

A STUDY OF DATA WAREHOUSING END USER TRAINING METHODS,
THEIR EFFECTIVENESS, AND CHALLENGES

by

KATHERINE LIDDELL AVERY

(Under the direction of HUGH J. WATSON)

ABSTRACT

Effective end user training is important to data warehousing success. Telephone interviews were conducted with data warehousing managers at Owens&Minor, AT&T Wireless, and Blue Cross and Blue Shield of North Carolina. The interviews investigated the specific training methods employed with end users; the success of these efforts; and the problems, issues, and challenges associated with current training methods.

Based on the interviews it was learned that organizations use a variety of training methods depending on the nature of the user. The three companies believe that their training methods are either “successful” or “largely successful”. Two important challenges were identified as a result of the study. Users need a better understanding of the data stored in the data warehouse and how to integrate the warehouse into their work and business processes. Six best practices were identified which synthesize what companies can do to successfully train their end users.

INDEX WORDS: Data warehouse, Data warehousing, Training, Owens&Minor, AT&T Wireless, Blue Cross Blue Shield of North Carolina

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KATHERINE LIDDELL AVERY

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KATHERINE LIDDELL AVERY

Major Professor: Hugh J. Watson

Committee: Dale L. Goodhue
Archie B. Carroll

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
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DEDICATION

To my parents, Katherine and Philip Avery, who always believe in me.

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CHAPTER 1

INTRODUCTION

Introduction to Data Warehousing

The first data warehouses emerged in the late 1980s in industries such as retail, telecommunications, and financial services to support decision-making applications (Inmon, 1992). In the early 1990s, Bill Inmon, who is considered to be “the father of data warehousing,” coined the data warehousing term to refer to these large repositories of data (1992). By the late 1990s, data warehousing had become one of the most strategic initiatives in the information systems field (Eckerson, 1998). Data warehouses are currently playing critical roles in understanding customer behavior, electronic commerce, supply chain integration, and performance management (Watson, 2001).

What Is a Data Warehouse and Data Warehousing

There are many possible definitions for a data warehouse. Inmon (1992) defines them by their characteristics:

- Subject oriented -- data is organized around specific subjects, such as sales, customer, or products.
- Integrated -- data are collected from multiple source systems and are integrated around subjects.
- Time variant -- a warehouse maintains historical data.
- Nonvolatile -- users cannot change or update the data.

Imhoff (1995) defines a data warehouse as “a collection of integrated, subject-oriented databases designed to support the DSS (decision support system) function,

where each unit of data is relevant to some moment of time. It is a collection of databases optimized for decision support.”

Corey and Abbey (1997) define a warehouse as “a collection of corporate information, derived directly from operational systems and some external data sources. Its specific purpose is to support business decisions, not business operations.”

The Architecture for Data Warehousing

Figure 1 shows a comprehensive architecture for data warehousing. It shows the component parts and the relationships among the parts. The left-hand side of the figure

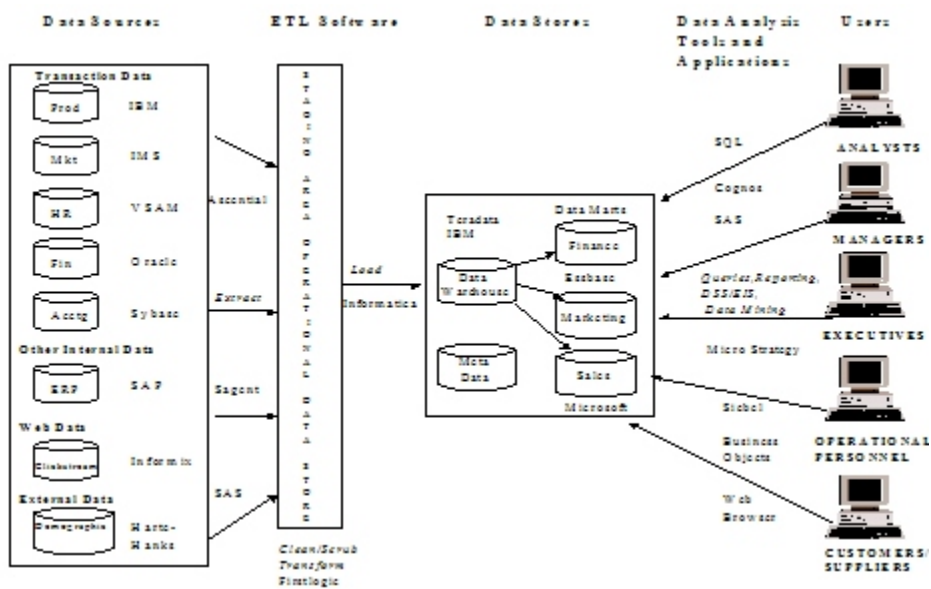


Figure 1: A Comprehensive Framework for Data Warehousing

Source: Watson, 2001

shows potential source systems (e.g., transactional systems, web data, external data) for the warehouse. Data from these systems are extracted and moved to a staging area or an operational data store (ODS), where the data are transformed using data cleansing and integration processes. The data are then loaded into the data warehouse. Users then access the data from the warehouse, or in some cases, from dependent data marts. Some organizations extract data from the warehouse and place subsets of the data in dependent data marts for easier and faster access by users. For example, sales, finance, and manufacturing data may be placed in separate data marts. Meta data is maintained that provides the information technology staff with the information needed to maintain, enhance, and operate the data warehouse (e.g., the source systems used) and the information that users need to effectively and efficiently use the warehouse (e.g., the reports that are available). A variety of tools, applications, and users access the data in the warehouse. For example, power users may write Structured Query Language (SQL) queries. Or an executive may access data through an executive information system. A customer may access order-related data using a web browser.

Delivering Business Value

Data warehouses by themselves do not deliver value. It is only when warehouses become the link between the data (which was previously found in separate databases, now unified in the warehouse) and the applications employed by users to support decision making that value is created. A data warehouse provides an infrastructure to support decision making. It is the potential applications (e.g., customer relationship management) of the warehouse that explain why a company builds a data warehouse. Once users understand not only the mechanics of how to obtain information from the warehouse, but also acquire an understanding of the kind of information that can be generated, that business value is created (Gray and Watson, 1998).

The Importance of End User Training

In order for users to be able to use the warehouse, and thus to create business value, they must be able to understand the warehouse. They must be knowledgeable about the data in the warehouse and be able to use the data access tools and applications that they are given. These skills can only be imparted through training. There is no “silver bullet” to end user training, however. There is no single “right” way to train end users. They have different computer skills and aptitudes, different job and information requirements, work with different data access tools and applications, and have varying amounts of time to devote to training. Different training approaches need to be used with different kinds of users. Whereas the data warehouse is the repository of decision support data, data warehousing is the entire process of data extraction, transformation, and loading of the data to the warehouse and the access of the data by end users and applications (Watson, 2002). Consequently, data warehousing is more encompassing than the data warehouse. The data warehouse is just part of data warehousing.

Users of Data Warehouses

There are multiple ways to consider the users of a data warehouse. One way is by looking at the organizational position of the user. Another is by examining whether users tend to consume or create information (Eckerson, 2002). And finally, warehouse users can be categorized by how they utilize the warehouse. Each perspective helps to understand the users of a warehouse and will be discussed later in the chapter. It is important to note that the perspectives are complimentary, not mutually exclusive.

By Organizational Position

People in a variety of organizational positions are potential users of a data warehouse. The positions include (Gray and Watson, 1998):

- *Executives* - the senior managers of the organization. They typically access information through custom-developed applications, such as an executive information system.
- *Managers* – they range from middle to lower management. They, too, typically use custom-developed applications.
- *Analysts* – they analyze data and present their analyses to others. They typically use managed query environments (e.g., Business Objects), or if they are power users, write their own SQL queries.
- *Operational personnel* – they perform operational tasks throughout the organization and typically use custom-built or packaged applications.
- *Customers and suppliers* – as warehouses have been opened up to customers and suppliers, they have become the most recent users of warehouse data. They normally access data through web-based applications.

By Production or Consumption

Organizational personnel are either predominantly producers or consumers of information (Eckerson, 2002).

- *Information producers* – these people either submit ad hoc queries to create reports and snapshot analyses for themselves or the rest of the organization. Information producers tend to consist of IT specialists, business analysts, and power users.
- *Information consumers* – these people, on the other hand, consume the reports and analyses created by the information producers. They include executives, managers, operational personnel, and customers and suppliers.

By Warehouse Usage

Bill Inmon (1999) has a unique taxonomy for users based on how they use the warehouse. Inmon identifies the following kinds:

- *Tourists* – these users are not sure about the information they need. As a result, they explore lots of territory. They do not conduct deep analyses. Metadata is very important to the tourist. The tourist loves the Internet.
- *Explorers* – these people have an idea for what they want, but do not have a real feeling for how to find it. Explorers do not go to many places to find information. They know where the potential “gems” are located. The problem is the vast amount of data that stands between the explorer and the gem.
- *Farmers* – these people who know what they want and how to get it. Farmers do not look around for much data. Also, they do not look at much data because they know exactly what they are looking for.
- *Miners* – this is the latest class of users. They are equipped with tools (e.g., data mining) to find rare and valuable nuggets of information from mountains of data. They analyze data to find meaningful correlations.

Alternative Training Methods

There are many methods employed to train warehouse users (Sprague and Carlson, 1982; Salopek, 2000). The specific methods used depend on a variety of factors, such as the organizational position of the person being trained, the number of people being trained, the amount and complexity of the training, and how frequently the training needs to be conducted. The following are some of the more common methods. The methods are not mutually exclusive. Organizations use multiple methods and may use more than one method with any one user.

- *One-on-one training* -- Also known as the tutorial technique, this method appears to be the most common, the most effective, and the most expensive. With this method, the subject matter is covered in a way that is directly related to the needs and interests of the user.
- *Training classes* -- Courses, lectures, and developmental training seminars employ a classroom setting to train users. It is often employed when there are large numbers of users to be trained. The classes can be in-house or external, such those provided by vendors.
- *College courses* – Some companies use college courses for employee training. The courses may be regular courses or continuing education courses offered on specific topics. Sometimes the courses are offered specifically for a company's employees.
- *Conferences* – Some companies send end users to conferences to receive training. The conferences relieve the companies of providing specific kinds of training, such as understanding data models.
- *Local "expert"* -- Colleagues recognized to be in-house experts are available to answer individual questions. This user-initiated technique serves to answer immediate needs of the users in an expeditious manner.
- *Computer-based instruction* -- Computer interaction allows instruction through prepared lessons and exercises. Users can be trained on specific applications that pertain to their jobs. Follow-up questions can be used to test the general understanding of the material.
- *"HELP" component* -- The resident "expert" may be associated with the applications that use the data warehouse itself. Users are able find answers to problems that they are experiencing in using the systems.
- *Hotline number* – Companies typically have a hotline number that users can call to get answers to specific questions.

- *Web-based training* -- Companies are using the Internet as a training resource. Departments recognize the possibility of reducing regular classroom expenses and lengthy programs.
- *Digital collaboration* – Computer and communications technologies have expanded the training possibilities, including webinars, audio conferencing, video conferencing, and data conferencing.

Trade-offs exist throughout the range of available methods and must be considered when deciding which training method(s) to use. This begins with the obvious -- cost. Some methods, such as one-on-one, are extremely expensive. Some methods would not be considered appropriate with regard to organizational position. For example, because executives have only rare moments of time to devote to training and also expect personalized attention, one-on-one training is the norm. By way of contrast, large numbers of clerical personnel may be trained in a classroom setting or use computer-based instructional materials.

Topics for Training

Training potentially needs to cover a variety of areas, including:

- *How data are modeled in the warehouse* – Users need to understand the tables that are available in the warehouse and which ones can be joined for queries.
- *How to use the data access tools* -- Most users access warehouse data through a commercial data access tool (e.g., Business Objects, MicroStrategy). Users need to be trained on the use of the tools that are available to them.

- *How to use the warehouse for specific types of applications* – Users may be given applications that were developed that use warehouse data (e.g., an executive information system). Training on the use of these applications is also typically required.

Research Questions

The study focuses on end user training. More specifically, there are three specific questions that the study investigated:

1. What specific training methods are employed with end users?
2. How successful are the methods?
3. What are the problems, issues, and challenges associated with current training methods?

The answers to these questions should provide insights about current end user training methods, their effectiveness, and problems that are being experienced.

Research Method

In order to investigate the research questions, telephone interviews were conducted with three data warehousing managers. These managers work for companies that are recognized as leaders in data warehousing. Some of the companies (e.g., Owens&Minor, Blue Cross and Blue Shield of North Carolina) have been winners in The Data Warehousing Institute's Best Practices competition. Others (e.g., AT&T Wireless) have had their practices published in leading journals (Matney, 2003). It was assumed that companies that are recognized leaders in data warehousing are also likely to be above average in their training practices. Without well-trained users, it is unlikely that the companies' data warehousing efforts would have been highly successful.

An advantage of using companies that have won competitions and had journal articles written about them is the amount of information that is available about the

company and the warehouse. To enter the competitions, the companies have to provide information about the company, the data warehouse that was built, how it is used, the benefits, and so on. The thesis advisor (Dr. Hugh Watson) judges some of these competitions and has access to the competition information. Journal articles contain similar information. Having access to this information made it easier to focus on end user-training related questions in the data collection phase of the study.

Telephone interviews were selected for data collection because of the richness of the information they provide (Lavrakas, 1993). In the interviews it was possible to learn about overall strategies, unanticipated training methods, the nuances of how the training methods are used, what makes them successful or unsuccessful, and the shortcomings of current training practices. Other data collection methods, such as surveys, would not have provided these kinds of insights as well as interviews. Telephone rather than in-person interviews were used because of distance, time, and cost reasons. For the study's purposes, it was believed that telephone interviews would provide the same quality information as in-person interviews.

Potential study participants were contacted by phone or email to determine their willingness to participate in the study. They were told why the study was being conducted, the topics for discussion, how long the interview would most likely take, their opportunity to review what was written based on the interview, and how the interview data would be used. All potential participants agreed to be included in the study.

The interviews began by asking the participants' permission to tape record the interviews. All of the participants agreed. Then the reasons for the study and the topics to be covered were reviewed. The interview questions and discussion focused on the research questions, but some questions varied from interview to interview depending on the participants' responses. Consequently, the interviews used a guided approach (Patton, 1990). At the end of the interviews, the participants were told that they would be sent a copy of the case study based on their interview for their review. The case studies

were written based on the interviews and information from the competitions and the articles. Feedback from the study participants was used to fine-tune the case write-ups. The case studies are presented in Chapter 2. Based on the case studies, an overall analysis was made in order to answer the research questions. This analysis is presented in Chapter 3.

Anticipated Findings

The study's findings should be valuable to practitioners and researchers. For companies with data warehouses, and the need for end user training, it provides insights and ideas about how companies are training end users, how effective the methods are, and the problems and challenges that are being experienced. The findings should help companies improve their own end user training practices.

For researchers, it should provide an enhanced understanding of the current state of practice and help make their research questions and models more reality based. While the literature contains many references to data warehousing and end users, and to different training methods, there is relatively little research on the effective training data warehousing end users.

CHAPTER 2

CASE STUDIES

Introduction to the Case Studies

In order to investigate the research questions about data warehousing end user training, data warehousing managers at three companies were interviewed over the telephone about their practices and experiences in training end users. Each interview took approximately 45 minutes and was tape-recorded. Information was also obtained from information in applications to The Data Warehousing Institute's (TDWI) Best Practices competitions and from journal articles. The study participants reviewed the case study write-ups for accuracy and were given the opportunity to suggest changes and to provide additional input.

Multiple criteria were used in selecting the companies and managers (Patton, 1990). First, companies that are leaders in data warehousing were considered. Indicators of a leadership role included recognition by TDWI as a Best Practices award winner, or journal articles that suggested the company's practices as leading edge. The thinking was that these companies are also likely to be at least above average in their thinking and practices in regard to end user training. Consequently, the study focused on "the high end" of end user training.

Also, these managers and companies were deemed likely to be able (permitted by company policy) and willing to discuss end user training, given that they had entered competitions and had journal articles written about them. In most cases, the thesis advisor (Dr. Hugh J. Watson) also knew the managers.

Another consideration was to have a diverse representation of companies. While all of the companies are large (characteristic of companies with data warehouses), companies from different industries were selected.

Participating Companies

The three data warehousing managers and companies that participated in the study were Don Stoller at Owens&Minor, Denise Many with AT&T Wireless, and Celia Fuller at Blue Cross and Blue Shield of North Carolina. Don Stoller is the Director, Information Management at Owens&Minor, which is leading distributor of name-brand medical/surgical supplies. Denise Matney is a Senior Business Analyst with AT&T Wireless which in 2001 split off from AT&T to become the largest independently owned wireless company in North America. Celia Fuller is the Director, Corporate Data Warehouse at Blue Cross and Blue Shield of North Carolina, a major provider of health care insurance.

Interview Questions

While each interview varied depending on the training methods used and specific responses, there were commonalities to the questions asked. The common questions were:

1. Would you please provide an overview of how your company trains different kinds of end users?
2. What kinds of skills do you provide in your training?
3. Do you provide training at different skill levels and what methods does your company employ for the different levels?
4. How does your company support ongoing training needs?
5. How can users obtain assistance when needed?
6. How successful have your training methods been?

7. What issues, challenges, and problems have been experienced in training end users?
8. If you could start over, would you do anything differently in your training?

Probing questions were asked based on the interviewee's responses to the initial questions (Mariampolski, 2001).

The Case Studies

The telephone interviews were conducted using the research and more specific questions as a guide. From the interviews and supporting documentation (e.g., journal articles), case studies for the three companies were prepared and are presented next.

Owens&Minor

Company Background

Owens&Minor (OM), headquartered in Richmond, Virginia, is the nation's leading distributor of name-brand medical/surgical supplies. It has evolved from its initial beginnings as a local wholesale drug company into a Fortune 500 firm traded on the New York Stock Exchange. It purchases products from over 1,400 suppliers, stores them in its 50 distribution centers, and sells them to over 4,000 hospitals, integrated health care systems, and group purchasing organizations (Stoller, Wixom, and Watson, 2000; Owens & Miner, Inc., 2003).

Owens&Minor has operated like most distributors of health care products (e.g., McKesson, Cardinal Health), serving as one of several intermediaries between its customers and suppliers. The distributors compete to hold contracts between the manufacturers of medical products (Johnson&Johnson) and the health care organizations that use them. In order to compete effectively, Owens&Minor must focus on customer service and lean operations, while helping its trading partners reduce their costs.

About the Warehouse

Owens&Minor has a three part business strategy that includes (1) operational excellence, (2) following and supporting patient care, and (3) turning information into knowledge into profit. In pursuit of the third part of this strategy, the Board and senior management brought in Don Stoller (who was the source of information for this case study) to head up data warehousing and decision support systems. The initial warehouse development team consisted of Stoller, three other OM employees, and a system integrator who provided the experience to jumpstart the project and provide knowledge transfer. Teammates were added as the warehouse grew, and within a year, the system integrator left the warehouse in the hands of a 12-person full-time DSS team. The team includes a director, a data warehouse manager, three programmers who load the data and new subject areas, a data administrator, and six business analysts, two of whom are dedicated to extranet support. The warehouse was built incrementally, one subject at a time, beginning with sales, and proceeding on to inventory, accounts receivable, purchase orders, purchase order receiving, customer account fees, budget, and group contracts.

Early in 1998, OM recognized the potential of making warehouse data available to suppliers and customers (i.e., their trading partners). Working with its trading partners, OM developed a system called WISDOM that allowed the trading partners to use a Web browser to access reports of the products that they either supplied OM (the suppliers) or purchased from OM (the customers). Initially, the reports were only static; that is, further analyses could not be performed (other than copying the data into a spreadsheet). In 2000, WISDOM 2 was rolled out. In addition to providing static reports, it allows users to write *ad hoc* queries and create reports that use warehouse data.

Use of the Warehouse

Owens&Minor has over 900 internal users of its data warehouse. All of them access the warehouse using Business Objects as the data access tool. Power users employ the client/server (i.e., “fat” client) version of Business Objects in order to have

the functionality that they need. Casual users employ the Web-based version because they only access canned reports and predefined queries. Senior managers have access to an executive information system (EIS). Over 400 external users (trading partners) have access to the warehouse through WISDOM and WISDOM 2.

Kinds of Users

Owens&Minor's users are classified as internal or external. Internal users are from within the company; in other words, they are Owens&Minor employees. External users are suppliers and customers (i.e., trading partners). Internal users are further classified as power or casual users. Power users access the warehouse on a daily basis and perform advanced analytics (e.g., *ad hoc* queries) against warehouse data. As the name implies, casual users access the warehouse occasionally and in basic ways, such as accessing predefined reports.

Training Methods Used

The training methods used vary with the kind of user – internal or external.

Internal Users

When the warehouse was first implemented, a consultant was brought in for the first year to conduct two-day training programs on Business Objects (the data access tool used by end users) and the information in the warehouse itself. Over time, the training program was taken over by OM's Corporate Training Department, and the training department now provides all of the Business Objects training for end users. In the class, participants work with a training database (e.g., including sales and inventory data) that is a subset of the data in the warehouse. As a result, the participants not only learn how to use Business Objects but also the data that will be available to them. Each class is limited to 10-12 people at a time and classes are held every month or two, depending on the demand. Being PC literate is a requirement for being admitted to the class. Users

must successfully complete the training program before they are given a Business Objects ID and password. This training program has been very successful.

Some of OM's end users rose to the power user level and a second class was developed for them. The class covers more complex features of Business Objects that are used for analysis and reporting. The DSS business analysts that work with users and Business Objects on a daily basis developed the class. The Corporate Training Department also teaches this course. It has also worked out very well.

Even after training, users need assistance. In response, the DSS business analysts provide ongoing support. They help with Business Objects and understanding what data in the warehouse to use. This assistance is especially important to sales representatives in the field who meet with trading partners. It is also important to users who need to use data that was not covered in the classes. Power users also work with novice users to provide support. These ongoing sources of training have been successful.

Senior managers (e.g., vice presidents) do not go through the training classes. They typically work with custom-built applications, like the EIS, and receive one-on-one training in their offices.

External Users

Fairly early in the evolution of the warehouse, the user base took a dramatic turn. With the development of WISDOM, pertinent company information became available to customers and suppliers. New users were introduced and trained on the system during an hour and one-half phone discussion. In this session, the user and a member of the DSS team at corporate headquarters are both logged on to WISDOM, and they go through the system's navigation, discuss how to find information, and experience the basic functions and capabilities of WISDOM. At the end of the session, a user ID and password are assigned. When users go online, a series of prompts provide the starting point to view, order, and finally, run, pre-canned reports. An 800 number is available to support users,

as well as an on-line user guide. A secondary training session several months after the initial call helps to determine if customers have gained full value from their investment.

Every trading partner has a sales representative who is expected to work with the customer or supplier to help ensure that WISDOM is used effectively. They are expected to help the customer develop a plan for how to effectively use the system.

System usage by customers and suppliers is measured. Sales representatives can access this usage information, and if a trading partner is not using WISDOM, they are expected to meet with the partner to see if they need further assistance in using the system.

Training trading partners on WISDOM 2 has created new challenges. WISDOM 2 allows users to create new reports and queries and requires additional skills in using Business Objects and understanding the data models in the data warehouse. Only users who are experienced with WISDOM are offered WISDOM 2. Training on WISDOM 2 is also done with an hour and a half telephone conversation. The approach taken is similar to the training and follow up that is used with the initial version of WISDOM.

Training Success

Don Stoller describes OM's training methods as "successful." An important consideration as to whether users actually employ the warehouse, however, is how quickly they try to use the warehouse after they are trained. The longer they wait, the less likely they will be able and willing to use the warehouse.

Problems, Issues, and Challenges

Stoller believes that the major problem with their current approach to training is that users do not receive sufficient training on the data and data model associated with the warehouse. Currently, users receive two hours in the two-day introductory training course. A possible solution is to extend the training to three days but there is a hesitancy to make the training program longer.

Another problem is training users when new subject areas and data are added to the warehouse. Several methods are used to address this problem. First, users are sent email notifications about additions and enhancements to the warehouse. They can also go to the corporate intranet to get information. And they can turn to power users and the business analysts for assistance. Even with these approaches, there is difficulty in getting users to understand that new data is available that might be useful to them.

Currently, Owens & Minor does not formally measure the success of its training methods. Rather, the DSS team relies on the calls that it receives requesting assistance. It was because of the calls that the second training program was created.

O&M does not measure usage of the warehouse by individual, internal users. Consequently, it has no idea, for example, of who has received training but is not using it in their work. There is no closed loop to their training process. Adding software tracking of warehouse usage would alleviate this problem.

While OM's sales representatives are expected to work with trading partners who use WISDOM, some of the representatives are not as familiar with the system as they should be. The current expectation is that the sales representatives should take the time to learn on their own. This may be an unrealistic expectation.

As external users are given the ability to run *ad hoc* queries against the warehouse (with WISDOM 2), there is the problem of training them to use Business Objects in advanced ways. This level of training is difficult to deliver through a telephone training session. Owens& Minor is currently struggling with how to provide this kind of training.

AT&T Wireless

Company Background

With 21.85 million subscribers (as of September 30, 2003), and revenues of more than \$14.5 billion in 2002, AT&T Wireless is a leading provider of advanced wireless voice and data services. Created in 1994 as the result of AT&T Corporation's purchase of

McCaw Cellular Communications, AT&T Wireless split from AT&T Corp. to become an independent company in 2001 (AT&T Wireless, 2003).

Wireless communications depend on core networks that allow voice calls and information to travel to and from wireless devices. AT&T Wireless service is available to millions of customers in more than 7,700 cities across the United States and Canada.

About the Warehouse

AT&T Wireless began as a regional company. As Federal Communications Commission (FCC) licenses were sought after and obtained from various geographical locations, the wireless business expanded. In order to support a national company view, the decision was made in 1998 to consolidate the various regional data sources. Each regional area had developed distinct data practices. National reporting as a company dictated a consolidation of data. The project to build and support a national data warehouse was pulled together in 1998 and launched in the spring of 1999.

The national data warehouse stores data about AT&T Wireless' customers and their usage habits (a separate data warehouse stores call detail data). Data is sourced from customer interface and billing systems, including Siebel and Atlys. The warehouse stores 16 terabytes of data (of which about 10 are consumed) on a Teradata platform.

Use of the Warehouse

AT&T Wireless supports over 4,162 unique, registered data warehouse users. Some of them are executives who access a Holos-based electronic dashboard application. Power users either write their own SQL queries, use Teradata's Queryman tool, or Business Objects' *ad hoc* query tool. Casual users view information rather than do analyses, and use an internally developed application called SMART, an acronym for Sales and Marketing Analytical Reporting Tool. It is Web based and allows users to easily specify and access the information they want. SMART was originally developed

to provide information to sales personnel in AT&T Wireless' stores. Only internal employees (including consultants) have access to warehouse data.

Kinds of Users

AT&T Wireless thinks of its users in multiple ways. One way is through the type of data that they need, which is related to the type of wireless technology they are responsible for. 2G users access data about older cellular phones and "talking" is the primary function of the technology. 3G users access data for a more complex technology, which allows users to have "always on" connectivity to the Internet, and the use of imaging, pictures, and full-motion video conferencing. Users are also categorized on the basis of the business units they are in, such as marketing and finance. Users also differ on the data access tools they use (e.g., Business Objects, SMART). And finally, users can also be thought of as casual or power, depending on their need to either analyze or simply view data. Casual users may rely heavily on information to perform their jobs, but do not produce new information themselves.

Training Methods Used

One way to discuss AT&T Wireless' training methods is based on whether the users are executives, and whether they primarily analyze (power users) or view data (casual users). The training methods for power and casual users are similar in many ways, and differ primarily on the tools covered (e.g., Business Objects) and the depth of the training (better understanding the underlying data models in the warehouse) on the various topics.

Executives

Executives use an executive information system that presents information in a dashboard format. Like most EISs, it is very simple to understand and use. Training has

proven to be unnecessary. The executives' direct reports and data warehousing staff provide support as needed.

Power users

These are people who are comfortable writing their own SQL queries and/or are capable of employing the *ad hoc* query capabilities of Business Objects. These users begin their training with an internal, online system known as SPOT, or Self-Paced Online Training. The Business Objects version of SMART (there is also a SMART version) covers the *ad hoc* query capabilities of Business Objects.

User forums are also an important part of A&T Wireless' training initiatives. New users are encouraged to participate in forums as soon as they complete their SPOT training. Forums are bi-weekly meetings that are either held in face-to-face or through conference calls. A forum may focus on understanding a particular tool or application, discussing the data that is available to users, the sharing of knowledge among attendees, or discussing business issues. The agenda for the meetings are announced in advance and users are encouraged to provide information, share insights, and eventually use the online forum as a source to improve their ability to use the data warehouse and perform their jobs. Some forums are run by the data warehousing staff while members of the business community lead others.

The forums are an effective way to show new users how Business Objects can be integrated in work and business process. For example, in an online forum, a power user might use NetMeeting to discuss a business problem and then show step-by-step how the problem was analyzed using Business Objects.

Another training method uses NetMeeting or Web Meeting with a conference call bridge. This training is typically conducted in short blocks of time (e.g., 2 hours) over a period of days (e.g., 4 days). AT&T Wireless has found that people have a difficult time focusing on training for too many hours in a row. They need time to assimilate the material, and to perform their normal job responsibilities. To illustrate, a recent program

covered the new data that would soon be available in the warehouse. Over the course of the program, people had time to think about the data, try it out, and come back with questions.

Specific training on the data in the data warehouse is also given. Some of the training is done in formal classes and other is done online. Power users especially need an in-depth understanding of their Business Objects universes (i.e., the data that are available to them). They have access to online PowerPoint presentations that describe the Business Objects universes, object by object in some cases.

Support is also available through support specialists and online FAQ pages. A Tool Support Specialist may provide support in person, but most of it is done over the phone since most users are geographically dispersed. Users may or may not have anyone in their work unit that can provide assistance. The FAQ materials are organized by each tool and separately cover data issues (Matney, 2003).

Casual Users

The training needs of casual users is less than for power users because they consume rather than produce information, and as a result, work with a data access tool (i.e., SMART) that is easier to use and understand than that needed by power users (i.e., Business Objects). Casual users learn to use SMART online, through the SMART version of SPOT. They also have access to online data training for SMART. SMART users also have access to forums, end user support, and FAQ pages.

The data warehousing staff also conducts road shows. A road show may be done in person or over the phone with a particular department. A common purpose of a road show is to demonstrate the capabilities of a particular tool or group of tools so that the department knows what is available and can select the tool(s) that best meets their needs.

Training Success

AT&T Wireless considers the current approaches to training at AT&T Wireless to be “largely successful.”

Changes Over Time

AT&T Wireless’ training methods have evolved over several years. The first data warehouse training centered on understanding and using the data access tools. Upon completion of a two or three day training course, held in a classroom setting, the employee was given an ID and password that allowed access to the warehouse. This approach did not work well. Users had difficulty remembering the materials that were presented and applying the materials to their work.

Today, users and their learning habits are far better understood. The use of the SPOTs, user forums, conference bridge sessions, online help, consultations with Tool Support Specialists, and FAQ pages serve users better than single, intensive training classes.

Problems, Issues, and Challenges

The warehouse staff would like to provide more training in person. People have different learning capabilities and some of them need someone to work in person with them. This is not feasible, however, because of the geographical dispersion of the user base.

Another problem is that senior management does not always give the buy-in for training that is needed. Management needs to allocate the time that is needed for training in employee’s busy workdays. Other wise, employees have to “fit” their training in, and this can be very difficult to do.

Blue Cross and Blue Shield of North Carolina

Company Background

Blue Cross and Blue Shield of North Carolina (BCBSNC), based in Chapel Hill, N.C., is North Carolina's largest health insurer, serving 2.9 million members, including 492,000 served on behalf of other Blue plans. It is an independent licensee of the Blue Cross and Blue Shield Association. As an organization in the highly competitive health care industry, BCBSNC views being customer-focused as an important element of its strategy for organizational success. The company strives to provide its members effective services such as high quality health care information in order to improve their health (Watson, Fuller, and Ariyachandra, 2003).

About the Data Warehouse

Fundamental deficiencies in the information access and reporting capabilities within BCBSNC were the key drivers that led to the creation of the corporate data warehouse (CDW) in 1997. Prior to its implementation, organizational personnel, including top management, had a general lack of confidence in data quality and information reporting within the organization. Insufficient data definitions, redundancy in data, multiple data extract and transformation processes, lack of accountability, absence of data documentation, and poor communications on data usage were some of the contributing factors underlying the lack of credibility of existing data management systems.

The ever-changing health care regulatory environment further supported the need for consistent and effective data management practices across the organization. In order to ensure that the organization's practices were in compliance with health insurance regulations such as HIPAA (Health Insurance Portability and Accountability Act), an integrated single repository of corporate data became essential. Any data included in the warehouse needed to satisfy HIPAA requirements.

In addition, areas within the organization requiring strong decision support capabilities were experiencing great difficulty in accessing and manipulating data to meet their daily needs.

As a result, an information management oversight team, with representatives from the business units and IS, was established to investigate these issues and develop a set of recommendations that addressed them. The final recommendations included creating a corporate data warehouse.

Use of the Warehouse

Since 1997, the data warehousing initiative has evolved and delivered data and functionality in phases as identified and prioritized by the business areas. The current CDW supports a broad set of applications for more than 300 users in the business areas of Sales and Marketing, Financial Services, Corporate Analysis and Risk Assessment, Corporate Audit, Commercial Operations, and Health Quality Improvement. It draws data from 12 source systems, including five legacy claims processing systems, six external and third-party data sources, and a new managed care claims processing system introduced by the company.

The data warehousing staff is organized into four groups: Decision Support Consulting, Business Information and Design and Architecture, DW Project Management and Development, and DW Operations and Quality Control. The Decision Support Consulting team manages training and educating the users on the current functionality of the data warehouse. This team interacts with users in the field and provides one-on-one mentoring and training where required. They also work closely with users in various business areas to identify new needs, functionality, and business areas to be served. The Decision Support Consulting team does not produce reports or do analyses, their role is to support these functions which happen in business areas.

Kinds of Users

BCBSNC categorizes its warehouse users as power users, business analysts, casual users, and executives. These users differ in whether they create or consume information, how computer and warehouse sophisticated they are, and the data access tools they employ. Power users employ SQL, SAS, and the full client, *ad hoc* query capabilities of Business Objects to analyze data. The business analysts use SAS and the full (i.e., “fat”) client version of Business Objects. Casual users use Business Objects as well, but only the thin, Web-based version. Executives use the simplest version of Business Objects, Web Intelligence, to view information.

Training Methods Used

The training methods used with executives are unique to them. However, other kinds of users – power, business analysts, and casual -- often share training methods. That is to say, they have access to many of the same training methods. The power users have access to all training, and often take advantage of it, because of the support role that they often play with other users. Business analysts use a smaller subset of training, because they do not require as much training as power users. For example, business analysts do not need SQL training. And casual users use the smallest subset of training methods.

Executives

The training for executives is one-on-one. A member of the data warehousing staff installs and shows the new executive user how to access information using Business Objects Web Intelligence. The training is relatively simple, because the executive’s applications are accessed through a browser and all the executive has to do is to “point and click” (e.g., to select a time frame or region) in order to view the desired information.

The power users in the executives' business units provide support for the executives. The kinds of questions that the executives ask and the data knowledge that is needed are best handled by the power users in the business units.

Power Users

It is recommended that power users (and business analysts and casual users) begin their training by going through computer based training (CBT) materials that are on the corporate intranet. For the power users, there are materials on relational databases and SQL. For power and other users, there is a two-hour course on Business objects. The CBT materials were purchased rather than being developed internally.

After going through the CBT materials, users take a one-day course that provides an introduction to the CDW. Its content includes an introduction to the warehouse (e.g., why the warehouse was built, how it is governed), the organization of the warehouse team (e.g., who to work with), the warehouse's physical architecture, the subject areas in the warehouse, the online data dictionary, how to frame the business question for using the warehouse, how to use the tools, security and access, how to report problems, and how to get help.

The data warehousing staff also runs labs for power users (and business analysts) where users can work with the data access tools and warehouse in a hands-on manner. Some of the lab sessions are open-ended and anyone with a problem can attend while others are devoted to covering a particular business user or problem area that users are experiencing.

The decision support consultants also conduct training courses for power users (and a few business analysts) that target users' specific job functions (i.e., the reports and analyses they need to perform). In one approach to the labs, users bring a work-related project to the training course, and in the course of one half-day per week over four weeks, work on the project using skills learned during the course. At the end of the four

week course, participants are given a month to work on their project and then the class reconvenes for the participants to present their results. The project presentations also serve as a means of educating other users on the potential uses of the warehouse.

Business Analysts.

The business analysts perform *ad hoc* and routine analyses on warehouse data using SAS and Business Objects. The business analysts receive their initial training from the CBT materials on the intranet and the course that provides an introduction to the warehouse. They can also learn more about using Business Objects through CBT materials, short courses, and the labs.

Casual Users

These users access information rather than create it. Consequently, their training requirements are relatively simple. They only need to be able to use the data access tools to view warehouse data. Their training typically starts with CBT materials and the one-day course that provides an introduction to the data warehouse.

Causal users can attend 1-2 hour courses that cover specific topics that are important for them. For example, some casual users need to generate complex reports using HIPAA data. While the queries are prewritten, users do need to understand the HIPAA data and how to parameterize queries.

Ongoing training and support is provided to casual and other users by the decision support consultants. There is a bi-weekly open forum for users of all levels to discuss topics of interest and cover all methods of accessing the warehouse. Consequently, on alternate weeks, users can receive in-depth presentations on business cases and advanced query concepts as well as receiving one-on-one coaching.

The decision support consultants also set up times to go to the business areas and “walk around” and “hang out” to provide help to anyone who requests it. These mentoring sessions are particularly successful in new business user areas. These sessions

are scheduled in advance and the decision support consultants work in the area for a half to a full day, stationed in a cubicle and traveling around to provide help to users on specific and often predefined business problems. These sessions are most successful when they are a joint effort with one or more power users from that business area.

BCBSNC uses the Web to post responses to FAQs. Many of the FAQs are problems that are experienced or questions about how to do specific things with the warehouse. It provides a good resource for users.

Training Success

The training practices and additional support at BCBSNC have been met with enthusiasm by the user groups and have proven to be an effective strategy for educating the user community. Celia Fuller considers BCBSNC's current training practices to be "largely successful."

Changes Over Time

The training methods used at BCBSNC have evolved over several years. The first data warehouse training centered on the understanding and use of the data access tools (e.g., Business Objects). An external trainer was brought in to conduct the training. Upon completion of the course, users complained that they were unable to use the warehouse. The training had been conducted using a generic set of business data (e.g., airline data), and did not prepare them to use warehouse data. After that experience, subsequent to the CBT BCBSNC has customized all of its training. The training moved to a little on the data access tool and much more on the data and how it can be used.

Today, users and their learning habits are far better understood. The former lengthy classroom sessions did not contribute to the retention of material. Information learned from the classroom lecture was not put into the actual work situation for three or more days. Users now receive their training in more and shorter sessions. BCBSNC is

continuously receiving feedback on its training methods and modifying them accordingly.

Problems, Issues, and Challenges

While BCBSNC believes that its training is largely successful, it also believes that there is more that can be done. There are additional demands for training and support that cannot be met with currently available resources. For example, training opportunities should be offered more frequently. Currently, the initial introduction class is offered only once a month. The warehouse team would also like to offer more customized training, such as going around and coaching users.

BCBSNC's data is very complex and even power users and analysts struggle with being able to effectively access and use warehouse data. Training users on the warehouse's data models is a challenging task. The data warehousing staff is working on developing dimensional data models and views (through the Business Objects universes given to users) of the data, which should make the data easier to use. Doing this work requires a strong partnership with the business units.

BCBSNC has unsuccessfully tried to use the "train the trainer" approach with the business units, but still believes that it has merit. The use of the warehouse varies considerably with the business units. Having trainers in the business units who are very familiar the needs of their units seems to make sense. The "train the trainer" approach has worked well sometimes, but more often the business units feel that the warehouse staffers are the experts and should be doing the training. Expert users do emerge in the business units and they informally help their peers. The warehouse staff would like to formalize this help and provide advanced training for the local experts.

CHAPTER 3

FINDINGS AND CONCLUSION

Overview of the Study

This study explored the training of data warehouse users. In particular, it investigated three research questions: (1) What specific training methods are employed with end users? (2) How successful are the methods? (3) What are the problems, issues, and challenges associated with current training methods? To investigate these questions, the data warehousing and training literature were examined, and telephone interviews were conducted with data warehousing managers at three companies that excel in data warehousing, and also potentially are leaders in the training of end users. Based on the interviews and other documentation (e.g., corporate Web sites, articles, and Best Practices application submissions), case studies were written about the companies, their data warehousing initiatives, and the training of end users.

In this chapter, profiles of the companies are presented. The profiles summarize key information from the case studies and help to compare training practices across the three companies. This is followed by the findings about the research questions. The interviews also serve as a basis for identifying best practices in training end users, and these practices are identified and discussed. The chapter concludes with a discussion of the study's implications for practitioners and academics, the study's limitations and possible future research opportunities.

Company Profiles

Summary information about the three companies, their data warehouses, and end user training practices are shown in Table 1. All of the companies are large, but are in different industries. Their data warehouses are enterprise-wide and have medium (e.g., Blue Cross and Blue Shield of North Carolina) to large (e.g., AT&T Wireless, Owens&Minor) user bases. All of the warehouses are used by executives, power users, and casual users. Owens&Minor makes its warehouse available to customers and suppliers. All of the companies employ a rich variety of training methods. They vary from computer-based training over the Web, to classes, to one-on-one training. Some of the methods are the same across the companies (e.g., training classes) while others are unique to particular methods (e.g., training by sales representatives at Owens&Minor). All of the companies report their overall training of end users as being “successful” or “largely successful.” The companies describe many different problems, issues, and challenges, but there are problems that exist in multiple companies (e.g., training users on the underlying data and data models, the difficulty of training geographically dispersed users).

Table 1: Company Profiles

Company Demographics			
	Owens & Minor	AT&T Wireless	Blue Cross and Blue Shield of North Carolina
Industry	Health care supplies distribution	Wireless voice and data services	Healthcare insurance
Headquarters	Richmond, Virginia	Redmond, Washington	Chapel Hill, North Carolina
Interviewee	Don Stoller, Director, Information Management	Denise Matney, Senior Business Analyst, End-User Support	Celia Fuller, Director, Corporate Data Warehouse

Warehouse scope	Enterprise-wide	Enterprise-wide	Enterprise-wide
Number of users	1300 plus	4,000 plus	200 plus
Types of users	Internal (executives, power users, and casual users), and trading partners (customers and suppliers)	Executives, power users, and casual users	Executives, power users, business analysts, and casual users
Training methods used	<ul style="list-style-type: none"> – Training classes (introductory and advanced) – Local expert – One-on-one training – Distance training using the telephone – Email communications about warehouse-related issues – Corporate intranet for information – 800 number support – Training and support from sales rep 	<ul style="list-style-type: none"> – Training classes – Local expert – Online computer-based instruction – FAQ's on the Web – Training forums (face-to-face and through conference calls) – Web-based training – Support specialists (in person and most over the phone) – Road shows (in person and over the phone) 	<ul style="list-style-type: none"> – Training classes – Local expert – Online computer-based training – FAQ's on the Web – One-on-one training – Introductory course – Labs – Project-oriented classes – Support specialists – Forums
Training success	Successful	Largely successful	Largely successful
Problems, issues, and challenges	<ul style="list-style-type: none"> – Users do not adequately understand the data and data models – Training users when new subject areas and data are added to the warehouse – No formal measures of the success of training – Effectiveness of sales representatives in training trading partners – How to train trading partners to do <i>ad hoc</i> queries – Getting users to employ warehouse quickly after training 	<ul style="list-style-type: none"> – Inability to provide in-person training for geographically dispersed users – Lack of management buy-in to ensure adequate time for training 	<ul style="list-style-type: none"> – Difficulties in meeting training needs with existing resources – Offer more customized training – Need for better understanding and use of warehouse data – Being able to use the train-the-trainer approach

Findings About the Research Questions

Three research questions were investigated. Based on the case studies, the findings about each one are discussed.

Research Question #1: What specific training methods are employed with end users?

The case studies showed that multiple methods are used:

- Computer-based instruction (largely delivered over the Web)
- Orientation classes on understanding and using the warehouse
- Classes on using the data access tools and warehouse data
- Project-oriented classes that focus on using the warehouse in work and business processes
- Training forums
- One-on-one training
- Local experts
- Decision support specialists
- Distance training using teleconferencing methods
- Road shows (in person and using teleconferencing methods)
- Email updates
- Information on the corporate intranet
- 800 and local support numbers
- FAQs

Multiple methods are used in every company and companies select the combinations that best meet their training needs.

The training methods employed vary with the nature of the users. For example, executives tend to receive one-on-one training and have local experts and support personnel available to help them if they require assistance. Executives also tend to have

data access applications (like an executive information system) that are very easy to use and require little or no training.

Power users utilize the largest set of training methods. They need an in-depth understanding of a variety of data access tools (e.g., SQL and managed query environments such as Business Objects) and how the data is organized in the data warehouse. They are also called upon to serve as local experts to help other users and must be familiar with these users' tools and applications.

Casual users tend to either view information by setting parameters (e.g., show this report for this time period) or accessing predefined reports. Consequently, their training is more limited and focuses on how to view rather to create information. They need training that provides an orientation to the warehouse, what data is in the warehouse, and how to access it. This training can be provided through computer-based instruction and short courses. They also need access to assistance, such as local experts and telephone help.

Some companies that provide customers and suppliers with access to warehouse data. As long as the access is limited to queries and predefined reports, the training can be delivered over the telephone. When the access includes the ability to do *ad hoc* queries, training becomes more difficult, because users need to use either a new data access tool or the advanced features of the current tool, and they need to understand the data much better. At Owens&Minor they have local sales representatives provide the training.

Research Question#2: How successful are the methods?

All of the interviewees believe that their overall approach to training is either “successful” or “largely successful.” Even though they feel this way, they all think that there is room for improvement. For example, Don Stoller at Owens&Minor is still grappling with giving users a better understanding of the data in the data warehouse and

how to use it, and how to train customers and suppliers who want to run *ad hoc* queries against warehouse data. Denise Matney at AT&T Wireless also has concerns about training geographically dispersed users. Celia Fuller at BCBSNC feels that their training could be improved if they had more training resources.

The interviewees do not think about the success of the training methods individually. Rather, they think of each method as being a useful component of an overall training approach. For example at BCBSNC, computer based instruction helps prepare users for formal classes. After a user has initial training, it is helpful for he or she to attend forums or classes that focus on how the user can apply the warehouse in work and business processes. A variety of support programs, such as local experts and decision support consultants, help the user in effectively using the warehouse.

A clear message from the case studies is that users must ultimately receive personalized training on how to directly apply the data access tool(s) and warehouse in their work. This can be done through classes where users bring specific work-related projects to work on and through direct help from experts. Without this training and support, the ability of users to effectively employ the warehouse is limited. This point is discussed further in the next section.

Research Question#3: What the problems, issues, and challenges associated with current training methods?

All of the case study companies have training-related problems, issues, and challenges. Some of the issues were mentioned by a single interviewee, but they can occur in any company. They include weaknesses in measuring the success of various training methods, getting users to quickly use what they have learned, lack of management buy-in to provide adequate time for training, difficulties in meeting training needs with current resources, and an issue related to the last, the need to offer more specialized training.

Some of the training issues are more interesting and relatively subtle. Both Owens&Minor and Blue Cross and Blue Shield of North Carolina indicated that users are having difficulty understanding the data in the data warehouse and how to use it. This should not be surprisingly. Most users do not understand data models. Concepts such as entities and joins are foreign to most users. Also, users may not know where the data comes from or what the definitions are. This information, of course, should be contained in the metadata, but users need to be trained on how to access, understand, and use it. It appears that companies are not spending enough time on training users on the data they will be using.

Related to the previous problem is that users need more training on how to specifically employ the warehouse in their work. While users need to be computer literate, know how to use the data access tool(s), and understand the data in the data warehouse, they also need to understand all of this in a work context. Users need structured training experiences where they use the warehouse on their own work-related projects. The project-oriented classes at BCBSNC provide an excellent example of how hands-on, work-related training can be provided.

As companies open up their warehouses to customers and suppliers, as Owens&Minor has, there is the problem of training geographically dispersed users. A similar problem exists at AT&T Wireless where the user base is wide spread. It is not typically feasible to bring these users to a central site for training. Rather, they must be able to receive their training where they are located. This is not too difficult as long as users only need to view predefined reports. They can be trained to do this through a variety of teleconferencing methods, including simple telephone calls. The problem occurs when the users want to more complex tasks, such as run *ad hoc* queries. Owens&Minor is trying to address this problem (with limited success) by using sales representatives to do the training. AT&T Wireless is using forums and road shows. If

the volume of training justifies it, computer-based instruction over the Web also seems to be a viable option.

It is interesting that BCBSNC has had limited success in using the “train the trainer” approach. On the surface, it seems that this would be an excellent way of making local experts available. However, many of the business units are unwilling to take on this responsibility and look for the warehouse staff to provide all training and support.

Training Best Practices

The case studies provide the basis for identifying best practices for training end users. The best practices can be identified based on the changes the companies made from how they were training end users in the past, to how they are currently training them; the success of current training practices; and their current training problems, issues, and challenges.

Best Practice #1: Recognize that different kinds of users require different kinds of training.

Executives often access warehouse data through an executive information system that is sufficiently easy to use that virtually no training is required, and if it is, executives are surrounded with support personnel who are readily available to help. This was the case at Owens&Minor and AT&T Wireless. On the other hand, power and some casual users require more structured, formal training in order for them to effectively access warehouse data. Power users require training on a variety of data access tools and on the data in the warehouse. If users are going to do more than access predefined queries and reports, they need much more training than those that do not have these needs. Overall, in the progression from executives, to casual users, to power users, more kinds and more in-depth training is required.

Best Practice #2: Users require considerable training on the warehouse data they will access.

It is easy to overlook how much training on using the data is needed. Whereas the need for strong training on the data access tool(s) is recognized, it is easy to under emphasize how much time needs to be spent on understanding and being able to use the warehouse data. Both Owens&Minor and BCBSNC have experienced problems in educating users about warehouse data. Data training is probably best conducted in formal classes.

Best Practice #3: Training should focus how users will employ the warehouse in their every day work.

While the initial training (either CBT and/or classroom) can be generic, this is not adequate. Users need to have applied training on tasks and projects that are directly related to their work. Doing so increases both the motivation to learn and the internalization of how to use the warehouse. Blue Cross and Blue Shield of North Carolina illustrates this approach to training through their use of labs and classes where users bring specific projects to the training sessions. It is also addressed by having the decision support consultants available to meet with users and having the consultants sometimes going to the departments and “hang around” in order to answer questions and provide help.

Best Practice #4: Training should be spread out long enough that people have time to assimilate and practice the materials.

Consecutive, multiple day training sessions are too long. Users need time to try what they have learned and to identify what they do not know. BCBSNC originally used the former, intensive approach and it was unsuccessful. Now, they teach course materials one day a week for four weeks, and users apply what they learned to a specific work-

related project. AT&T Wireless also learned that training should not be compressed into a short time frame.

Best Practice #5: It is important to provide ongoing training and support.

Users need for training and support continues and evolves over time. Training is not a one-time occurrence. Project-oriented classes, courses on advanced topics, forums, and labs, such as those used at BCBSNC, are effective ways of providing ongoing training. The use of decision support consultants, local experts, online training materials, 800 and local support numbers, emails, and online answers to FAQs are other common approaches to providing support. It is especially important to make users aware of all additions and changes to the data in the warehouse.

Best Practice #6: Use the web to provide training and support.

The Web is ubiquitous on users' desktops and is an excellent way of delivering training materials. It can be used for computer-based instruction, introductory courses, forums, and providing answers to FAQs. All of the case study companies employ the Web for training and support in some way.

Research Implications

The study has useful implications for both practitioners and academics. For practitioners, it provides examples of how other companies are training their end users; their experiences with different training methods; and the problems, issues, and challenges that are being faced. The Best Practices synthesize what companies can do to successfully train their end users. Of particular importance are the findings that users require extensive training on the data in the data warehouse and training experiences where users are taught how to use the warehouse in their work and business processes.

For academics, the study provides information and insights about current training practices for warehouse users. This information is useful in teaching, consulting, and research. There has been little previous research on how data warehouse end users are being trained. Some of the most enlightening findings of this research include the need for work-specific data training, the multiplicity of training methods that are being used, and the emerging challenge of having to train geographically dispersed users.

Study Limitations

Like all research studies, this one has limitations that need to be recognized when interpreting the findings. Only three case studies were conducted. It is likely that additional case studies would reveal additional training practices; problems, issues, and challenges in training; and training best practices.

The assumption was made that companies that have won best practices competitions and had journal articles published about their data warehousing training would at least be above average in their training practices. While the companies included in the case studies do have extensive training programs and consider their training to be “largely successful,” there may be other companies that are even more successful and are doing things in their training that other companies should emulate.

The case studies only included interviews with data warehousing managers. While they provided important information and insights, there is another major stakeholder group that was not considered – the people who receive the training. Interviews with people who received the training in the companies would have probably provided additional insights.

Future Research Opportunities

The limitations of this research and the research findings suggest future opportunities for research. It would be potentially useful to conduct additional case

studies and to include interviews with a sample of users (from different categories of users) in the companies. This would provide a broader sample of companies and perspectives from an additional stakeholder group.

The companies selected for inclusion in this study were all believed to be at least above average in their training practices. The case studies suggest that this is probably true, given the richness of their training methods employed and the “largely successful” assessments of their training practices. It would be interesting to investigate the practices of companies that are at least somewhat unsuccessful in their training practices. The differences between the successful and unsuccessful companies would help highlight what companies should do in the training of warehouse users.

This research method utilized case studies. Now that more is known about training data warehouse users, survey research could be conducted. For example, descriptive research could explore what training methods are used, how common are the methods, who receives various types of training, what kinds of skills (e.g., data access tool) is training addressing, how common are different problems in training, and so on.

Survey research could also be done to investigate specific hypotheses. For example, a key finding from this research is the importance of training end users on how to apply the data warehouse directly to their work. Simply training end users on the data access tool and providing general information about the warehouse are not sufficient. This hypothesis could be tested using a survey instrument that collected data on the extent of a company’s training on how to directly apply the data warehouse to work processes and the perceived success of the company’s training programs.

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