

# Harnessing the Power of Business Intelligence

By Jeff Jackson and Carol Market

Harris County, Texas, used business intelligence technology to automate its financial reports and become more effective in analysis and forecasting.

*Harris County, Texas, won a Government Finance Officers Association Award for Excellence in 2012 for* A Unique Approach: Enhancing and Streamlining Reporting and Analysis in Harris County.

Financial and operational complexities and ever-increasing financial reporting requirements led the Harris County, Texas, auditor's office to create a more innovative and efficient approach to reporting, analysis, and forecasting. The county particularly needed to automate and streamline the preparation of its comprehensive annual financial report, associated audit schedules, and the office's monthly reporting. The manual process previously in use was repetitive and time consuming, and also increased the risk of clerical error. The same process weaknesses also existed in budgeting, forecasting, and other financial analysis activities. To address these issues, the auditor's office implemented business intelligence software solution known as online analytical processing.

## SELECTING A SOLUTION

The county's CAFR reporting process was not in line with the auditor's mission of being a progressive organization or the office's vision of creating and maintaining efficient financial operations. Reports were run from the county's enterprise resource planning system and then manually keyed into spreadsheet schedules, which were updated manually – and often – during the year-end CAFR process. Preparing cash flow projections, performing revenue forecasting and analysis, and estimating available resources (an annual statutory requirement) also relied heavily on manual querying from the ERP system and manual input into spreadsheet schedules. Ad hoc querying and reporting was cumbersome and time consuming, as well.

A needs assessment determined that online analytical processing technology would be the most robust means of meeting Harris County's analytical and financial reporting challenges. A request for proposals was prepared, using input from areas of expertise including the county attorney's office, Information Technology, and Purchasing. After receiving and evaluating several proposals, the auditor's office did an initial evaluation based on cost, ease of implementation, level of reliance on internal IT resources, alignment with the current ERP system, and other relevant factors. The primary contenders presented their product solution to an evaluation committee that included representatives from the auditor's office, IT, and Purchasing. The online analytical processing software ultimately selected was chosen based on the committee's evaluation of what would best fit Harris County's needs: It was user friendly, required minimal technical training, and would not rely

heavily on the IT department for implementation or maintenance. Most of the implementation and maintenance was done by Harris County auditor's office personnel.

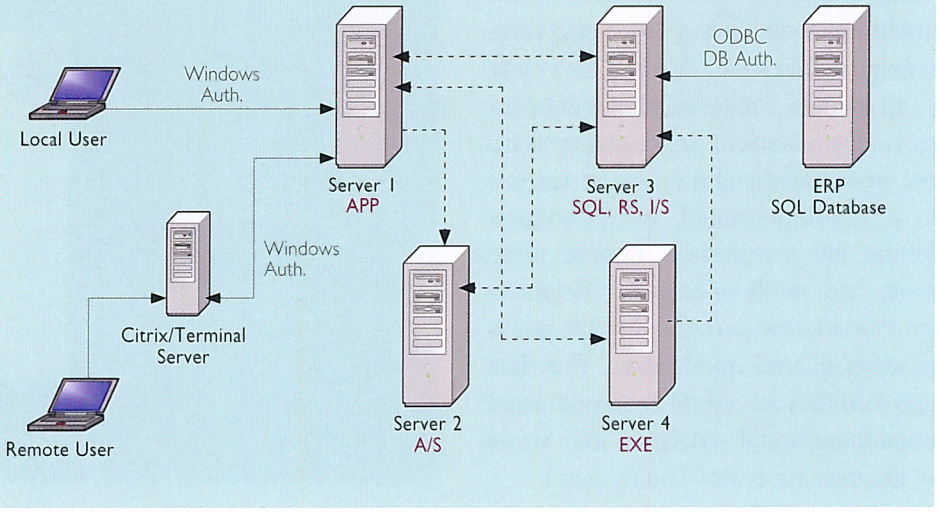
## IMPLEMENTING THE SYSTEM

The work revolved around building a financial reporting online analytical processing cube (a multidimensional dataset; this term will be explained in greater detail in the following section) and then using the technology to design the CAFR schedules. Harris County has six months to disclose CAFR information to the Electronic Municipal Market Access of the Municipal Securities Rulemaking Board, and one goal of CAFR automation was gaining the ability to submit the county's data more quickly. Doing so provides more current information to the county's governing body and to its financial management decision makers, investors, rating agencies, taxpayers, and other stakeholders.

Implementation took approximately four months, with two months of assistance from the software vendor. The Harris County Auditor's Office allocated 1,100 hours to the project, while the vendor allocated 445 hours, and internal IT resources, 180 hours. The auditor's office assisted the vendor in preparing business requirements, design and technical specifications, business process design, and a project risk document to keep the project on scope.

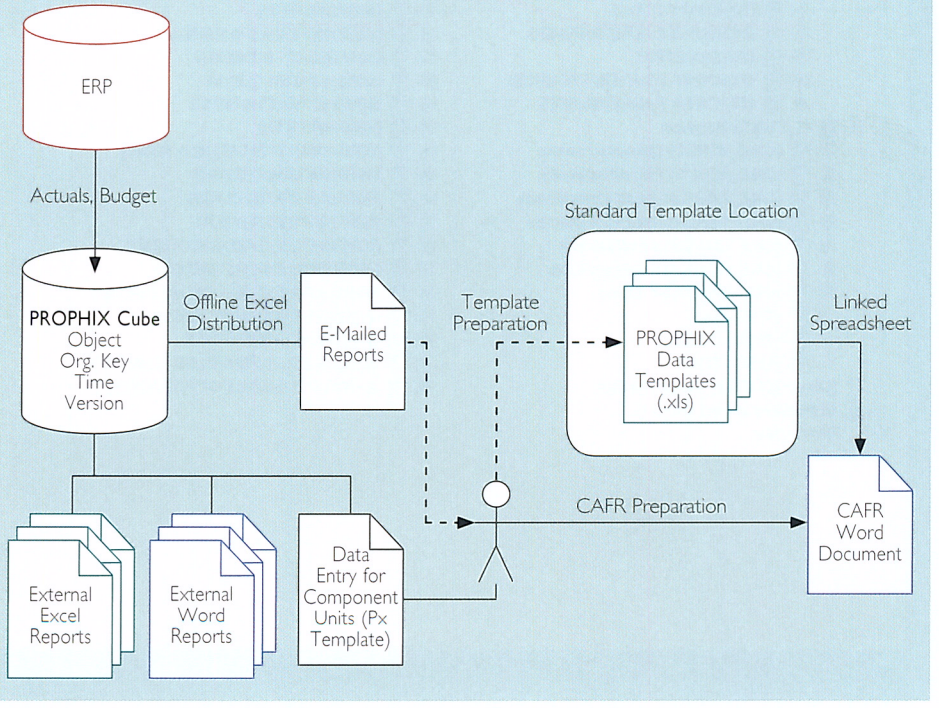
The IT architecture and server configuration includes six main components: a structured query language database; the online analytical processing software; process execution; analysis services; reporting services; and integration services. These components are hosted across four servers and have high speed connections that are accessed over the local network, as shown in Exhibit 1.

**Exhibit 1: Harris County's Online Analytical Processing Architecture**




The project team designed and built one financial reporting online analytical processing cube that interfaces with Harris County's ERP system for data extraction. The reports generated by the online analytical processing software are created and exported to the CAFR, monthly financial reports, or other reporting output. See Exhibit 2 for the annual CAFR process.

**Exhibit 2: Process for Generating the Annual CAFR**



## HOW IT WORKS AND WHAT IT DOES

Many spreadsheet users have heard about online analytical processing technology, but its meaning likely isn't clear to all readers. Unlike relational databases, online analytical processing tools do not store individual transaction records in a two-dimensional, row-by-column format, like a worksheet. Instead, these tools use multidimensional database structures known as cubes to store arrays of consolidated information. The data and formulas are stored in an optimized multidimensional database, and views of the data are created on demand.

**Exhibit 3: The Six Dimensions of the Online Analytical Processing Cube**

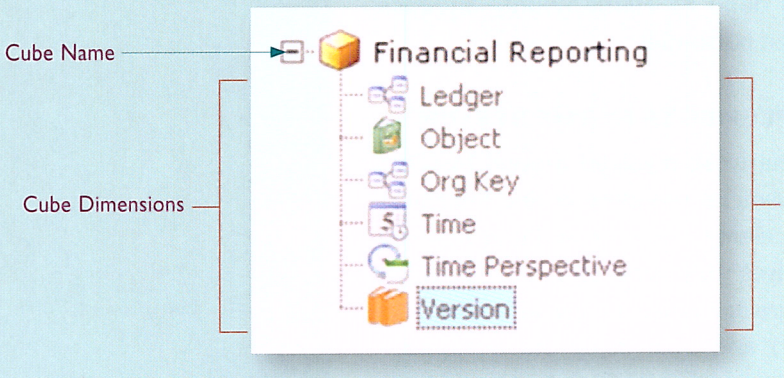
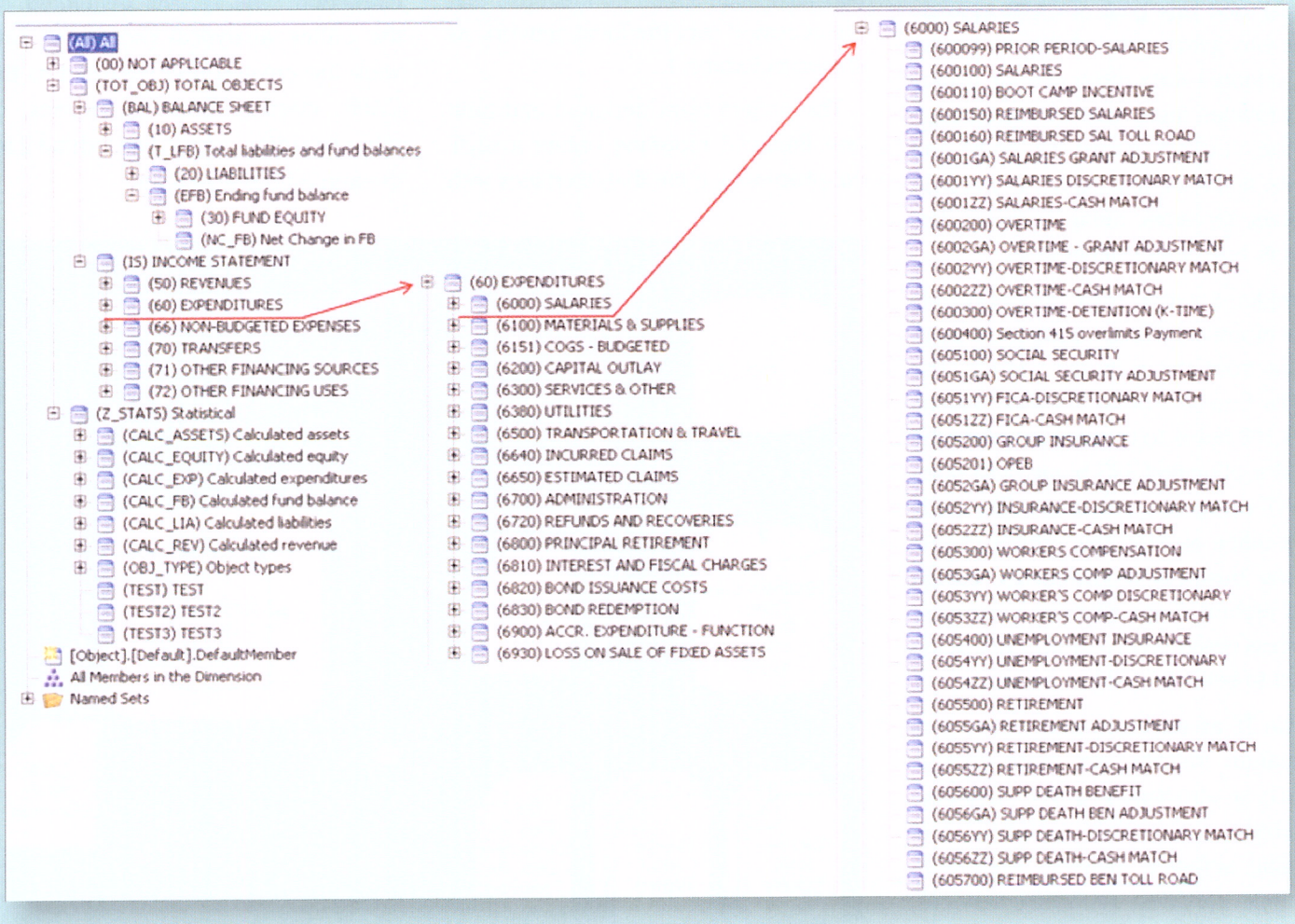



**Exhibit 4: The Object Dimension of the Online Analytical Processing Cube**



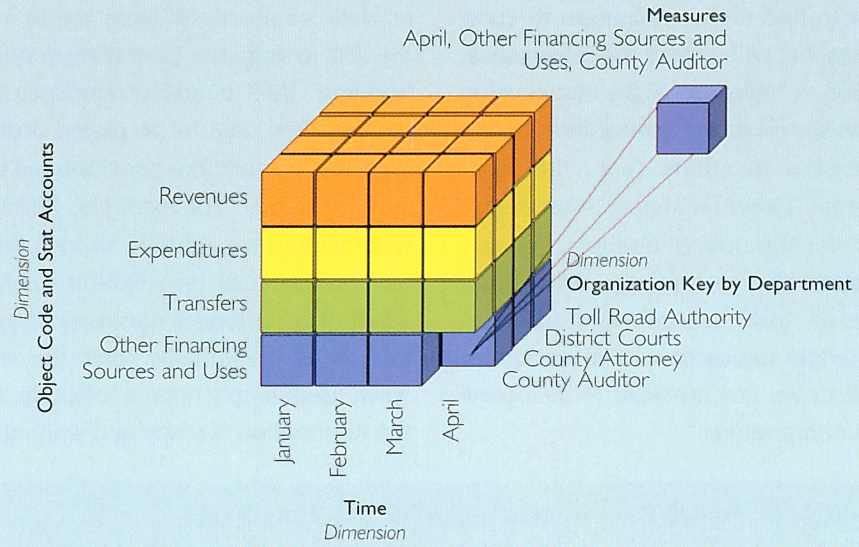
Rather than working with just three dimensions, organizations have many dimensions and groupings to keep up with. Using a financial example, Harris County primarily uses two general ledgers in the online analytical processing software, 540 funds in the 2 ledgers, 90 departments, more than 2,700 balance sheet and income statement accounts, seven government functions, more than 5,600 organization cost centers (known as "keys"), and various versions of reporting, including adopted budget, adjusted budget, actual cash basis, actual modified accrual basis, and actual government-wide basis. These dimensions comprise the base for Harris County's planning, analysis, and reporting activities. Exhibit 3 illustrates the six dimensions of the Harris County auditor's office financial reporting online analytical processing cube.

Each dimension contains "members," which are simply the items that belong in a dimension hierarchy. For example, Exhibit 4 illustrates the "object" dimension. It has members that include account type (expenditures), CAFR category (salaries), and object codes (prior period – salaries).

Dimensions can include "alternate" hierarchies, which provide a quick way to analyze all the parts of an organization key, including fund, department, division within a department, county function, grant roll up into federal, state or local, and so on. The "org key" dimension shown in Exhibit 4 was designed with 11 alternate hierarchies.

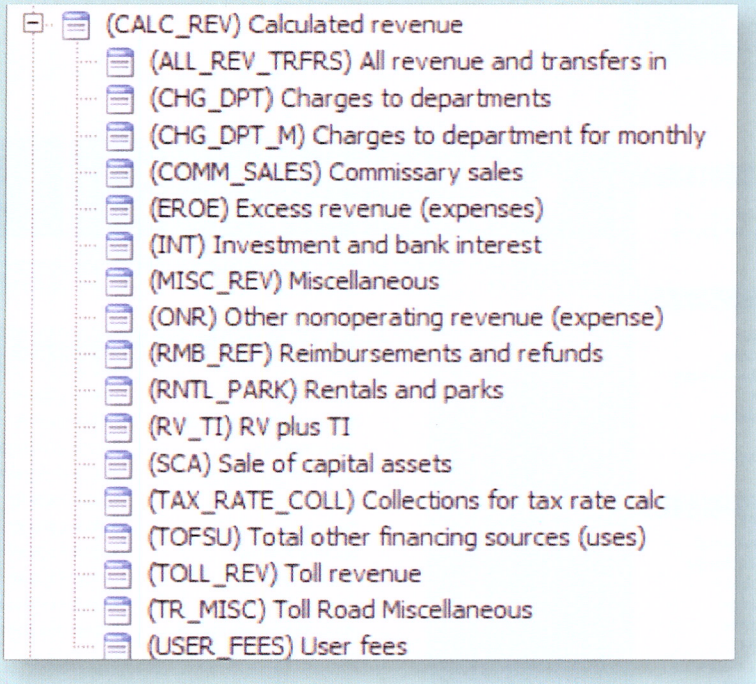
Putting it all together, Exhibit 5 illustrates the dimensions of the Harris County Auditor's Office online analytical processing cube, using sample members for illustration purposes.

**Exhibit 5: The Dimensions of the Online Analytical Processing Cube**




Other Dimensions
- Versions – Adopted budget, adjusted budget, and actual results
- Ledger – Harris County and Flood Control
- Time Perspective – Monthly, month-to-date, yearly, year-to-date

**Exhibit 6: Formulas to Compute Financial Components of the CAFR**



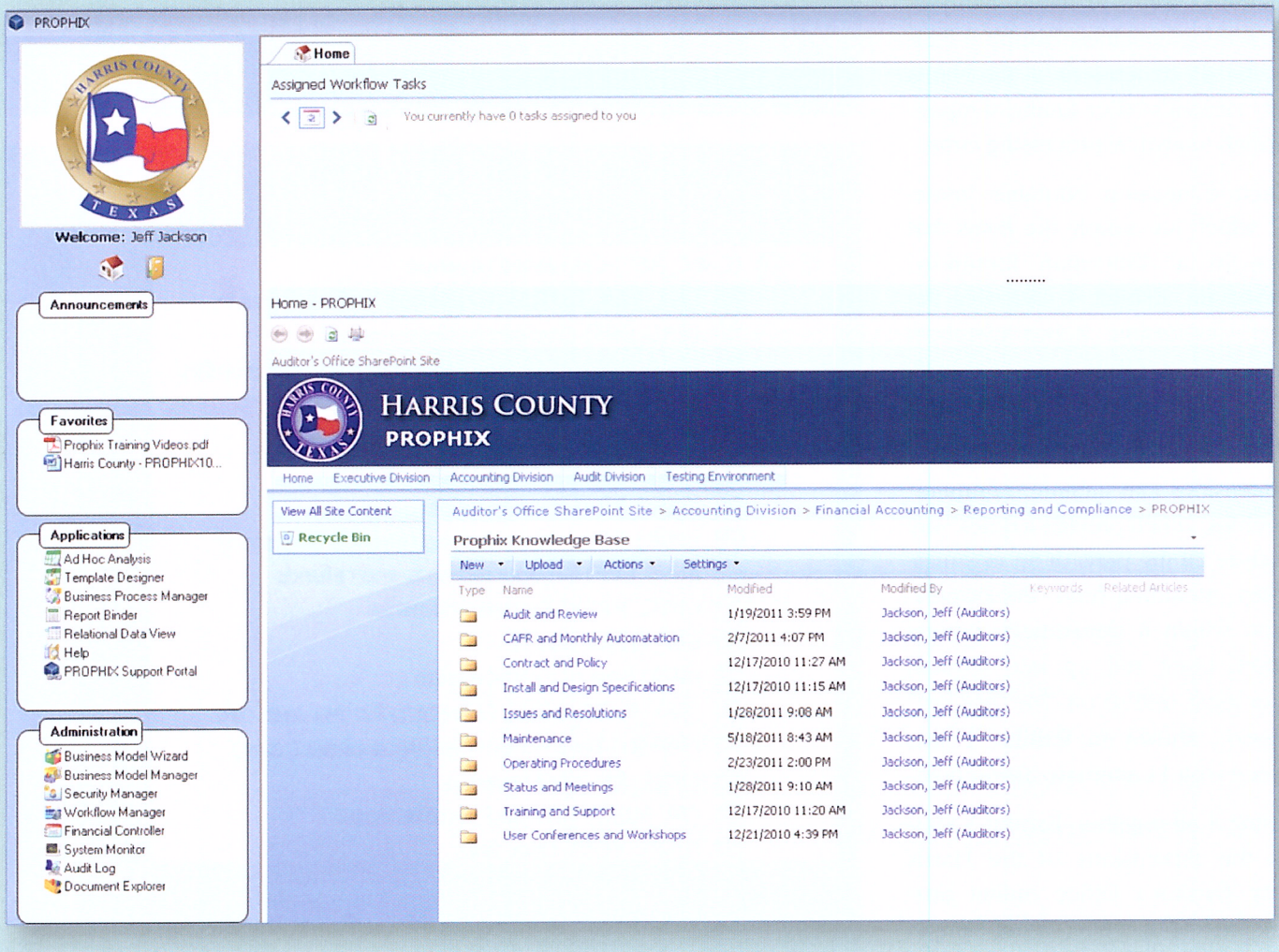
Online analytical processing technology gives users the ability to twist and turn the cube like a Rubik's Cube in order to find the combination of coordinates that will display the information needed. A "measure" is the actual value that is stored at the intersection of the dimension members (e.g., the April value for "Other Financing Sources and Uses" for the county auditor). For any measure, the technology also allows users to "drill across" into the general ledger transaction detail to further break down any measure to its lowest-level components.

After the county's financial reporting online analytical processing cube was designed and constructed, and the proper data connections were made with the ERP system, the project team began building CAFR financial templates that would allow data to be pulled around the exact calculations programmed into each schedule. For example, formulas were written to compute various financial components (see Exhibit 6). As a result, it is no longer necessary to print reports and manually enter the data. Now, users simply open a template, and the information is ready and waiting.

Once the CAFR schedules were prepared, the same approach was taken in designing the monthly reporting templates. Once these were created, other templates and query views were built for a wide variety of needs associated with cash flow projections, revenue and expenditure forecasting, tax rate calculations, detailed financial analysis, and ad hoc querying.

To provide training for the county's 40 licensed users, the county used commercially available collaboration software to create a smart portal (see Exhibit 7). This put training

**Exhibit 7: Portal Puts Resources at Users' Fingertips**



and other useful resources at users' fingertips. The collaboration software makes it easy to create websites for sharing information, managing documents from start to finish, and publishing reports. The "Training and Support" folder contains training materials including a standard user's guide, a training manual, training videos, and information about new releases.

## CONCLUSIONS

By implementing online analytical processing, the Harris County auditor's office has taken a critical step in applying innovative and cutting-edge business intelligence technology. The system has allowed Harris County to automate its CAFR and monthly reporting, providing timelier reporting to the county's internal and external customers. The technology has also made annual and interim reporting more cost-effective, accurate, and efficient. The ability to create complex analytical and ad hoc queries with a short execution time has made users more effective, allowing them to analyze more data and thus make better decisions. Harris County anticipates expanding the use of this state-of-the-art technology for additional ad hoc reporting and other analytic and business needs, as well as creating additional online analytical processing cubes.

---

**JEFF JACKSON** is the director of revenue accounting for Harris County, Texas. He has extensive experience in accounting, auditing, financial, and operational management. **CAROL MARKET** is the director of financial accounting for Harris County. She has extensive government accounting experience, including the responsibility for the comprehensive annual financial report reporting.