%</td>
<td>3%</td>
</tr>
</tbody>
</table>

*Table 4-14: Results for questions about integration of technology into teaching and learning for District B.*

In District B, 79% of respondents indicated that they felt there is a vision or plan for technology use in their school. However, only 56% agreed that teachers and staff support the vision. 58% of respondents agreed that the amount of funding
allocated for technology is sufficient. 42% agreed that the speed and reliability of their internet connection is sufficient. 78% agreed that teachers and students have ample access to hardware and use it regularly.

The extent to which different innovative technology-related pedagogies were used in District B is listed in Table 4-15.

<table>
<thead>
<tr>
<th>Technology-Related Pedagogies in District B</th>
<th>Sometimes Used</th>
<th>Widely Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications Software</td>
<td>57%</td>
<td>16%</td>
</tr>
<tr>
<td>Collaborative Software</td>
<td>55%</td>
<td>13%</td>
</tr>
<tr>
<td>Learning Management System</td>
<td>42%</td>
<td>10%</td>
</tr>
<tr>
<td>Online Tutorials</td>
<td>24%</td>
<td>5%</td>
</tr>
<tr>
<td>Art and Graphics Software</td>
<td>52%</td>
<td>5%</td>
</tr>
<tr>
<td>Flipped Classroom</td>
<td>42%</td>
<td>3%</td>
</tr>
<tr>
<td>STEM Specific Software</td>
<td>21%</td>
<td>3%</td>
</tr>
<tr>
<td>Game Based Learning</td>
<td>34%</td>
<td>10%</td>
</tr>
</tbody>
</table>

*Table 4-15: Prevalence of various technology-related pedagogies in District B*

There is very little “wide-use” reported for any of the pedagogies. However, all of the various pedagogies are reported as being present to some extent in the district. In fact, most of the pedagogies (with the exception of online tutorials, flipped classroom, and STEM specific software) were reported by greater than 50% of respondents as being sometimes or widely used.

Responses to the administrative questionnaire indicate that District B has spent approximately $3,000,000 over the past three years on network and wireless infrastructure, a security camera system, laptops, Chromebooks, and copiers.

District B’s technology plan was reviewed. The plan was written over the past several years by a committee of 26 district stakeholders including teachers,
administrators, students, board members and community members. The plan is available on the district web page.

The plan begins with a review of research on 21st Century learning and strategies for incorporating 21st Century skills into the curriculum. District B’s technology plan provides a detailed breakdown of the 2009 ISTE Standards, relating each board standard to specific curricula, instructional methods, assessments, and learning environment. For each broad standard, the district plan has identified necessary professional development, the role of administration, important strategic partnerships, and needed board of education policy.

The District B technology plan then provides concrete examples of classroom activities for all grade levels that integrate various technologies in an effort to teach 21st Century skills. The plan identifies the ISTE Standards that are supported through each activity.

The District B technology plan also includes a scope and sequence based upon the ISTE Standards. This tool identifies all of the technology skills that the district expects will be taught between kindergarten and grade 12. It specifies the grade levels at which each skill should be introduced, reinforced, and mastered.

Only after an extensive description of how technology supports teaching and learning does the District B plan turn to the specifics of the technology. It describes staffing, technological infrastructure, a plan for purchasing additional equipment, and an inventory of current equipment. District B reports that there are approximately 1260 computers in the district that are less than five years old and
250 peripheral devices (cameras, projectors, whiteboards, etc.) that are less than 5 years old.

**District C**

Results for the items related to technology integration in District C are shown in Table 4-14.

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. In my school building, there is a <strong>technology plan</strong> or a commonly understood <strong>vision</strong> for technology use.</td>
<td>48%</td>
<td>46%</td>
<td>4%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>5. In my school building, teachers and other staff members <strong>support a common vision</strong> for technology in the school.</td>
<td>18%</td>
<td>58%</td>
<td>9%</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>9. In my school building, the amount of <strong>money allocated for technology</strong> is sufficient.</td>
<td>33%</td>
<td>42%</td>
<td>20%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>10. In my school building, reliability and <strong>speed of internet connections</strong> are sufficient (e.g. wireless connections, streaming speed, etc.)</td>
<td>35%</td>
<td>47%</td>
<td>4%</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>12. In my school building, teachers and students have <strong>ample access to hardware</strong> (computer, projectors, cameras, etc.) and use hardware regularly.</td>
<td>37%</td>
<td>49%</td>
<td>6%</td>
<td>8%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Table 4-16: Results for questions about integration of technology into teaching and learning for District C.*

In District C, 94% of respondents agreed that the district had a commonly understood vision for technology use and 76% of respondents believed that teachers and staff supported it. There seemed to be strong agreement that sufficient funding was allocated for technology (75%), that the internet connection was fast
and reliable (82%), and that students and teachers had ample access to hardware and use it regularly (86%).

Most of the technology-related pedagogies in District C are identified by a majority of respondents as either sometimes used or widely used (Figure 4-17). Communications software was identified as widely used by 46% and sometimes used by 44% of respondents. Similarly, 54% of respondents indicated that collaboration software was widely used and 35% indicated that it was sometimes used. Learning management systems, art and graphics software, and game based learning also had more than 70% indicating some or wide use.

<table>
<thead>
<tr>
<th>Technology-Related Pedagogies in District C</th>
<th>Sometimes Used</th>
<th>Widely Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications Software</td>
<td>44%</td>
<td>46%</td>
</tr>
<tr>
<td>Collaborative Software</td>
<td>35%</td>
<td>54%</td>
</tr>
<tr>
<td>Learning Management System</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Online Tutorials</td>
<td>36%</td>
<td>8%</td>
</tr>
<tr>
<td>Art and Graphics Software</td>
<td>45%</td>
<td>26%</td>
</tr>
<tr>
<td>Flipped Classroom</td>
<td>35%</td>
<td>3%</td>
</tr>
<tr>
<td>STEM Specific Software</td>
<td>35%</td>
<td>11%</td>
</tr>
<tr>
<td>Game Based Learning</td>
<td>50%</td>
<td>26%</td>
</tr>
</tbody>
</table>

*Table 4-17 Prevalence of various technology-related pedagogies in District C*

The District C administrative questionnaire indicates that the district has spent $1,900,000 on technology over the past three years. The majority of this spending (approximately $600,000 per year) focused on continuing the cyclical purchase of updated laptop computers (Chromebooks). Approximately $100,000 was spent in the past three years to upgrade the wireless infrastructure.
The District C technology plan was reviewed. The plan was written by a district committee that included seventeen teachers and administrators from across the district. The plan has been available to the public for more than 10 years through the district’s web page. It has been updated regularly. The current plan is prefaced by a reference to three goals that were approved by the Board of Education one-year prior to the plan’s adoption. The first goal states that all students in the district will meet or exceed NYS standards for graduation. The second goal states that students will have the ability to think critically and apply knowledge creatively. The third goal references involvement in extracurricular or community service-related activities. The plan follows these goals by declaring that the use of technology, as well as all of the other services the district provides, should be focused on meeting those three goals. The plan’s mission statement incorporates the 6 ISTE standards for students. The preface to the plan goes on to state: “The use of technology is not an option in our classrooms.” It concludes: “We must look for ways to integrate technology at a deeper level, moving beyond just using it to replace a traditional activity once done on paper with pencil.”

The District C plan laid out three technology-specific goals: 1) digital equity (students will have similar access to technological tools); 2) digital age skills (students will have a strong foundation of technology skills); and 3) professional development (teachers will learn to integrate technology more effectively through a supportive culture of engaging professional development. For each of these technology goals, a specific set of recommendations was made.
After clearly laying out the District C’s vision for the role of technology in the teaching and learning process, the plan goes on to describe the technological infrastructure of the district, laying out a plan that will ensure “maximum connectivity in instructional spaces.”

District C reports that there are approximately 4425 computers in the district that are less than five years old and 270 peripheral devices (cameras, projectors, whiteboards, etc.) that are less than 5 years old.

Summary and Analysis for Question Set 4

Question 19 of the survey asked respondents to integrate the extent to which they agreed with the following statement: “It is important to provide students with regular and integrated access to technology (hardware and software) in school.” The results, shown in figure 4-12 below, show very strong agreement across the three districts.

<table>
<thead>
<tr>
<th>Question Item 19: “It is important to provide students with regular and integrated access to technology (hardware and software) in school.”</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Total Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>District A</td>
<td>64%</td>
<td>32%</td>
<td>96%</td>
</tr>
<tr>
<td>District B</td>
<td>66%</td>
<td>32%</td>
<td>98%</td>
</tr>
<tr>
<td>District C</td>
<td>73%</td>
<td>21%</td>
<td>94%</td>
</tr>
</tbody>
</table>

*Table 4-18: Responses to survey question 19 from all districts.*

These results suggest that goal of integrating technology into the teaching and learning process is almost universally accepted when presented in general terms. Despite this widespread agreement, the extent to which technology was actually integrated into each district varied widely. Some of the differences that stand out
most definitely among the three districts in this study are the articulation and acceptance of a common vision, internet connectivity, hardware availability, and the prevalence of various technology-related pedagogies.

**Articulation and acceptance of a common vision for technology use.** The awareness of a common vision varies across the three districts. Similar to the trend found in other parts of the survey, the awareness of a common vision increased as the leadership structure became more visible, seasoned, and distributed. Overall agreement and strong agreement were highest in District C, where a strong visionary leader was present (Figure 4-10). The importance of an inspirational leader in setting a technology vision was consistently emphasized in the research (Vanderline 2009; Devolder 2010; Chen 2013).

![In my school building, there is a technology plan or a commonly understood vision for technology use.](image)

*Figure 4-10: Vision for technology use.*
Teacher support for the common vision was lower than the awareness of the vision in all three districts (Figure 4-11). This can be explained by the numerous factors involved in policy implementation. The presence of a policy does not in any way ensure that it will be supported. All of the factors discussed earlier, including the amount of pressure applied, the amount of support and incentive provided, the manner in which the policy is interpreted and applied to the teacher’s work and the overall attitude of the community into which the policy is introduced all play a role in the ultimate support for that policy among the “street-level” implementer.

Districts must work intentionally to bring the teacher to a place where they consistently support the broader policy. Often times this involves increasing “ownership of the policy” by including the teachers in its development (Dexter 2008; Kowch 2009; Davies 2010). Districts that build in more opportunity for incorporating teacher input into policy development should see more support. This is the case in the present study. It has been shown that the leadership structure in District A currently involves very little teacher input. Less than 50% of survey respondents in District A agreed that there was support among teachers for the district’s vision for technology use. District B has increased the overall commitment to distributed leadership through the formation of a centralized team, but this sense of ownership and involvement has not yet been transferred to the “street-level.” District C, with its building level technology teams and strong network of teacher leadership, has a strong majority (76%) of respondents agreeing with the notion that teachers support the common vision for technology use in the school.
The review of the district technology plans helps to explain the extent to which the three districts’ vision for technology integration. The technology plan in District A was written by the district’s DTC and was not made public. It referenced the ISTE standards briefly but did not go into detail in laying out a specific plan for technology integration that meets these standards. The plans in District B and District C were both developed with large stakeholder committees and widely publicized. Both of these documents went into detail about ways in which the ISTE standards would be put into practice in the respective districts. The only substantive difference between the two is the length of time that the detailed plan has been in place. The plan in District B has been developed over the course of the past three years and the plan in District C has been in place for over a decade.
Internet connectivity. There was a marked difference in the reported internet connectivity and reliability between District C and the other two districts (Figure 4-12). First and second generation policy implementation research clearly emphasizes the importance of an organization’s resource capacity to its ability to implement policy (Gross et al. 1971; Huberman and Miles 1984; McLaughlin 1987). For technology-related policy, this would clearly include reliable internet connectivity. In fact, the Smart Schools Bond funding of 2014 includes a requirement that schools meet a minimum level of connectivity (100 Mbps per 1000 students) prior to applying for funding to support any other technology purchasing (NYSED 2014).

![Internet connectivity and reliability](chart)

**Figure 4-12: Internet connectivity and reliability**

In the administrative questionnaire, District A did not include wireless infrastructure in its list of significant expenditures over the past three years.
District B reported spending approximately $1,500,000 recently to improve its wireless infrastructure. This work was not completed prior to the administration of the survey. District C reported spending $100,000 in maintenance of its wireless infrastructure over the past three years.

The variability in technological infrastructure among the districts underscores the complex nature of developing a strong IT leadership structure. A fast and reliable wireless internet structure is expensive for a school district. It requires the commitment of leaders with the formal position to influence a significant investment of funds. Once the funding is secured, it requires leadership with the knowledge and understanding to accomplish the task effectively.

**Hardware availability.** The availability of the appropriate hardware and software resources for students and teachers is listed in the ISTE standards as an important responsibility of IT leadership. It is difficult to achieve the levels of technology integration called for in the standards without access to the appropriate resources.

The results of survey question #9, asking respondents if they agreed that the amount of money allocated for technology in their school was sufficient, reflect the consistent trend of increased agreement moving from District A to District C was repeated. District A reported 28% agreement while District B reported 58% agreement. In District C, 75% agreed. When asked specifically if students and teachers had ample access to hardware and used the hardware regularly, the results were similar (Figure 4-13).
Table 4-19 lists the ratio of computer devices per individual (includes total number of students, teachers, administrators and support staff. This data is presented to give a basic comparison. Ratio for staff members is often one-to-one, which would likely increase student ratios in District A and District B. Computers are often housed in clusters with high densities in computer labs and library media centers. However, it is clear that there is higher access to devices in District C than in the other two districts.

<table>
<thead>
<tr>
<th>District</th>
<th>Students</th>
<th>Staff</th>
<th>Computer Devices</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>District A</td>
<td>2600</td>
<td>310</td>
<td>1600</td>
<td>1.81 : 1</td>
</tr>
<tr>
<td>District B</td>
<td>2000</td>
<td>222</td>
<td>1260</td>
<td>1.76 : 1</td>
</tr>
<tr>
<td>District C</td>
<td>3500</td>
<td>360</td>
<td>4425</td>
<td>0.87 : 1</td>
</tr>
</tbody>
</table>

Table 4-19: Ratio of Computer Devices to Students/Staff
As with the case of internet connectivity, the acquisition of large numbers of computers is a complicated and expensive undertaking. It requires an IT leadership structure with the formal power to authorize these expenditures and set a vision for how the hardware will be used. A successful hardware plan must go further than just purchasing computers and plugging them into the wall. It must address questions about how the computers will be distributed, stored, accessed, and repaired. It requires a leadership structure that includes the qualities suggested earlier, including formal power, vision and expertise, and a commitment to shared decision-making and professional development. For example, District C has implemented a one-to-one student-to-laptop program district-wide. This type of deployment requires a leadership structure that has the vision and expertise to plan this large-scale initiative and the formal power to authorize significant expenditures. It also requires a leadership structure committed to shared decision-making with respect to the myriad of logistical issues that will arise in this large scale policy change. Finally, it requires leadership with the commitment necessary to provide high quality professional development in the new pedagogical model.

**Prevalence of technology-related pedagogies.** This study did not directly examine classrooms and observe the level to which technology integration supported the ISTE standards. A glimpse of the prevalence of various technology-related pedagogies was gathered through the survey. Each of the items listed in survey questions 17 and 18 represent specific technologies recommended in the ISTE standards as helpful in achieving more effective technology integration for students. Figure 4-14 compares the extent to which respondents in each of the
districts reported that the particular technology-related pedagogies were “sometimes” or “widely” used in their district.

Figure 4-14: Comparison of prevalence of various technology-related pedagogies across districts.

Once again District C shows the highest percentage of respondents who indicate that these pedagogies are sometimes or widely used. This further supports the idea that the ISTE standards are being more broadly implemented in District C than in the other districts. For example, ISTE Standard 1 encourages schools to give
students the opportunity to demonstrate creativity and innovation. The survey indicates that art and graphics software and STEM-related software is more broadly used in District C than in the other districts. Standard 2 encourages schools to promote the use of digital tools to communicate and work collaboratively. 90% of respondents in District C report use of communications software in teaching and learning, including 46% reporting wide use. 89% of respondents indicate the use of collaborative software in the classroom, with 54% reporting wide use. Although these pedagogies are present in District A and District B, they are not integrated to nearly the level that is reported in District C.

In conclusion, some evidence of the implementation of best practices was seen in each of the three districts. However, there are clear indications that there are differences in the level at which these practices are integrated and widely accepted across each district. In each of the cases, a majority of teachers recognize that their district has a vision for technology use. However, only District C reports that a large majority of its teachers support the vision. The technology plans of all three districts reference the ISTE standards to some extent. However, the plans in District B and District C provide a specific roadmap for increasing the integration of these standards. District C has a fast and reliable wireless infrastructure. District B is in the process of making significant investments toward upgrading internet connectivity. District A will be required to invest in a similar high-quality network through Smart Schools Bond funding in the near future. Districts A and B have approximately one computer for every two individuals in the school community. District C has achieved a one-to-one ratio. In each of the three districts, we see that
technology-related pedagogies are also showing up as “sometimes used” in different pockets and different buildings. However, the reported “wide use” of these pedagogies are much more prevalent in District C.

Summary

This chapter has documented significant differences in the IT leadership structures among the three districts studied. It was suggested that there are three categories of a technology leadership structure based upon the districts’ circumstances and that these categories could be viewed as evolving stages: Stage I: Reactive and Stabilizing, Stage II: Visionary and Shared, and Stage III: Engaged and Local. The observation was made that there are four important qualities in an IT leader that are supported by research on policy implementation: 1) the individual has the formal power to effect significant change within the organization; 2) the individual has a strong student-centered focus and expertise in championing technology as a tool for improving teaching and learning and shares that focus in a positive and inspiring manner; 3) the individual incorporates authentic input and shared decision-making for teachers, administrators, and other stakeholders into the IT leadership process; and 4) the individual has a strong commitment to providing meaningful professional development.

In addition to examining IT leadership structure, the study of the three districts looked at the extent to which technology-related best practice was implemented in each district. Results demonstrated that there is variation in the level at which best practice is integrated and widespread in the different districts.
Research question 4e asks: “Can any observations be made about the relationship between IT leadership structure and effective implementation of technology best-practice?” This discussion will be taken up in Chapter 5.
Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

The research literature describes the historical development of school IT leadership as a largely reactive response to the rapid influx of new technologies over the past 25 years. Schools have often been forced to put individuals in leadership positions reactively in order to help them manage technologies that are thrust upon them. This study seeks to help reverse this “build the plane while it is flying” approach. Rather than constantly reacting, it is desirable that school districts make deliberate choices about their leadership structure in order to put them in the best position to implement technology-related best-practice. This study set out to gain insight into “what works” and perhaps to provide guidance for proactive design of an IT leadership structure.

Research question 4d asks, “Can any observations be made about the relationship between IT leadership structure and effective implementation?” Ultimately, gaining insight into the answer to this question is the main purpose of this study.

The study describes three school districts that are working hard to “get it right.” As technology becomes ubiquitous in our society and technology-related best practice becomes more clearly identified and understood, school leaders typically want to incorporate technology successfully into the instructional and operational work of the district. It is clear that in all three districts student access to technology is highly valued by faculty and administration. However, schools exist in a milieu of
external influences. The resource capacity to support technology effectively and human capacity to understand, harness, and lead it appropriately are constantly in flux. These variables make it difficult for schools to accomplish technology-related goals. Without a deliberate, research-supported approach to technology leadership, it is difficult for schools to find sustained success.

As we look at the IT leadership structures of these districts in the context of the environmental factors that they face, we can understand why each is in its respective state. We can describe each district as being in one of three different stages of development, each one evolving from and building upon the one before it.

District A, having lost a District Technology Coordinator (DTC) due to financial stress and having faced a crisis in public confidence brought on by significant infrastructure concerns, is in a reactive and stabilizing stage. This emphasizes a primary need for stability. First and foremost, the district must have a reliable, stable technology foundation. Teachers, parents, and community members must be confident that there are individuals in the district who can make things work the way they are supposed to work. The implication is that a district must, above all else, have a reliable infrastructure and a team of technical experts that are capable of reacting to changes in the technology landscape and supporting the basic operational needs of the district.

While stability is critical, it is obtained at a cost. In order to shore up the technical structure of the district, it is necessary to standardize and centralize. Because this is often urgent work, the lengthy processes of gaining stakeholder input and employing shared decision-making are impractical. When technology
systems are in crisis, there are often few immediate choices. Rapid, basic solutions must be enacted to address the crisis. As discussed in Chapter 4, policy implementation research clearly predicts the difficulties that will result from this approach to leadership. The lack of authentic involvement of stakeholders makes it difficult to gain the support of the “street-level” members of the organization. Without the support of teachers and principals at the grassroots level, new policies are not embraced, peer-to-peer teaching does not occur, and ultimately the process of building capacity among members of the organization becomes very difficult.

The lack of a clearly articulated and organization-wide approach to integration of technology in District A is clearly seen in the survey and interview responses. Teachers and principals identify weaknesses in (and frustration with) the district’s technological infrastructure. Teachers express confusion about the technology leadership structure. They repeatedly indicate that they do not feel that they are a part of the technology-related decision-making process. Their support for a common and widely supported vision is mixed. The widespread use of various technology-related pedagogies across the district is limited.

At the same time, District A teachers and principals express strong support for the value of technology in the teaching and learning process. They identify effective technology teacher-leaders and indicate the value that these individuals have for helping technology integration. They express their belief that professional development is critical to success.

District A is working through a stabilizing period during which they are reacting to changes in the technological environment and seeking ways to harness
it, to lead it, and leverage it in their work. As they look to other districts with more developed IT leadership structures, they will find that answers lie in untapped resources that already exist within the organization, specifically teacher leadership for technology-related decision-making and professional development. A district that could provide an example for them would be one like District B.

Three years ago, District B had achieved the stability currently sought in District A. They had a long-tenured, technically strong DTC. They had tight controls on technological systems. They had a uniform approach to device use and software access. However, these elements were not enough to yield effective pedagogy and operations management. Once this stability was achieved there was recognition that technology was not being leveraged in any appreciable way to improve teaching and learning or to enhance the operations of the organization.

In order to move forward, District B specifically tailored their superintendent search to seek out a strong, visionary leader for technology. The new superintendent immediately created a large stakeholder group to develop an instructionally focused long-range technology plan. She identified teachers who had the ability and desire to help make decisions about technology and she empowered them to work. District B is in a visionary and shared stage. This stage recognizes that, in addition to stability, a district needs a strong visionary leader who understands technology-related best practice in the educational setting. While this leader does not necessarily need to be a technical expert, they should have a working knowledge of technology and expertise in educational aspects of the field. The leader should also be willing reach out to a broad spectrum of stakeholders and include them in
decisions about how best to implement such policy. Furthermore, the leader, and the organization as a whole, must have a strong commitment to professional development. As discussed earlier, allowing teachers to have real influence and decision-making power as well as strong assistance in the form of resources, training, and outside consulting have long been associated with improved implementation of policy.

Implementation of technology-related best practice is expensive and complicated. As a result, the visionary and shared stage of the IT leadership model suggests that the individual who is formally recognized as the technology leader in a district should not only possesses a student-centered vision for technology integration and a commitment to shared decision-making and professional development but should also have the formal power to effect the necessary changes for implementation to occur. In District B the formal technology leader is the superintendent. However, the role could be taken by any one of a number of individuals in a typical school district. The formal technology leader could be a designated DTC. It could be a principal or an assistant superintendent. Regardless of the official title of the individual, it is critical that the vision of that individual is shared by the organization as a whole and that the leader is given the power to enact and support change.

While District B has a district-level commitment to visionary and shared leadership of technology, there is evidence that technology-related best practice is not yet as widely adopted in this district as the superintendent and the Tech Cabinet would like it to be. There is still considerable confusion among faculty members as
to how technology-related decisions are made. There is a sense that there are technology “haves and have-nots.” While it is widely recognized that a technology plan exists, support for the plan by teachers lags behind. Use of technology-related pedagogies across the district is inconsistent.

The findings discussed above are understandable given that the structure in District B was very new. At the time of the study, the Tech Cabinet had only been in place for a year. Most of its major decisions are in the early stages of implementation at the building level. While the technology leadership structure was designed to value shared leadership and a commitment to professional development, there are many ways that these qualities can ultimately take shape. It would be valuable for the leadership of District B to examine a district that has been successful in institutionalizing these principles in its leadership structure over a period of time. This guidance would be especially important if it could be shown that commitment to these values leads to strong outcomes.

District C provides just such a model. All of the important leadership qualities present in District B are also found in District C. There is a strong visionary leader with formal power. The leadership has a commitment to a student-centered focus on technology as a tool for improving teaching and learning. There is a structure that incorporates shared leadership and decision-making. There is a commitment to professional development.

The value of studying District C lies in the longevity of the leadership structure. Each of the important qualities of leadership in District C has evolved and matured over time into a structure that can be described as *engaged and local.*
Rather than the formal leadership being provided by the superintendent, District C has a strong visionary DTC. The formal power necessary to accomplish the work of technology-leadership has been vested in this individual. The DTC has an educational and administrative background.

The district champions a bold, student-centered vision for technology use through a long-standing and well-publicized technology plan designed by stakeholders. The plan insists on the integration of technology. Furthermore, it challenges all teachers to use technology in ways that are not necessarily intended to replace traditional activities but rather to enhance teaching and learning.

Shared-decision making power in District C has moved from the district-level to building-level technology committees in each school. This building-centric model ensures that there are multiple teachers who are at the forefront of technology integration within each building in the district. These teachers, who represent their colleagues, are given authority to have direct input into day-to-day decisions regarding technology. Teachers who serve on the building committees also receive technology training from the district experts. In turn, these teacher-leaders become a ubiquitous source of meaningful, real-time professional development for other teachers in their building.

District C demonstrated consistently positive progress related to the implementation of technology. The technological infrastructure of the district is strong and reliable. There is a common vision that is supported by a sizeable majority of teachers. There is a sense of teacher ownership of technology-related
decisions and professional development. Finally, the faculty reports wide use of technology-related pedagogies across the district.

Common elements exist among all three districts. It is the presence of these commonalities, progressively more defined, that suggests that the technology leadership structure in each district is evolving. The strength of the leadership structure in District C underscores the importance of studying and learning from this evolution.

**Recommendations for Policy and Leadership**

Many school districts are looking to design IT Leadership structures that are effective in helping them to manage and leverage the rapid influx of technology in schools and in society at large. As discussed below, this study suggests six key areas of recommendations for policy makers and educational leaders who aim to create strong IT leadership in schools.

1. **Develop a strong, stable infrastructure.** First of all, reminiscent of a technological version of Maslow's hierarchy, it is critical that districts have a stable, robust, and secure infrastructure in order to operate effectively. Districts must have a plan for maintaining adequate capacity, connectivity, and bandwidth and a plan for keeping network hardware up-to-date. A good approach to IT leadership must start with quality technical expertise. Districts can hire technology consultants on their own or through Boards of Cooperative Educational Services (BOCES) Regional Information Centers (RICs). Private companies and BOCES RICs can provide technical audits of a
district’s infrastructure, indicate weaknesses in the infrastructure, and provide a plan for improvement.

2. **Identify a formal district technology leader.** Once a district has a plan for a robust, stable, and secure infrastructure, it can turn to the development of a similarly strong IT leadership structure. The first step is the identification of a formal technology leader. This leader could be the superintendent or another leader in the district including an assistant superintendent, a principal, or a specific district technology coordinator. This study suggests that it is important that this IT leader be in a position of formal power at the district level. Thus, this leader should most likely have administrative certification. In addition to an administrative skill set, the IT leader should have expertise in several key areas:

   a. **Technical Expertise.** The district technology leader should be technically competent. The technology leader does not have to be a computer technician or have a background in networking or computer science. However, the individual should have a solid technical understanding of the basics of networking and a working knowledge of other important areas such as hardware configurations, technology purchasing, and database management.

   b. **Instructional Expertise.** The district’s technology leader should have extensive training in technology-related pedagogy. It is essential that the individual have expertise in using technology to support, enhance,
and transform teaching and learning. The individual should be able to champion these ideas across the organization.

c. **Training in Shared-Leadership.** The district’s technology leader should have training and a high comfort level in working in a distributed leadership or shared-decision making environment. Although formal leaders are ultimately responsible for making decisions, it is essential that the formal technology leader be comfortable in working with teams of teachers to gather input and help to make consensus decisions whenever possible.

d. **Commitment to Professional Development.** The district’s technology leader should be skilled at teaching teachers and committed to promoting extensive professional development across the district.

Any district that currently has a designated technology leader would do well to provide that individual with training and encouragement in each of the four areas mentioned above.

There is currently no certification for a District Technology Leader in New York State. These findings suggest that policy makers should develop specialized certification in “technology leadership” that emphasizes competency in these key areas. Graduate programs that prepare educators for administrative certification should design courses and program strands in these key areas to prepare these specialized leaders for effective
technology leadership. In the absence of specific state certification for technology leadership, a specific endorsement from a college or university graduate program would be helpful.

3. **Create and publish a district technology plan.** The three case studies suggest that it is very important to have a district technology plan. This plan should be developed by a broad group of stakeholders from the school and community. The plan should describe a vision for the use of technology in the district. The plan should make district expectations for technology use very clear and direct. It should promote technology as a tool for enhancing and transforming teaching and learning. The plan should be reviewed and updated often, perhaps published on a web page rather than written as a static document.

4. **Develop authentic shared decision-making structures.** Districts should build a structure that incorporates teacher-input and the development of consensus whenever possible. As discussed earlier, implementation research continually emphasizes the value of shared leadership when introducing new policy. The three case studies indicated that shared decision-making was important at the district level as a means of advising large-scale district-level decisions. The findings indicated that “top-down” decisions on major issues were acceptable to faculty when teachers had the opportunity for meaningful input. The findings also suggested that teacher autonomy at the classroom level was very effective in encouraging technology integration. Finally, the case studies highlighted the importance of local, building-level teams of
teachers helping to make decisions about day-to-day implementation in each individual school. The three cases suggested that it is valuable to identify multiple teachers in each building as technology teacher-leaders because teachers place high value on decisions supported by colleagues that they view as experts. It is also important to have the support of principals and other administrators for building-level shared decision-making. Authentic consideration of the recommendations of a shared decision-making process by the building leadership is key to its success.

5. **Support teacher-to-teacher professional development.** The case studies consistently showed that teachers value the leadership and expertise of other teachers. This is supported in research on policy implementation. As part of the commitment to teacher leadership and building-level shared decision-making, district technology leaders should identify groups of teacher-leaders at the building level and provide them with high quality training. Such teachers can then be very effective, in turn, at providing training to their colleagues.

6. **Promote stability in leadership structure.** The findings suggested that there is value in long-term, stable structures for technology leadership. Districts should look to promote this stability by supporting the formal technology leader and the technology plan. Long-term acceptance and stability of the leadership structure can also be promoted by encouraging involvement of principals and other administrators in the work of technology leadership. In order to maximize the impact of the previous five elements, it
is important that these middle-level administrators embrace the vision of technology integration and a culture of shared decision-making and rich professional development.

**Limitations of the Study**

While the three case studies involved triangulation and yielded rich data, several limitations merit discussion. First, the sample was limited to three districts. Given the in-depth interview and survey work conducted for each case, it was not feasible to examine a larger number of school districts. Additional cases might provide deeper insight into the validity of the leadership structure classification scheme and the characteristics of effective technology leadership suggested by this research.

A second, related concern is the applicability of findings across a variety of school sizes and types. The research design for this study purposely focused on examining similar districts. Districts A, B, and C are fairly large suburban school districts in a similar geographic location. The findings of this study do not address how variables such as district size, school setting (rural, suburban, urban), and socioeconomic factors might influence the development of effective IT leadership structures.

A third limitation of the study is the lack of direct observation of technology use in teaching and other district operations. The three case studies included interview data and responses to survey questions about vision, professional development, and the prevalence of various technology-related pedagogies. The
formal technology plans in the three districts were also examined. These methods yielded valuable insights on the extent to which technology best-practice was being implemented in each district. Our confidence in the findings could be enhanced by the addition of direct observations in each district.

The basic nature of technology in schools may stabilize in the coming decade. However, if technology continues to change rapidly, leading to new demands on educators, it may be difficult to identify “best practices” with confidence for the long-term. In this scenario, it is likely that schools will continue to struggle reactively to develop effective leadership structures. Even so, a more thorough and thoughtful understanding of effective technology leadership will aid schools in the process of adapting to these continual changes.

**Recommendations for Future Research**

This research adds to the relatively scant body of scholarly research on IT leadership in schools. This examination of IT leadership structures in three large suburban school districts provides instructive findings regarding the design of effective IT leadership structures. There are four main recommendations for future research on IT leadership in schools.

First, future research could assess the general applicability of the IT leadership classification scheme presented herein via case studies that examine a broader range of districts. Second, future research could look more deeply into the concept of “effective implementation of best-practice” by observing classrooms directly. Third, the case study findings suggest that a more detailed look at the role
of shared-decision making in technology leadership could help to identify the most important elements of such processes and aspects that typically hamper effective IT policy implementation. Finally, future research that looks more closely at teacher-led professional development in technology would be instructive. The study findings indicated that teachers are especially receptive to peer instruction on technology matters. It would be useful for researchers to directly observe the quality of such instruction.

The rapid development of computers, internet connectivity, and a wide variety of related instructional technologies have had a dramatic impact on schools over the past twenty five years. The introduction of these technologies has cost schools in the United States tens of billions of dollars. The rapid availability of information, the development of collaborative software, and the design of new devices have affected the core of schooling. Schools leaders may often find themselves in a position of reactivity because they do not have IT leadership structures that anticipate, manage, and leverage these powerful changes. As a result, schools waste funds, put data at risk, and limit opportunities for students. Such missteps should be strong motivation for scholars and policy makers to continue to research and promote principles of effective IT leadership for schools.
Appendix A

District Interview Protocol

This interview will be conducted with the superintendent of schools, the District Technology Coordinator, and any other district level personnel responsible for the integration of technology into the operational and instructional work of the district.

1. Please describe your involvement with the integration of technology in the school district. *(Discuss interviewee’s background and ascertain comfort with technology and overall philosophy the role of technology in operations of a district and in educational process.)*

2. What do you see as the district’s greatest strength with respect to technology?

3. What are areas in need of improvement for the district with respect to technology?

4. Please describe the formal technology leadership structure in your district. Thinking back over the past twenty years, has this structure changed over time? If so, how? Why?

5. How does the technology-related decision-making process work in your district? Can you give an example of a major technology-related decision and how it was made?

6. The job of integrating technology is sometimes described as fourfold- a) setting vision; b) developing and administering budgets; c) leading integration of technology into the day to day work of teachers and staff; and c) providing technical support. Lets talk about each of these:
   a. How is a vision for technology use developed in your district?
   b. How are decisions about spending on technology made in your district?
   c. How is the integration of technology into the work of teachers, staff, and students led?
   d. How does your district provide technical support?

   *(Follow-up each of these questions with questions about the individuals (roles) involved with each area of IT decision making to clarify the extent to which actual decisions are distributed.)*

7. Is there anyone else that you think I should talk to regarding technology leadership in your district?
Appendix B

Building (Principal and Teacher) Interview Protocol

This interview will be conducted with the school principal and 4-5 teachers identified by the principal in an effort to learn about the technology-related decision making process within the school and the larger school district.

1. What do you see as your school’s greatest strength with respect to technology?

2. What are areas in need of improvement with respect to technology?

3. Please describe the formal technology leadership structure in your school and/or district. Thinking back over the past twenty years, has this structure changed over time? If so, how? Why?

4. How does the technology-related decision-making process work in your school and in your district? Can you give an example of a recent major technology-related decision and how it was made?

5. The job of integrating technology is sometimes described as fourfold- a) setting vision; b) developing and administering budgets; c) leading integration of technology into the day to day work of teachers and staff; and c) providing technical support. Let’s talk about each of these:
   a. How is a vision for technology use developed in your school and/or district?
   b. How are decisions about spending on technology made in your school and/or district?
   c. How is the integration of technology into the work of teachers, staff, and students led?
   d. How does your school and/or district provide technical support?

   (Follow-up each of these questions with questions about the individuals (roles) involved with each area of IT decision making to clarify the extent to which actual decisions are distributed.)

6. (Principal only) Can you give me the names of 4-5 teachers that I could interview regarding technology use in your building? Clarify that these could be teachers that use technology frequently or those that are more hesitant to use technology- it is most important that they have insight into technology decision making in the school.
Appendix C

School Technology Use Survey * Teachers

This short survey is being used to gather data about technology in your particular school building. It consists of 21 questions with some options to comment. It should take about 10 minutes. Please answer questions from the perspective of your building. All results are anonymous. In order to proceed, please read the Informed Consent statement below and check the box at the bottom of the page.

* Required

Informed Consent

Protocol (Study) Number
Study Title Investigating IT Leadership Models in Schools
Study Principal Investigator Name Patrick M. McGrath Jr.
Study Principal Investigator Phone # (518) 399-9141 ext. 85002
Study Principal Investigator Email address pmcgrath@tbhi.org

This is a research study. You are being asked to participate in this research study because the opinion of educators on the structure and effectiveness of technology leadership in schools is an important and timely subject. This study is being done to help add to the research on effective technology leadership models. You will be asked to respond to a series of questions regarding technology in your school. This survey should take approximately ten minutes. All survey data is being collected anonymously from teachers in your school. There are no requests for demographic or personally identifiable information. The study will help provide insight into effective structures for IT leadership, benefiting the educational community at large. Aggregate data for each school will be made available when the study is complete. There is no payment or cost for participation.

All information collected in this survey is anonymous. It is being collected for research purposes only. All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board, the sponsor of the study (e.g. NIH, FDA, etc.) and University or government officials responsible for monitoring this study may inspect these records. You should also know that participation in research is entirely voluntary. Even after you agree to participate in the research, you may decide to leave the study at any time without penalty or loss of benefits to which you may otherwise have been entitled. You should also be aware that the investigator may withdraw you from participation at his/her professional discretion. Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact the principal investigator or the researcher's faculty advisor:

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Research at the University Albany involving human participants is carried out under the oversight of the Institutional Review Board (IRB). This research has been reviewed and approved by the IRB. If you have any questions concerning your rights as a research subject or if you wish to report any concerns about the study, you may contact University at Albany Office of Regulatory &
Research Compliance at 1-866-857-5459 or hsoncerns@albany.edu.

This project has been approved by the University at Albany Institutional Review Board. Approval of this project only signifies that the procedures adequately protect the rights and welfare of the participants. Please note that absolute confidentiality cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

You can print a copy of this document or request one from the researcher using the contact information above.

Informed Consent

Please check the box below if you have read the above statement and you wish to continue.

1. *
   Check all that apply.
   
   - I have read the informed consent information above and I want to participate in the survey.

Vision and Leadership

2. Vision
   In my school building, there is a technology plan or a commonly understood vision for technology use. Mark only one oval.
   
   - Strongly Agree
   - Agree
   - No Opinion
   - Disagree
   - Strongly Disagree

3. Technology Innovators
   In my school building, teachers who are technology innovators are seen as leaders. Mark only one oval.
   
   - Strongly Agree
   - Agree
   - No Opinion
   - Disagree
   - Strongly Disagree
4. **Administrators**  
In my school building, administrators model effective uses of technology and promote technology integration.  
*Mark only one oval.*  
[ ] Strongly Agree  
[ ] Agree  
[ ] No Opinion  
[ ] Disagree  
[ ] Strongly Disagree

5. **Support for Vision**  
In my school building, teachers and other staff members support a common vision for technology in the school.  
*Mark only one oval.*  
[ ] Strongly Agree  
[ ] Agree  
[ ] No Opinion  
[ ] Disagree  
[ ] Strongly Disagree

6. **Teacher Input**  
In my school, teachers have significant input setting the direction for technology integration.  
*Mark only one oval.*  
[ ] Strongly Agree  
[ ] Agree  
[ ] No Opinion  
[ ] Disagree  
[ ] Strongly Disagree

7. **Teacher Input**  
In my school building, teachers are part of the decision-making process regarding technology integration.  
*Mark only one oval.*  
[ ] Strongly Agree  
[ ] Agree  
[ ] No Opinion  
[ ] Disagree  
[ ] Strongly Disagree
8. Other Comments on Vision and Leadership
   Please feel free to offer any other comments about Technology Vision and Leadership in your school building:
   
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Resources and Budget

9. Budget Allocations
   In my school building, the amount of money budgeted for technology is sufficient. *Mark only one oval.*
   ○ Strongly Agree
   ○ Agree
   ○ No Opinion
   ○ Disagree
   ○ Strongly Disagree

10. Internet Connection
    In my school, reliability and speed of internet connections are sufficient (e.g., wireless connections, streaming speed, etc.) *Mark only one oval.*
    ○ Strongly Agree
    ○ Agree
    ○ No Opinion
    ○ Disagree
    ○ Strongly Disagree

11. Access to Hardware
    In my school building, teachers and students have access to technology resources in the following ways (check all that apply): *Check all that apply.*
    ○ Library Media Center
    ○ Computer Labs
    ○ Mobile Computer Carts
    ○ Students have access to a Dedicated (one-to-one) Device
    ○ No Opinion
    ○ Other: ......................................................................................................................
12. Access to Hardware
In my school building, students and teachers have ample access to hardware (eg. computers, projectors, cameras, etc.) and use the hardware regularly. 
*Mark only one oval.*
- [ ] Strongly Agree
- [ ] Agree
- [ ] No Opinion
- [ ] Disagree
- [ ] Strongly Disagree

13. Access to Software
In my school building, teachers have ample access to software and electronic resources. 
*Mark only one oval.*
- [ ] Strongly Agree
- [ ] Agree
- [ ] No Opinion
- [ ] Disagree
- [ ] Strongly Disagree

14. Teacher Input
In my school building, teachers play an active role in making decisions about hardware and software purchases. 
*Mark only one oval.*
- [ ] Strongly Agree
- [ ] Agree
- [ ] No Opinion
- [ ] Disagree
- [ ] Strongly Disagree

15. Other Comments on Resources and Budget
Please feel free to offer any other comments about Technology Resources and Budget in your school building:

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Integration of Technology in Teaching and Learning
16. Various Technologies used in my School
In my school building, indicate the extent to which the following technologies are utilized in teaching and learning:
Mark only one oval per row.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Widely used</th>
<th>Sometimes used</th>
<th>Rarely used</th>
<th>Not used at all</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software that promotes communication among students and teachers (as appropriate for grade level).</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Software that allows student and teachers to collaborate on work.</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>A Learning Management System (eg. Blackboard, Moodle, etc.)</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Online tutorial software (eg. iReady, Successmaker, Study Island, etc.)</td>
<td>☐</td>
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<tr>
<td>Online Coursework (eg. NovaNet, Plato, etc.)</td>
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<td>☐</td>
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</tbody>
</table>

17. Various Technologies used in my School (continued)
In my school building, indicate the extent to which the following technologies are utilized in teaching and learning:
Mark only one oval per row.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Widely used</th>
<th>Sometimes used</th>
<th>Rarely used</th>
<th>Not used at all</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flipped-Classroom videos</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Presentation Software (Powerpoint, Prezi, Video Editing, etc.)</td>
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<tr>
<td>Art and Graphics related Technologies (eg. Photoshop, iMovie, etc.)</td>
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<tr>
<td>STEM specific technologies (eg. robotics, scientific probes, CNC)</td>
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<tr>
<td>Online Textbooks</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Game-based learning</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

18. Other Technologies (optional)
Please indicate any other ways that technology is integrated into the teaching and learning process in your school building:

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19. Importance of Integration of Technology in Teaching and Learning

It is important to provide students with regular and integrated access to technology (hardware and software) in school.  
Mark only one oval.

☐ Strongly Agree
☐ Agree
☐ No Opinion
☐ Disagree
☐ Strongly Disagree

20. Professional Development

In my school building, teachers have ample access to professional development in the area of technology integration.  
Mark only one oval.

☐ Strongly Agree
☐ Agree
☐ No Opinion
☐ Disagree
☐ Strongly Disagree

21. Professional Development

In my school building, teachers are involved in planning and conducting professional development in the area of technology integration.  
Mark only one oval.

☐ Strongly Agree
☐ Agree
☐ No Opinion
☐ Disagree
☐ Strongly Disagree

22. Other Comments on Technology Integration

Please feel free to offer any other comments about the Integration of Technology in Teaching and Learning in your school building:

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Technical Support
23. **Accessing Technical Support**
   In my school building, teachers have timely and ample access to technical support.  
   *Mark only one oval.*
   
   - [ ] Strongly Agree
   - [ ] Agree
   - [ ] No Opinion
   - [ ] Disagree
   - [ ] Strongly Disagree

24. **Accessing Technical Support**
   In my school, technical support for teachers is accessed in the following ways (check all that apply):
   *Check all that apply.*
   
   - [ ] Submitting a formal "Help Ticket"
   - [ ] Calling Tech Support on the phone
   - [ ] E-mailing Tech Support
   - [ ] Asking a colleague for help
   - [ ] Asking a technical person in the building for help
   - [ ] No Opinion
   - [ ] Other: .................................................................

25. **Accessing Technical Support**
   My PREFERRED method of technical support is (check only one):
   *Check all that apply.*
   
   - [ ] Submitting a formal "Help Ticket"
   - [ ] Calling Tech Support on the phone
   - [ ] E-mailing Tech Support
   - [ ] Asking a colleague for help
   - [ ] Asking a technical person in the building for help
   - [ ] No Opinion
   - [ ] Other: .................................................................

26. **Teacher Input**
   In my school building, teachers help design how technical support is provided.
   *Mark only one oval.*
   
   - [ ] Strongly Agree
   - [ ] Agree
   - [ ] No Opinion
   - [ ] Disagree
   - [ ] Strongly Disagree
27. **Other Comments on Technical Support**
   Please feel free to offer any other comments about Technical Support in your school building:

   .....................................................
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   .....................................................
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Appendix D

Administrative Questionnaire *District Technology Coordinator & Principals

Thanks for agreeing to participate in this case study. This short survey will help to prepare for the face-to-face interview by giving you some examples of the types of items that will be discussed in the interview and some of the documents and artifacts that will be helpful to the study.

* Required

Informed Consent

Protocol (Study) Number
Study Title Investigating IT Leadership Models in Schools
Study Principal Investigator Name Patrick M. McGrath Jr.
Study Principal Investigator Phone # (518) 399-8141 ext. 85002
Study Principal Investigator Email address pmcgrath@hhbri

This is a research study. You are being asked to participate in this research study because the opinion of educators on the structure and effectiveness of technology leadership in schools is an important and timely subject. This study is being done to help add to the research on effective technology leadership models. You will be asked to respond to a series of questions regarding technology in your school. This survey should take approximately ten minutes. All survey data is being collected anonymously from teachers in your school. There are no requests for demographic or personally identifiable information. The study will help provide insight into effective structures for IT leadership, benefiting the educational community at large. Aggregate data for each school will be made available when the study is complete. There is no payment or cost for participation.

All information collected in this survey is anonymous. It is being collected for research purposes only. All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board, the sponsor of the study (e.g. NIH, FDA, etc.) and University or government officials responsible for monitoring this study may inspect these records. You should also know that participation in research is entirely voluntary. Even after you agree to participate in the research, you may decide to leave the study at any time without penalty or loss of benefits to which you may otherwise have been entitled. You should also be aware that the investigator may withdraw you from participation at his/her professional discretion. Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact the principal investigator or the researcher’s faculty advisor:

Sandra Vergari, Ph.D.
Associate Professor
Dept. of Ed. Admin. and Policy Studies
Education Bldg #344
State University of New York at Albany
Albany, NY 12222
Email: avergari@albany.edu
Phone: 518-442-5080

Research at the University Albany involving human participants is carried out under the oversight of the Institutional Review Board (IRB). This research has been reviewed and approved by the IRB. If you have any questions concerning your rights as a research subject or if you wish to report any concerns about the study, you may contact University at Albany Office of Regulatory &
Research Compliance at 1-866-857-5459 or hsscomments@albany.edu.

This project has been approved by the University at Albany Institutional Review Board. Approval of this project only signifies that the procedures adequately protect the rights and welfare of the participants. Please note that absolute confidentiality cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

You can print a copy of this document or request one from the researcher using the contact information above.

Informed Consent

Please check the box below if you have read the above statement and you wish to continue.

1. *
   Check all that apply.
   - I have read the informed consent information above and I want to participate in the survey.

District Technology Coordinator and Principals

2. Role *
   What is your role in the district?
   Mark only one oval.
   - District Technology Coordinator Skip to question 3.
   - Building Principal Skip to question 13.

District Technology Coordinator

3. Does the District have a District Technology Plan?
   Mark only one oval.
   - Yes
   - No

4. Web address of District Technology plan (if applicable)
   (If not available online, please bring a copy of the District Technology Plan to the interview.)

5. Does the district have a District Technology Committee?
   Mark only one oval.
   - Yes
   - No
6. **Web Address of Minutes/Agendas from District Technology Committee (if applicable).**
   (If not available online, please bring samples of minutes and/or agendas from 2-3 meetings during the past year to the interview.)

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7. **Does the district have technology benchmarks or a "scope and sequence" that describes the technology related competencies that students are expected to achieve at each grade level?**
   *Mark only one oval.*
   
   ☐ Yes
   ☐ No

8. **Please provide a link to the technology benchmarks or scope and sequence (if applicable).**
   (If benchmarks exist but are not available online, please bring a hard copy to the interview.)

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9. **Please list some of the major technology expenses/purchases within the district over the past 3 years. Please provide approximate costs.**

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10. What district level employee(s) are mostly responsible for helping teachers to integrate technology into their classrooms and coursework?
   (Check all that apply)
   Check all that apply.
   - District Technology Coordinator
   - Specific educator(s) designated as Technology Integrator
   - Teaching Assistants/Computer Lab Assistants
   - Technicians (Technical Staff)
   - Administrator
   - District Professional Development Coordinator
   - Outside Consultants
   - Other: .................................................................

11. How does the district facilitate plans for related professional development?

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12. Do you use a ticketing/tracking system for technical support requests?
   (If "yes", please bring a summary of the number and types of requests filled during the current school year to the interview.)
   Mark only one oval.
   - Yes
   - No

Stop filling out this form.

Principals

13. Does your school have a building level technology committee that meets regularly?
    Mark only one oval.
    - Yes
    - No
14. Web address of agendas/minutes for building technology committee (if applicable).
   (If not available online, please bring samples of minutes and/or agendas from 2-3 meetings
during the past year to the interview.)

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15. Please list some of the major technology related purchases in your building over the
   past three years?

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   ..............................................................................................................

16. Various technologies used in your school.
   For your school building, indicate the extent to which the following technologies are utilized in
   teaching and learning:
   Mark only one oval per row.

<table>
<thead>
<tr>
<th>Widely used</th>
<th>Sometimes used</th>
<th>Rarely used</th>
<th>Not used at all</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software that promotes communication among students and teachers (as appropriate for grade level).</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Software that allows student and teachers to collaborate on work.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A learning management system (eg. Blackboard, Moodle, etc.)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Online tutorial software (eg. iReady, Successmaker, Study Island, etc.)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Online coursework (eg. NovaNet, Plato, etc.)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
17. Various technologies used in your school (continued).

For your school building, indicate the extent to which the following technologies are utilized in teaching and learning:

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Technology</th>
<th>Widely used</th>
<th>Sometimes used</th>
<th>Rarely used</th>
<th>Not used at all</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flipped-Classroom videos</td>
<td></td>
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<tr>
<td>Presentation Software (Powerpoint, Prezi, Video Editing, etc.)</td>
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<tr>
<td>Art and graphics related technologies (eg Photoshop, iMovie, etc.)</td>
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</tr>
<tr>
<td>STEM specific technologies (eg. robotics, scientific probes, CNC)</td>
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<tr>
<td>Online textbooks</td>
<td></td>
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<tr>
<td>Game-based learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18. Other Technologies (optional)

Please indicate any other ways that technology is integrated into the teaching and learning process in your school building:

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19. 5. How many hours per year does the average teacher receive in technology-related professional development?

*Mark only one oval.*

- ○ 0-3 hours (half day)
- ○ 3-6 hours (full day)
- ○ 6-12 hours (1-2 days)
- ○ more than 12 hours (more than 2 full days)
20. Who provides the majority of the technology-related professional development for teachers in your school?
(Check all that apply)
Check all that apply.

☐ Professional Development Coordinator
☐ Individual specifically designated as Technology Integrator
☐ Technicians (Technical Staff)
☐ Teaching Assistants/Computer Lab Assistants
☐ District Technology Coordinator
☐ Principal
☐ Individual(s) from outside the district
☐ Other: .................................................................

21. How would you rate the technical support process in your district?
Mark only one oval.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>poor</td>
<td></td>
<td></td>
<td></td>
<td>excellent</td>
</tr>
</tbody>
</table>

22. Other Artifacts

Please list any other artifacts (documents, policies, exemplars, web pages, etc.) that you could share at the interview that would provide a richer understanding of the way that technology is used in your school.

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