

# **Leadership and Adoption of Instructional Technology in Schools**

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Instructional Technology in Schools

by  
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## Abstract

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This applied dissertation was designed to investigate the characteristics most represented in two school districts, an inner-city and a suburban district. These characteristics were related to the innovativeness of the school district and the perception of individual leadership in schools that have passed the performance criteria for state accreditation. Forty schools and 200 principals were randomly selected to participate in the study for a period of 3 to 4 months.

The researcher used three instruments to determine whether differences existed between the two districts in regard to performance on the Standards of Learning assessments. He developed a checklist for interview questions on instructional technology strategies that might be implemented by leaders and teachers in the classroom. A Perceived Organizational Innovativeness Scale was used to measure the innovativeness of the school district, and an Individual Innovativeness Scale was used to measure the perception of individual leaders concerning the innovativeness of the school district.

The findings indicated that organization innovativeness contributed to the innovativeness of individuals, such as leaders. Leaders categorized by innovativeness contributed to the overall structure of the organization by means of social networks with predictable human behavior in the organization. The passing of the Standards of Learning assessment and the schools' proven performance and accreditation status were clearly related to the behavioral patterns of individual and the social networks implemented by the leadership.

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## Chapter 1: Introduction

The No Child Left Behind Act (NCLB) of 2001 has highlighted the importance of leadership for school success, mandated raising student performance levels, and demanded accountability of leaders (Wilson, 2001). The act covers all educational districts and requires public schools to raise student performance across the curriculum. The act also requires computer technology standards for all curricula and holds educational leaders responsible for communicating these standards to classroom teachers (Dillon, 2006; Miech, 2000).

This study focused on two school systems titled the inner-city district and suburban district. Both are in the southeastern United States. The three areas covered by this study involved the diffusion of innovation and the adoption process of instructional technology: (a) The researcher reviewed and classified the processes associated with individual and organizational innovation, (b) compared the characteristics associated with organizational leaders in schools where state accreditation had been attained and where principals and other leaders have supported the use of instructional technology (Simonson & Wheeler, 2003), and (c) assessed the similarities and differences between the organization and the leadership innovativeness approach in schools that failed to meet state standards. The researcher related these three areas to the performance of each school and indicated whether they successfully gained or failed to gain state accreditation. The study included 40 schools and 200 principals.

At the outset of this study, the researcher examined the literature that focuses on organizational leadership to discover whether the innovativeness of the organization corresponded to the use of instructional technology by teachers. A great deal of research was available on the diffusion of instructional technology (Couros, 2003). Researchers,

however, have paid scant attention to how the relationships and dependencies among educational leaders and their organizations affect the adoption of instructional technology. For this study, the researcher addressed many critical factors that have influenced the dissemination of technology by using the diffusion theory and adoption theory.

### *Theoretical Background*

*Diffusion theory.* According to Rogers (2003), "Diffusion is a process in which an innovation is communicated through channels over time among members of a social system" (p. 409). The diffusion process is a systematic approach to an organization's adoption of new technology. Many organizations have been compelled by the NCLB to participate in the diffusion process and acquire new technology.

*Adoption theory.* The adoption theory was instrumental in acquiring data about the innovations implemented by both individual school leaders and the organizations they represented. LaRose and Hoag (1996) noted that the adoption theory noted that, when plotted, the rate of adoption forms an S-shaped curve. This curve has a steep slope on the right and reflects individuals and organizations most receptive to new ideas.

### *Rationale for the Study*

American school systems have invested dearly in the adoption of instructional technology for school buildings and classrooms. The technology inventory has accumulated considerably huge amounts of record keeping. Shuldman (2004) reported that the National Center for Educational Statistics conducted the Fast Response Survey in 1999 and found that 51% of teachers surveyed reported that they were moderately well prepared to use technology in the classroom, whereas 33% indicated that they were either well prepared (23%) or very well prepared (10%).

In a study of New Hampshire teachers, Shuldman (2004) used the Levels of

Technology Implementation scale, developed by Moersch in 1995, to measure a teacher's level of technology use on a 6-point rating scale where 0 = *nonuse* and 6 = *refinement*.

Shuldman found that 31% of the New Hampshire teachers responded that their integration of technology was at Level 3 or higher; nationally, 28% of teachers responded at the same level. In the New Hampshire study, 69% of the teachers indicated levels of 0 to 2; 32% scored at Level 2, indicating the need to be cautious when adopting; and 21% scored at the Level 0, indicating a failure to use instructional technology integration.

According to Rogers' (2003) theory of innovation decisions, the process of socially adopting or rejecting an innovation by individuals or organizations in a social system may be based on the individual or the entire social system. One factor that is essential is administrative support and leadership.

This study focused on opinion leadership. Rogers (2003) defined this term as the degree an individual is able to influence the attitudes and behaviors of other individuals with relative frequency. He characterized opinion leadership as an informal position associated with social status and believed, "[It] is earned and maintained by the individual's technical competence, social accessibility, and conformity to system's norms" (p. 27). The most outstanding characteristic of opinion leadership is the ability to communicate or network among peers within the social environment of the organization. Rogers also found that both opinion leadership and leaders who oppose changes may be found in many organizations.

The study of Rogers (2003) raised two questions. They are as follows: (a) Is there a relationship between the leadership styles of school districts passing state standards accreditation, and (b) is the leadership in a school district that is passing state accreditation characterized by the opinion leadership styles and characterized as technical

competencies, social accessibility, and conformity to the norms of school district?

According to Vitale (2005), the process of development and organization may become the basic framework for mastering what is not known about instructional technology for leaders when an organization is integrating instructional technology. In a study of the spread of an educational innovation among 38 school superintendents in Pittsburgh, an overhaul of the math curriculum for the public schools brought about innovations that included textbooks, audiovisual aides for teaching new concepts, and summer institutions to train teachers in new subject areas.

The new math innovation spread relatively quickly and was reinforced by the National Science Foundation in conjunction with the U.S. Department of Education (Rogers, 2003). Educators accepted modern math as an improvement to the curriculum. Of the 38 school superintendents, only one adopted the innovations in 1958 without any interpersonal network links from fellow colleagues. Six friends constituted a group that developed the framework while interacting inside and outside of normal obligations. The efforts of these six friends played a significant role in the diffusion of modern math in the Pittsburgh public schools.

Once the group members (opinion leaders) adopted the math innovations, the rate of adoption increased tremendously (Rogers, 2003). According to Rogers, only one adoption took place in 1958 (innovator). This single adoption increased to 5 in 1959, 15 in 1960, 27 in 1961, 35 in 1962, and 38 in 1963. Characteristics associated with opinion leadership styles include conformity to the norms of the social system, serving as role models, and accessibility. Rogers asserted that understanding the processes of diffusion and opinion leadership characteristics may form a basic framework and may serve as a guide for school districts.

### *Focus of Instructional Technology Adoption*

Surry (1997) indicated that the focus of adoption of instructional technology is human perceptions. This was the reason for adopting instructional technology for this study. A more gradual slope downhill on the left side of the S-shaped curve indicates schools with slower rates of adoption. In the years from 1984 to 1988, technology in some school districts was limited to two IBM clone computers.

However, both districts in this study have adopted many technological innovations in the last decade. The results of a survey conducted by the National Center for Education Statistics (2000) indicated the degree that teachers and administrators were using computers and were using instructional technology to access the Internet. All told, 34% of the respondents reported using technology to assist with administrative duties, and only 10% reported using instructional technology for classroom lessons, research, or best practices. Dikkers, Hughes, and McLeod (2005) wrote that technology has emerged so rapidly that a bridge has developed between educators and school leaders. Few mechanisms exist to prepare leaders for the ever-changing espousal of innovation in kindergarten through Grade 12 education.

Teachers have access to LCD projectors, scanners, digital cameras, videocassette recorders, and compact disc players. Clearly, adoption of instructional technology is not the obstacle preventing teachers from using computer technology. This applied dissertation study has attempted to discover (a) how innovative the organization is and how it perceives change, (b) whether individual leaders regard change favorably or unfavorably, and (c) what issues are facing the organization.

### *Inner-City District*

*Description of community.* The inner-city district is located in the southeastern

United States. Through the area flow rivers that serve as the building blocks of the economy. The physical geography is marked by a fall line. The falls of the rivers have produced a site that has allowed for easy settlement and has become a foundation for economic development. Driven by law and finance, the inner-city district is home to an administrative center that includes both a U.S. Court of Appeals and a Federal Reserve district.

*Inner-city district's population.* According to the 2000 census, the population of the community was 996,512. Of residents who were 25 years old and older, 82.6% were high school graduates; 29.2% were college graduates. Median household income was \$46,800, 6% above the U.S. average. The unemployment rate was 4.1%. The labor force numbered 540,102, and businesses have had low levels of unionization and union election activity.

*Description of work setting.* The community has adopted educational reforms titled Standards of Learning (SOL). This program sets high, clear, measurable academic standards on a statewide basis and then measures students' progress in meeting those standards. Students are tested in English, math, science, and history in the third, fifth, eighth grades and in high school. The work setting in this study is two middle schools. Each middle school has a principal, two assistant principals, two media specialists, and support staff. The ethnicity breakdowns of the two middle schools in the 2004-2005 school year was 88.95% Black, 7.36% White, 2.93% Hispanic, and less than 1% Asian and American Indian students. The operating budget for the inner-city district amounted to \$287,028,365.

*Demographics of the inner-city district.* This public school district enrolls 25,222 students in 32 elementary schools, 10 middle schools, 9 high schools, 6 exceptional

education schools, and 5 vocational and alternative schools. The high schools offer thematic programs in the arts, world languages, business, life sciences, math, science, and technology. Two of the schools in the community allow gifted students to take classes at area colleges and at a military school that is the nation's first public military school.

The Mathematics and Science Center promotes excellence in learning and teaching in math, science, and technology. The Governor's School for Government and International Studies has been a semifinalist in the National Academic Championship Quiz Bowl for the past 2 years. The city's Technical Center is an award-winning vocational technical school. Forty-five percent of contracted teachers have advanced degrees.

The schools feature distance learning classrooms and provide access to the Internet. Of the graduates, 53.6% received an advanced studies diploma and 72.9% plan to pursue postsecondary education. The district has 46 accredited private and parochial elementary and secondary schools that enroll nearly 14,000 students.

### *Suburban District*

*Description of community.* The suburban district is a thriving community in the southeastern United States. In 2005, the community had an estimated population of 281,000 residents and was home to 22,000 businesses. The suburban district is growing. Its community recently earned an AAA bond rating from three agencies and is home to a newly built semiconductor plant and to one of the largest shopping centers in the United States. The suburban district's community has low taxes, good business opportunities, and excellent infrastructure. The newest additions include a home to Fortune 500 companies, technological innovations, and global business communication.

*Statistics on the suburban district.* The district enrolls 47,000 students in 43

elementary schools, 12 middle schools, 9 high schools, 2 technical centers, and an alternative school that houses elementary and middle school students. Demographically, the district has 51% White, 35.8% Black, 4.9% Asian, 3.6% Hispanic, and 4.7% other students. The operating budget is \$411 million; the expenditure per pupil is \$7,768.

*Limitations*

This study was not limited to principals from schools that contained all grade levels except kindergarten. Additionally, time was a factor in receiving information from designated school personnel through the mail.



## Chapter 2: Review of Related Literature

### *The Problem*

*Statement of the problem.* Some researchers perceived a lack of successful individual leadership and organizational innovativeness (De Leon, 2006; Mazzeo, 2003; Sanders, 2006). They contended that this lack of leadership and innovativeness has prevented the successful implementation of instructional technology to boost students' academic performance.

*Description of the problem.* Even though some literature supported this perceived lack of successful leadership and an effective use of innovativeness in organizations, results have indicated that, of 1,822 schools in the state, only 1,336 schools (73%) have met the goals of each district statewide, as expressed in the adequate yearly progress (AYP) report that measures the accreditation of school divisions based on students' overall SOL assessments for accreditation (Virginia Department of Education, 2006b). According to the Virginia Department of Education, the annual report card provides data on schools and school divisions that have or have not met the objectives required by the federal education law to reach 100% proficiency of all students in reading and mathematics by 2014. The report used in this study included data reflecting that 400 schools (22%) did not meet AYP standards and the status of 86 schools (5%) was yet to be determined.

In a breakdown of data for the two districts involved in this study, a report of the AYP for the inner-city district noted that the district did not meet the state's AYP standards. The report further addressed the local school division, the suburban district, where AYP standards were met. These findings caused the researcher to explore what might be

generalized from these data and what factors or solutions might cause a differentiation in the two districts' data reports developed by the state department of education.

### *Definition of Leadership*

For the purpose of this study, the term *leadership* has been defined as individuals (principals) in a school district who influence the attitude and behavior of individuals (teachers) informally with relative frequency. In this context, leadership is an informal status that usually is earned through technical competence, social accessibility, and the leader's conformity to the school district's norms (Rogers, 2003). In this study, the researcher found that this kind of individual leadership was recognized throughout the related literature and represented the opinion leadership aimed at school districts' principals.

According to Rogers (2003), "When the social system is oriented to change, the opinion leaders are more innovative but when the systems norm are opposed to change, the behavior of leaders also reflect the norm" (p. 27). This finding led the researcher to explore solutions to the following questions: (a) What may be assumed about leadership in school districts that are not passing state accreditation and the leadership characteristics, (b) what may be assumed about school districts passing state accreditation and leadership characteristics, and (c) are the communication networks effective in districts passing state accreditation? Rogers made a striking point that the position that opinion leaders have in their communication system or network links in a school system is unique and influential.

According to Clarke (1991) and to Ruebling, Stow, Kayona, and Clarke (2004), if school districts are not meeting performance standards for state accreditation, the

behavior of the leadership is in question. In a study to determine the quality of a newly implemented curriculum for language arts and math, Ruebling et al. found that 143 classroom observations indicated that few teachers used the new curriculum, and only one third had acceptable lesson plans. In another category relating to leadership behavior deficiencies, these researchers indicated the following findings:

1. Only 25% focused on skills and concepts appropriate to new curriculum's sequence and score.
2. Fewer than 40% aligned teaching with the appropriate concepts or skills.
3. Fewer than 40% provided the right setting for students to use concepts or skills.
4. Only 33% of the teachers aligned the level of thinking to Bloom's taxonomy.
5. Fewer than half were knowledgeable of the subject.

Ruebling et al. (2004) found data from interviews with leaders in the systems that indicated these deficiencies:

1. No formal training was received by teachers on the new curriculum.
2. No formal system was established to process or monitor the new curriculum.
3. No system existed for evaluation or curriculum revisions.
4. Teachers were unable to discuss the results of assessments.
5. Teachers were unable to discuss the results of assessments.
6. Teachers were unable to discuss the difference in classroom instruction.
7. Teachers' expectations for using, communicating, and understanding the results were unmet.

According to these findings, the behavior of the leadership in the school system needed to change to improve the learning performance of a district.

In North Dakota, Feldner and Kincaid (2002) conducted a 5-year study on the

process and movement of educators toward the integration of technology. Their methodology consisted of two professional development phases. One phase was to give teachers an opportunity to design current lessons or units that implemented the integration of technology, and the other was to increase leadership knowledge, the integration of technology, and modeling for the effective use of technology. The study used the Professional Competency Continuum (PCC) profile assessment; an assessment tool that is used to collect data on the behavior of educators based on national technology standards.

Upon completion of the PCC assessment, the North Dakota educators were placed on a continuum that consisted of three ranges: entry level, adoption level, and level of transformation. The range for educators signified the degree of experience that the educators had with the integration of technology standards at the national level. Feldner and Kincaid (2002) indicated that 9,120 educators in kindergarten through Grade 12 participated, or 89% of all of the full- and part-time educators.

The results for administrators indicated that their proficiency levels rated higher in PCC competency areas. The mean for the core competency areas for administrators was 4.71. Feldner and Kincaid (2002) found the following mean scores for each PCC competency area for administrators: (a) 3.98 for core technology skills; (b) 3.82 for curriculum, learning, and assessment; (c) 3.98 for classroom and instructional management; 3.95 for professional practice; and 5.04 for administrative competencies.

Support from opinion leaders in the field of education exemplifies characteristics associated with technology competence, accessibility, conformity, and the ability to be role models who inspire followers. Key characteristics are experienced by leaders in school districts that take advantage of their ability to plan for staff development.

Facilitators of teacher training effectively teach instructors how to integrate technology

into the curricula that encourage academic performance. Developing opinion leaders through communication channels linked by interconnecting individuals establishes a pattern that provides performance results acceptable to the performance and norms of a school district struggling to meet state accreditation standards (Rogers, 2003).

### *Documentation of the Problem*

In considering how to document the problem, the researcher explored studies in related literature concerning the efforts made toward district staff development by school divisions for leadership training for school leaders when planning for the integration of instructional technology in the day-to-day work setting of school divisions. According to Dikkers et al. (2005), a 2000 statistical report of the National Center for Education Statistics indicated that few mechanisms exist in kindergarten through Grade 12 education to prepare school leaders to understand and espouse innovative technologies, even though technological innovation is occurring rapidly. Although nearly all public school teachers have access to computers or the Internet somewhere in their schools, only a third of them are well prepared or very well prepared to integrate the use of computers and the Internet in their teaching.

Concerning district reforms and leadership, Fullan (2004) asserted that capacity building gives leaders the ability to build future leaders through (a) maintaining and continuing to use their own professional development training and (b) focusing on both achievement and future development of school leaders. To explain these ideas, Fullan provided a successful example of capacity building in an innovative federally sponsored program titled School Teams Achieving Results for Students (STARS):

In Chicago, people learn in weekly meetings, study groups, focused institutes, extended academies, and walkthrough site visits, during which teams visit schools to learn from and react to leadership and pedagogical strategies. STARS (School

Teams Achieving Results for Students), an innovative program launched with 135 schools in Chicago in 2002 and with 115 schools in Guilford County in 2003, focuses on building the capacity of school leadership teams to improve both pedagogy and results. This comprehensive, multiyear initiative includes school teacher-principal teams and district-level leaders in weeklong institutes and multiple-day follow-ups each year, thereby fostering deep professional learning communities across the districts. Cycles of application and regular examination of student results enhance the transfer of skills to classrooms and schools. (p. 44)

*School Teams Achieving Results for Students*

STARS projects are supported by federal grants. These grants serve as resources, bringing schools together for opportunities to talk one-on-one with state leaders. STARS give students the opportunity to take classes not offered in their own districts and to take virtual field trips. States are reaching for the same goals as STARS projects: to equalize education between rural and urban school districts and to serve the underserved population.

In studying the STARS, the researcher asked, What literature is presently in research that addresses an overall school district instructional technology planning for districts that may be suffering with the diffusion of large-scale instructional technology integration? In South Dakota, Simonson and Wheeler (2003) implemented a STARS school project for the state titled the Digital Dakota Network (DDN). The DDN is a statewide telecommunications network that connects 176 schools in South Dakota school districts. Simonson and Wheeler spearheaded a large-scale diffusion project that consisted of data that measured quantitative and qualitative components and summative and formative evaluation strategies that enabled researchers to evaluate the overall goals and objectives concerning the effectiveness of the DDN project:

Formative evaluation made it possible for SDADE personnel to adjust aspects of the program as needed and addressed (1) the status of project objectives and (2) how activities have affected participants. Summative evaluation addressed the

overall effectiveness of the project and determined whether objectives have been met. (p. 12)

Some of the goals consisted of wiring all the schools, connecting the schools, and training the teachers. According to Simonson and Wheeler (2003), the academy titled Technology for Teaching and Learning was set up as an initiative mandated by former Governor Janklov to teach all instructors across the state how to integrate and use technology. The aim was for teachers to learn (a) to change teaching and learning in classrooms through the use of technology into the curriculum, (b) to model effective teaching practices using technology, and (c) to assist fellow educators in learning how to use technology.

Simonson and Wheeler (2003) noted that project results for the Technology for Teaching and Learning academies for teachers were as follows:

1. The need for additional training for teachers as an important factor for teachers using of DDN.
2. That visits to kindergarten through Grade 12 schools indicated the need for continuing professional development for success in kindergarten through Grade 12 school districts.
3. The need for continued support from administrators for teachers as a factor that contributed to the adoption of instructional technologies in kindergarten through Grade 12 classrooms.

Simonson and Wheeler (2003) explained how teachers and administrators worked together to ensure the success of the project:

To encourage the use of the DDN in the classroom, administrators offered a half-day free time to teachers who were venturesome enough to attempt to integrate the DDN into their curriculum. Administrators were more than happy to cover a class for a teacher to use that time in developing new adaptations of the

technology for their students. (p. 19)

Again, what may be generalized from the data presented in the DDN project? Do certain patterns develop that school districts may examine to make concrete decisions regarding school leadership and the diffusion of instructional technology training? Are there regularities to assist leaders in schools with the huge amount of instructional technology diffusion?

Manternack and Muashak (1997) collected data during 1996 and 1997 for a final report on the STARS project of the Iowa Distance Education Alliance. The alliance included partnerships of Iowa's educational institutions that included the Iowa Department of Education, public television, 3 institutions, 15 community colleges, 15 area education agencies, and local education agencies. The purpose of the alliance was to implement a special statewide STARS school grant. The goals of the STARS schools project, according to Manternack and Muashak, were as follows:

1. To develop instructional materials for distance education.
2. To support the training and resources for distance education.
3. To provide training and technology support for distance education.
4. To extend information to the public about distance education.
5. To incorporate distance education in colleges and universities while involving teachers for future training.
6. To implement and integrate new technology in selected schools.

The grant has been instrumental in providing Iowa with the ability to implement and use fiber-optic technology for live, two-way, full-motion interactive instruction that has provided greater levels of interactivity than previous instructional technology has. Have the objectives and leadership been effectively planned for the adoption and



diffusion of instructional technology in the Iowa STARS project, and what may be learned to aid in this applied study?

According to the report by Manternack and Muashak (1997), the use of classroom instructional technology has been identified and shared in the Iowa Communication Network database, and constant use of instructional technology by teachers has continued to grow. Moreover, the Iowa Communication Network has been used in classrooms for students in kindergarten through Grade 12 in the districts' schools. The project has integrated new educational approaches at the same time that new opportunities have been provided for underserved learners of all incomes including (a) limited-English proficient students, (b) Chapter 1 student minorities, and (c) students in rural schools. Courses have been offered that would not have been offered if the network were not in place.

The evidence indicated that goals and objectives of the Iowa STARS project were supported. Along with teacher training and support from leaders, the indicated changes have taken place in teacher behavior in using technology to enhance curricula and motivate students. The style of teachers' pedagogy has changed: Teachers (a) have been more geared toward student-centered instruction, a concept that has been integrated into other areas of curricula; (b) have been more focused on the content; (c) have recognized the advantages and disadvantages of using instructional technology and distance education; and (d) have experienced a sense of newness as they observed student interactions (Manternack & Muashak, 1997).

Although the diffusion process of instructional technology into the schools where this applied dissertation study took place looked at leadership and instructional technology in two school districts that were using instructional technology as a tool to enhance students' performance, the lack of resources for instructional technology