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Has technology created a safer school environment?

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HAS TECHNOLOGY CREATED A SAFER SCHOOL ENVIRONMENT?

by
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A Thesis

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Abstract

Mark Leung

Has Technology Created a Safer School Environment?

2003

Dr. Robert Kern

School Business Administration

The purpose of this study was two-fold. It was to determine and evaluate the effectiveness of technological advances on the maintenance operations of a school district's facilities. It was also to determine and evaluate the types, amounts, and locations of technology equipment implementations in school districts and how these implementations have affected the school environment's overall safety.

Forty-two school districts in Burlington County, New Jersey were surveyed using a questionnaire with twenty-two queries. The survey targeted Directors of Buildings and Grounds and the surveys were distributed and collected via electronic-mail or facsimile. The survey data was analyzed using the SPSS version 10.0 statistical software application.

Results of the survey showed that 89% of the school districts in Burlington County use video surveillance cameras. Survey results indicated that 55% of the school districts in Burlington County have a full or part-time School Resource Officer. Furthermore, results of the survey demonstrated that 100% of the districts have a crisis

management plan. Only 22% of the districts reported experiencing mold or other indoor air quality problems in the last ten years. Lastly, results of the survey showed that over two-thirds of the school districts in Burlington County use preventative maintenance software.

Mini-Abstract

Mark Leung

Has Technology Created a Safer School Environment?

2003

Dr. Robert Kern

School Business Administration

Have technological advances incorporated in the maintenance operations of school facilities made school environment safer?

Survey results indicate that school district maintenance operations have become more efficient through the wide spread implementation of technological advancements. Interestingly, the outcome of a more efficient facility maintenance operation is a safer school environment.

Table of Contents

List of Tables

Chapter One

Introduction

Focus of Study

School facilities and maintenance operations is one of the core areas for which a school business administrator is responsible. Within this area of concentration centers a focus of all school districts nationwide - safety. Technological advances continue to occur as we further understand and develop more sophisticated circuits, computers, and equipment. As technology improves, the level of infusion into private industry parallels the intensity of its advances. Accordingly, the public sector, specifically education, looks to infuse technology for two main purposes. Educating children is the primary focus of schools and, using the New Jersey Core Curriculum Content Standards as a guide, school districts prepare students for the future by integrating technology skills across curricula and throughout the educational process. Secondarily, schools incorporate technology into their own business practices to make operations more efficient and their overall environment safer.

The focus of this study was to determine what types of technology are being implemented in schools to enhance safety measures. The study concentrated on how much safety technology is being implemented, where in the district it is being employed, and how cost factored into the decision making process.

Purpose of the Study

With the events of Columbine High School in 1999, the attacks on the World Trade Center's Twin Towers in 2001, continuing terrorist threats against our nation, increasing insurance costs, and overall concern of parents and community members, safety is at the forefront of most school administrators' agendas. In the past,

1

resource/police officers were only found in urban districts and mainly in the high schools. Now we are seeing resource/police officers in rural K-8 school districts, regardless of the socioeconomic status of the community. Establishing crisis management plans quickly became the hot topic of 2002, in similar fashion to the development and frenzy of technology plans just five years earlier.

In the past five to ten years, technology has played a major role in the educational environment. Technology has been infused into curricula as well as being a curriculum of its own. The New Jersey Core Curriculum Content Standards even has a section devoted for technology. However, we are not only seeing technology as something that we impart to our students, but also as a tool to help increase the efficiency of school operations. In a school district, some of the areas in which technology is used include maintaining student records, school budgeting, payroll and benefits, human resources, food service applications, transportation, public information storage, public relations, electronic board meetings, and overall communication.

Recently, we are finding technology making its way into the area of school maintenance and facilities operations. In the Lumberton Township School District, work orders are now being entered and maintained electronically. Security cameras, digital video recorders, electronically controlled door access, and closed circuit TV devices help patrol the facilities at a micro-management level. Fixed assets, plant maintenance, Material Safety Data Sheets (MSDS), Right-to-Know, and Blood-borne Pathogen information is stored and maintained electronically. Heating/Ventilation/Air-conditioning (HVAC), fire alarm, and security alarm systems are tied into the school network for remote access, control, and instant updates about the status of the facilities. Budgeting

and purchasing of school maintenance supplies is entered, tracked, and maintained electronically.

The purpose of this study is to describe and evaluate the effectiveness of technological advances on the maintenance operations of a school district and to determine whether these advances have made a positive impact on the school district's overall safety. The study will result in a feasibility report to inform administrators, board members, and the local community about the findings. The use of technological advances in the maintenance operations of a district's school facilities means providing personnel with an opportunity to innovatively and creatively enhance the efficiency of their job tasks, while increasing the overall success and safety of the school district.

Definitions

ASSA – Application for State School Aid – A yearly count of students enrolled in a particular public school district as of October 15 that is used in calculating educational state aid.

Blood-borne Pathogen – HIV/AIDS, Hepatitis B, and other infectious diseases found in the blood.

Budget Cap – The amount of money a New Jersey school district is authorized to raise its local tax levy without exceeding their school budget. Exceeding the budget cap warrants pre-approval from the Commissioner of Education and an approval of the voters in some cases.

CD-ROM – A type of optical disk capable of storing large amounts of data, with the most common size being 650 megabytes. A single CD-ROM has the storage capacity to accommodate about 300,000 pages of text.

Core Curriculum Content Standards – The minimum educational guidelines defined by

the New Jersey Department of Education that establishes a Thorough and

Efficient model for education in New Jersey public schools.

Crisis Management Plan – Policy developed to prevent crisis events at school, manage

and respond appropriately to crisis events, and help affected people cope with

pain and trauma after a crisis.

District Factor Group (DFG) – an indicator of the socioeconomic status of citizens in

each district and has been useful for the comparative reporting of test results from

New Jersey's statewide testing programs.

Elementary School Student – A regular education student enrolled in grades K-5.

Federal Aid – The funds allocated by the federal government through grants and

entitlements.

Fiscal Year – A twelve-month period that denotes the commencement of a new budget

cycle. The budget cycle in New Jersey public schools starts July 1 and ends June

30 of the following year.

Fixed Assets – Durable goods with life expectancies of greater than five years and cost

more than $2,000.00

General Fund – The discretionary portion of the school district budget that is approved

by the Board of Education and voted on by the public to deliver the mandated

educational program.

IDEA – Individuals with Disabilities Education Act – A federal act that requires school

districts to provide an adequate educational program for children with disabilities.

The federal government provides some funding for the implementation of this act.

IEP – Individualized Educational Plan – An educational program developed by a school's educational professionals for a classified Special Education student that requires parental input and approval.

Internet – A shared network of government agencies, educational institutions, private organizations, and individuals from many nations. It is also commonly referred to as the World Wide Web (WWW). The World Wide Web is made up of a collection of interconnected computers using a special language protocol to communicate.

Local Tax Levy – The amount of taxes assessed to the community in financial support of the school budget. This is more commonly referred to in cents per hundred of assessed property value.

Middle School Student – A regular education student enrolled in grades 6-8.

Material Safety Data Sheet (MSDS) – A data sheet designed to provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance.

New Jersey District School Report Card – A report distributed by the New Jersey Department of Education that contains statistics on every public school district in New Jersey. This report is distributed to local residents and compares like school districts within the state. Like school districts are compared by their DFG (district factor grouping). The report contains items including teacher/student ratio, administrator/teacher ratio and costs per pupil.

PTA – Parent Teacher Association - A local organization of concerned parents and residents of the town, designed to raise funds for the benefit of students.

Rancocas Valley Regional High School – The regional public high school district for students located in Eastampton, Hainesport, Lumberton, Mt. Holly and Westampton Townships. This school enrolls students in grades 9-12.

Rateables – The assessed value of commercial, residential and all other taxable property located in the township.

Right-to-Know – The New Jersey Worker and Community Right to Know Act requires public and private employees to provide information about hazardous substances at their workplace via a survey. The community Right-to-Know Survey is an annual inventory of environmental hazardous substances, which are stored, produced or used at a place where business is conducted in the state of New Jersey.

School Resource Officer (SRO) – Law enforcement official working in a school district that is charged with educating, counseling, and mentoring students.

Smart Cards – Photo-Identification badges that have an electronic chip, which stores information about the cardholder.

Special Education Student – A student who has been identified by the district's Child Study Team as a student with special needs and requires an Individualized Educational Plan (IEP).

Special Revenue Fund – Funds received by the federal or state government earmarked for a specific purpose. These funds are not subject to a vote by the public.

Socioeconomic Status (SES) – Relative rank of people with respect to social position and prestige, usually measured by criteria such as education, occupation, and income.

State Aid – A source of revenue from the New Jersey Department of Education.

Zero Tolerance Policy – The policy or practice of not tolerating undesirable behavior,

such as violence or illegal drug use, and imposing automatic severe penalties for

first offenses.

Limitations of the Study

There are several limitations to this study. One is the use of one technique for data

collection. Although the study utilizes a thorough survey, it would be more complete if

both interviews and surveys were conducted. Another limitation is the limited sample

size in comparison to the whole. The study will only reference data collected from school

districts in Burlington County, New Jersey. Finally, a possible limitation might be a lack

of complete data. School district business offices that are not implementing much

technology to improve their maintenance operations or safety measures may not want to

divulge this information and, therefore, may not participate.

This study is being conducted during the 2002-2003 school year with the current

laws, regulations and limitations set forth by the U. S. Department of Education, the New

Jersey Department of Education, and the Lumberton Township Board of Education. The

outcomes of this study will be further reviewed and analyzed for possible incorporation

into Lumberton School District's future security and maintenance operation

improvements. Both negative and positive outcomes will help facilitate more efficient

and effective upcoming capital projects, including the 2002-2003 construction of

Lumberton's fourth school, the Ashbrook Elementary School.

Setting of the Study

Burlington County is the largest county in New Jersey, covering 827 square miles.

It was originally settled in 1677 by members of the Society of Friends, or "Quakers", as

they are more widely known. Burlington County inherited its name from a city on the

banks of the Delaware River. This city was known as Burlington City and it served as the capital of "West Jersey," before New Jersey was formed. Burlington City served as the county seat until 1796, when Mount Holly then took its place.

Burlington County is bordered on the north by Mercer County, Monmouth County from the northeast, Ocean County from the east, Atlantic County from the southwest, and Camden County to the west. From east to west, Burlington County stretches from the Delaware River to the Atlantic Ocean.

Burlington County's economy is largely agriculturally based and has always been one of the leading agricultural counties in the state. Tomatoes, corn, peaches, apples, blueberries, asparagus, and cranberries are some of the leading agricultural crops harvested in Burlington County. More Burlington County acres are devoted to farming than any other county in the state.

There are forty political subdivisions, three cities, six boroughs, and thirty-one townships in Burlington County. The 2000 census data reports the population for the county as 423,394 people, with a population density of 526.2 people and 200.5 housing units per square mile (US Census Bureau, 2000). Also according to the 2000 US Census Bureau, the median household income in 1999 was $58,608, with 4.7% of the population in Burlington County below poverty in 1999.

Table 1

Educational Attainment of the Burlington County Population Age Twenty-Five Years and Over

Educational attainment	Percent of population 25 years and over
Less than 9th grade	3.3
9th to 12th grade, no diploma	9.5
High school graduate (includes equivalency)	31.1
Some college, no degree	20.8
Associate degree	6.9
Bachelor's degree	19.2
Graduate or professional degree	9.2

Note. From the 2000 US Census Bureau Report.

As shown in Table 1, 87.2% of the population, age twenty-five years and older in Burlington County have a high school degree or higher and 28.4% have a bachelor's degree or higher. The 2001 unemployment rate for Burlington County is listed as 3.2% (US Department of Agriculture, 2001).

More specifically within Burlington County lies the quiet town of Lumberton. The Rancocas Creek, which flows through Lumberton Township, historically served as a vital link to Philadelphia. In the early 19th Century this small town of 14 square miles was an essential source of lumber to other towns in the region; hence the name Lumberton was adopted. The town of Lumberton is located in Burlington County just 21 miles

southeast of Philadelphia, Pennsylvania and a short 25-minute drive southwest of Trenton. Lumberton Township is situated to the east of Mt. Laurel, to the west of Southampton, to the north of Medford, and to the south of Hainesport, Mt. Holly and Eastampton Townships.

The 1990 US Census Report noted Lumberton Township's resident population at 6,705 and the updated 2000 US Census Report lists Lumberton Township's total population as 10,461. Over a ten-year period, this is an amazing population increase of roughly 56%. The 2000 census data reports the median household income in Lumberton Township to be $60,571 with 3.8% of the population below the poverty level in 1999 (US Census Bureau, 2000).

Table 2

Educational Attainment of the Lumberton Township Population Age Twenty-Five Years and Over

Educational attainment	Percent of population 25 years and over
Less than 9th grade	4.5
9th to 12th grade, no diploma	9.3
High school graduate (includes equivalency)	28.9
Some college, no degree	18.6
Associate degree	7.8
Bachelor's degree	21.3
Graduate or professional degree	9.6

As shown in Table 2, 86.2% of the population age twenty-five years and older in Lumberton Township have a high school degree or higher and 30.9% have a bachelor's degree or higher. In 2000, the township's unemployment rate was listed at 2.6% and the per capita income was $25,789 (US Census Bureau, 2000).

The total residential, commercial and personal property is currently assessed at $563,994,036 (Lumberton Township Municipal Tax Assessor, 2000). The average home is assessed at $150,000 for 2001 and currently pays a tax rate of $2.525 per hundred of assessed value or an average dollar amount of $3,787.50 per year (Lumberton Township Municipal Tax Assessor, 2001). As shown in Table 3, the tax rate contains levies from multiple taxing authorities.

Table 3

Lumberton Township Tax Rate Levies by Purpose

Purpose	Rate/$100 assessed value
County	0.508
County Library	0.035
Open Space	0.041
District School	1.289
Regional School	0.275
Municipal Local Purpose	0.377

Note. From the 2001 Lumberton Township Municipal Tax Assessor Report

Lumberton Township is governed by a mayor, deputy mayor and three council representatives. The voters of Lumberton Township elect all five representatives for four year terms. The mayor and deputy mayor are selected by a majority of the council representatives at a reorganizational meeting in January after the November election. The mayor only votes on issues where a tie must be broken. The current makeup of the Township Council representatives consists of four Democrats and one Republican. One of the Democrats has been a member on the Township Council for over thirty years and is an active member of the town's senior citizen community.

As shown in Tables 4 and 5, over 75% of Lumberton's total population is white and almost 50% of its population over 16 have an occupation as a manager or professional.

Table 4

<u>Lumberton Township Ethnicity Breakdown</u>

Race	Percent of total population
White	78.3
Black	13.7
American Indian and Alaska Native	0.2
Asian	3.4
Some other race	1.9
Two or more races	2.4

Note. From the 2000 US Census Bureau Report.

Table 5

Lumberton Township Occupational Breakdown of Citizens Over 16 Years of Age

Occupation	Number of people	Percent of total population
Managers and Professionals	2,217	44.5
Sales and Office	1,317	26.4
Service	526	10.6
Farming, Fishing, and Forestry	0	0.0
Construction, Extraction, and Maintenance	336	6.7
Production, Transportation, and Material Moving	587	11.8

Note. From the 2000 US Census Bureau Report.

The township rateables are comprised of mainly family dwellings. As shown in Table 6, Lumberton Township's 10 highest taxpayers comprise of 14.1% of the total rateables for the district.

Table 6

Lumberton Township's 10 Highest Taxpayers

Taxpayer	Percent of total assessed value
CVS New York	4.47
The Estaugh	1.91
BP Saul Reit	1.86
Whitehall Apartments Association	1.51
Lumberton Associates LP	1.36
Mount Holly Associates, LLC	0.68
Dorado Garden Apartments, LLC	0.67
Aviation Industrial Realty	0.44
Wal Mart	0.43
Carlson Craft of NJ	0.43
New Jersey Bell	0.34
Total	14.10

Note. From the 2000 Lumberton Township Municipal Tax Assessor Report

Additionally, the township is still growing by leaps and bounds. The school district's

enrollment has grown 7% annually over the last five years and is expected to continue to

grow at this rate for the next five years (New Jersey School Report Card, 2001 and

Lumberton Township Long Range Study, 1994).

The Lumberton Township School System consists of three schools. The Florence L. Walther School, which dates back to 1917, houses students in grades kindergarten through second grade. The Bobby's Run School, which opened in 1998, houses students in third through fifth grade. The Lumberton Middle School, which opened in 1991 with an addition in 1996, houses students in sixth through eighth grade. A fourth school, named Ashbrook Elementary School, is currently under construction and is planned to be open for the 2003-2004 school year. The Ashbrook Elementary School will house students in second and third grades, absorbing the second grade from Florence L. Walther School and the third grade from Bobby's Run School. Presently, the Lumberton Township School System houses six to eight sections of every grade level K-8 (Lumberton Township ASSA Reports, 1999-2001). The district's average class size is 21.2 students, with the state average being 20.8 students (New Jersey School Report Card, 2001).

The Lumberton Township School System is a kindergarten through 8th grade (K-8) district that belongs to the FG District Factor Group and is a Type II school district with nine elected Board of Education members. After graduating from Lumberton Schools in eighth grade, the students attend Rancocas Valley Regional High School located in Mt. Holly, New Jersey. Organizationally in Lumberton, the Superintendent of Schools, Frank Logandro, reports to the Board of Education, with the Business Administrator, Assistant Superintendent, Director of Educational Technology, Child Study Team Director, and school principals reporting directly to Mr. Logandro.

The Lumberton Township School System employs 143 professional staff members, 40 instructional and after school aides, 21 custodial/maintenance personnel, 14 secretaries and 10 administrators (Lumberton Township School District Personnel

Records, 2001). Most professional staff members are relatively new to the school district. The New Jersey State average for the number of years of service is ten. The average Lumberton Township professional staff member has been in the district less than eight years. Many of the district's teachers are beginning to further their educational background by attending graduate school in the evening and during the summer months. As of 2000-2001, 66% of Lumberton Township Schools' faculty and administration possess a bachelor's degree and 34% of them have earned their master's degree (New Jersey School Report Card, 2001).

The latest student enrollment for the Lumberton Township School System was 1,558 (Lumberton Township Board of Education ASSA Report, 2001). The enrollment classification and ethnicity breakdown for Lumberton Township's student population are shown in Tables 7 and 8 respectively.

Table 7

Lumberton Township Student Enrollment Classification

Description	Number of students
Regular Education Students (In-District)	1,301
Special Education Students (In-District)	242
Special Education Students (Out-of-District)	15
Homebound Instruction Student	0

Note. From the 2001 Lumberton Township Board of Education ASSA Report

Table 8

Lumberton Township Student Ethnicity Breakdown

Ethnicity	Percent of total students
White	74.3
Black	15.4
Hispanic	5.3
Asian	4.8
Other	0.2

Note. From the 2001 Lumberton Township Board of Education ASSA Report

Within Lumberton's student population, the first language spoken at home is 98%

English and 2% Spanish. The percent of Limited English Proficient (LEP) students in the

population is 1% (New Jersey School Report Card, 2001).

The Lumberton Township School System offers a multitude of in-house

educational programs and services for the majority of regular and special education

students, thus avoiding out-of-district placements whenever possible. This philosophy has

been adopted by the Board of Education and administration to offer the best educational

programs for the majority of the students of Lumberton Township in their home school as

well as in the least restrictive environment. Some of the unique programs offered at the

Lumberton Township Schools include:

1. A World Languages program beginning in the first grade;

2. Percussion and strings instrumental music;

17

3. Four to five computers in each classroom with Internet and e-mail access for the students and staff;

4. Learning and/or Language Disabilities programs within-district special education classes;

5. Multiple Disabilities programs within-district special education classes;

6. Resource Rooms/Resource Centers within-district special education classes;

7. Part-time Pre-School Disabilities programs within-district special education classes for student ages three through five;

8. A Gifted and Talented program offering pull-out instruction in grades 3-5 and advanced classes in grades 6-8;

9. A summer school remedial, enrichment and recreational program;

10. An after-school tutoring program;

11. A variety of middle school electives, including Family and Consumer Science for vocational awareness, Journalism, and Critical Thinking;

12. A complete inventory of Co-Curricular and after school athletics including intramurals;

13. An Extended Day Care program commencing at 7:00AM and lasting until 6:00PM.;

14. A Character Education program district-wide, with a 7th grade Character Education class.

The Lumberton Township School System reports its comparative cost per pupil at $7,868 for the 2001-2002 budget year (New Jersey School Report Card, 2001). The state average for the other 63 "like districts" that educate students in grade K-8 with similar

enrollment numbers is $8,321. Therefore, the cost of educating students in Lumberton Township is well below the state average.

The total 2002-2003 Lumberton Township General Fund budget is $14,146,302. This represents an increase of $873,760 or a 6.58% over the 2001-2002 school budget. Due to the New Jersey Department of Education's flat funding formula for all school districts in the 2002-2003 school budget year, growing school districts like Lumberton Township were penalized and as a result, Lumberton had its highest tax levy increase in over nine years. Latest indications from the New Jersey State Department of Education suggest that next year's funding formula from the state will be the same as 2002-2003. Lumberton residents are being forewarned in preparation for another tax increase next year due to this flat funding formula from the state and the municipality's constant growth.

The Lumberton Township School District also participates in a consolidated grant provided by the New Jersey Department of Education. This special revenue of $137,811.00 consists of Title I, Title II, Title IV and Title VI. These funds are earmarked for specific purposes, and may only be spent on those areas detailed in a written and approved plan. The district also received $264,223.00 in IDEA funds used for out-of-district tuition and special education capacity reduction expenses.

Two of the three Lumberton Township Public Schools received Best Practice Awards presented by the New Jersey Department of Education for commendable teaching practices. Along with the Best Practice Awards were $500.00 stipends to continue the teaching practice for the 1999-2000 school year. There are other restricted grants awarded by the New Jersey Department of Education. In the 1999-2000 school year, Lumberton Township School System was allocated $47,838.00 in Instructional

Supplemental Aid for Basic Skills Programs and $60,411.00 in Distance Learning Network Aid for district technology.

The voting trend in Lumberton Township for the past eight years has been in favor of the school district budget. An example of Lumberton constituents' strong support was during the school budget election on April 20, 1999, where 394 voters cast their ballots, resulting in an approved school budget by a vote of 297 to 61. That same year, the Lumberton Township Board of Education also requested a second question for additional monies to be raised outside the budget cap. Voters once again approved the question in a vote of 276 for and 100 against.

Organization of the Study

The objective of this chapter was to inform the reader of the environment surrounding this study. The second chapter will review the literature available on the infusion of technology on the maintenance operations of public schools and how it relates to the overall safety of a school district. This review will examine how safety is measured in a school district, the different means by which public schools enhance safety measures, and technology infusion in public schools. The third chapter will discuss the research design used for this study. The fourth chapter will present the findings of the research. The fifth chapter will expound on the conclusions of the study, noting the major findings and their advantages and disadvantages. This chapter will also discuss the implications of the research findings and address the need for further study.

Chapter Two

Review of Literature

The safety of our school children has always been important to school administrators, teachers and parents. However, due to some of the unique and tragic events that have unfolded over the last several years, safety has been catapulted to the forefront of everyone's agenda. School administrators were given a jolting wakeup call in 1999 when 15 people were killed in an attack on Columbine High School in Jefferson County, Colorado. Additionally, any thoughts of complacency afterwards were destroyed merely two years later on September 11, 2001, when terrorist attacks on the United States caused everyone to realize that our safety can be threatened in places we use to think were safe havens. Finally, and closer to home, during the 1999-2000 school year the Lumberton School District website was breached and vandalized. References to the Columbine High School incident were made and inappropriate language was placed on the district's hompage. Fear struck the community of Lumberton after this incident and the people of this small township realized that even remote areas are not immune to the terrors that threaten public safety. The times of confining school safety issues to concerns of children safely crossing busy intersections to and from school have vanished. Parents used to believe, and for the most part still do, that other than their own home, school was the safest place for their child (Lewis, 2002).

Safety as defined in Merriam-Webster's Dictionary, is "the condition of being free from harm or risk that would cause hurt, injury, or loss." Student achievement is a school district's top priority, with safety of its pupils right behind it. What research has found is that when the safety of school children is threatened, student achievement is

relegated to second place. Studies have shown that student achievement is hindered when safety concerns occupy the students' thoughts (Lewis, 2002). Creating a safe educational environment that is conducive to student achievement is a responsibility and should be a priority of school administrators. If parents believe that their children's school environment is not safe, they will question the ability and fortitude of the school's leaders to provide a thriving atmosphere. Having parents and community members who support the local school district is vital to its success and is the foundation of any flourishing educational environment. Like a house, if the foundation of the educational environment is weak, it will falter and be unsuccessful. However, unlike a house, students cannot be simply rebuilt using new materials. The damages may not be reversible. Children are products of their environment, developed through both positive and negative experiences. Students are entitled to a thorough and efficient education, which school administrators are responsible for providing. Fostering a safe environment for learning requires commitments from the community and school administrators to be proactive in making schools safer (Nanjiani, 2000).

The safety of students and employees of a school district can be threatened in a multitude of ways. Violence, facility-related dangers, air quality, pathogens, chemicals, and health emergencies all pose risks to the safety of individuals located in schools. Each one is different and therefore must be addressed by school administrators in a different manner. However, they all have a common theme and that is they all threaten the safety of the buildings' occupants. Strategies for preventing and eliminating these safety risks continue to be developed, reviewed, debated, and examined (Brown and Brown, 1996). How has technology in the school environment played a role in eliminating or reducing these safety risks? Are schools using the latest technology developments to foster a safer

atmosphere more conducive to learning? Are these emerging technologies cost-prohibitive to most schools and as a consequence, are districts finding themselves unable to reap the benefits these technologies offer in making schools safer?

One of the most obvious threats is violence in the school. Violence can include peer-to-peer attacks, assaults on teachers, and child abuse through verbal, physical, emotional and sexual means. According to the U.S. Department of Education's 1998 Annual Report on School Safety, almost 75% of all high schools reported at least one incident of a violent crime on campus and more than 6,000 students were expelled during the 1996-1997 school year for bringing guns to school. (Lewis, 2002). The same report in the year 2000 notes over 133,500 violent crimes committed against teachers at school. The 2000 National Study of Delinquency Prevention in Schools, reports over 6,450 schools reporting at least one incident of physical attack or fight with a weapon in the 1997-1998 school year (Kennedy, 2002). There is a rising concern about violence prevention within the school environment as a whole. Schools are seeing disciplinary infractions such as vandalism, hate crimes, and assaults against teachers. The 1999 Annual Report on School Safety reports incidents of hate crimes based on gender, ethnicity, race, and color. According to this same report, incidences of multiple victim homicide in schools have steadily increased over the last several years (Nanjiani, 2000). School violence is consuming increasing amounts of educators' time, which takes away from the time these individuals should be devoting to developing the educational curriculum and planning instructional improvement (Brown and Brown, 1996).

It is evident why curbing violence in schools is a major concern for all stakeholders in the educational process. Studies have shown that peer-to-peer violence reduces learning for offenders and non-offenders because these infractions cause

classroom disruptions. Violence invokes fear in students, causing them to become emotionally ill and resulting in days missed from school. The 2000 Indicators of School Crime and Safety reports that five percent of students between the ages of 12 and 18 feared being attacked or harmed at school during the last six months of 1999 (Kennedy, 2002). Ultimately, this interruption in the learning process of a child hinders the overall educational development for that student. Over time, if unattended these developmental gaps can lead to complete academic failure and thus cause a student to dropout of school. Research has revealed that potential drop-outs are at risk with language development limitations, have limited coping skills, are socially withdrawn, lack parenting skills and have school attendance problems (Brown and Brown, 1996). These potential dropouts eventually become adults who have developed social interaction problems, which can result in violent tendencies. This is a vicious cycle that begins at the early developmental stage of a child when educators have a chance to make a difference.

According to the research, there is a myth that inner-city schools are more likely candidates for violence on campus than are rural districts. The belief is unfounded because studies have shown that the urban districts are most often the ones most prepared to respond to these possibilities of violence (Batsis, 2000). Strategic planning and careful balancing of many interrelated factors are crucial in creating a safe atmosphere. Factors such as making safety/security a top priority, integrating the technology into the school infrastructure, a change in attitude toward the process, and proper training are commitments that must be made in order to begin effective school planning for a crisis (Hylton, 1998).

Detailed in the subsequent paragraphs, research has identified six areas where technology can be implemented to assist in the reduction of school violence:

24

commitment; eliminating weapons from school; bringing low technology to classrooms, restrooms, and hallways; using technology to teach nonviolent curriculum; escalating awareness of television subject matter; and increasing after-school activities to include technology (Brown and Brown, 1996).

Commitment from the school community is developed through open channels of communication to school stakeholders. A crisis management plan with emergency policies and programs is crucial in the process of knowing how to react in an emergency situation. Commitment and the overall success of this emergency operations plan is established through communication and training of the policies and procedures to the stakeholders. Stakeholders in this process are the students, faculty, administrators, board members, community, and local law enforcement and emergency services. The plan should designate a team of leaders who will take charge during a crisis, describe how to alert staff members that an emergency has developed, and set up procedures of how to respond (Kennedy, 2002). Communication to these stakeholders can be facilitated with technology in the form of website content, e-mails, automated phone calls, local cable channel programs, and school newsletters developed on publishing software. Training of school personnel and emergency drills with building occupants are critical in the success of the crisis management plan. Appropriate personnel must know what specific things need to be done and how these tasks should be executed in case there is an incident.

Technology can also support the efforts of the crisis management plan through means of archiving. Copies of the plan along with building schematics, interior and exterior photographs, and even video tours of the buildings can be kept on CD-ROM and accessed remotely in a time of crisis (Dorn, 2001).

Eliminating weapons from the school buildings is crucial in curbing violence in the district. Zero-tolerance policies have been developed and adopted by many school districts in hopes of deterring weapons being brought to school. Technology, in the form of surveillance equipment, has been implemented to assist in this deterrence while also providing monitoring capabilities. Varieties of this surveillance, monitoring, and archiving technology includes: stationary metal detectors; hand-held metal detectors; video surveillance cameras with remote access to the video feed; security control stations using closed-circuit televisions; digital cameras; digital video recorders (DVR); and two-way communication devices such as walkie-talkies, wireless phones, and cellular phones.

Research has also shown that some of the other technological equipment used for security measures in preventing violence and promoting safety in schools have been electronic locks, fire and intrusion alarm systems, and smart cards (Kuehl, 1998). Electronic locks are being incorporated with video surveillance cameras, microphones, and speakers so entrance points can be monitored and access can be limited to only those individuals who have legitimate business entering the school building. Front desk personnel are able to see, hear, and speak to the individual requesting access to the building. The employee then has the option to either electronically unlock the door to permit access or refuse entrance to that individual simply by not unlocking it. Coupling electronic lock technology with a policy of limited entry and exit points enhances security and reduces safety risk (Kuehl, 1998).

Recently, microphone technology has been incorporated with intrusion alarm systems to further enhance its functionality. By integrating microphones, law enforcement and emergency personnel can listen to what is going on in the building prior to entering the facility for strategic purposes if an alarm is triggered. Furthermore,

"panic" buttons are being added to alarm systems to allow staff to immediately trigger the alarm and notify appropriate authorities during a crisis or emergency (Schneider, 2001).

Research has shown that smart cards are being implemented in many school districts across the country. Smart cards are being used for building access, attendance information, visual identification, library services, food services, and student schedule information. The photo-ID smart cards, which are visibly worn by faculty and students, have computer chips that store valuable information such as what areas of the school building they are allowed to access once inside, library book checkout data, food account data, and their daily school schedule (Rittner-Heir, 2001). Using these smart cards with a data network allows administrators greater monitoring capabilities. Information on whether a staff member or student is in the building and what area of the facility that person is currently located is simply a touch of a button or click of a mouse away. The latest trend in this area of security technology is biometric identification technologies. Examples of this type of technology are fingerprint ID, iris and retinal scanning, hand geometry, and facial recognition. Using this type of technology prevents loopholes in security procedures such as loaning out or theft of a smart card (Szczerba, 2000).

According to the research, security measures do not need to break the budget. One of the most important steps a school district must take before making the leap into purchasing security equipment is to determine the needs. One researcher suggests soliciting feedback from the students, faculty, and parents to identify and prioritize concerns (Dorn, 2001). It is easy for a school district to get caught up in the security hype, post Columbine High School and September 11, and go overboard with security technology in areas of the building that may not require the level of surveillance or detection another district might warrant. Introducing appropriate levels of security

technology in areas that merit its placement is the cost-effective solution to perpetually tight school budgets.

Studies have shown that low technology such as bullhorns, walkie-talkies, classroom/desktop phones, and wireless phones also plays an integral part in the security process of keeping school environments safe. Two-way communication devices are vital tools and in a time of crisis, could easily become the only and crucial lifeline to the outside world (Wilcox, 1999). Security equipment is only a component within a broader solution and therefore purchasing the hardware, albeit important, is just one piece of the puzzle. Cost-effective and feasible security solutions that are in-line with the school's existing technology infrastructure are critical in the success of school safety efforts. Many school districts do not want security technology to be too visible in and around the buildings. School administrators do not want to give the impression to the community that the local school district is turning into a prison (Patterson, 1998). By concentrating more on the integration of security basics, accountability, and some security technology, noticeable and timely results in providing a safe learning environment can be achieved (Hylton, 1998).

There has to be a balance between technology and programs in preventing violence and promoting safety in schools. Therefore, along with technology-based solutions schools have begun the trend of incorporating School Resource Officers (SROs) as part of the faculty. These law enforcement officers, who act as a "friendly" police presence, are becoming more commonplace in rural, suburban, and urban school districts and not only at the secondary school level. This has been due in part to the COPS in Schools program that was developed as part of the U.S. Justice Department's Office of Community Oriented Police Services (COPS). These grants provided up to $125,000 to

pay for a school resource officer for three years. However, these officers are not only responsible for law enforcement in the school, but they are also charged with educating, counseling, and mentoring the students. These officers often teach classes on topics such as substance abuse, crime prevention, and safety (Kennedy, 2001).

Technology can also be used in proactive rather than reactive approaches in maintaining a safe and secure learning environment. Using technology to deliver a non-violent curriculum to students and promoting awareness of non-violent television programs and media is essential in the process of creating a safe school atmosphere. By teaching the younger generation peaceful and non-aggressive behavior, we are in theory, shaping a future society where conflict resolution and compliance to societal requirements are the norm. If this happens, security measures to prevent safety risks in schools will stay a lower priority than the education of students. Furthermore, using technology like computers, software, scanners, digital cameras, and the Internet in after-school-programs further enhances the ability of educators to make a positive impact on future generations (Brown and Brown, 1996).

Safety of students and employees in a school building can also be threatened by the facility and its surroundings. Air quality, poorly maintained buildings, improperly stored chemicals, pathogens, and a host of other dangers all can threaten the safety of a school's occupants. School district maintenance departments are typically understaffed and have undersized budgets for the size buildings they are asked to maintain (Geiger, 2002). Because of these low budgets and small maintenance crews, the buildings are poorly maintained. When school buildings are not properly maintained, the condition of the facility declines over time at an exponential rate. Currently, school buildings across the country are mediocre at best and many are dilapidated.

According to the research, it would cost between $112 and $150 billion to bring the state of existing schools in the country up to good condition. Shockingly, 70% of the country's schools face serious facility problems, with 30% requiring extensive repairs and 40% needing replacement of major components (Geiger, 2002). The General Accounting Office report revealed that 28,100 schools serving 15 million students have less-than-adequate HVAC systems; 23,100 schools serving 12 million students have less-than-adequate plumbing; and 21,100 schools serving 12 million students have less-than-adequate roofs (Krysiak, 1999). In New Jersey, a study established that 20% of its school buildings were rated as inadequate and 52% were assessed as less than good. Furthermore, the study found that it would cost about $2,476,100,000 to replace the inadequate facilities and $6,437,860,000 to replace the ones rated as less than good (Honeyman, 1998).

Many times, the budget for capital improvement projects was redistributed to operating dollars because school boards and administration believed that operating capital was more important than maintaining the facilities (Geiger, 2002). What these leaders did not realize was that by not properly designating the funds for capital improvements and maintaining the school buildings, the facilities have become literally dangerous, unhealthy, and not conducive to optimum learning---an oxymoronic effect. Research has proven that decaying environmental conditions such as inadequate plumbing, HVAC systems, poor lighting, and dilapidated classrooms can affect students' learning as well as their health and morale (Krysiak, 1999). Cutting maintenance budgets ultimately has a negative affect on the ability of students to learn and achieve and the impact is significant.

Improperly maintained facilities can also have a domino effect on other areas that can jeopardize the safety of a school building's occupants. Inadequately maintained roofs normally cause poor indoor air quality (IAQ), which often leads to serious health problems affecting staff and student attendance. Leaky roofs allow water infiltration and moisture is required for mold and other toxic microbes to grow. Studies have shown that airborne contaminants are linked to illnesses among children and research has proven that children who attend schools where mold is present have increased incidences of respiratory illness and absences compared to those in mold-free facilities (Krysiak, 1999).

Inadequate HVAC systems are another cause of poor indoor air quality. The building's HVAC system maintains the proper fresh air ventilation and controls the temperature and amount of humidity in the air. Inadequate ventilation in a building causes an accumulation of carbon dioxide, volatile hydrocarbons, and formaldehyde. At summer room temperatures, humidity levels that exceed 60% can create the precise recipe for toxic mold growth (Bacci, 2002). Interestingly, the HVAC system can also be the vehicle in which toxic microbes and mold are distributed throughout the school building. Studies have shown that toxic mold has been linked to health complaints ranging from headaches, nosebleeds, sinus problems, and chronic fatigue to respiratory problems, such as asthma, and death. Mold can also have damaging effects on the building itself. Mold destroys whatever it grows on and can take hold in less than one to two days. Common building materials where mold is likely to be found growing if moisture is present include ceiling tiles, carpet, drywall, and insulation (Williams, 2002).

The common theme to the cause of why many of the nation's school buildings are in a dilapidated condition, which causes significant threats to student and staff safety, is an inadequate maintenance program. A quality maintenance program is essential in

preserving the first-rate condition of a new or fairly new facility. Qualities such as top level commitment; a written preventative maintenance plan that is implemented regularly and consistently; adequate funding to sustain the maintenance plan; and creative ideas to assist the maintenance plan are essential. Recently, creative ideas linked to technological advances have assisted with the overall maintenance plan school districts have implemented.

Technology has allowed school maintenance departments to cut costs, improve effectiveness, and bolster efficiency (Larock, 2000). Technological advances have helped reduce the facility related dangers and minimized safety risks through incorporation into existing preventative maintenance methodologies. Equipment, such as the boiler and HVAC system, and the building structure, like the roof, must be properly maintained to ensure suitable performance from these components. Technology has helped with the facility administrator's enormous task of keeping track of preventative maintenance schedules for all of the components in a school building that require regular and timely maintenance. According to the research, most school districts are creating databases that track preventative maintenance cycles and alert administrators when a scheduled maintenance task is due on a specific piece of equipment or building structure. These software databases also provide a maintenance history by tracking maintenance parts installed, costs of the parts and labor, and dates maintenance was performed. This record keeping is invaluable to a facility administrator and the information stored assists with long-range planning and discerning problems peculiar to a particular facility (Spencer 1997).

A recent technology trend for school maintenance departments has been in the area of Internet-based or online software applications. There are online software

application tools for scheduling and managing preventative maintenance work. There are also online software application tools for documenting and managing work order services in a school facility. Online workflow processes that allow for teachers and other faculty members to enter work order requests on the computer are replacing paper work order requests. Work order requests, such as a request to fix a faulty lunchroom table, can be prioritized, assigned, and fixed in a manner more expedient than in the past. Again, technology has provided an excellent management tool for the facility administrator for overall safety, efficiency, history, and budgetary reasons.

Technology has also assisted with reducing dangers associated with storing and handling dangerous chemicals, such as those found in chemistry labs or used for cleaning in the school district. Electronic databases and Internet capabilities are used for storing and quickly retrieving Material Safety Data Sheet (MSDS) information. Information such as how to clean up chemical spills and what to do in the event of ingestion, inhalation, or contact can immediately be accessed via a computer. Furthermore, the latest protocols for handling suspicious substances and procedures for responding to biochemical threats can be easily retrieved using the Internet (Lewis, 2002). Technological advances have also helped in the area of mixing and diluting chemicals needed in the daily operations of a school maintenance department. Using technology equipment, cleaning chemicals can automatically be diluted, mixed, and poured and this assistance reduces safety risks in a school building (Larock, 2000). Similarly, information regarding blood-borne pathogens, such as the Human Immunodeficiency Virus (HIV) and Hepatitis B, can easily be stored and retrieved on an electronic database or through the Internet.

Computerized temperature controls and integration of the HVAC system with the schools existing network infrastructure have allowed for increased managerial control

33

and organization for the facility administrator (Chan, 2002). This has allowed for more efficient maintenance operations and ultimately safer conditions in the school buildings.

Technological advances in the area of lighting have increased overall safety in school facilities. According to the research, new light source technology, improved design, and built-in diagnostics are some of the latest trends in facility exit signs. In emergency situation, exit signs are vital to the safety of the school building's occupants. Brighter, longer lasting, and more cost-effective lighting technology has assisted in increasing school facility safety (Wright, 2000).

Even with the best programs and systems, some safety issues are precipitated beyond a school's control. With sudden cardiac arrest being the second-leading cause of death in America, many schools are purchasing automated external defibrillators. These portable laptop-sized devices can save of the life of an individual who goes into sudden cardiac arrest by delivering an electrical shock to restore a heartbeat to normal. Recently, schools have seen several cases of athletes go into sudden cardiac arrest due to an unknown heart defect. By having an automated external defibrillator, these schools can increase the survival chances for that individual (Moon, 2002). School administrators feel that if there is a chance that this type of technological equipment can save a life, it is worth the cost (Lewis, 2002). By taking advantage of this technological advance, districts have increased the overall safety in their school building.

Safety is a critical component of a successful learning environment for school children. No plan or procedure is absolutely foolproof and safety cannot ever be guaranteed. Safe is only safe enough when districts have exhausted every reasonable effort to protect the health and safety of their students (Lewis, 2002). Unfortunately, safety is often compromised in order to satisfy expediency or budgetary requirements

34

(Shaw, 1999). Implementing a multitude of policies, procedures, programs, and technology that is fully and unconditionally supported creates a safe school environment. A safe school environment creates a nurturing and thriving atmosphere for school children to excel and achieve at learning, the ultimate business of schools.

Chapter Three

Design of the Study

This study will utilize the action research methodology design. The literature on improving maintenance and facilities operations, along with enhancing security measures was reviewed. Certain theories were incorporated, where applicable, in developing an overall security and operations approach for the Lumberton Township School District. The literature review also provided a clear illustration of the significant numbers of safety risks that are rampant throughout many school districts. The research was designed to provide Lumberton Township School District with a means of collecting meaningful data that would help address those safety risks, while keeping within tight budgetary constraints. With the impending construction of its fourth school and a constant vigilance of maintaining an up-to-date facilities operation, the Lumberton School District would benefit from research data in surrounding Burlington County school districts for its analysis and design of the project. The overall project was designed to provide the reader with the knowledge of designing and developing more efficient maintenance, facility, and security operations and through this process, securing a safer environment.

For the data to be meaningful for the Lumberton Township School District, a broad and significant quantity must be collected and analyzed. However, the data also ought to be relevant for Lumberton, and therefore should be collected from districts that face similar limitations such as budget parameters, socioeconomic status, geographical location, and legal requirements. Keeping all of these factors in mind, it was clear that the best approach to collecting this scope of meaningful data would be through a questionnaire survey. This research data collection instrument provides quantitative data in a timeframe best suited for this type of project.

The questionnaire was designed to collect data that could be analyzed and used to assist in the design and implementation of future projects in the Lumberton School District. Furthermore, the questionnaire was designed to provide support to readers of this thesis and other districts in the process of implementing similar projects and interested in examining this research. The questionnaire was designed to be thorough enough to collect meaningful data, but not too long as to prohibit participation and completion. The first nine questions in the survey focus on finding out about crisis management plans, school resource officers, surveillance/security equipment, and building access strategy. Questions ten through twenty-one center upon preventative maintenance procedures, maintenance equipment, air quality issues, work order request procedures, and technology-enhanced facility operations. Overall, the questions were developed and incorporated in the survey to query other school districts about technology related programs that make their schools safer and more efficient.

For the data from the survey questionnaire to be relevant for this project, an appropriate sample had to be chosen. The sampling had to be broad enough to produce meaningful data, but targeted only to districts similar enough to Lumberton to provide consequential data. Furthermore, to ensure a good response rate, the sampling could not be so large to jeopardize the completion of the project. With these factors in mind, public school districts in Burlington County, New Jersey were chosen as the sample for this data collection process. There are a total of forty-two public school districts in Burlington County, New Jersey. These forty-two school districts comprise a thorough sample and can provide a bountiful amount of data for the project.

In the beginning of December 2002, the Lumberton School District Business Administrator and Director of Buildings and Grounds reviewed and edited the rough draft

of the survey. Both individuals made suggestions and all of their comments were incorporated into the final draft of the survey. This final draft of the survey was submitted to the Rowan University mentor on December 11, 2002, for review and suggestions. The suggestions of the Rowan University mentor were incorporated during the week of December 16, 2002, and subsequently the survey was approved for release into the field for data gathering. On February 4, 2003, the Security/Safety/Maintenance Survey of Burlington County School Districts was e-mailed to all forty-two Burlington County districts. The e-mail was addressed to the Supervisor or Director of Buildings and Grounds and a cover letter explaining the purpose of the survey was attached. At the February 12, 2003, Burlington County School Buildings and Grounds monthly meeting, the Lumberton Director of Technology presented the purpose of the survey and thanked the members for their anticipated participation.

By the February 12, 2003, Buildings and Grounds monthly meeting, four completed surveys had been received via fax transmission. Near the end of February 2003, a total of six completed surveys had been received either by fax transmission or as an e-mail attachment. On February 25, 2003, a second e-mail to all forty-two school districts was sent urging for additional participation, emphasizing the importance of the survey, and reiterating the willingness to share results. On the cutoff date of February 28, 2003, a total of nine completed surveys were received. The goal to receive at least twenty-five completed and returned surveys was not met. However, enough surveys were received to ensure a valid research sampling (nine out of forty-two, which comes out to a 21.4% response rate).

Now that all of the data has been collected, the next step is to enter it into a statistical software program, called SPSS, for thorough analysis and effective

presentation of the information. The software will provide charts, graphs, and reports of the data trends, which will be analyzed, scrutinized, and interpreted. The information interpreted from the statistical data will be utilized for the presentation of the research findings and will assist with the conclusions, implications, and need for further study.

Chapter Four

Presentation of Research Findings

The security/safety/maintenance survey was sent to the forty-two public school districts in Burlington County, New Jersey. Of the public school districts surveyed, nine responded. This represented a 21% response ratio. The Buildings and Grounds Supervisor of the district completed seven of the nine surveys and the Technology Coordinator of the district completed the other two. Demographically, 67% of the surveys were completed by districts that house a grade span of pre-kindergarten through eighth grade.

Table 9

Total Student Population

Student population range	Percentage of returned surveys
500 - 999	44.4
1000 - 1499	11.1
1500 - 1999	33.3
2000 - 2999	0.0
3000 - 3999	0.0
4000 - 4999	0.0
5000 or more	11.1

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts.

As shown in Table 9, over 40% of the school districts that completed the survey have less than 1,000 total students in the district.

The recent tragic events at Columbine High School and the World Trade Center have prompted school districts to become more proactive in developing policies and procedures surrounding possible crisis events. The results of the survey show that 100% of all the responding districts have a crisis management plan in place and have trained their staff members on what to do during a crisis event. Furthermore, 89% of the districts that completed the survey responded that lockdown drills have been performed in their districts for staff and student readiness in the event of a crisis. The importance of local emergency personnel having a copy of, or remote access to, the district's school building schematics was evident in the survey results. Calculated from the results, 89% of the respondents claimed that local emergency personnel either have a copy of, or remote access to, their building schematics.

In spite of their desire to proactively prepare for crises, interestingly, only 44% of these districts have a full-time School Resource Officer (SRO), 11% have a part-time SRO, and 44% do not have an SRO at all, as calculated by the survey results. Additionally, only 50% of the high school districts that responded to the survey have a full or part-time School Resource Officer and only 57% of the pre-kindergarten through eighth grade districts have a SRO either full or part-time. Furthermore, the survey results demonstrated that 50% of the districts with student populations of less than 1,500 do not feel the need to have a full or part-time School Resource Officer. Surprisingly, all of the school districts with over 5,000 students also do not have a full or part-time SRO, while 100% of the districts with a student population between 1,500 and 2,000 students have a full-time SRO.

Personnel is only one issue in the area of technology-related security strategies. School districts in the twenty-first century have many different types of surveillance and security equipment technologies available to them.

Table 10

Surveillance and Security Equipment

Type of surveillance and security equipment technology	Percentage of returned surveys that have implemented the technology
Video surveillance cameras	88.9
Electronic or magnetic door locks	55.6
Smart cards	33.3
Metal detectors	0.0
Building interior microphones	0.0
Classroom panic buttons	0.0

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts. As shown in Table 10, all of the school districts agreed that metal detectors, interior microphones integrated with the fire/security alarm system, and classroom panic buttons linked to the building alarm system were not necessary surveillance/security equipment technologies for their school community. Notably, 89% of the Burlington County school districts have implemented video surveillance cameras in or around their school buildings and over 50% use electronic or magnetic door locks for controlled building access.

Table 11

Smart Card Usage

Smart card use	Percentage of returned surveys
Identification	100.0
Cafeteria account activity	66.7
Controlled building access	33.3
Library account activity	33.3

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts.

As shown in Table 11, all of the school districts that use smart cards use them for student

or staff identification. This verifies that 33% of the districts have their staff and/or

students wearing multifunctional photo-identification badges, which serve other purposes

such as controlled building access, library account, and cafeteria account functionality.

Results of the survey verified that 100% of the districts that use electronic or

magnetic door locks have a policy of keeping all of the facility doors locked 24 hours a

day and monitor these entrances via video surveillance cameras over a closed-circuit

television network.

Table 12

School Building Access Policy

Building access policy	Percentage of returned surveys
All of the building doors locked	55.6
Front door entrance unlocked only	33.3
All or most of the building doors unlocked	11.1

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts. As shown in Table 12, over 50% of the districts keep all of the building doors locked and only 11% have a policy of allowing all or most of their building doors to remain unlocked during the school day. 100% of the districts that have the policy of leaving all of the building doors unlocked have video surveillance cameras at the entrances and monitor the activity over a closed-circuit television network.

Based on the survey results, 100% of the districts that have video surveillance cameras monitor the transmission of these cameras over a closed-circuit television network. Only 25% of the districts that use video surveillance cameras record the data onto a digital medium using a digital video recorder, while the other 75% record the data transmission onto a video cassette using a standard analog video cassette recorder.

Table 13

Areas Monitored on Video Surveillance Cameras

Area monitored	Percentage of returned surveys
Building entrances	100.0
Hallways	37.5
Loading dock	37.5
Parking lot	37.5
School playground	25.0
Cafeteria	25.0
Main Office	12.5
Central Administrative Office	12.5
Gymnasium	12.5

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts.

As shown in Table 13, of the districts that use video surveillance cameras, 100% use the

cameras to monitor the building entrances. The results verify that school district

personnel are most concerned with who is entering or leaving the school buildings.

Two-way communication devices proved to be one of the most effective tools

during the Columbine High School shooting crisis. Survey results verified that 89% of

the school districts currently use cell phones and two-way radios, also known as walkie-

talkies. Additionally, 22% of the school districts use wireless phones that operate either

on the 900 MHz or 2.4 GHz frequency range, and none of the districts that responded to the survey currently use megaphones or bullhorns.

Interestingly, budget constraints, school image, and a false sense of security played a role in these districts' decision on implementing specific types of surveillance/security equipment in their buildings. Only 44% of the districts that completed the survey identified at least three types of surveillance/security equipment utilized in their districts, while 56% identified less than three. Analyzing the survey results further, 44% identified only two types of surveillance/security equipment being utilized in the district and 11% did not identify a single type of security or surveillance technology being implemented. The survey included an area for the districts that did not utilize at least three types of surveillance or security equipment to respond with reasons why they chose a minimal approach.

Table 14

Reasons for Lack of Surveillance/Security Technologies Implemented

Reason	Percentage of returned surveys
Equipment and installation cost too high	60.0
Lack of funding	60.0
Did not want to portray their district like a "prison"	40.0
Lack of need	20.0

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts.

As shown in Table 14, equipment/installation cost and lack of funding tied for the number one reason why the districts had less than three types of surveillance/security technology implemented. Not far behind, 40% responded that a reason for the minimalist approach was that they did not want their district to be perceived to be prison-like by the community. Notably, 20% responded that based on the location, demographics, and overall makeup of the district they did not feel a need to utilize at least three types of surveillance/security technologies.

Preventative maintenance is an area where school districts must invest time and money to ensure a safe environment. Research has demonstrated that budget is normally the number one reason why preventative maintenance is sometimes overlooked and many times under accomplished. The survey collected information regarding the school district's average yearly allowable maintenance budget (function 261) and also its overall yearly general fund budget. Function 261 is comprised of budget items including, but not limited to, maintenance contract fees, roof tests, parking lot resurfacing, carpet replacement in classrooms, water treatment for water towers, maintenance and replacement of fire alarm and clock service, replacement of air handling units, and provision of backup generator service. A ratio of the yearly allowable maintenance budget to the overall yearly general fund budget was then compared among the school district survey results. The results of the survey showed that the minimum percentage of yearly allowable maintenance budget to the overall yearly general fund budget was 0.41%, the maximum was 1.50%, the mean was 0.81%, and the median was 0.84%. Furthermore, these survey results show that districts in Burlington County budget an average of 0.81% of their yearly general fund budget on yearly allowable maintenance expenditures. Survey results demonstrated that 44% of the districts budget less than the

47

average percentage of 0.81%. The school district that responded with the lowest budget percentage is a pre-kindergarten through eighth grade district with an overall student population of over 5,000 students. The school district that responded with the highest budget percentage is also a pre-kindergarten through eighth grade district with an overall student population of under 1,000 students.

Results of the survey showed that 3.2 is the average number of buildings maintained in a Burlington County school district. Additionally, survey results showed that the average square footage maintained in a Burlington County school district is 237,198 square feet. None of the school districts that participated in the survey privatizes their custodial, maintenance, or grounds work. All of the school districts employ their own buildings and grounds personnel.

Table 15

Buildings and Grounds Staff Averages

Position	Average number of personnel according to returned surveys
Full-time custodian	18.00
Part-time custodian	1.44
Full-time maintenance mechanic	1.78
Part-time maintenance mechanic	0.11
Full-time grounds keeper	1.11
Part-time grounds keeper	0.22

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts.

As shown in Table 15, a Burlington County Buildings and Grounds Supervisor is responsible for managing an average full-time staff of approximately 21 people. This calculates to a ratio of 1:21 for the supervisor-to-employee ratio in the school buildings and grounds department.

The average square footage that a full-time equivalent custodian and maintenance mechanic maintain in a Burlington County school district is valuable information to a Buildings and Grounds Supervisor in helping to minimize safety risks.

Table 16

Average Square Footage a Full-Time Equivalent Custodian Maintains in a Burlington County School District

Variable	Variable definition	Amount used in the variable	Answer
S	Avg. bldg. square footage of a district	237,198 sq. feet	N/A
C	Avg. number of full-time custodians	18.00 people	N/A
P	Avg. number of part-time custodians	1.44 people	N/A
A	Avg. square footage of area a full-time equivalent custodian maintains	N/A	12,671 sq. feet per custodian

Note. The formula, $A = S / (P \times 0.50 + C)$ was used in the table to calculate the answer. As shown in Table 16, the equation, $A = S / (P \times 0.50 + C)$ was used to determine the average square footage of area a full-time equivalent custodian maintains. Using the

results of the survey and the formula above, calculations prove that the average square footage of area a full-time equivalent custodian maintains in Burlington County is 12,671 square feet.

Table 17

Average Square Footage a Full-Time Equivalent Maintenance Mechanic Maintains in a Burlington County School District

Variable	Variable definition	Amount used in the variable	Answer
S	Avg. bldg. square footage of a district	237,198 sq. ft.	N/A
M	Avg. number of full-time maint. mech.	1.78 people	N/A
T	Avg. number of part-time maint. mech.	0.11 people	N/A
B	Avg. square footage of area maintained		129,263 sq. feet
	by a full-time equivalent maint. mech.	N/A	per maint. mech.

Note. The formula, B = S / (T x 0.50 + M) was used in the table to calculate the answer. As shown in Table 17, the equation, B = S / (T x 0.50 + M) was used to determine the average square footage of area a full-time equivalent maintenance mechanic keeps up. Using the results of the survey and the formula above, calculations prove that the average square footage of area a full-time equivalent maintenance mechanic keeps up in Burlington County is 129,263 square feet.

Research has proven that indoor air quality problems caused by mold spores circulating through a school district's HVAC system are prevalent in many schools

throughout the United States. The survey results of the Burlington County school districts demonstrated that only 22% of the participating districts reported experiencing mold or other indoor air quality problems over the last ten years.

Software that tracks preventative maintenance for buildings, equipment, and vehicles is becoming a popular maintenance technology tool. Based on the results of the survey, 67% of the Burlington County school districts use some form of software to track scheduled preventative maintenance for buildings, equipment, and vehicles.

Table 18

Information Tracked by the Preventative Maintenance Software

Information tracked	Percentage of returned surveys
Date the maintenance was performed	83.3
Amount of hours spent to accomplish the task	83.3
Fixed asset number and type	66.7
Date of next scheduled maintenance	66.7
Cost of the maintenance part installed	50.0
Maintenance part installed	33.3
Employee who performed the maintenance	16.7

Note. From the 2003 Leung M.A. Thesis Survey of Burlington County School Districts.

As shown in Table 18, over 80% of the districts that use preventative maintenance software, utilize it to track the date the maintenance was performed and also the amount

of hours spent to accomplish the maintenance task. Notably, only 17% of the districts use this software to track the employee who performed the maintenance.

According to the research, software, electronics, and other technologies have greatly improved the efficiency and safety of maintenance tasks for which a Buildings and Grounds Supervisor is responsible. Some of these areas include work orders, Material Safety Data Sheet information, and mixing/dispensing of cleaning chemicals. Results of the survey showed that 56% of the school districts in Burlington County use electronic or web-based software to track district work order requests. Interestingly, none of the districts reported using electronic databases or any other technology to electronically store Material Safety Data Sheet (MSDS) information. Additionally, 78% of the school districts use building automation software to electronically control and monitor their Heating, Ventilation, and Air-conditioning (HVAC) equipment. Remarkably, 100% of the districts use some form of technology to automate the dilution, mixing, and dispensing of cleaning chemicals.

Although the majority of the research results have focused on proactive measures, use of technology in school districts can also aid in reacting to crises. Research has shown that portable defibrillators are becoming more prevalent in school districts across the country. Survey results verified that 78% of the school districts in Burlington County have portable defibrillators. Calculating the results showed that the minimum number of portable defibrillators that a district had was one, the maximum was three, and the mean and mode were two. Additionally, 86% of the districts with portable defibrillators housed them in the nurse's office, while only 14% of these districts housed them in the school's main office. Research results support the theory that portable defibrillators are fast becoming an important part of a school district's arsenal of crisis technology tools.

The security/safety/maintenance survey comprised a total of twenty-two questions, with the last question querying whether the participant was interested in receiving the results of the survey. All of the survey participants responded that they were interested in learning the results of the survey. Conclusions based on the research findings will be presented and discussed in the next section, chapter five.

Chapter Five

Conclusions, Implications and Further Study

The purpose of this research study was to determine the impact of technological advances on the maintenance operations of the school facilities, and whether that impact has ultimately made the school environment safer. The focus of the study was to determine what types of technology are being implemented in schools to enhance safety measures. Furthermore, the study concentrated on how much safety technology is being implemented, where in the district it is being employed, and how cost factored into the school district's decision-making process.

What is the effectiveness of technology on the maintenance process of the facilities?

Indoor air quality problems have plagued many school districts over the last ten to twenty years. Most likely, these problems were occurring before then as well, but were not as highly publicized and documented as they have been lately. The results of the survey indicate that technological advances, which have been implemented in the maintenance operations of schools, have lowered the occurrence of indoor air quality problems in Burlington County schools. The survey results showed only a small percentage of school districts in the county that have experienced indoor air quality problems in the last ten years. Evidently, technological enhancements in the maintenance procedure of schools, such as preventative maintenance software, work order software, building HVAC automation software, and chemical handling automation equipment, have helped make maintenance operations more efficient and reduced incidents of poor indoor air quality.

Overall, survey results indicate that facility maintenance operations of school districts in Burlington County have become more efficient through the widespread

54

implementation of technology advancements. Interestingly, the outcome of a more efficient facility maintenance operation is a safer school environment. Improved indoor air quality makes for healthier occupants. The use of preventative maintenance software that tracks critical information necessary for the continual upkeep of vital facility equipment, such as boilers, ensures a safer environment. Chemical handling automation equipment ensures the safe and proper dilution, mixing, and dispensing of cleaning chemicals. Storing Material Safety Data Sheet (MSDS) information in an electronic database provides for a method of quickly and accurately retrieving critical information in an event of a crisis. In conclusion, not only have technology innovations streamlined maintenance operations, but these same technological improvements, in the process of providing maintenance efficiency, have also created a safer school environment.

The implication of the results offers the Lumberton School District a better understanding of the types of maintenance operation technologies that Burlington County schools are implementing. Using the survey results, the Lumberton School District's Director of Facilities will be able to make more informed decisions on maintenance operations in his department. In the process of making the Lumberton School District's maintenance operations more efficient, the Director of Facilities will ultimately be creating a safer school environment. Lumberton School District's safer building environment will be accomplished with an outcome of better indoor air quality, increased equipment maintenance, safer handling of chemicals, better-informed employees, increased surveillance, and enhanced lock down procedures. A safer school environment, created through technological advances in maintenance operations, breeds a school atmosphere more conducive to learning. A safe and nurturing school atmosphere is every school district's ultimate goal.

Have technological advances made school environments safer?

Based on the survey results, it is evident that schools have taken swift advantage of the technology surveillance/security equipment that is available to them in the twenty-first century. The outcome of this wide spread implementation of security equipment, which includes video surveillance cameras, analog/digital video recorders, electronic/magnetic door locks, and smart cards in Burlington County schools is that these schools have become safer and more prepared for crisis events. Results of the survey indicate that schools have also created new administrative policies and procedures to support the security equipment technology. From the survey results, it is apparent that school officials and community members understand the necessity of crisis management plans, proper staff training, lockdown drills, availability of building schematics for local authorities, and police presence in school buildings. Administrators in Burlington County school districts understand the importance of not only having the precise security equipment, but also appreciate the importance of supporting the equipment with properly trained personnel and clearly defined procedures.

It is evident from the survey results that school districts in Burlington County have also learned from the tragic outcome at Columbine High School and the untimely deaths at school-sponsored sporting events. Results of the survey showed that safer school environments have been created by the thorough implementation of two-way communication devices and portable defibrillators in Burlington County school districts. Furthermore, the results confirmed that enhanced safety measures have been incorporated, such as strict policies on limited school building access. Still some districts cited that cost, lack of funding, and public perception played major roles in the decision making process regarding what technologies were implemented, how much, and where.

Overall, the results of the survey indicate that school environments have become safer due to technological advances and integration.

The implication of these results provide the Lumberton School District with a clear understanding of what other districts in the county, with a similar socioeconomic makeup, are currently doing to implement security technology and policy. From these results, the Lumberton School District can formulate a more informed decision on what types of security equipment technologies and procedures it should implement in its new school building, that has a planned opening date in September 2003.

Further Study

Although many valuable pieces of information were gathered from the security/safety/maintenance survey of school districts in Burlington County and important conclusions were drawn, further study should be performed. Only nine of the forty-two school districts in Burlington County responded to the survey, which is only a 21% representation. While this is a valid survey response rate by research standards, collection of further data to support or contradict the conclusions in this study is warranted. Furthermore, expanding the research sample from just the Burlington County school districts would not only enhance the validity of the results, but would also produce outcomes that are useful to a wider range of school districts.

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Appendix A

Research Instruments & Results

Survey of Burlington County School Districts
Security/Safety/Maintenance Survey

DIRECTIONS: For fill-in-the-blank style questions, please write your answers in the space provided. For multiple-choice style questions, please circle your answer(s).

Person completing survey (optional):	Title (optional):	E-mail (optional):
Name of school district:	District grade span:	# of students in the district:

1. a) Does your district have a Crisis Management Plan? YES NO

   b) If yes, have staff members been trained on what to do during a crisis event?

   YES NO

   c) If yes to question (1a), have lockdown drill(s) been performed? YES NO

2. Do local emergency personnel have remote access to the district's school building schematics (floor plans) or have a copy in their files in case of an emergency/ crisis?

   YES NO

3. Does your district have a School Resource Officer?

   YES, FULL-TIME YES, PART-TIME NO

4. What types of surveillance/security equipment does your district currently use?

   [Circle all that apply]

   a) Metal detectors

   b) Video surveillance cameras

   c) Digital Video Recorders

   d) Analog/Standard Video Recorders

   e) Electronic/magnetic door locks

   f) Smart Cards (Student/Staff ID

   cards with barcode or chip)

   g) Interior microphones integrated with

   fire/security alarm system

   h) Classroom panic buttons linked to the

   building alarm system

   i) Other, please specify _____

   _____

If you circled 4b, please answer question 5(a) and 5(b), otherwise skip to question 6.

5. a) Are the video surveillance cameras monitored on a closed-circuit

    television/monitor?   YES   NO

  b) What areas are the video surveillance cameras monitoring? [Circle all that apply]

    Hallways   Central Administrative Office

    School Main Offices   Building Entrances/Exits

    Loading Dock   Cafeteria

    Playground   Parking Lot

    Other, please specify _____

6. If you circled 4f, how does your district use the smart cards? [Circle all that apply]

    a) Identification   d) Cafeteria account

    b) Controlled building access   e) Other, please specify _____

    c) Library account   _____

7. What types of wireless two-way communication devices does your district use?

    [Circle all that apply]

    a) Cell phones   d) Wireless phones (900 MHz, 2.4 GHz)

    b) Two-way radio (walkie-talkie)   e) Other, please specify _____

    c) Megaphone/Bullhorns   _____

8. What type of building access is implemented in your district? [Circle the one that

    applies]

    a) All/most doors unlocked   c) All doors locked

    b) Front door unlocked only

9. If you circled less than 3 items in question 4, what are some of the reasons why your district chose not to implement these types of surveillance/security measures? [Circle all that apply]

   a) Equip./installation cost too high   d) Didn't want to portray the district as a

   b) Lack of need   "prison"

   c) Lack of funding/budget   e) Other, please specify:_____

10. What has your district's average yearly allowable maintenance budget (function 261) been over the last 3 years? $_____ $_____ $_____

                                        (current year)   (previous year 1)   (previous year 2)

11. a) How many schools does your maintenance/custodial staff upkeep? _____

    b) What is the total square footage of the area that is maintained? _____square ft.

12. If you privatize, circle the area(s) that you privatize, otherwise circle NONE.

    GROUNDS   MAINTENANCE   CUSTODIAL   NONE

13. a) How many custodians do you employ or use through contracted service?

                                                  _____full time and _____part time

    b) How many maintenance/mechanics do you employ or use through contracted service?

                                                  _____full time and _____part time

    c) How many grounds keepers do you employ or use through contracted service?

                                                  _____full time and _____part time

14. In the last 10 years, has your district experienced mold or other indoor air quality problems?   YES   NO

15. Does your district have software that tracks scheduled preventative maintenance for buildings/equipment/vehicles?   YES   NO

16. If you answered yes to question 15, what does the software track? [Circle all that

    apply]

    a) Fixed asset number and type (ie – building, equipment, vehicle, etc.)

    b) Parts installed   e) Date(s) maintenance was performed

    c) Cost of parts   g) Date of next scheduled maintenance

    d) Labor hours to install parts   h) Other, please specify:_____

17. Does your district have software that tracks work orders (online or electronic work

    order requests)?   YES   NO

18. Does your district electronically store MSDS information in a database or other form?

                                                              YES   NO

19. Does your district use building automation software to electronically control and

    monitor its HVAC equipment?   YES   NO

20. Does your district use technology to automate the dilution, mixing, or dispensing of

    cleaning chemicals?   YES   NO

21. Does your district have portable defibrillators?   YES   NO

    If yes, how many? _____ Where are the defibrillators located? _____

22. Are you interested in receiving the results of this survey?   YES   NO

Table 19

2003 Leung M.A. Thesis Survey Results

Question	Result
Percentage of school districts that have a crisis management plan	100 %
Percentage of school districts with a crisis management plan that	
have trained their staff members on what to do during a crisis event	100%
Percentage of school districts with a crisis management plan that have	
performed lockdown drill(s)	89%
Percentage of school districts that have given local emergency	
personnel remote access to or a copy of the district's school	
building schematics (floor plans) in case of an emergency/crisis	89%
Percentage of school districts that have a full-time school resource officer	44%
Percentage of school districts that have a part-time school resource officer	11%
Percentage of school districts that do not have a school resource officer	44%
Percentage of school districts that use metal detectors	0%
Percentage of school districts that use video surveillance cameras	89%
Percentage of school districts that use digital video recorders	25%
Percentage of school districts that use analog/standard video recorders	75%
Percentage of school districts that use electronic/magnetic door locks	56%
Percentage of school districts that use smart cards	33%

(table continues)

Table 19 (continued)

Question	Result
Percentage of school districts that use interior microphones integrated with their fire/security alarm system	0%
Percentage of school districts that use classroom panic buttons linked to the building alarm system	0%
Percentage of school districts that monitor their surveillance cameras on a closed-circuit television/monitor	100%
Percentage of school districts with surveillance cameras that monitor the hallways	38%
Percentage of school districts with surveillance cameras that monitor the school main offices	13%
Percentage of school districts with surveillance cameras that monitor the loading dock	38%
Percentage of school districts with surveillance cameras that monitor the playground	25%
Percentage of school districts with surveillance cameras that monitor the central administrative office	13%
Percentage of school districts with surveillance cameras that monitor the building entrance/exit(s)	100%

Table 19 (continued)

Question	Result
Percentage of school districts with surveillance cameras that monitor the cafeteria	25%
Percentage of school districts with surveillance cameras that monitor the parking lots	38%
Percentage of school districts with surveillance cameras that monitor the gym	13%
Percentage of school districts with smart cards that use the cards for identification purposes	100%
Percentage of school districts with smart cards that use the cards for controlled building access	33%
Percentage of school districts with smart cards that use the cards for library account use	33%
Percentage of school districts with smart cards that use the cards for cafeteria account use	67%
Percentage of school districts that have and use cell phones	89%
Percentage of school districts that have and use two-way communication devices (walkie-talkies)	89%
Percentage of school districts that have and use megaphones/bullhorns	0%

(table continues)

Table 19 (continued)

Question	Result
Percentage of school districts that have and use wireless (900 MHz or 2.4 GHz) phones	22%
Percentage of school districts that have a policy of locking all of the school doors during the school day	56%
Percentage of school districts that have a policy of locking all the doors but the main entrance during the school day	33%
Percentage of school districts that have a policy of not locking any of the doors during the school day	11%
Percentage of school districts that had identified less than three security/surveillance items and gave the reason as cost	60%
Percentage of school districts that had identified less than three security/surveillance items and gave the reason as lack of need	20%
Percentage of school districts that had identified less than three security /surveillance items and gave the reason as lack of funding	60%
Percentage of school districts that had identified less than three security /surveillance items and gave the reason as image/perception	40%
Average ratio of yearly allowable maintenance budget to the yearly general fund budget	0.81%

Table 19 (continued)

Question	Result
Average total number of schools maintained in a school district	3.20
Average total square footage maintained in a school district	237,198 sq. ft.
Percentage of school districts that privatize grounds services	0%
Percentage of school districts that privatize maintenance services	0%
Percentage of school districts that privatize custodial services	0%
Average number of full-time custodians employed in a school district	18.20
Average number of part-time custodians employed in a school district	1.44
Average number of full-time maintenance mechanics employed in a school district	1.78
Average number of part-time maintenance mechanics employed in a school district	0.11
Average number of full-time grounds keepers employed in a school district	1.11
Average number of part-time grounds keepers employed in a school district	0.22
Average number of people a Buildings and Grounds Supervisor manages	21.00
Avg. square footage of area a full-time equivalent custodian maintains	12,671 sq. ft.

Table 19 (continued)

Question	Result
Avg. square footage of area a full-time equivalent maintenance mechanic maintains	129,263 sq. ft.
Percentage of school districts that have experienced indoor air quality problems in the last ten years	22%
Percentage of school districts that have preventative maintenance software	67%
Percentage of school districts with preventative maintenance software that track fixed asset number and type of fixed asset	67%
Percentage of school districts with preventative maintenance software that track parts installed	33%
Percentage of school districts with preventative maintenance software that track cost of parts	50%
Percentage of school districts with preventative maintenance software that track labor hours to install part	83%
Percentage of school districts with preventative maintenance software that track the date the maintenance was performed	83%
Percentage of school districts with preventative maintenance software that track the date of the next scheduled maintenance	67%

Table 19 (continued)

Question	Result
Percentage of school districts with preventative maintenance software that track the employee who performed the maintenance	17%
Percentage of school districts that have work order software (online or electronic work order requests and tracking)	56%
Percentage of school districts that electronically store MSDS information	0%
Percentage of school districts that use building automation software to electronically control and monitor its HVAC equipment	78%
Percentage of school districts that use technology to automate the dilution, mixing, or dispensing of cleaning chemicals	100%
Percentage of school districts that have portable defibrillators	78%
Average number of portable defibrillators in the districts that have implemented them	2.00
Average number of districts with portable defibrillators that store them in the nurse's office	86%
Average number of districts with portable defibrillators that store them in the school's main office	14%
Percentage of school districts that were interested in receiving a copy of the survey results	100%

Note. Results compiled from the 2003 Leung M.A. Thesis Survey of Burlington Districts.

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