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CASE STUDY

The Path Toward Pervasive Business Intelligence at The School District of Palm Beach County, Florida

Sponsored by: Cognos, an IBM Company

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Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.872.8200 F.508.935.4015 www.idc.com

SUMMARY

The trend toward evidence-based decision-making is taking root in commercial, non-profit and public sector organizations. Driven by increased competition due to changing business models, deregulation or, in some cases, increased regulation in the form of new compliance requirements, organizations in all industries and of all sizes are turning to business intelligence (BI) and data warehousing (DW) technologies and services to either automate or support decision-making processes.

An increasing number of organizations are making BI functionality more pervasively available to all decision makers, be they executives or customer-facing employees, line-of-business managers or suppliers. IDC defines pervasive BI as follows:

Pervasive BI results when organizational culture, business processes and technologies are designed and implemented with the goal of improving the strategic and operational decision-making capabilities of a wide range of internal and external stakeholders.

Despite the fact that the term Business Intelligence was first coined in 1958 and the first BI software tools emerged in the 1970's, BI is not truly pervasive in any organization. As organizations identify more stakeholders who can benefit from improved decision-making capabilities, they are choosing to deploy BI and thus come increasingly closer to achieving pervasive BI. For organizations struggling with changing organizational structure and culture, business and IT processes and technologies, several lessons can be learned by examining the best practices organizations employ on their path toward achieving pervasive BI.

METHODOLOGY

In 2008 IDC launched a global market research project with the goal of uncovering best practices in expanding the use of BI and analytics processes and technologies. The research project was underwritten by eleven competing BI software, services and hardware providers. The project methodology, which was developed by IDC and contributors from Boston University School of Management Information Systems Department included both a survey of over 1100 private and public sector organizations in 11 countries and in-depth interviews with 22 of these organizations resulting in a series of case studies on best practices in achieving pervasive BI. One of the organizations interviewed was The School District of Palm Beach County, Florida.

ORGANIZATION

The School District of Palm Beach County, Florida (PBCSD) is the 5th largest school district in Florida and the 11th largest school district in the U.S. The school district's 2008/2009 fiscal year budget of $3.5 billion supports 184 schools and 22,144 teachers who serve 169,454 students. The school district's board has set out a mission of commitment to excellence in education and preparation of all of the district's students with the knowledge, skills, and ethics required for responsible citizenship and productive employment. The PBCSD has earned an "A" rating from the Florida Department of Education for the fourth consecutive year based on student performance on FCAT. Three of the district's schools were recently ranked among the top 100 schools in the U.S. by U.S. News and World Report.

SITUATION OVERVIEW

Business Drivers

Like all organizations that took part in IDC's research project, PBCSD was influenced by both external and internal factors that triggered a need to re-evaluate its decision-making processes and the supporting BI and analytics technology architecture. In the case of PBCSD, these business drivers were both strategic and operational. Note that PBCSD refers to its overall BI solution as the Educational Data Warehouse (EDW). Throughout this case study IDC will use PBCSD's definition of EDW and IDC's definition of BI interchangeably.

Strategic

The primary drivers that influenced the school district's launch of a new BI solution were upper management's need to make fact-based decisions with timely and consistent information for teachers and school administrators. In addition, the accountability and reporting requirements of the No Child Left Behind Act of 2001 and the appointment of a new district superintendent, who felt strongly that data analysis should be at the core of ongoing decision-making, converged to give impetus to the new BI solution.

Operational

Operationally, various PBCSD applications, such as the student or payroll systems, had been developed independently over time without an integrated data model. Thus, any reports run on these disparate systems resulted in inconsistent data. Each system had its own definitions of certain data elements. As an example, in one system a 'teacher' may have been defined as someone who had students assigned to him or her, while in another system a 'teacher' may have been defined as an employee who is part of a "bargaining unit". Queries run in response to questions from end users often resulted in conflicting answers depending on the source system of the query. In addition to information inconsistencies, the reports available to various end users within the school district lacked sufficiently granular data for root-cause analysis. The paper reports, naturally, also lacked interactivity that would allow decision makers to drill into the detail of any given metric or key performance indicator (KPI). Although the paper reports contained extensive historical data and trend analysis, there was still a need to consolidate the development and maintenance efforts associated with the various information management and report development efforts.

SOLUTION

Towards Pervasive Business intelligence

To address its BI and analytics needs, PBCSD embarked on a path towards pervasive BI that would require changes to the organization's culture, technologies, and business and IT processes.

Organizational Culture

The various stakeholders within PBCSD were interested in more consistent, timely, and granular information to support their decision-making processes. The superintendent had always understood that having the right data in the hands of administrators and teachers would improve student achievement and close the achievement gap.

To fulfill these goals the school district relied on the Department of Research and Evaluation (DRE) to bring together IT staff, district level employees, and individual schools' principals to evaluate the BI needs of all stakeholders and the potential benefits of a new BI solution. This approach helped build consensus among the various end user groups and contributed to the acceptance of the EDW. The DRE has historically been the provider of analytic and trend analysis reports and its leadership in development of the EDW was essential.

To prevent the possible reluctance of some users groups, especially teachers, to utilize the EDW, the EDW team provided training on the new query, reporting and analysis functionality. This process included the initial training of three liaisons from individual schools, who then, along with EDW specialists from district area offices, trained colleagues from the rest of the schools on both the use of the software and the meaning of new reports. This collaborative approach assured smooth acceptance of the EDW.

Technology

The PBCSD's EDW team decided that its new BI solution should be based on two primary components, the DW and the query, reporting, and analysis tools. For its DW, PBCSD used database technology from IBM. After a request for proposal (RFP) for query, reporting, and analysis software was issued, the functionality evaluation of several software packages resulted in the decision to purchase BI software from Cognos, an Ottawa, Canada based supplier of BI software. Since the initial purchase and deployment of Cognos software products, IBM acquired Cognos in early 2008.

In January 2003, the initial Cognos product selected by PBCSD was Cognos Impromptu, which was used primarily for operational reporting prior to the deployment of the EDW. The subsequent need for cross-system data integration and historical data analysis resulted in the development and deployment of the EDW, the deployment of Cognos PowerPlay multi-dimensional analysis software, and an upgrade of the reporting software to the Cognos ReportNet product. As of August 2008, PBCSD was in the process of upgrading its various BI tools to the latest Cognos product set, called Cognos 8.3.

For some data integration tasks, the EDW team deployed Cognos' DecisionStream software (now called IBM Cognos DataManager). However, like most other large organizations, PBCSD is not reliant on technology from a single software provider. Thus, for capturing data changes and loading them into the DW, the EDW team is using technology from Informatica. Over the past few years, source systems feeding the EDW have increased to include the school district's Peoplesoft ERP system, the Planning Department's system, various flat files, and Microsoft SQL Server and IBM DB2 databases. Today the EDW is used also to feed 10 other systems, among them the library system and the student testing system.

Business and IT Processes

The primary change to the IT process resulted in the creation of an EDW team, which is responsible for the BI solution development, deployment and ongoing support to district, area, and school end users. Although organizationally located outside the central IT group, the EDW team includes 33 people, including database, security and server administrators, data architects, report and extract/transform/load (ETL) developers as well as the EDW team's director, administrative assistant, six report navigation and analysis specialists, one BI consultant, and one national consultant. In addition, the EDW team works closely with central IT for various security and networking related support tasks. The EDW team also developed a close relationship with consultants from Cognos, who helped with some of the initial report development.

After the new EDW was deployed to administrators at the district, area, and school levels, the EDW team tackled development of the EDW for Teachers project. This project targeted development of a system to allow the 15,000+ teachers access to their students' achievement, attendance, and behavioral data. A staged approach to the EDW for Teachers deployment was started with a pilot project in the spring of 2007. One of the goals of the pilot project was to ascertain the quality of the organization's hardware systems. This step proved to be crucial to the overall success of the project as the EDW team was able to identify and correct some hardware issues prior to the new EDW for Teachers deployment to all schools. The EDW team began the pilot project with 200 classroom teachers at 67 schools who represented schools at various academic and socioeconomic levels. Pilot participants were granted access to the EDW for Teachers database for a nine-week period and were trained to navigate and analyze all available reports and graphs. Participants were able to electronically access their students' state testing data for the first time. During the pilot period, participants were asked to complete surveys related to general usage, accessibility, report interpretation, and personnel assistance. The EDW for Teachers was modified to utilize their recommendations.

Over the summer of 2007, five schools at various academic levels were then selected to become test schools for the rollout of the EDW for Teachers. Using a "train-the-trainer" model, the EDW area specialists trained representatives from the five schools on the EDW for Teachers and these representatives trained their colleagues at the schools. The second phase of the deployment incrementally extended access the EDW for Teachers to groups of approximately 20 additional schools at a time. By December 2007, 225 schools (including the 184 K-12 schools, as well as, charter and alternative schools) had access to the new EDW for Teachers. The order of the rollout, which took place in the fall of 2007, was determined by area superintendents.

As the EDW for Teachers rollout expanded, the EDW team continued to monitor system scalability and held system capacity evaluation meetings with Cognos. As Michael Via, Manager in the EDW group, said, "Given the complexity and breadth of the EDW's reach, we were pleasantly surprised by how smoothly the deployment went." From the 'business' perspective, the new EDW enables both administrators and teachers at the level of the district and individual schools to make decisions based on accurate, consolidated and timely data. As so often happens, as soon as the users saw the type of information access and analysis that was possible with the new EDW, the EDW team began receiving new requests for reports, dashboards and scorecards. The new EDW also enables the EDW team to respond to such requests much more rapidly than would have been possible in the past.

BENEFITS

Since the broad deployment of the EDW, the school district conducted an internal survey of all school principals, which showed that the new EDW was well received. The PBCSD has experienced many benefits from the new EDW, which have resulted in improving the capabilities of all administrators and teachers to work toward fulfilling the mission of the school district. Diane Conley, Director of the EDW group (and a former school principal) said that "the use of the new EDW was highlighted as a key factor in the recent granting of District Accreditation as a Quality School System through SACS CASI and AdvancED to the Palm Beach School District as a whole, without requiring each school to apply for accreditation individually. This event clearly highlighted the appreciation for our EDW by both employees and external parties." In other words, PBCSD has been able to make substantial progress toward providing the right information to the right people at the right time using the right tools.

The Right Information

- With the new EDW, teachers and administrators have gained invaluable access to both summary and detailed data relevant to each group's activities. For example, teachers are able to view demographic, attendance and performance data on each of their students. Teachers, who can now access online reports on-demand, have indicated that due to more granular data and drill-down functionality of the EDW, they are able to find new, actionable information that was previously either non-existent in paper reports or delivered to them too late to affect any potential corrective action.

- Administrators and principals are able to evaluate overall school performance and compare their school's performance against that of other schools in the district. Administrators are able to perform historical trend analysis and root-cause analysis based on detailed data, using interactive query and analysis tools. The availability of certain state-wide data even allowed for a recent comparison of PBCSD schools against 10 other schools in the State of Florida – a task that would have been time consuming if not impossible in the past. The availability of comparative demographic data about students has raised accountability by eliminating the ability of some educators to blame the performance of their schools on the previously used excuse that they were working with struggling students.

The Right People

- The PBCSD's EDW is reaching a wide range of decision makers from the district superintendent and school principals to administrators and teachers. Some of the administrators who benefit from the EDW include those in the K-12 Curriculum and Safe Schools Departments. Although the Finance and Human Resource Departments don't yet have access to the EDW, users from these departments are also expected to gain access to the Cognos-based BI tools as additional data sources are added to the EDW. The EDW and related BI tools have been deployed to 15,000 teachers. Each user group receives access to the EDW according to a security scheme that ensures that the right people get access to the information that is most appropriate to them.

- Although external users, such as parents of students, do not have direct access to the EDW through reports on the school districts web site, parents do benefit from the new EDW indirectly when teachers share certain reports with them.

The Right Time

- The right time can mean many things. Ultimately, data must be captured and then information made available to decision makers at time intervals that match the specific needs of underlying business processes. At the PBCSD most data is loaded into the EDW on a nightly basis. Some of this data is sourced from operational applications, while some is input by employees through a data entry application.

- The EDW also enables both scheduled and on-demand access to relevant reports and dashboards, which allows all decision makers to access information and perform data analysis when they find it appropriate. One of the examples of information delivery at the right time was the change in the process of delivering reports to teachers. In the past, paper reports containing student performance metrics were sent to school principals, who, after initial review of the reports, distributed them to teachers. With the EDW, teachers have gained direct access to their personalized performance reports without having to wait for principals to distribute them. This enables teachers to analyze the information on a timely basis and to propose or to take corrective action on helping students.

The Right Tool

- A BI solution must be able to address not only the needs of various end user groups but also those of IT, in its effort to support the ongoing BI needs of end users. At PBCSD, the new EDW solution provides broad-ranging functionality such as static reporting, ad-hoc query and analysis, and scorecarding. Some of the new scorecards provide both aggregated information on KPIs as well as functionality to drill into the KPIs to analyze root-causes of adverse performance indicators. In other cases, electronically available EDW reports have helped eliminate the need for hard copy reports, which prevented end users from quickly identifying exceptions or trends on which they should focus.

- Almost all end user BI tools include both tabular content and data visualization that helps highlight exceptions. The interactivity is supported through parameterized and filtered reports and multi-dimensional analysis based on Cognos data cubes.

LESSONS LEARNED

IDC's goal in interviewing PBCSD was to identify best practices that other organizations can apply in their efforts to make the use of BI and analytics processes and tools more pervasive. Neither PBCSD nor IDC would claim that PBCSD has fully achieved the goal of having pervasive BI. Nevertheless, there are several important lessons that the case highlights:

- Two organizational factors contributed to the success of the EDW. First was the appointment of a former principal as the Director of the EDW in June 2006. Second, was the strategic placement of the EDW Department in the Division of Performance Accountability, which is part of the academic part of the organization. This organizational relationship contributes to the positive and ongoing communication and connection to school center personnel, as well as academic and operational departments.

- Few, if any, BI solutions succeed when IT tries to anticipate the needs of end users and launches technology development and deployment projects without involving end users. PBCSD's leadership ensured that representatives from schools and administrative departments participated in the requirements identification process. It was important to create a collaborative environment for the EDW, IT, and end users groups. Each of these groups brought with it expertise in either technology

infrastructure management, DW and BI software design and deployment, or business processes and KPIs, respectively. “Communication with all groups and organization to meet the needs of the users were ultimately the keys to success” said Dawn Pumphrey, Manager in the EDW group.

- IDC research suggests that the amount of training on BI tools and on the meaning of data and metrics is the strongest predictor of pervasive BI. PBCSD developed an effective training method whereby a small group of end users working with experts from the EDW team were tasked with training the rest of the organization. As EDW has continued to evolve, PBCSD has kept up with the various training needs of its employees. As Sandra Raymond-Roberts, Manager in the EDW group said, "the more reports we make available to our users, the more we train."

- BI projects should be viewed as ongoing initiatives that require constant, iterative updates to deliver the right information to the right people. PBCSD utilized a staged approach to deploy the EDW to all the schools within the district. Today the school district continues to work on deploying the EDW solution to additional internal and external stakeholders. In addition, the EDW project spurred the development of a new data entry interface that allows teachers to enter data and view this data within their reports the next day. In the past teachers had to send any new data to the school’s data scanners for input into performance reports. As a result, in the past it could sometimes take weeks before new data became available in teachers' reports.

- Given the opportunity, organizations should try to get involved as a partner of the software provider to influence product development and potentially gain favorable terms for the use of the software or related consulting services. In the PBCSD case, the organization was able to gain initial report development expertise from Cognos, while Cognos utilized the relationship to develop expertise in the primary education market. Cognos was since able to parley its primary education market knowledge into a BI project at other school districts in North America.

- Finally, any large BI solution deployment, such as the one at PBCSD involves many software and hardware components. It is important that the existing or new hardware platform is capable of supporting the proposed software architecture, especially when there are thousands of potential end users. Prior to EDW deployment, PBCSD evaluated the condition of hardware at each of the schools. Although it may seem obvious, this step assured that there were no delays in the subsequent software deployment phases. The EDW team has "only one chance to make the first impression" on end users. Any early project delay or BI solution deployment that results in sub-optimal query performance can frustrate end users and derail the project by a significant amount of time.

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