Best Practices in Data Warehouse Implementation

In this report, The Hanover Research Council offers an overview of best practices in data warehouse implementation with a specific focus on community colleges using Datatel. We feature profiles of nine community colleges that have recently begun or completed Datatel implementation, highlighting aspects such as the implementation timeline, required resources, staffing organizational models, institutional and staff support, and project leadership.
Introduction

In this report, The Hanover Research Council explores best practices for data warehouse implementation, with a specific focus on Datatel implementation at community colleges. In order to respond to the points of interest raised by XYZ College, we examined a variety of sources, including:

- Datatel implementation success stories available on the Datatel website
- Data warehouse implementation plans from Southeast Arkansas College, Hudson County Community College, Shasta College, and others
- Previously conducted research by the Hanover Research Council
- Articles on the topic of data warehouse implementation published by the Business Intelligence Best Practices forum and Campus Technology
- Excerpts from books such as Best Technology Practices in Higher Education and Data Warehousing: A Comprehensive Guide for IT Professionals

The report is divided into three key sections. Below is an overview of our main findings within each topic area:

- **Overview of Data Warehouse Implementation**
  
  - Given the current information concerns among higher education institutions, an up-to-date data warehousing system can effectively improve data utilization by providing a more integrated, subject-oriented, time-variant, and nonvolatile information system. With these benefits in mind, higher education institutions may decide to adopt a plan for data warehouse implementation in order to be able to accurately assess the costs and resources involved in the warehouse project and derive the maximum benefit of a data warehouse.

- **Profiles of Datatel Implementation at Community Colleges**
  
  - In light of the value of Datatel for community colleges, in this section we provide in-depth profiles outlining the Datatel implementation process at nine community colleges across the country, highlighting issues such as the implementation timeline, staff and institutional resources, and organizational structures and leadership at each campus.

  - Hanover has identified a number of common features of these community colleges’ experiences with Datatel implementation. Specifically, we note the following critical components of implementation initiatives: development of a strategic plan for a multi-year, phased implementation timeframe; organizational structures comprised of application teams and
overseen by a project management team; and ongoing communication and training support for all campus staff.

❖ Common Pitfalls in Data Warehouse Implementation

o Drawing from a survey on best practices in data warehousing – previously conducted by The Hanover Research Council – we conclude by presenting an overview of six primary areas of recommendation for avoiding pitfalls and improving implementation processes. These six critical factors in the implementation of a data warehouse include issues related to: executive sponsorship, initial deployment of a single business area, concrete understanding of the needs and objectives of the end-users, proper funding, knowledge base of data warehouse team members, and capable and passionate leadership.
Overview of Data Warehouse Implementation

Keen competition for students and the increasing usage of operational management software have raised the bar for data utilization and decision support technology. However, a well architected data warehouse enables institutions to address these concerns and harness data to improve strategic decision-making. Specifically, an updated data warehouse can improve:

- Organization of data
- Standardization of information and reporting
- Ability to utilize greater amounts of data
- Ability to perform in-depth analysis
- Accessibility and ease of use of system
- Preservation of data

Given the numerous benefits of utilizing a data warehouse system for higher education institutions, in this section, we discuss the fundamentals of data warehouse implementation. We begin by examining current IT needs in higher education. We further discuss the benefits of data warehouse systems, explore features of the component architecture of data warehouse systems, and review the steps for integrating data quality in the implementation process. We conclude with an overview of the planning process and underlying considerations involved in an implementation project.

Current IT Needs in Higher Education

According to *Best Technology Practices in Higher Education*, the key information needs of institutional leaders consist primarily of the following:¹

- Extracting information from a large amount of data
- Integrating diverse internal and external data sources
- Utilizing historical data
- Fast reporting capabilities
- Ability to generate ad hoc queries

In light of these information technology needs, *Best Technology Practices in Higher Education* also addresses a number of common problems associated with current IT infrastructures at institutions of higher education. Firstly, existing IT systems are typically designed to support day-to-day decision making and are commonly web-based applications, referred to as online transactions processing (OLTP) systems. These systems do not integrate long-term historical data and only reflect the current state, thus providing only a short-term perspective; ultimately, this lack of historical data severely limits an institution’s strategic decision-making ability.² The second

² Ibid., 137.
problem is that data is often scattered or integrated inefficiently. Several sources of data used to make one decision may be scattered across different storage areas, and integrating that data may be a time-consuming process requiring highly “complicated programming.” The third problem frequently preventing effective data warehouse utilization is that running day-to-day operations performed by OLTP systems strains hardware and software resources. Performance can be significantly lowered by “adding a decision support function on top of an OLTP system.” Finally, many organizations underutilize IT which negatively affects data warehouse efficiency. Applications are often purchased on a need-to basis, thus hindering data integration and compatibility between implemented systems. This can affect data consistency and also complicate the data extraction process.

Four common problems in current higher education IT infrastructures are:

- Lack of historical data
- Scattered data
- Strain on system resources
- Lack of integration and compatibility

Source: Les Lloyd, ed. *Best Technology Practices in Higher Education*

Benefits of Data Warehouse Systems

However, an up-to-date data warehousing system can remedy these problems and will put an institution on track toward effective and efficient data utilization. **Advantages of an up-to-date data warehouse include four characteristics:**

- Integrated
- Subject-Oriented
- Time-variant
- Nonvolatile

The official definitions of these characteristics are as follows:

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3 Ibid., 138.
5 Ibid., 138.
http://dheise.andrews.edu/LitSurv/Guan,Jeff.pdf.
Integrated

“Data integration implies a well-organized effort to define and standardize all data elements.”\(^9\) Integration can be a time-consuming process; however, well-integrated data results in a higher functioning data warehouse. Benefits include increased data compliance and accessibility for users.

Subject-oriented

“Data are arranged and optimized to provide answers to questions coming from diverse functional areas within an organization. Therefore, the data warehouse contains data organized and summarized by topic, such as student demographics and human resources.”\(^10\)

Time-variant

Data includes present and historical data, allowing better forecasting capabilities. Additionally, once data are loaded to the data warehouse, “all time-dependent aggregations are recomputed.”\(^11\)

Nonvolatile

Data that is entered into the warehouse is not “removed.” Depending upon the nature of the decision making, data moves from operational entry\(^12\) into the data warehouse at a certain frequency.\(^13\)

Component Architecture of Data Warehouse Systems

On the next page we provide an illustration of a typical, up-to-date data warehouse,\(^14\) followed by definitions of each component.

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\(^9\) Lloyd, 139.
\(^10\) Ibid., 139.
\(^11\) Les Lloyd, ed. 139.
\(^12\) This data is typically used for day-to-day decision making.
\(^13\) Ibid. 139-140.
\(^14\) Ibid., 141.
Figure 1: Architecture of a Typical Data Warehouse System

Data Warehouse Component

- Integrated, Subject-oriented, Time-variant, Non-volatile Data

Data Presentation Components

- Standard Reporting Tool
- Rollup & Drilldown Tools
- Multi-dimensional Analysis Tools
- Ad hoc Query Tools

End-User Component

Power Users
- Analytics

Analysts
- Reporting
- Analytics

Average Users
- Reporting

Definitions

A **data source component** “represents all of the sources from which the raw data originate.” The data source components feed into the **data acquisition component**, which evaluates the integrity of quality of data. When programming the data acquisition component, rules **must** be defined in order to ensure the acquisition process occurs properly. The acquisition process involves “cleansing, enhancement, restructuring, integration, and aggregation of source data” – steps necessary in order to generate useful, accurate data. Definitions used for the data acquisition process may also be stored and used later as **meta-data**. Meta-data is considered “soft data” (versus “hard data” – the original source data) and can be used later for information regarding data storage and extraction. We will discuss the methodology for assuring data quality for both hard and soft data in the coming pages.

After the data acquisition process, data flows into the **data warehouse component** which houses and stores the **enterprise data warehouse**, along with other smaller data warehouses, called **data marts**. The enterprise data warehouse contains data that “provides an integrated view of the data of an organization,” offering a comprehensive overview of an organization spanning across departments. A data mart, on the other hand, provides an area or user specific view of an organization. For example, a data mart may represent data related to human resources or finance departments.

Users interact with the data warehouse through the **presentation component**, which “represents different levels of services from simple reporting to roll-up and drill-down functionality to multidimensional analysis to true ad hoc query capability.” The end-users include those utilizing the data warehouse. The pyramid illustrates the three typical categories of end-users: **power users**, **analysts**, and **average users**. On one end, average users utilize the system for standard reporting; on the other, power users utilize the system for advanced data analysis, which involves longitudinal analysis and data mining. In between are the analysts who use the system for reporting and advanced data analysis, primarily multi-dimensional analysis involving roll up and drill down techniques.

This is the typical set-up for a data warehouse used in higher education institutions, and if well architected, will not only store “cleansed, integrated, historical and aggregated data” but will also structure data in a way that encourages accessibility and analysis. However, regardless of how well constructed the warehouse and its

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16 *Ibid*.
17 *Ibid*.
18 *Ibid*.
20 *Ibid*.
21 *Ibid*.
components are, it is not possible to achieve high functionality without high quality data.

**Integrating Data Quality**

Data quality assurance is an important step in the overall process of warehouse implementation. Proper data quality assurance will provide greater insight into how to architect a data warehouse, as well as resolve data quality related problems prior to implementation. This will reduce headache during later phases of warehouse implementation and particularly during utilization of the data warehouse.

**Think Big, Start Small**

In the article “Integrating Data Quality into Your Data Warehouse Architecture” published in the Business Intelligence Journal, senior Oracle programmer Jean-Pierre Dijcks describes the basic principles for data quality assurance. He begins with the concept “Think Big, Start Small,” encouraging the usage of iteration when working toward data warehouse implementation goals. Because implementation of a data warehouse is such a large-scale project requiring significant time and resources, breaking the project into segments will allow the institution to better manage the implementation process and track progress.

Dijcks goes on to enumerate five primary steps for implementing a data warehouse:

- **Scope**
  - Determine area or problem to solve
  - Determine project extent
- **Design**
  - Determine information required from end-users
  - Design warehouse to match needs
- **Build**
  - Refine design
  - Construct data warehouse
- **Test**
  - Test system including unit testing and end-user testing
- **Deliver**
  - “Rollout” of system into production
  - Training and organizational change management

These five primary steps outline data warehouse implementation methodology. In addition to those steps, there are five other steps recommended for assuring data quality. The first step requires defining what type of data is being assessed: “hard

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23 Ibid.
data” or “soft data?” Once the type of data is assessed, four quality assurance phases remain.

For “hard data” the four phases of data quality assurance methodology are as follows:

**Investigate data quality**

Before beginning the implementation process it is imperative to establish clear guidelines for data quality so that all implementation staff members understand what the standards are. If time and resource restrictions prevent this from occurring before the project begins, guidelines should be established at a later point, though still as early on as possible during the implementation process.

**Scope data quality**

Once data quality and organization have been assessed, the scope of the data quality within the data warehouse project must be defined.

**Architect the solution**

In order to architect a solution, the institution must: evaluate needed and/or available technology, evaluate the resources needed, and identify business rules that solve the data quality issues.

**Solve data quality issues**

This is the final step in the methodology for data quality assurance. However, it is important to note data quality assurance is a continuous process – data quality changes over time and therefore must be monitored. In addition to end-user feedback, a reporting and measurement system should be implemented to assure quality data.

For “soft data” or “meta data” the data quality methodology is comprised of the same basic steps, with added considerations:

**Investigate Data Quality**

When investigating metadata quality, it is important to:

- Investigate the source systems by direct access
- Interview key users of the source systems

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24 Ibid.
25 Ibid.
Once the investigation and interviews have been completed, the next step is to establish a baseline. Specifically: “What is the data quality of the organization, and where do you want it to go?”

An example of a quantitative baseline measurement system is Six Sigma, which quantifiably measures data defects by a sigma (standard deviation number).

**Scope Data Quality**

The scope phase for metadata quality assurance is the same as for the hard data methodology. In this step, the necessary measures to complete the project are determined.

**Architect the Solution**

Data must be converted from its original value to the true or expected value during this phase. It is also important to realistically assess performance needs and potential achievement levels.

**Solve Data Quality Issues**

Establish a set of project checkpoints as well as:

- Establish and maintain end-user involvement in the project
- Verify rules distilled from investigation of real data
- Identify new problems with data quality
- Show both progress and potential to the users

In light of data quality and other logistical considerations, in the remainder of this section we offer an abstract of key issues in planning for data warehouse implementation.

**Planning for Data Warehouse Implementation**

As previously noted, while there are significant paybacks derived from a data warehouse, implementation and creation can be a long, expensive process. According to a recent article entitled “Data Warehousing ROI: Justifying and Assessing a Data Warehouse” posted on an online forum for business intelligence, typical cost categories associated with a data implementation project include hardware, software, and personnel expenses. Subdivisions of each category are listed in Table 1.

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26 Ibid.


28 Ibid.
Table 1: Costs of Data Warehousing

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>◆ Disk storage</td>
</tr>
<tr>
<td></td>
<td>◆ Processor</td>
</tr>
<tr>
<td></td>
<td>◆ Network</td>
</tr>
<tr>
<td>Software</td>
<td>◆ Extraction, transformation, loading</td>
</tr>
<tr>
<td></td>
<td>◆ Database and management software</td>
</tr>
<tr>
<td></td>
<td>◆ Metadata software</td>
</tr>
<tr>
<td></td>
<td>◆ End-user data access tools</td>
</tr>
<tr>
<td>Personnel</td>
<td>◆ IT Staff</td>
</tr>
<tr>
<td></td>
<td>◆ Business and end-user personnel</td>
</tr>
<tr>
<td></td>
<td>◆ Consultants</td>
</tr>
</tbody>
</table>

Source: Business Intelligence Best Practices

In order to be able to accurately assess the costs and resources involved in the warehouse project and derive the maximum benefit of a data warehouse, a higher education institution should create an implementation plan that addresses the specific data processing needs of the user community. This plan will ultimately provide insight into data warehouse functionality, assist institutional leaders to assess issues such as time and financial resources required for project implementation, as well as ensure the institution’s investment in the new data management system is fully returned.

According to Data Warehousing Fundamentals: a Comprehensive Guide for IT Professionals, a “well-thought-out formal plan” is defined by these aspects:29

This plan is a formal plan that sets the direction, tone, and goals of the initiative. The plan lays down the motivation and the incentives. It considers the various options and reasons out the selection process. The plan discusses the type of data warehouse and enumerates the expectations. This is not a detailed project plan. It is an overall plan to lay the foundation, to recognize the need, and to authorize a formal project.

In particular, specific features of a plan for a data warehousing initiative should include the following segments:30

- Introduction and Mission Statement
- Scope
- Goals and Objectives
- Key Issues and Options
- Values and Expectations
- Justification
- Executive Sponsorship

30 Ibid., 69.
Implementation Strategy
Tentative Schedule
Project Authorization

In particular, defining the scope of a data warehouse project is a crucial initial step in determining the resources and time spent on warehouse creation and maintenance.
Profiles of Datatel Implementation at Community Colleges

Having focused on the technological needs of colleges and universities for three decades, Datatel is a “leading provider of fully-integrated information management systems,” providing services to over 300 community colleges. Among its client success stories, Datatel cites a number of community colleges across the nation that have successfully implemented Datatel options as their leading information system.

Table 2 presents a sampling of community colleges that have implemented Datatel, noting their initial technology needs, Datatel solution, the timeline for implementation, and the resulting impact:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
<th>Implementation Time Frame</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Butte College</strong>&lt;sup&gt;33&lt;/sup&gt;</td>
<td>The College was outgrowing its administrative system and experiencing increasing costs and risks associated with operating a non-integrated system. Implemented Colleague, including Colleague Student, Colleague Finance, and Colleague HR.</td>
<td>15 months</td>
<td>Whereas their previous system required 7 programmers and 3 technicians, the Datatel system requires 5 programmers and 1 technician. The College also cut schedulers down from 29 part-time employees to 3 full-time employees.</td>
</tr>
<tr>
<td><strong>College of the Redwoods</strong>&lt;sup&gt;34&lt;/sup&gt;</td>
<td>Needed to consolidate data into a single source, provide online registration options, and track enrollment trends. Colleague data administration system, plus WebAdvisor</td>
<td>2001 – 2003</td>
<td>Registration and data entry processes are streamlined now that there is a single data source across all campuses.</td>
</tr>
<tr>
<td><strong>Erie Community College</strong>&lt;sup&gt;35&lt;/sup&gt;</td>
<td>The College needed to seamlessly merge all its databases and Web information into a single resource for the three campuses and sought online application capability. Implemented Datatel ActiveAdmissions allowing for easy web accessibility to speed up admissions process.</td>
<td>2004 – 2005</td>
<td>Staff are able to manage Web content without having to go through Webmaster for approval. Staff have seen “increased efficiency,” as the new system gives them the time to focus on more face-to-face student and customer interaction rather than processing hard data.</td>
</tr>
</tbody>
</table>

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<sup>32</sup> Datatel. “Community Colleges – Client Success Stories.”
http://www.datatel.com/clients/success_stories/community_colleges.cfm

<sup>33</sup> “Butte College Uses Datatel to Maximize the Power of Oracle.” Datatel.

<sup>34</sup> “College of the Redwoods Reaps Rewards with Datatel Colleague in Increasing Applications Online and Tracking Enrollments.” Datatel.

<sup>35</sup> “Community College Boosts Online Applications Using ActiveAdmissions.” Datatel.
<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
<th>Implementation Time Frame</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>The College wanted to streamline HR processes and paperwork, and needed to “establish a more effective position management capability.”</td>
<td>Implemented <em>Colleague</em> HR and accompanying Workflow Management System (WfMS)</td>
<td>8 months</td>
<td>Through the use of “one well-designed workflow,” the College has experienced significant time savings and effective position management.</td>
</tr>
</tbody>
</table>

Source: Datatel

In light of the value of Datatel for community colleges, in the remainder of this section we provide in-depth profiles outlining the Datatel implementation process at nine community colleges across the country. In an effort to assist XYZ College in its own data warehouse implementation efforts, we highlight issues such as:

- Implementation Timeline
- Required Resources
- Staffing Organizational Models
- Institutional Support
- Project Leadership
- Support Services for Staff Members

**Southeast Arkansas College (SEARK) – Pine Bluff, AR**

According to Datatel, in 2002, Southeast Arkansas College (SEARK) was ready to “replace its outdated POISE data management system.” In January 2004, the College began implementing *Colleague* as its ERP system, using *SmartPath* – “an affordable combination of administrative software and professional services that enables institutions to take advantage of Colleague quickly, efficiently, and within budget.” By April 2005 full implementation of *Colleague* was complete.

In order to guide the Datatel implementation process, the Title III Monitoring Team at SEARK developed a formal plan (as described earlier in this report) entitled “Mission to Mars: Launching the Datatel System.” In the remainder of this profile,

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58 Ibid.
we describe the components of this plan as well as the staffing organizational model adopted by SEARK to oversee successful implementation.

The Project Overview begins with a description of the rationale for the selection of Datatel College and WebAdvisor products, as well as a mission statement for project implementation. Among the institution’s stated goals for the implementation process were:

- To complete the installation, implementation, training, and configuration of the Colleague, Web Advisor, and related systems in a cost-efficient, effective, and timely manner;
- To ensure that all college staff attain the appropriate skill level in using the Datatel Colleague and WebAdvisor products for their assigned tasks; and
- To ensure that all staff using the Datatel Colleague and WebAdvisor products have the appropriate support from the Information Systems and Technology staff to effectively fulfill their role with the data system.

After outlining specific project goals and objectives, the plan presents an overview of the college’s implementation plans. The plan notes that the implementation process is to be overseen by the Title III Monitoring Team, consisting of the following administrative leaders:

- Director of Information Systems
- President
- VP for Academic Affairs
- VP for Fiscal Affairs
- VP for Student Affairs
- VP for Assessment and Nursing/Allied Health
- Associate VP of Technical & Workforce Education
- Director of Information Technology

On-the-ground implementation, however, requires the collective efforts of several teams, each consisting of 3 to 11 individuals. These teams and the respective scope of their implementation responsibilities are described in Table 3:

**Table 3: Implementation Teams at SEARK**

<table>
<thead>
<tr>
<th>Team</th>
<th>Scope of System Implementation Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>✤ All Project Planning</td>
</tr>
<tr>
<td></td>
<td>✤ All Documentation</td>
</tr>
<tr>
<td></td>
<td>✤ All Training</td>
</tr>
<tr>
<td></td>
<td>✤ All Management</td>
</tr>
<tr>
<td>Team</td>
<td>Scope of System Implementation Responsibilities</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Technical Team</td>
<td>✶ Hardware</td>
</tr>
<tr>
<td></td>
<td>✶ Networking System</td>
</tr>
<tr>
<td></td>
<td>✶ Underlying Software Required by Datatel System</td>
</tr>
<tr>
<td>CORE Team</td>
<td>✶ Demographics</td>
</tr>
<tr>
<td></td>
<td>✶ Communication Management</td>
</tr>
<tr>
<td></td>
<td>✶ Facilities Profile</td>
</tr>
<tr>
<td></td>
<td>✶ Scheduling and Staff/ Volunteer Info</td>
</tr>
<tr>
<td></td>
<td>✶ Electronic Import/ Export</td>
</tr>
<tr>
<td></td>
<td>✶ Accounts Receivable/ Cash Receipts</td>
</tr>
<tr>
<td></td>
<td>✶ General Ledger, Planning for and using Core</td>
</tr>
<tr>
<td></td>
<td>✶ Colleague Shared Codes</td>
</tr>
<tr>
<td></td>
<td>✶ Rule Writing for Colleague</td>
</tr>
<tr>
<td></td>
<td>✶ Interfaces between legacy system and Datatel system</td>
</tr>
<tr>
<td>Financials Team</td>
<td>✶ Accounts payable</td>
</tr>
<tr>
<td></td>
<td>✶ Purchasing</td>
</tr>
<tr>
<td></td>
<td>✶ Budget Management</td>
</tr>
<tr>
<td></td>
<td>✶ Fixed Assets</td>
</tr>
<tr>
<td></td>
<td>✶ Inventory</td>
</tr>
<tr>
<td></td>
<td>✶ Financial System Reporting</td>
</tr>
<tr>
<td>Human Resources/</td>
<td>✶ Personnel</td>
</tr>
<tr>
<td>Payroll Team</td>
<td>✶ Payroll</td>
</tr>
<tr>
<td></td>
<td>✶ Human Resources system reporting</td>
</tr>
<tr>
<td>Student Team</td>
<td>✶ Academic records and registration</td>
</tr>
<tr>
<td></td>
<td>✶ Recruitment/ Admissions management</td>
</tr>
<tr>
<td></td>
<td>✶ Curriculum Management &amp; Faculty Information</td>
</tr>
<tr>
<td></td>
<td>✶ Student Preparation Day</td>
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<tr>
<td></td>
<td>✶ Student Shared Codes Day</td>
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<td></td>
<td>✶ Student System Reporting</td>
</tr>
<tr>
<td></td>
<td>✶ Degree Audit Advisement</td>
</tr>
<tr>
<td></td>
<td>✶ Registration Rate Table Build</td>
</tr>
<tr>
<td></td>
<td>✶ Live Registration Simulation</td>
</tr>
<tr>
<td></td>
<td>✶ Electronic Application Utility</td>
</tr>
<tr>
<td></td>
<td>✶ Colleague for International Student Office Workshop</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>✶ Pell payments and loads</td>
</tr>
<tr>
<td></td>
<td>✶ Need Analysis</td>
</tr>
<tr>
<td></td>
<td>✶ Awarding and Aid Distribution;</td>
</tr>
<tr>
<td></td>
<td>✶ Interface between Legacy and Datatel systems</td>
</tr>
<tr>
<td></td>
<td>✶ Ensure all financial aid transactions are handled by Datatel</td>
</tr>
</tbody>
</table>

Source: SEARK

Aside from the previously identified Title III Monitoring Team and the application implementation teams presented in Table 3, the plan also notes Datatel Partners as a key stakeholder in the implementation process.

The plan goes on to recommend regular meetings be held within teams, to be organized by the Team Leader. In terms of communicating progress in the implementation process, the plan elaborates on the following communication
methods: a project website, emails list-serves, and an email newsletter provided to all staff members.

The conversion process itself is organized incrementally, with implementation slated to occur over the course of the July 2004 to August 2005 period. Throughout this period, SEARK’s previous system – POISE – was scheduled to remain in operation until the conversion process has been finalized. Key conversion milestones are listed as follows:

- July 1, 2004: CORE (Demographics, Communications Management, Facilities Profile, General Ledger, Purchasing, Accounts Payable)
- January 1, 2005: Human Resources/Payroll
- February 1, 2005: Financials
- April 1, 2005: Student
- August 2005: Financial Aid

In addition to outlining a strategy and timeline for implementation, the plan also presents a list of potential challenges or roadblocks in the conversion process as well as corresponding preventative measures. Among foreseeable risks – to be addressed by Team Leaders, the CORE Team, and the Project Management Team include:

- Security risks
- Varying levels of expectations about the project from different stakeholders
- Unidentified relationships and interdependencies between areas of the College
- Lack of availability of Datatel consultants
- Incorrect implementation module as a result of wrong resource on a team
- Concerns about the appropriate number, type, and deployment of technical resources to complete all of the project tasks
- “Scope creep”
- Lack of commitment from team members outside of the team lead’s area
- Decisions not being made on time
- Lack of communication to teams regarding policy change
- Lack of information sharing
- Inconsistencies as a result of not adhering to data gathering/entry standards
- Key individuals leaving the project as a result of unforeseen or unavoidable staff resources
- Project tasks are not completed on time
- Separate IT and IS departments

**Hudson County Community College (HCCC) – Jersey City, NJ**

In August 2009, Datatel announced that Hudson County Community College (HCCC) selected the Datatel Colleague SQL Server to enable the institution to “build a Strategic Academic Enterprise that drives student achievement and institutional
More specifically, in order to expedite the implementation process, HCCC opted for Datatel’s Expressway service - “a unique approach that reduces the time and resources required to implement a comprehensive enterprise-wide solution, improving institutional effectiveness.” Ultimately, as suggested by HCCC’s Board of Trustees Chair William J. Netchert, “this new system will provide a single, seamless, integrated information system that will enhance productivity, streamline processes and costs, and adapt flexibly as the College grows.”

According to HCCC’s Datatel Implementation Project webpage, conversion to the Datatel Colleague information system was initiated in summer 2009 and is expected to last between 18 and 24 months. According to Netchert, conversion and full implementation is scheduled to be complete by July 2010. Similar to SEARK, HCCC designated teams of individuals to coordinate specific areas of implementation. These teams focused on different areas, including: finance, recruitment, student data, financial aid, human resources, and e-College. As critical components in the organizational structure of administrative leaders overseeing the conversion and implementation process, these teams report to the Executive Steering Committee or Project Management Team, consisting of the Project Manager and the Team Leaders from each of the six teams. Ultimately, it appears that the Project Management team collaborates with the Technical Team, Datatel Project Management Support, and the Executive Sponsor, and is accountable to the President and Board.

Although HCCC has created a webpage for communicating updates regarding implementation progress to concerned stakeholders, we did not find further information of the project’s status.

**Shasta College – Redding, CA**

Similar to other institutions profiled in this report, Shasta College developed a webpage to post information and updates concerning conversion to the Datatel Colleague administrative software package. According to the homepage, the

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41 Ibid.
46 Ibid.
institutions initiated the implementation process after being awarded a $1.7 million Title III U.S. Department of Education – Strengthening Institutions Program Grant to be awarded over the 2000-2005 period.\textsuperscript{49} As stipulated within the grant, Shasta College sought to develop an integrated information system and train staff in its use in an effort to enhance institutional decision-making and foster student development.\textsuperscript{50} Having selected Datatel, the College outlined the following project implementation goals:\textsuperscript{51}

- Improved services to internal and external users;
- Increased staff access to accurate, useful, and timely data;
- Provide students with direct access to appropriate information;
- Meet community college, state and federal reporting requirements;
- Enhance decision making and planning capabilities; and
- Ensure reliable service throughout the system’s life cycle.

Also like other community colleges featured in this report, the implementation process at Shasta College was administered through a collaboration of teams charged with specific areas of oversight. Table 4 summarizes the organization of teams, including their duties and members. Of particular note, it appears that a number of the same individuals serve as members on multiple teams.\textsuperscript{52}

Table 4: Implementation Teams at Shasta College

<table>
<thead>
<tr>
<th>Team</th>
<th>Responsibilities</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering/Oversight</td>
<td>Oversee the entire project; Review decisions from application teams and resolve any discrepancies; Convey proposed policy changes to the Board of Trustees.</td>
<td>Vice President of Academic Affairs Vice President for Student Services Associate V.P. of Information Services &amp; Technology</td>
</tr>
<tr>
<td>CORE Team</td>
<td>Identify core data elements to be included in the database; Define shared codes, demographics, rules, data standards, naming conventions and reporting requirements. Translate current processes into the Colleague system workflow.</td>
<td>Personnel Technician - Human Resources Supervisor, Administrative Computing Services - Datatel Director of HR Supervisor, Administrative Computing Services Senior Accounting Technician - Business Office</td>
</tr>
</tbody>
</table>

\textsuperscript{49} Ibid.  
\textsuperscript{50} Shasta College. “Activity Two.” http://www2.shastacollege.edu/Title3/ActivityTwoMainFrame.htm  
\textsuperscript{51} Ibid.  
\textsuperscript{52} Shasta College. “Team Information.” http://www3.shastacollege.edu/datatel/teams.htm
<table>
<thead>
<tr>
<th>Team</th>
<th>Responsibilities</th>
<th>Members</th>
</tr>
</thead>
</table>
| Student Team         | Training and implementation for student components; Determine all Colleague functions supporting demographics, admissions, financial aid, counseling and other student support services, registration, student accounts receivable, course file management, class schedules, grades, transcripts, degree audit and related activities for students. | - Associate V.P. of Information Services & Technology  
- Business Office Manager  
- Admission and Records Tech III  
- Admission and Records Office Manager  
- Financial Aid Office Manager  
- Executive Asst. to V. P. of Academic Affairs  
- Computer Applications Technician  
- Computer Applications Trainer - Datatel |
| Human Resources Team | Training and implementation for HR components; Examine and determine all Colleague functions supporting human resources including recruitment and hiring of staff, management of personnel files, benefits administration, payroll and personnel legal compliance issues and related areas. | - Supervisor, Administrative Computing Service  
- Computer Applications Technician  
- Business Office Manager  
- Admission and Records Tech III  
- Admission and Records Office Manager  
- Financial Aid Office Manager  
- Computer Applications Trainer - Datatel  
- Web Coordinator |
|                      |                                                                                                                                                                                                              | - Personnel Technician - Human Resources  
- Supervisor, Admin. Computing Services - Datatel  
- Director of Human Resources  
- Supervisor, Administrative Computing Services  
- District Payroll Officer  
- Personnel Technician  
- Business Office Manager |
<table>
<thead>
<tr>
<th>Team</th>
<th>Responsibilities</th>
<th>Members</th>
</tr>
</thead>
</table>
| Finance Team | Training and implementation for finance applications; Work with all areas related to the business functions of the college, including accounts receivable and payable, purchasing, budgeting, auditing, insurance, fixed assets and auxiliary enterprises. |  Supervisor, Administrative Computing Services - Datatel  
 Administrative Asst. - Business, Math & Tech.  
 Supervisor, Administrative Computing Services  
 Senior Accounting Technician - Business Office  
 Business Office Manager |

Source: Shasta College

As further noted on the implementation website, the entire conversion process was scheduled to take place over the July 2002 – March 2003 period. According to this timeline, the financial and human resources components of the Colleague system became operational in July 2002, followed by curriculum management (December 2002), admissions and financial aid (January 2003), and registration and accounts receivable (March 2003). Throughout this time period, staff members were scheduled to receive training immediately prior to the system “going live,” in order to make effective use of employees’ time and maximize information retention. Furthermore, within each of these component areas, administrators established a list of initial operational expectations for features and capabilities of the new system.

According to a Datatel Board update in 2002, this timeline for completion is fixed. According to one Board member, the institution met with a Datatel consultant in order to “evaluate and report on [their] status” and ensure that they were “on track.”

Foreseeing an additional use for the Datatel system – web registration for students in Fall 2003/Spring 2004 – the institution coordinated a “Mock Registration” period for students; staff in Admissions and Records developed scenarios for registering mock students on the new system.

54 Ibid.
57 Ibid.
**Morton College – Cicero, IL**

In October 2009, Campus Technology reported that Morton College hired Datatel “to implement a portfolio of applications to address the entire student lifecycle – from recruitment to alumni relationships,” scheduled to take place in cycles and be completed by summer 2011.\(^{59}\) While the College’s website does not appear to offer any status updates on implementation progress or staffing model, the Campus Technology announcement does suggest that the College does have a “selection committee” responsible for the decision to implement Datatel. As noted by President Leslie Navarro, “The selection committee reviewed several products and the college overwhelmingly chose Datatel…Datatel’s strong reputation, support, and special features presented us the greatest value.”\(^{60}\)

**Muskegon Community College (MCC) – Muskegon, MI**

In Fall 2004, Muskegon Community College (MCC) initiated a Future Information Transformation (FIT) project to replace its Legacy system.\(^{61}\) As a multi-year endeavor, the FIT project was divided into four key phases:

- Phase I: Needs Assessment
- Phase II: Selection
- Phase III: Implementation
- Phase IV: Post-Implementation

As such, in Fall 2005, MCC selected Datatel to provide an integrated suite of products to “form a common database.”\(^{62}\)

According to the FIT project webpage, the project was led through a collaboration of the MCC President’s Cabinet, FIT Project Co-Chairs, and an Implementation Oversight Committee.\(^{63}\) In particular the Implementation Oversight Committee – consisting of approximately 14 staff members from various departments – held regular meetings throughout the December 2005-November 2007 period.

In addition to the Implementation oversight committee the website describes a number of team modules and staff groups to handle various components of the implementation process. Staff were organized according to the following groups:\(^{64}\)

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\(^{60}\) Ibid.


\(^{62}\) Ibid.

\(^{63}\) MCC. “FIT Phase III Implementation Team Structure,” http://fit.muskegoncc.edu/pages/464.asp

\(^{64}\) MCC. “Implementation Teams,” http://fit.muskegoncc.edu/pages/1.asp
Muskegon Community College Datatel Administration Group (MCCDAG)
- MCCDAG meets the first Thursday of each month. The purpose of this group is to discuss, decide and vote on codes, policies and administration issues in dealing with Datatel Colleague System working with the MCC President’s Cabinet.
- Records indicate the MCCDAG met between February and July 2008.

Muskegon Community College Datatel Users Group (MCCDUG)
- MCCDUG meets the third Thursday of each month. The purpose of this group is to discuss, decide and vote on codes, policies and administration issues in dealing with Datatel Colleague System working with the MCC President’s Cabinet.
- Records indicate the MCCDUG met between January and July 2008.

FIT CORE Module, which primarily standardizes protocols and recommends codes to MCCDAG, will remain an ongoing Module.
- Records indicate the CORE Module meets the 3rd Tuesday of every month between November 2005 and March 2009.

Specific implementation teams were organized in areas such as: Finance, Human Resources, Student Services, Technical, Change Management, and FIT Communication. Each of these teams consisted of a number of individuals drawn from departments across the campus.

As a scan of MCC’s website reveals, between 2006 and 2008, staff members involved in the implementation process provided regular updates to the campus’s Technology Governance Committee.65

As at other institutions, MCC updated the institutional community regarding implementation progress through a series of FIT News briefings, posted between July and September 2007.66 According to these briefs, the institution successfully launched the Student Module of Colleague in July 2007, and began providing Colleague training sessions and developing training manuals for campus employees the following month. By September 2007, MCC announced that it had successfully implemented applications including: General Ledger, Purchasing, Accounts Payable, Budget, Admissions, Human Resources, Payroll, Financial Aid, Active Apply, Student Records & Registration, WebAdvisor, and Deferred Payment. At the same time, modules remaining to be implemented included: Fixed Assets, HR Position Budgeting, Financial Workflow Definition Tool, HR Workflow Definition Tool, Degree Audit, E-Advising, FA Award – WebAdvisor, Instant Enrollment, Physical Plant, Purchase Order Online, Purchase Requisition Online, Web Time Entry.

66 MCC. “FIT Communication Team Members.” http://fit.muskegoncc.edu/pages/461.asp
Kansas City Kansas Community College (KCKCC)

Kansas City Kansas Community College (KCKCC) provides valuable insight into the decision to pursue a data warehousing initiative. As minutes from a March 2007 Board of Trustees meeting reveal, the decision to select Datatel as a provider was a collaborative effort between the KCKCC Provost, Dean of Information Services, Dean of Financial & Administrative Services, and the Board of Trustees:

[The Provost] referred to information that was mailed to the board [of trustees] members regarding a proposal to purchase a new software program from Datatel. He then introduced [the] Dean of Information Services and [the] Dean of Financial & Administrative Services to elaborate on the proposal and answer any questions. Following questions discussion ensued. [the Provost] then requested the authority to negotiate within a $1,500,000 limit with Datatel on the purchase of the new software system. Trustee Rios moved to grant the college authority to negotiate within a $1,500,000 limit with Datatel on the purchase of the new software system as presented with the understanding that once a negotiated price and agreement is reached, that this be brought to the Board for final approval for purchase. Trustee Townsend seconded and the motion carried.

In October 2007, KCKCC signed an agreement with Datatel to provide phased implementation of Colleague and other services. Specifically, as of March 2009, KCKCC reported the following services had been implemented: Colleague Student, Colleague Finance, Colleague Human Resources, ActiveCampus Portal, ActiveCampus and Content Management, and ActiveAdmissions. As of April 2009, the College planned on “going live” with Datatel WebAdvisor, providing a “centralized database for students, finance, and human resources applications as well as provide on-line application and student registration capabilities.”

Central Texas College (CTC) – Killeen, TX

Beginning in 2002, administrators at Central Texas College (CTC) initiated a search for purchasing an administrative information system – selecting Datatel as the service provider. On CTC’s Colleague Implementation website, the institution offers an outline of Colleague systems to be integrated.

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69 Ibid.
71 CTC. “Colleague Implementation.” http://www.ctcd.edu/colleague/index.htm
In discussing data transfer issues, a Quality Enhancement Plan (QEP) Core Committee meeting reports:72

…it was suggested that we simply place the data in files on-line until DATATEL is ready for us. Although we won’t have a database for the first year, we will be “electronic” and the data can be entered into DATATEL later. If we develop a database now, we will have to pay someone to create it, just to dump it later and re-enter everything into DATATEL anyway. We can write in the plan that, since we were in the middle of DATATEL implementation when the QEP began, we will have to wait for the database until the DATATEL process is ready for us.

As of 2004, a CTC update reported that the institution was live on most of the Financial components of Colleague, but had yet to implement the Student and Human Resources systems.73 Completion of the Datatel implementation project was reportedly slated for September 2005.74

The institution also provided resources for staff members using Colleague, including training sessions75 and various user guides, including a Colleague Learning Guide,76 a Datatel User Interface Guide,77 and a Colleague Learning Guide for Academic Program Entry and Changes.78 IT Service Advisories were provided to staff members to notify staff of changes in the system and completion of Datatel implementation stages.79

Jackson Community College – Jackson, MI

The Administrative Systems staff website at Jackson Community College (JCC) provides a timeframe for completed and future milestones in the Datatel DataOrchestrator ODS (Operational Data Store).80 As part of the ODS

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80 Jackson Community College. “Administrative Systems Projects.” http://www.jccmi.edu/infotech/administrativesystems/ProjectInformation.htm#p0159
Implementation Phase I and review of Colleague application security, JCC had completed the following benchmarks:

- Evaluated reporting needs and reviewed product
- Purchased and coordinated installation and training for Administrative Systems Staff
- Server created and ODS Data Populated
- ODS Database Administration and Reporting Consulting
- Created Database for use in Account Provisioning
- Created reports for Exit Loan Interviews
- Created export for use in TutorTrac student data population
- Corrected refresh errors and scheduled nightly refreshes
- Installed and configured SQL Reporting Services
- Established new security structure and standards
- Migrated all current Colleague users to the new structure and standards
- Developed and documented process for creating new accounts for employees and student employees
- Developed and documented process for removal of permissions for internal transfers
- Developed and documented process for granting additional permissions
- Created and distributed communication to appropriate stakeholders

In terms of future implementation targets, Table 5 lays out the following tasks:

### Table 5 Implementation Tasks, Resources, and Timeframe

<table>
<thead>
<tr>
<th>Additional Task</th>
<th>Resources</th>
<th>Estimated Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customize ODS Targets</td>
<td>Information Technology</td>
<td>20 hours</td>
</tr>
<tr>
<td>ODS Data Clean-Up</td>
<td>Information Technology</td>
<td>120 hours</td>
</tr>
<tr>
<td>Review AP5 Needs</td>
<td>Information Technology</td>
<td>10 hours</td>
</tr>
<tr>
<td>Brainstorm and create data models</td>
<td>Information Technology</td>
<td>50 hours</td>
</tr>
<tr>
<td></td>
<td>Institutional Research</td>
<td>10 hours</td>
</tr>
<tr>
<td>Develop and deploy security model</td>
<td>Information Technology</td>
<td>10 hours</td>
</tr>
<tr>
<td>Develop custom reports</td>
<td>Information Technology</td>
<td>65 hours</td>
</tr>
<tr>
<td>End-user training</td>
<td>Information Technology</td>
<td>40 hours</td>
</tr>
<tr>
<td>Internally audit current user permissions to identify weaknesses</td>
<td>Information Technology</td>
<td>40 hours</td>
</tr>
</tbody>
</table>

Source: Jackson Community College
Oklahoma City Community College (OCCC)

Similar to other community colleges implementing Datatel Colleague, Oklahoma City Community College (OCCC) developed a strategic plan for implementation in which it outlines the mission, goals, scope, approach, organizational and administrative structure, and timeframe for the approximately two-year long process.81

As noted in the section on the implementation approach, OCCC “every College employee will be involved, some extensively…training will be critical as we implement new software, hardware, processes and systems, and all College personnel should realize that this training is required.”82 To this extent, the implementation project organizational structure consists of a “Project Vision” team of ten administrative leaders overseeing four Application Teams (of seven to twelve individuals each) addressing a different functional area – Finance, Human Resources, Student Information, and Technical.83 Within the Project Vision team, the OCCC further outlines the responsibilities of key team members as follows:84

- **Project Leader (VP for Special Projects)**
  - This position provides leadership for the entire project implementation efforts. The main role of the Project Leader is to provide a global viewpoint, to lead project activities with executive involvement, to ask the right questions, and to assign the appropriate resources to an implementation team or administrative unit so that they can determine how to best implement the software.

- **Project Manager (IT Project Manager)**
  - The on-site Project Manager works closely with Datatel employees, the Project Leader, all the implementation teams and technical staff. Additionally, she will work with the teams to coordinate project activities, set priorities, schedule tasks, anticipate and mitigate conflicts, ensure timely progress toward full implementation and to maintain clear communication among all departments.

- **Application Team Leaders**
  - The Application Team Leader is to lead, motivate, organize and facilitate the functioning of his or her team. Each team leader will serve as a liaison and member of the Project Team. S/he will seek out expertise as identified by the team to work toward the goal of the implementing their portion of the Colleague system.

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81 OCCC. “Project Purpose.”
http://employee.okc.cc.ok.us/vision/project/project_purpose.htm

82 OCCC. “Implementation Approach.”
http://employee.okc.cc.ok.us/vision/project/project_implementation.htm

83 OCCC. “Team Member Responsibilities and Roles.”
http://employee.okc.cc.ok.us/vision/project/project_teamroles.htm

84 Ibid.
Aside from the Project Vision Team, each team is:

…empowered to make decisions that affect only their area of responsibility. Decisions that affect more than one team must be made with the involvement of all affected teams. Any decision that impacts College policy or would extend the project time line must be reviewed by the Project Team. It will be expected that the issues on the agenda will be adequately discussed and all members encouraged to express their viewpoint. While it is desirous that a consensus be reached, simple two-thirds of those present would be considered adequate to carry the vote. In the event that differences arise and attempts to find a common ground are not reached, the Project Team resolves to take the matter to Executive Council.

**Broad Conclusions**

With these nine profiles in mind, Hanover has identified a number of common features of these community colleges’ experiences with Datatel implementation. Specifically, we note the following critical components of implementation initiatives:

- **Strategic Plan**
  - A number of institutions outlined their mission, goals, organizational structure, and timeline for implementation in a written plan.

- **Timeframe**
  - In general, Datatel implementation was a multi-year endeavor, occurring in a series of gradual, planned phases.

- **Organizational Structure and Administrative Leadership**
  - Implementation was generally carried out by a number of teams – each focusing on a specific application area – overseen by a project management team, consisting of key institutional leaders.

- **Ongoing Communication with Campus Staff**
  - Generally, staff at profiled institutions were made aware of implementation progress through a dedicated website and/or updates and newsletters.
  - Datatel training sessions and/or manuals were provided to staff members.
Common Pitfalls in Data Warehouse Implementation

The following information on common pitfalls encountered during or after data warehouse implementation was gathered from a previously conducted report on data warehouse best practices by The Hanover Research Council. Results from a survey distributed to the administrators at University of Illinois, Bentley College, Georgia State University, University of Michigan, University of Richmond, Virginia Tech, and George Washington University showed six primary areas of recommendation for avoiding pitfalls and improving implementation processes.

Having developed successful data warehouse systems of their own, respondents provided valuable feedback on recommendations and suggestions that may prove to be helpful to a college or university in the initial stages of its data warehouse implementation effort. The respondents identified the following as critical factors in the implementation of a data warehouse:

- **Executive sponsorship**: Multiple respondents indicated the necessity for strong support from the institution’s senior leadership. As Mr. Gilbreath of Georgia State University noted, it is critical to have the support of a senior leader (such as the school’s President, Chief Academic Officer or a Provost) because there are “a lot of people who are out for your resources.”

- **Initial deployment of a single business area**: 6 of the 7 respondents emphasized the importance of focusing on the development of a single business area at a time, rather than concurrent deployment, particularly during the implementation stage of the data warehouse. As Ms. Shaffer of Virginia Tech noted, it is helpful to begin with a business area that offers a quick return so that the presence of the data warehouse is established. Once the data warehouse team experiences “success in one area, it feeds on itself and keeps it rolling.” Similarly, Mr. Gilbreath of Georgia State University emphasized the importance of incremental development: “We’ve found it’s much better to give folks incremental victories instead of making big promises for this huge system which gets delayed over and over again.”

- **Concrete understanding of the needs and objectives of the end-users**: Due to the time-intensive nature of data warehouse development, it is critical that the final products created by data warehouse teams are completely relevant to the objectives of the end-users. As Mr. Garosshen of Bentley College conceded, “A lot of times [the data warehouse team] can do work and [the end-users] can’t tell you if it’s been helpful or hurtful.” These situations may be avoided if the goals of the end-users are clearly defined at the outset of implementation process.
Proper funding: This is, perhaps, the most practical recommendation given by the respondents. The implementation and on-going development and maintenance of a data warehouse system are resource-intensive ventures. Furthermore, the adaptation of the data warehouse to end-user demands – which evolve over time – requires proper funding and resources over the long-run. As Mr. Gilbreath of Georgia State University noted, the data warehouse ultimately reaches “a critical mass of users and really begins to take off,” thus increasing the importance of proper maintenance and management of the warehouse. As Ms. Ballinger of the University of Illinois conceded, the institution should expect an ongoing schedule of altering and updating the data warehouse and must plan accordingly.

Knowledge base of data warehouse team members: Several respondents indicated the critical contributions made by the subject area experts within their respective data warehouse teams. Because the development of a particular subject area requires the guidance of an individual with relevant expertise, in-house subject area specialists are an invaluable asset. The alternative to in-house expertise is to seek guidance from subject-area experts among the broader university community. While these university- or college-wide experts may be numerous in quantity, their primary responsibilities would necessarily limit their availability to the data warehouse team.

Capable and passionate leadership: Due to the complex nature of data warehouse development and the extensive collaboration required by it, the presence of a leader who is both capable of guiding the overall project and familiar with the data being handled is ideal. As Ms. Ballinger of the University of Illinois stated, “this is going to be a headache and you need someone that is really going to believe in this.” Having a leader, or multiple leaders, capable of driving the data warehouse forward—while upholding the data stewardship rules and policies established at the outset—and cultivating support across the institution is critical for the success of a data warehouse project.
Project Evaluation Form

The Hanover Research Council is committed to providing a work product that meets or exceeds member expectations. In keeping with that goal, we would like to hear your opinions regarding our reports. Feedback is critically important and serves as the strongest mechanism by which we tailor our research to your organization. When you have had a chance to evaluate this report, please take a moment to fill out the following questionnaire.


Note

This brief was written to fulfill the specific request of an individual member of The Hanover Research Council. As such, it may not satisfy the needs of all members. We encourage any and all members who have additional questions about this topic – or any other – to contact us.

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