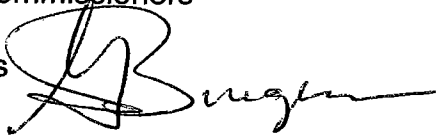


Memorandum



DATE: May 27, 2005

TO: Honorable Mayor Carlos Alvarez
Honorable Chairman Joe A. Martinez and Members
Board of County Commissioners

FROM: George M. Burgess 
County Manager

SUBJECT: Initial Report from Supervisor of Elections

Attached please find two initial reports from Supervisor of Elections Lester Sola in response to my April 4, 2005 charge memorandum to him requesting a comprehensive review of the Elections Department. I have just received these documents today and will be reviewing them with my staff in the coming weeks before making any specific recommendations. Since there has been much public interest in this matter and a standing records request for this document in particular, I am forwarding a copy to you at this time.

If you have any questions please feel free to contact Assistant County Manager Alina Hudak or me directly. Thank you.

cc: Robert A. Ginsburg, County Attorney
Murray Greenberg, Deputy County Attorney
Alina T. Hudak, Assistant County Manager
Lester Sola, Supervisor of Elections
Miriam Singer, Director, Department of Procurement Management
Jennifer Glazer-Moon, Director, Office of Strategic Business Management
Cathy Jackson, Director, Audit and Management Services
June Randall, Deputy Director, Enterprise Technology Services Department
Charles Anderson, Commission Auditor
Christopher Mazzella, Inspector General
Hilda Fernandez, Director, Communications Department

Memorandum



Date: May 27, 2005

To: George M. Burgess
County Manager

From: Lester Sola
Supervisor of Elections

Subject: Desirability and feasibility of converting to an optical scan voting system

Executive Summary

In a memorandum dated April 4, 2005, you directed me to review various aspects of the Elections Department's operations, including our current voting equipment and the desirability and feasibility of converting from our touchscreen system to an optical scan voting system. Because of the depth which a response to that issue requires, I am addressing that directive exclusively in this report and will address the other issues under separate cover.

First, for the purpose of analyzing and discussing options, I do want to state that we currently have equipment that – despite well-documented costs and challenges – does function and does not face decertification. This differs from the situation following the 2000 Presidential Election, when the County had soon-to-be-decertified voting equipment and a state-imposed deadline to convert to a new system. **In response to recent issues regarding our equipment, we have already taken steps to improve the integrity of our elections, including the comparison of machine-by-machine audit data and precinct totals before election results are certified.** This step would now bring to light issues such as the one that occurred in Precinct 816 in November 2004 immediately. We have already implemented and utilized this measure in recent municipal elections, and we will continue to do so for every election we administer. We will also continue to review all of our procedures and identify further means by which we can quickly reconcile all of the different sources of data available to us, enabling us to detect any potential problem early in the process.

Upon receiving your directive, I contacted the Department of Procurement Management (DPM) and asked them to conduct a market study and cost analysis of election equipment that is available and certified for use in the state of Florida, while our Department focused on the impact that a conversion would have on our operation and other important factors, such as voter confidence. Based on this analysis, I am strongly recommending that we explore the possibility of proceeding with the procurement of an optical scan election system because of a combination of two crucial factors. A conversion is likely to both 1) improve voter confidence and 2) result in cost savings to the taxpayers of Miami-Dade County. In the event that we ultimately choose to procure an optical scan system, I am recommending that any procurement and integration of a new system be conducted methodically and deliberately to avert the kinds of challenges this county experienced because of the decertification and state-imposed deadline I described above during the last conversion in 2002. We should be mindful of that experience as we seek to obtain the best equipment at the best-possible cost for our taxpayers, while integrating it into the Department's operation on a timetable that allows us to truly improve our operation.

Brief History

The 2000 Presidential Election exposed weaknesses in the punchcard voting system that was in use by most counties in Florida, including Miami-Dade. Specifically, many of the choices that voters made were instead tabulated as undervotes (no selection) or overvotes (too many selections), and voters did not have the opportunity to correct those selections because their ballots were not read until they arrived at a centralized tabulation facility. County canvassing boards were left with the task of assessing the voter's intent in the case of each "undetermined vote." In 2001, the state of Florida decertified punchcard systems as an approved method of voting and gave counties the option of purchasing two kinds of voting systems:

- **Optical scan** (also called "marksense"), which provides printed ballots on which voters either fill in an oval or bubble or draw an arrow indicating their choices, much in the same way that students indicate their answers on standardized tests. Counties purchasing optical scan readers are required to provide in-precinct ballot reading equipment, into which the voter inserts the ballot and receives an alert in the case of an overvote or undervote, giving the voter the opportunity to correct his or her selection. In 2004, about 32% of voters nationwide used this kind of equipment, according to the federal Election Assistance Commission (EAC).
- **Direct Recording Electronic** (or DRE, which includes "touch screen" equipment), which provides computerized terminals on which voters make their selections. The equipment does not allow overvotes and alerts the voter to an undervote, giving him or her the opportunity to make a selection if he or she intended to do so. In 2004, about 29% of voters nationwide used this kind of equipment, according to the EAC.

(Other kinds of election equipment used in the United States but not certified in the state of Florida include punchcards, still used by 19% of voters; mechanical lever machines, still used by 13% of voters; and hand-counted paper ballots, used by less than 1% of voters in mostly rural areas.)

In January 2002, the Miami-Dade County Board of County Commissioners (BCC) joined most other large Florida counties by approving a contract to procure DRE equipment. Miami-Dade selected Election Systems and Software's (ES&S) "iVotronic" touch screen equipment at an initial cost of \$24.5 million, which also included a parallel optical scan system to accommodate absentee voters. In all, 16 of Florida's 67 counties selected touch screen equipment; the remainder selected (or retained previously-purchased) optical scan equipment. With the exception of Orange County (Orlando), all urban counties selected electronic equipment similar to Miami-Dade's. Thus, the majority of *counties* selected optical scan, although a large proportion of *voters* use touch screen equipment – while all counties necessarily use optical scan equipment for absentee voting. Some touch screen counties use optical scan ballots for provisional voters, as well – though pending legislation appears likely to change that for disabled voters. Counties appear to have believed that, as is the case with most processes, a perceived automation of the ballot creation and tabulation process was increasingly sensible with a more complex operation, measured by factors such as the number of registered voters, number of precincts and number of languages provided. That is, the larger one-time capital

investment required for electronic voting equipment was expected to be offset by a simplified operation and lower future operating expenses resulting from savings related to less use of paper and labor.

After functioning in several smaller municipal elections, the iVotronic system made its large-scale debut in the September 2002 Primary Election. Unfortunately, the election was not a success. The combination of iVotronic terminals that could not "boot up" quickly enough to be ready by 7 a.m. and pollworkers who were not prepared to address such challenges left lines of voters waiting outside many polling places after they should have been able to begin voting. Following that election, the County devoted unprecedented resources to ensure the success of the November 2002 Gubernatorial Election. The Miami-Dade Police Department and numerous other County departments assisted the Elections Department, and the election was widely considered to be a success, albeit at an estimated cost of \$8 million, not including some interdepartmental support. (By comparison, Countywide elections through 2000 had generally cost approximately \$1.5 million.)

Ongoing fiscal issues

The cost of the November 2002 election was accepted as necessary to enfranchise our County's voters, and the expectation was that it would be a one-time cost, with future elections costing significantly less. The subsequent streamlining of the logistical operation in non-"crisis mode" elections has, in fact, led to lower costs, with the November 2004 Presidential Election costing an estimated \$7.27 million. (The County subsequently negotiated concessions from ES&S, which along with interdepartmental support reduced our costs to \$6.64 million, but for the purpose of this analysis and in the interest of an accurate comparison, the non-discounted cost is used.)

While each election provides lessons and opportunities to further "rightsize" our operation, it is not reasonable to expect that a future election of a similar magnitude could cost significantly less. Our current system would necessitate a similar level of interdepartmental support, and the Department has already reduced its reliance on ES&S and pays a negotiated project management rate that is, to our knowledge, among the lowest of any jurisdiction. Instead of yielding future savings, as was reasonably expected, the \$24.5 million expenditure led to more required expenditures. Indications are that still more expenditures, never envisioned when the equipment was purchased, are impending. For example, ES&S has informed me that we must replace the back-up batteries in our 7,200 iVotronic terminals at a cost of \$147.50 per unit, or approximately \$1 million, and the batteries in our 7,688 Personal Electronic Ballot (PEB) cartridges at a cost of \$8.00 per unit, or \$61,504. Additionally, we fully utilized our inventory of 7,200 iVotronic units in November 2004. Even with an increase in registered voters, lower historical voter turnout in mid-term elections means we would have enough equipment to effectively serve our voters in 2006, but we would need to purchase up to 1,000 additional units prior to 2008 at an estimated cost of \$3,300 to \$4,000 each, or a total of \$3.3 million to \$4 million. Essentially, from a fiscal standpoint, the decision facing this County is not whether to spend money on new equipment or not, but whether to continue spending money on our

current equipment versus investing in new equipment that may simplify our operation and generate future operational savings (which I will describe later in this report).

I should mention that even as expensive as our operation has become, our costs have actually been mitigated by, on some occasions, the provision of in-kind project management support from ES&S. Still, the system is designed in such a way that we would always have to rely on ES&S to a significant degree. We must purchase specialized equipment and replacement parts, and we are in no control over, for example, upgrades that could improve our operation. (Since late 2002, ES&S has been verbally assuring the County that an upgrade was forthcoming to improve issues such as iVotronic start-up times and the ability to accommodate all ballot styles on all units during Early Voting; last year, the company wrote in a letter to my predecessor that it was under no obligation to provide such upgrades. We have since been informed that the upgrade is now scheduled to be submitted for state certification in October 2005.)

Voter Confidence

Following 2000, our voters lost confidence in what they viewed as outdated punchcard technology, and the computerized touch screen system appeared to be the state of the art. In fact, it did address many of the issues of voter intent that arose in 2000, and the number of "undetermined" votes in our County has dropped significantly with the new system. However, a number of people in our community – some who are members of organized groups, but also many individuals from different parts of our County representing different ethnicities and political affiliations – have expressed concerns about a system that, in their view, does not provide a true auditable paper record of votes. These concerns have been exacerbated by several challenges related to our equipment that are not unique to Miami-Dade County but that have surfaced here because of the commendable efforts by local media and community groups and the County's own staff, who on several occasions have discovered equipment-related issues. Additionally, despite the many redundancies that we have in place to ensure the proper tabulation of votes even when an anomalous situation arises, our Deputy Supervisor of Elections for Outreach and Training has informed me that voters who attend community events have told our staff that while they appreciate our efforts to educate them, and while they have generally become comfortable with the process of voting on the equipment itself, they remain uneasy about the lack of a paper record that is independent of the equipment on which the votes are cast. These doubts, along with the continuing expenses associated with maintaining the equipment and administering touch screen elections, are not what the County envisioned when purchasing what it reasonably believed to be a state-of-the-art system.

An optical scan system provides a tangible record of votes that can be recounted even in what is, given the many redundancies in place, the mostly-theoretical case of a complete electronic failure. With our current system, the coding, casting of ballots and tabulation of an election are inextricably intertwined. Thus, a front-end coding error early in the ballot preparation process, such as the one that occurred during the March 8, 2005, Special Election, can ultimately affect the tabulation of an election (although fortunately, in that case, not enough to impact the

outcome). With an optical scan system, a coding or tabulation error could have been corrected after the fact, and paper ballots could have been re-tabulated. Of course, the Department must do everything necessary to prevent such situations regardless of the equipment in use, and as such, I have taken disciplinary action against the individuals involved and put the proper staff in charge of that operation. Additionally, I have fully enlisted the expertise of the Enterprise Technology Services Department (ETSD), which had previously been underutilized, and we have developed coding checklists and sign-off sheets to ensure accuracy and accountability while involving ES&S in the sign-off of election coding. I have more clearly defined the roles of tabulation room staff, and I have scheduled new training sessions for all technical and managerial staff. Still, acknowledging that human error can occur despite the best precautions, there is value in equipment that reduces the importance of such errors when they do occur. These are voter confidence issues, but they are not only that; not only in perception, but in reality, only optical scan equipment provides an auditable paper record that is independent of the tabulation system.

With respect to the ability to prevent voter error and disenfranchisement, touch screen and optical scan equipment have both provided dramatic improvements over punchcards. The Florida Division of Elections analyzed the percentage of ballots cast without a valid vote in the November 2004 Presidential Election. The average percentage of invalid votes (undervotes and overvotes) among optical scan voters was 0.40%; among touch screen voters, it was 0.42%. The state reported that the slightly better percentage for optical scan voters was an insignificant difference, and both figures were significantly better than in the 2.93% of votes that were invalid in 2000. However, removing absentee voters who are not given the opportunity to correct overvotes and undervotes, voters who voted *in person* on optical scan equipment cast a considerably lower percentage of invalid votes (0.29%) than those voting in person on touch screen equipment (0.42%). An in-person touch screen voter was 46% more likely to cast an invalid vote than was an in-person optical scan voter.

Optical scan elections in Miami-Dade

Working with DPM, we have analyzed the actual efforts and costs associated with the November 2004 Presidential Election and compared them with the efforts and costs that would have been required to administer the same election using an optical scan system. Our analysis shows that the election could have cost up to \$2.2 million less with an optical scan system; smaller elections would experience smaller but nonetheless significant savings. The savings would come from a decreased use of inter-departmental support and County employees to support what would be a less technologically complex system, with an average of just two pieces of electronic voting equipment (the optical scan readers) per polling place rather than up to 30 (the iVotronic units). Additionally, we would rely significantly less on high-level technical support from a vendor. We would also be able to discontinue the practice of printing hundreds of thousands of paper "substitute" or back-up ballots that are delivered to polling places to be in place in case of equipment failure. Instead, most paper ballots we print would actually be utilized. Also, after November 2004, we began printing our own paper ballots, allowing us we experience a significant reduction in our printing costs. Essentially, because of absentee, provisional and substitute ballots, we already code and tabulate parallel

optical scan elections but do not derive many of the potential benefits of the system, such as the potential increased voter confidence I described above. (If we were to convert, the Department would ensure the full enfranchisement of our disabled community by maintaining ADA-equipped audio units, which could include the retention of the 1,000 audio iVotronic units in our current inventory.) Completing the conversion to an optical scan system would likely bring appreciable benefits with relatively modest incremental effort and expense. The lower operating costs, coupled with the elimination of future capital and maintenance expenses associated with the current touch screen system, would allow the County to recover the estimated purchase price of \$9.4 million to \$12.3 million within a few election cycles. In fact, based on the initial analysis **the County could save more than \$13.21 million over five years.** (Further detail is provided in the attached DPM study.)

A conversion would present certain challenges. Our pollworkers and voters, as well as Department staff, would have to be trained once again to use a new system. However, the relative simplicity of an optical scan system, combined with the fact that, as I described above, we already use many aspects of such a system, makes it highly unlikely that challenges accompanying this conversion would approach those experienced during the conversion to our touch screen system. This can be further ensured through a methodical, deliberate procurement and implementation – a luxury the County did not have last time following the decertification of punchcards and a deadline to quickly implement the new system. An expedited procurement would take approximately nine months, excluding the contract award phase. We would also anticipate a voter education and outreach plan of approximately six months, followed by an implementation plan for the new equipment to include municipal elections. I believe our voters will accept the fact that we currently have a system that is certified for use and does work, but that a carefully-planned conversion can deliver increased assurances at a lower cost. Additionally, we would need to plan for the storage of additional paper ballots in our warehouse. However, the space required for this activity would be more than offset by the reduced space required by our voting equipment. Currently, our 75,000-square-foot warehouse houses 7,200 pieces of electronic voting equipment (as well as other documents and supplies that would be necessary with any system). An optical scan system would require 1,600 electronic readers (no less than two per polling place), and as I described above, we would either retain our 1,000 ADA-compliant audio iVotronic units or have a similar number of another kind of fully ADA-compliant unit. Those 2,600 pieces of equipment would be 4,600 less than the current 7,200 iVotronic units. By comparison, we have recently stored all absentee ballots from the November 2004 election, and they take up approximately 300 square feet of our warehouse, or 0.04% of our total warehouse space. Legally, ballots must be stored for 22 months, and the volume of ballots would of course increase if all voters (rather than only absentee voters) were voting on paper optical scan ballots. Still, the space required for our November 2004 absentee ballots projects to approximately 2,000 square feet if all ballots in that election had been optical scan. Ballots from that and numerous other elections could easily fit in the space that would be vacated by most of our touch screen voting equipment.

From the voter's perspective, an optical scan ballot would actually occupy far fewer pages than would a touch screen ballot. For example, in the November 2004 Presidential Election, voters had to work through at least 17 electronic pages (depending on their assigned ballot styles),

including several pages of review screens; absentee voters using optical scan ballots had only four or five pages, depending on ballot style.

I should mention that in the past, another way to address the issue of voter confidence has been proposed: the addition of printers to our voting equipment to print a record of each vote as it is cast. At this time, we cannot consider this option because no such equipment is certified for use in the state of Florida. However, even aside from that fact, the procurement of such equipment would be less desirable than a conversion to optical scan because while it could potentially meet our first requirement (voter confidence), it would fall short of our goal to simplify our operation and control our costs. In fact, it would further complicate our operation, by taking the complexities I described earlier and adding 7,200 new pieces of electronic equipment with maintenance and material (such as paper and ink) needs as well as additional

MIAMI-DADE COUNTY

**Election Voting Technologies
Market Research and Cost Comparison
for
Using Touch Screen vs. Optical Scan Election Systems**

**Department of Procurement Management
May 2005**

**Miami-Dade County
Election Voting Technologies
Market Research and Cost Comparison**

TABLE OF CONTENTS

1. Executive Summary	1
2. Background	4
3. Scope of Study	5
4. Existing Miami-Dade County Election Management Systems	5
5. Market Research	7
a. Electronic Voting Technology	8
b. Optical Scan Election Management Options	9
c. Voting Booths	10
d. Procedure for Conducting Elections Using Optical Scan Technologies	10
6. Cost Analysis	11
a. Assumptions	11
b. Capital Costs	11
c. Cost of Conducting Elections Miami-Dade County	12
7. Discussion	14
Attachments	16

Miami-Dade County
Election Voting Technologies
Market Research and Cost Comparison

1. EXECUTIVE SUMMARY

As requested, the Department of Procurement Management (DPM) completed market research regarding the availability and estimated pricing of optical scan voting technologies certified for use in the State of Florida. Additionally, DPM completed



systems. For the purposes of this analysis, a typical municipal election is projected to cost \$105,000 using the iVotronic touch screen system and \$78,750 (25% less) using optical scan technology.

The operational savings generated by switching to optical scan technology are largely due to the fact that there will be no need to set up precincts the night before each election. Additionally, technical support requirements, ballot preparation and printing costs, and interdepartmental support are significantly reduced. Significant savings are also realized as the need to prepare and print paper ballots as a back-up in case of massive touch screen machine failures is eliminated.

Over the past several years, the Elections Department conducted 29 or more elections per year. For the five-year period 2006 through 2010, it is projected that the County will conduct between 29 and 32 elections each year, the majority of which (between 26 and 29) will be municipal elections. Based on these estimates and the additional costs incurred for presidential and other elections, the County will spend approximately \$78.5 million in operating expenses over the next five years to conduct elections using the touch screen technology as shown in the table below. Additionally, a capital investment of \$5 million will be required to purchase 1,000 additional iVotronic machines, 7,000 batteries, equipment warranties and other peripherals.

Options for Conducting Elections (Cost in Million Dollars)	
Option 1 - Retire Touch Screen System and Switch to Optical Scan Technology	
Five-year Total Operating Cost	\$ 60.93
New Capital Investment Required	\$ 9.39
Sub Total	\$ 70.32
Outstanding Debt (Existing Touch Screens)	\$ 20.58
Total cost of Option 1	<u>\$ 90.90</u>
Option 2 - Continue use of Touch Screen Technology	
Five-year Total Operating Cost	\$ 78.53
New Capital Investment Required	\$ 5.00
Sub Total	\$ 83.53
Outstanding Debt (Existing Touch Screens)	\$ 20.58
Total cost of Option 1	<u>\$ 104.11</u>
Cost Variance (Option 1 - Option 2)	\$ 13.21

It should also be noted that the County will continue to make payments on outstanding debt associated with the purchase of the existing touch screen systems. The County will pay approximately \$2.94 million per year for the next seven years. Using

the optical scan system, in addition to the \$9.4 to \$12.3 million required to purchase the optical scanning machines and associated peripherals, it is estimated that the County would spend approximately \$61 million over the next five years to operate the new system without payments toward the existing debt. However, if the County opts to use the optical scanning system to conduct elections, pays the outstanding capital used to purchase the existing touch screen machines, and purchases \$9.4 million in new equipment, the total five-year estimated cost is \$90.9 million. If the County continues to use the touch screen machines to deliver elections, pays the outstanding debt and invests an additional \$5 million to purchase new equipment, the estimated total five-year cost is \$104.1 million or \$13.2 million more than the cost of using the optical scanning technology.

The analysis suggests that the cost of conducting elections can be significantly reduced by switching to an optical scan system. Additionally, having paper records available to verify and validate votes will be a key factor for addressing voter apprehension and distrust. Other factors that support the use of optical scan systems is the fact that the electronic voting systems industry remains fragmented, there are no industry standards, and individual jurisdictions have different legal, political and business requirements. Consequently, universal adoption of a standardized advanced voting system is still far from being a reality.

As the County contemplates making this change, staff should be cognizant of the fact that use of the paper ballots may require that special assistance be provided for some disabled persons. To overcome this obstacle, the County would continue to use the touch screen machines for persons with disabilities to meet ADA requirements. Additionally, the use of optical scan technology requires the perennial use of paper ballots and the management of the associated costs, retention and disposal logistics.

2. BACKGROUND

On April 4, 2005, the County Manager requested that the Miami-Dade County Elections Department (Elections) prepare a feasibility study for replacement of the existing touch screen electronic Voting System with a comprehensive Optical Scan

Despite the fact that the County has administered several very successful countywide
and municipal elections using the new touch screen systems, operating costs are high

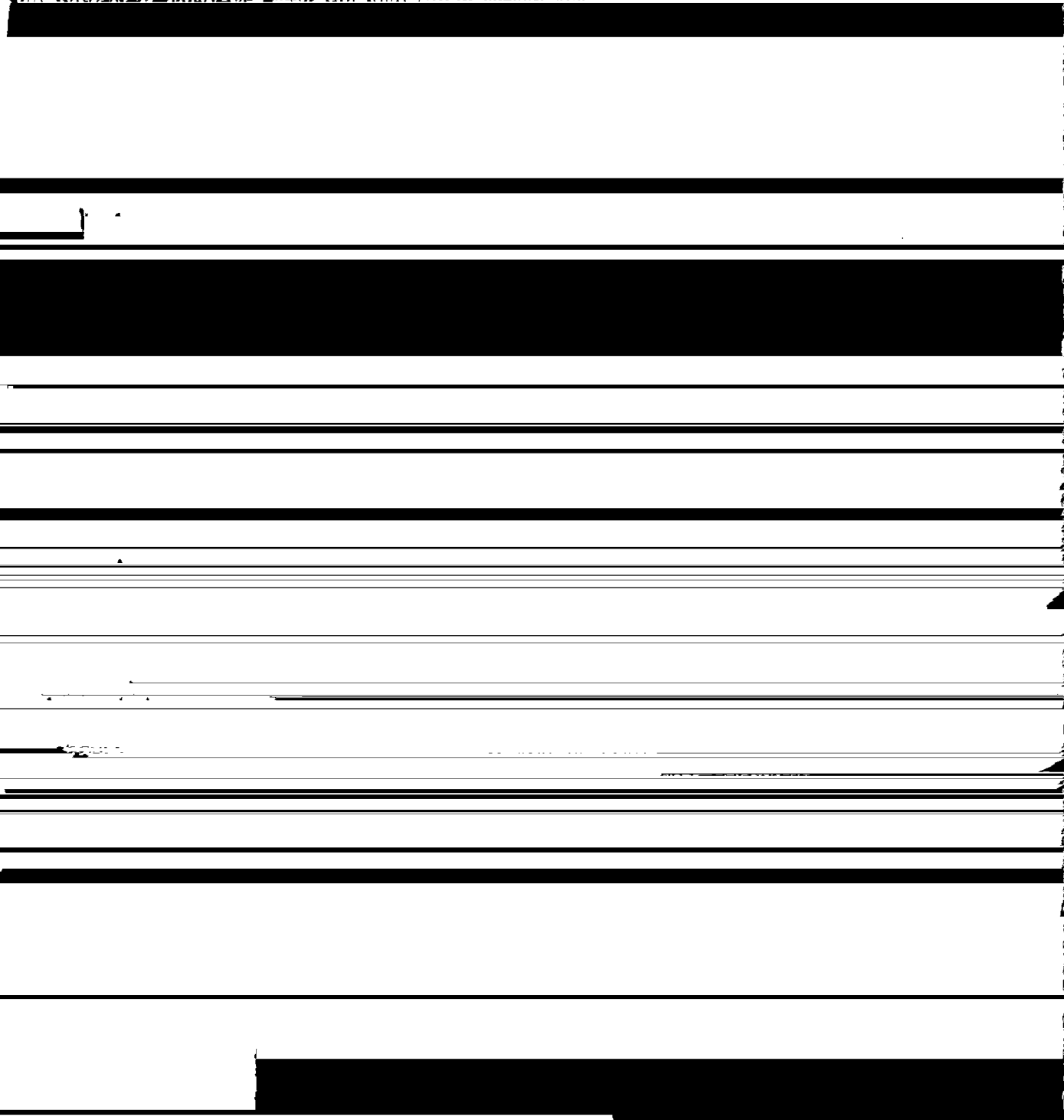


Table 2
Capital investment in Miami-Dade County's Election Management Systems
(iVotronics)

Qty	Description	Extended Cost
6200	Standard iVotronic Touch Screen machines	18,612,400
50	Supervisor iVotronic Touch Screen machines	140,500
1000	ADA iVotronic Touch Screen voting machines	3,250,000
4	M650 Optical Scan Units	200,000
10	M100 Optical Scan Units	52,000
1	Third Party Software and Hardware	128,983
1	ES&S Software	160,800
1	ES&S Support Services	132,125
1	Shipping & Handling	183,750
1	Performance Bond	50,000
1	3-Yr Post - Warranty Maintenance (due 1/2005)	1,176,089
1	Associated Equipment	453,700
		24,540,347
	Amendment to contract in December 2003	Up to 2,030,973
	Grand Total	26,571,320

Source: Miami-Dade County Elections Department

2. Voting machines are "function-tested" at the Elections warehouse and ballots with the appropriate electoral races are pre-loaded for each precinct. The number of machines per precinct is based on a ratio of 200 voters per machine. This ratio is decreased, as required, to minimize waiting times and maximize voter convenience.
3. Voting machines are delivered the week before polling day and opened the day prior to the elections. They are linked electronically to allow a single machine to report final results for a cluster of voting machines and then the machines are set up, tested and locked.
4. On Election Day, the machines are opened and voters are allowed to cast their votes using touch screen selections in their preferred language. Paper Provisional Ballots are also provided for use on an as needed basis.
5. Votes are tallied and saved in the computer memory of each machine until the polls are closed. The current iVotronic machines do not provide a paper trail detailing voter choices.
6. Once the polls close, voting machine reports are collected electronically and a paper report listing the total activity for each machine is printed.
7. The electronic and paper records and all provisional ballots (completed on paper forms) are delivered to the collections areas for final vote counts.
8. Acceptable absentee ballots are scanned using four large optical scanners. The tabulated votes are included with the electronic data from the

iVotronic machines.

9. During the vote counting exercise, all electronic data from the iVotronic machines are compiled and added to the votes from absentee ballots to generate the overall election results.
10. All voting equipment (machines, printers, communication packs) are returned to the warehouse for storage.

It should also be noted that where appropriate, ten smaller optical scanning machines supplied by ES&S may be used for specialized precinct level absentee ballot tabulation.

5. MARKET RESEARCH

DPM conducted market research to determine the available technologies used in delivering elections countywide. Additionally, DPM conducted research to evaluate the availability of optical scan technologies, their cost, suggested elections processes, and whether these technologies are approved for use in Florida.

Electronic Voting Technology

In the period following the 2000 presidential elections, several jurisdictions implemented more sophisticated systems than punch card ballots. According to Scientific American, electronic voting systems have been in existence for 135 years when the technology was first patented. However, jurisdictions only started to experiment with the technology in the 1970s when advancements in computing made it economical to do so. However, elections technology has been slow to mature largely because the industry is fragmented, there are no industry standards, and individual jurisdictions have different legal, political and business requirements. There is a myriad of rules and requirements across jurisdictions with regard to the approach to testing, system verification and election certifications. Consequently, universal adoption of a standardized advanced voting system is still far from being a reality. As counties strive to improve their elections processes, it is important to assess whether a modification to existing equipment adds more value than simply replacing existing systems. In assessing voting systems, the following operational factors should be considered.

- a. Staff should thoroughly understand the equipment and its operations
- b. Ongoing and intensive testing and verification exercises must be carried out
- c. Simple, effective voting procedures must be developed and staff and poll workers appropriately trained
- d. Comprehensive audit trails are to be provided to minimize opportunities for fraud and to provide system and data validation

Table 3 describes some existing voting technologies and the advantages and the disadvantages associated with each technology.

