Case Study: Palm Beach County School District's BI Program Establishes a Performance-Driven Culture

Gartner RAS Core Research Note G00200734, Kurt Schlegel, 18 August 2010

This case study analyzes the business intelligence (BI) and data warehouse program in the School District of Palm Beach County (SDPBC), one of the largest school districts in the United States. The SDPBC employs various best practices to drive adoption to 13,793 teachers and administrators.

Key Findings

- The Federal No Child Left Behind Act of 2001 has compelled many school districts to dramatically improve their ability to integrate and disseminate data on student performance.
- In many school districts, the investment in BI (initially made just to comply with federal and state regulations) has created a performance-driven culture that highly values fact-based decision making.
- The SDPBC has created a completely centralized report delivery model that works well for their culture and constituency.

Recommendations

- BI leaders should leverage compliance with federal and state regulations, such as the No Child Left Behind Act, as an opportunity to bolster their BI program.
- Drive user adoption, bolster the training budget and ensure users are trained on the new query, reporting and analysis functionality.
- Create a cross-functional team that blends business and IT skills to lead the business intelligence initiative.

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WHAT YOU NEED TO KNOW

This case study is a good example of how a local government organization was able to build a data warehouse and establish a performance-driven culture among all teachers and administrators who now rely on this data to make informed decisions. It also serves as a good example of how to drive adoption of BI to a very large number of users in a relatively short time period. The SDPBC educational data warehouse established a framework for growth to a full enterprisewide BI program across other subject areas including finance, facilities management and human resources.

CASE STUDY

Introduction

The SDPBC is the 11th largest school district in the United States. It manages 188 schools with 21,781 employees, serving 170,215 students in kindergarten through 12th grade education. Based on geographic area, it is the largest school district east of the Mississippi River. It is committed to excellence in education and the preparation of all students with the knowledge, skills and ethics required for responsible citizenship and productive employment.

The Challenge

The SDPBC's information systems relied on outdated analytic applications that produced untimely reports at a high cost with inconsistent data and no interactivity. Therefore, decision makers were unable to drill into the details of any given measure to perform root cause analysis. Moreover, its information systems were not able to meet the accountability and comprehensive reporting requirements of the Federal No Child Left Behind Act of 2001 and Florida's A+ Plan for Education.

The SDPBC recognized an urgent need to enhance its reporting environment to improve student achievement. It was imperative to provide the ability to make data-driven decisions pervasive throughout the organization, including its administrators and teachers.

Approach

In 2003, a new superintendent launched an initiative to overcome these challenges, based on a vision that data analysis should be at the core of ongoing decision making by the SDPBC's employees and that harnessing trusted information could strategically transform its performance. To make this vision a reality, a pervasive BI program, known internally as the Educational Data Warehouse (DW) was launched, in support of its educational mission and improved student achievement.

BI Team

The Department of Research and Evaluation (DRE), historically the provider of data analyses, was selected to bring together IT staff, administrators, principals and teachers to evaluate the BI needs of all stakeholders and identify the benefits of the BI solution. This approach helped build consensus among the various end user groups and contributed to the acceptance of the need for an educational DW.

Construction of the Educational DW began in 2003 at an initial labor cost of $2.8 million. At the beginning of the project there were seven full-time positions and four part-time positions. After the initial six months, the part-time positions were converted to full-time positions.

As the project progressed and demand grew over the years, the team expanded to include 33 full-time positions, including database, security and server administrators, extraction, transformation and loading (ETL) developers, data architects, report developers and the educational data warehouse team's director, executive secretary, report navigation and analysis specialists, and two BI consultants.

Data Warehouse

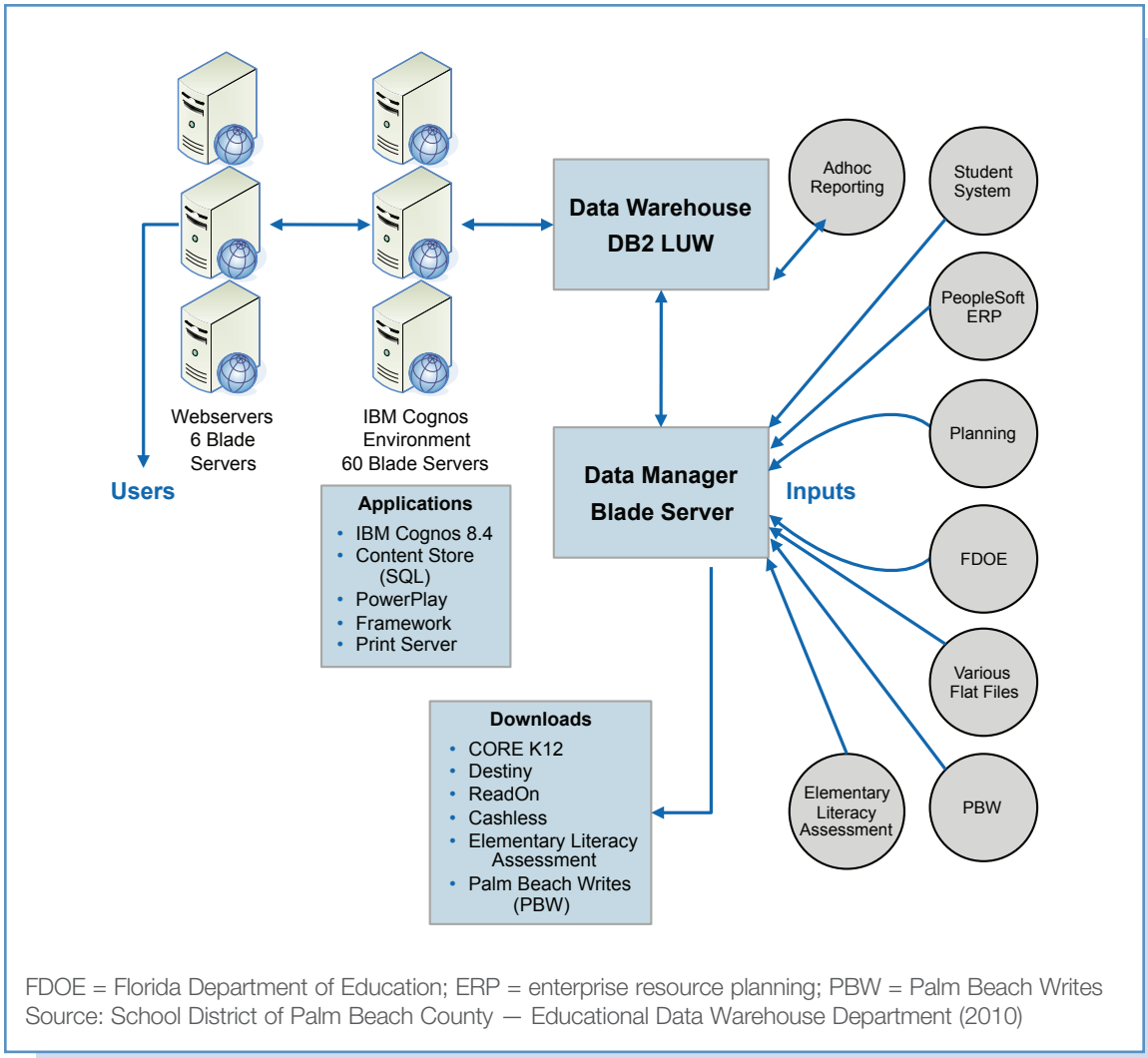
The SDPBC selected IBM DB2 running on a Z series platform for its Educational DW. Data is fed to the data warehouse from numerous sources, including the student information system (TERMS), PeopleSoft ERP system, Florida's Department of Education (FDOE) system, various flat files, Microsoft SQL Server and IBM DB2 databases.

Informatica's PowerExchange is used for capturing data changes from TERMS VSAM (virtual storage access method) files and IBM Cognos Data Manager (formerly DecisionStream) is used for data integration.

Figure 1 shows a high-level view of the Educational DW system architecture.

The Educational DW is routinely checked for accuracy. If any discrepancies are noted, the data ETL process is reviewed and modified to handle data exceptions. As new fields are added or processes are changed, the Educational DW and ETL programs are modified accordingly. This is a continuous process, since the business rules are constantly changing.

Figure 1. Educational Data Warehouse System Overview



FDOE = Florida Department of Education; ERP = enterprise resource planning; PBW = Palm Beach Writes
Source: School District of Palm Beach County — Educational Data Warehouse Department (2010)

BI Platform

The initial BI tool, Cognos Impromptu, was rolled out in February 2003 and used primarily for operational reporting. The subsequent need for cross-system data integration and historical data analysis resulted in the development and deployment of the Educational DW, the deployment of Cognos PowerPlay multi-dimensional analysis software and an upgrade of the reporting software to the Cognos ReportNet product.

In 2008, the SDPBC started upgrading to IBM Cognos 8 BI (version 8.3). IBM Cognos Framework Manager is utilized to create the business models of the data.

Users have a prompt page that enables them to filter information by items such as student groups, student-level performance, participation in services and programs, or grade levels. The Educational DW team does all the report writing.

Reports can be viewed in HTML, PDF or even comma-separated values formats and are all interactive, regardless of the format.

While Gartner has heard many complaints from organizations experiencing a BI bottleneck in over-centralized BI delivery teams, this model seems to be working for the school district, due to the consistency of reporting requirements across the district. For example, the Educational DW team, in collaboration with the Departments of information technology, curriculum, and assessment, provided a new data entry interface that allows teachers to enter assessment data for the Palm Beach Writes and Elementary Literacy Assessment System and view this data within their reports the next day. Prior to this effort, teachers scanned and uploaded the test results, a process that required up to two weeks to complete.

Some scorecards provide both aggregated information on key performance indicators (KPIs), as well as functionality, to drill into the KPIs to analyze root causes of adverse performance indicators. The end-user tools include both tabular content and data visualization that helps highlight exceptions. Interactivity with the data is supported through parameterized and filtered reports and multi-dimensional analysis of cubes.

The Educational DW has more than 400 student listings, graphs and summary reports and data warehouse users are expected to access more than 1 million reports this year, which is a 34% increase over last year. Table 1 lists examples of leading indicator reports provided through the Educational DW.

Deployment

The SCPBC took a staged approach to rolling out the Educational DW. Prior to start of the project, the Educational DW team, in collaboration with Cognos, developed and implemented a capacity planning model, based on expected usage. The deployment was started with a pilot project in early 2007. This step proved to be crucial to the overall success of the project, as the EDW team was able to identify and correct hardware issues, ensure security access and enhance reports through user feedback prior to the deployment to all schools.

The second phase of the deployment incrementally extended access to the Educational DW to groups of approximately 20 additional schools at a time. By November 2007, all teachers and administrators at 225 schools had access to the Educational DW.

This was the first time teachers had direct online access to their students' achievement, attendance and behavioral data.

Results

The Educational DW has played a key role in the realization of the SDPBC's vision to strategically transform its performance through a strategy of pervasive BI-driven, fact-based decisions by educators and administrators. It is able to measure performance against a number of internal and external benchmarks and directly link the Educational DW to a number of qualitative outcomes and quantifiable benefits:

Cultural Transformation. The Educational DW has brought about a cultural transformation in the school district, with educators making fact-based decisions to guide educational programming and set measureable performance objectives. Before the Educational DW was available to schools, a principal typically collected all student data by hand, completed all calculations and analysis of data and utilized the analysis with teachers during principal/teacher conferences held four times a year to discuss appropriate interventions for students. After the rollout of the Educational DW, principals and teachers meet in grade level or department teams to analyze data and develop student, grade level, subject area and school level interventions.

Empowering Educators. Making the Educational DW pervasive in the SDPBC empowers principals and teachers with a wealth of information that can be used in classrooms and individual working with students, to determine what strategies were positively affecting student achievement.

At one elementary school, the principal, after reviewing and analyzing the winter diagnostic performances of the students in grades 3, 4 and 5 (a leading indicator for student achievement), decided to make student schedule changes for several students proficient in the most current Florida Comprehensive Assessment Test (FCAT) and, according to the winter diagnostic results, had dropped to non-proficient status (Levels 1 or 2). According to one of the students, the new class involved the students in learning activities that were both challenging and fun. The reports, graphs and summaries in the Educational DW gave the principal sufficient data to make a decision that would give the students a chance to restore their academic performance level.

District Performance. In 2008, the school district was awarded District Accreditation as a quality school system by the national AdvancED Accreditation Commission. District Accreditation is a national protocol for school systems committed to systemic, systematic and sustainable improvement. In its quality review of the SDPBC, AdvancED specifically identified the Educational DW as a key contributing factor in granting accreditation.

Organizational Performance. The Educational DW has been a major contributing factor to the SDPBC being the only urban school district in Florida to earn an "A" score for six consecutive years (see Figure 2). The A+ Plan for Education sets high standards for student performance, requires districts to measure and publicly report on that performance and provides state assistance, rewards and sanctions.

Student Performance. Improvement in student FCAT performance has been directly linked to the extensive use of the Educational DW by SDPBC employees and by students and parents. A good example of this can be seen in Table 2, which shows the improved grades across the entire district in four areas (reading, math, science and writing) from 2005 to 2009.

Table 1. Examples of Leading Indicator Reports From the Educational Data Warehouse

Leading Indicator Reports	Description
Monitoring progress toward adequate yearly progress (AYP) goals (School and grade-level reports)	Summary reports show the previous two years of a school's assessment results on Federal and FDOE's AYP goals. The reports also provide leading indicator information for schools by calculating the school district's fall and winter diagnostic reading and mathematics assessment results using AYP rules and predicting whether or not the schools make AYP.
Monitoring progress toward school grade (A+) goals (School and grade-level reports)	Summary reports show the previous two years of a school's FCAT results for Florida's A+ Plan. The report is used to monitor school targets toward meeting A+ goals. Leading indicator information is provided by comparing the school district's fall and winter diagnostic reading and mathematics assessment results and comparing them to four different targets: standard, self, others and school self selected. The report also predicts the school's school grade.
Potential students for high school graduation rate	Report shows students in school included in graduation cohort rate. It also shows whether or not the student is on track for graduation by showing FCAT results, grade point average (GPA), credits earned, community hours and graduation cohort flags.
Potential students for at-risk graduation rate	Report shows students in school included in at-risk graduation cohort rate. It also shows whether or not the student is on track for graduation by showing FCAT results, GPA, credits earned, community hours and at-risk graduation cohort flags.
Potential students for postsecondary readiness report	Report shows students who are included in the Graduation Cohort, FCAT results, highest scores on Scholastic Aptitude Test, American College Test and College Placement Test, cohort graduation year and college readiness flags.
List of potential advanced placement students	Report identifies students who met College Board's eligibility criteria for participation in advanced placement (AP) courses, based on their previous FCAT developmental scores. It is used for placement of eligible grade 9 and 10 students in one or more AP classes.

FDOE = Florida Department of Education; FCAT = Florida Comprehensive Assessment Test

Source: School District of Palm Beach County — Educational Data Warehouse Department (2010)

Table 2. Select School District of Palm Beach County FCAT Results

School District of Palm Beach County Summary Table for the Evaluation of the Key Results						
Key Results 3: Reading FCAT SSS % >= Level 3 (Proficiency is Level 3) Grade: all grades FY04 to FY09 Historical Report: District **Year** **Percent**	2004 51.1	2005 53.4	2006 56.4	2007 57.8	2008 59.5	2009 61.6
Key Results 3: Mathematics FCAT SSS % >= Level 3 (Proficiency is Level 3) Grade: all grades FY04 to FY09 Historical Report: District **Year** **Percent**	2004 58.9	2005 61.5	2006 62.7	2007 65.4	2008 68.1	2009 70.2
Key Results 3: Science FCAT SSS % >= Level 3 (Proficiency is Level 3) Grade: all grades FY05 to FY09 Historical Report: District **Year** **Percent**	2005 35.5	2006 37.3	2007 44.1	2008 45.9	2009 46.6	
Key Results 3: Writing FCAT SSS % >= Level 4 (Proficiency is Level 4) Grade: all grades FY04 to FY09 Historical Report: District **Year** **Percent**	2004 57.8	2005 63.6	2006 68.2	2007 71.2	2008 73.5	2009 76.6
FCAT = Florida Comprehensive Assessment Test; SSS = Sunshine State Standards						

Source: School District of Palm Beach County — Department of Research and Evaluation (2010)

Critical Success Factors

- The appointment of a former principal as the director of the Educational DW ensured the BI solution would be an academic led initiative. The director had an intimate knowledge of the academic and business needs of the diverse user groups the Educational DW was targeting and a clear understanding of what it needed to deliver to make BI pervasive and effective within the school district.

- The Educational DW team was strategically placed in the Division of Performance Accountability, which includes the DRE and the Department of Assessment and is part of the academic side of the SDPBC. This organizational relationship contributes to the positive and ongoing communication and connection to school center personnel, as well as academic and operational departments. An Educational DW steering committee was formed at the onset of the project with representation from principals, area superintendents, the Classroom Teachers' Association and various district departments, including IT, quality assurance, curriculum and learning support, and educational technology.

- Critical to the success of the EDW was the underpinning technology provided by the Educational DW infrastructure team, with support from central IT. In addition, seamless integration processing with business applications, such as TERMS, ensured the data in the educational data warehouse was accurate and timely.

Lessons Learned

In assessing the lessons learned and insights gained from the Educational DW initiative, the SDPBC recommends that other organizations attempting a similar initiative should:

- **Employ a "train-the-trainer" model.** The school district developed an effective training method, where a small group of end users working with experts from the educational data warehouse team was tasked with training the rest of the organization. For example, in mid 2007 five schools at various academic levels were selected to become test schools for the rollout of the Educational DW to teachers. Using a "train-

Figure 2. Florida A+ Plan for Education District Level Grades: Seven Urban Districts 2005-2010

	Palm Beach	Broward	Dade	Duval	Hillsborough	Orange	Pinellas
FY2010	A	A	B	B	A	A	B
FY2009	A	A	B	B	A	A	B
FY2008	A	A	B	B	A	A	B
FY2007	A	B	C	C	B	B	B
FY2006	A	A	B	B	A	B	B
FY2005	A	B	B	B	B	B	B

Source: School District of Palm Beach County — Department of Research and Evaluation (2010)

the-trainer" model, data warehouse specialists trained representatives from the five schools on the educational data warehouse and these representatives trained their colleagues at the schools.

- **Employ an iterative implementation approach.** By doing initial small rollouts and achieving quick wins with a core set of reports, the Educational DW team was able to demonstrate value, while learning and testing the approaches needed to ensure the broader school district's strategy around pervasive BI could be successful.
- **Provide sufficient funding.** The school district was well aware that its strategy for pervasive BI was dependent upon sufficient and considerable resources being available. Such a large BI deployment involving thousands of users required major expenditures for hardware, software and services, as well as a sizeable investment in training and process development.