Data Warehousing

Ice Pops,
Heart Attacks
and Hot Days
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Executive Summary

Sitting in front of her laptop, statistics student Donna Quixote found a startling relationship between the consumption of ice pops and the occurrence of heart attacks. Thinking she may have discovered evidence of a chemical in ice pops that caused cardiac arrest, she breathlessly dashed off an email to her professors and colleagues detailing her discovery. Eager to press on with her ground-breaking research, she accessed her university’s linked database system and broke out the source of ice pop sales. She found out that ice pops sold by ice cream trucks were really the only ice pops spiking in sales. “Aha!” Donna exclaimed, “ice cream trucks, not ice pops, are killing our elderly!” Of course, her enthusiasm melted faster than an ice pop in the sun when one of her professors pointed out that ice pop consumption exploded on hot days; the heat probably had more influence on the increase in heart attacks than the rise in ice pops eaten.

As technology has become more available, organizations are recording and analyzing greater and greater amounts of data. But very often companies are like our hypothetical Donna Quixote: instead of analyzing all of their information together, they draw incorrect conclusions and take less than optimal action by looking at only a portion of their knowledge.

An increasingly common way of preventing your company from tilting at windmills is to centralize your customer, operational, and Web data in a “data warehouse.” This warehouse extracts data from your company’s various systems, puts that information in a central repository, and allows you to analyze and monitor all aspects of your organization.

CIOview has studied a number of companies that have implemented data warehouses. We used that research to build ROI Now!™ for Data Warehousing, a software product that helps you rapidly determine the financial costs and benefits of data warehousing prior to purchase. That research is also the basis for this white paper.

We found that the median company achieved a three year return on investment (ROI) of 160% and a payback period of less than 1 ½ years. Companies’ results varied tremendously depending upon:

- The pervasiveness of data warehousing
- The number of users affected by the data warehouse
- The complexity of the logic required to transform, process, and analyze data
- Project management skills
- The extent to which the data warehouse was used to improve business processes
- The ongoing support and maintenance costs of the data warehouse
- And a host of other factors detailed within this white paper

Data warehousing technology can help your company improve productivity, save on personnel costs, reduce your operating expenses, and provide new revenue opportunities. It can also be a launch pad for CRM and a crucial underpinning for an effective ERP environment. Data warehousing is hot because even without leveraging it for CRM or ERP it potentially can provide an enormous financial return. Not implemented properly, however, it can be a very expensive white elephant. This white paper, in combination with ROI Now! for Data Warehousing, will help you determine your likely outcome.
Data Warehousing: Ice Pops, Heart Attacks and Hot Days

Introduction

Data warehousing can have an enormous impact on your business, both positive and negative. This white paper:

- Briefly reviews the recent changes in data warehousing and the simple reasons why the financial picture is changing rapidly
- Analyzes the most common methods of deploying data warehousing and the impact these have on your financial costs and benefits
- Details the critical steps that will substantially reduce your risk of deployment and increase your likelihood of a good financial return
- Provides an assessment of who benefits from data warehousing and the magnitude of the different benefits that data warehousing typically delivers
- Discusses those items that are most likely to deflate your financial results

Finally, there is a brief definition of financial terms and an explanation of how to complete an ROI for data warehousing in less than two hours.

The Recent Changes in Data Warehousing — What It Was

Data warehousing is a way for companies to combine lots of data—information—into a centrally accessible location dubbed a warehouse. Historically, data warehouses required large financial investments: hardware costs alone routinely ran into seven figures, and deployment times commonly exceeded 1,000 days. For most companies data warehousing meant purchasing enormous amounts of storage, coupled with expensive dedicated servers. Add the costs of integration with multiple source systems, including in many cases an online transaction processing environment, upgrading or acquiring a new database management system, and making a substantial investment in a portfolio of analytical tools, and the total cost for many companies rapidly exceeded $3 million.

As recently as 24 months ago data warehousing was a fairly elite technology, acquired by a rarefied few for the benefit of a select few. The general worker population commonly only obtained trickle-down benefits. Unless you were a systems analyst or the beneficiary of some specially-run reports, data warehousing was, as the name implies, largely a central storage facility.
What It Is

The focus of data warehousing has moved away from data acquisition and storage towards making the information contained in the data warehouse benefit an increasing number of users. This basic philosophical shift has significant financial implications because the cost of data warehousing now can be spread over a much greater number of people. The result is that a newer data warehouse project will show a dramatically improving return on investment (ROI).

Not all of the extraordinary improvement in ROI for data warehousing is attributable directly to this technology benefiting a greater population. There also have been precipitous declines in the costs of servers and storage. Meanwhile, the time to deploy data warehousing is going down as integration facilities improve. Add lower ongoing costs as system administration and support have become easier, and data warehousing suddenly has ripened into a potentially hot IT (information technology) investment.

What It Will Be

Increasingly, the combination of new database technology and new data source options means that you can have batch processing and interactive data analysis simultaneously available. For the first time companies are able to alter the offer to the customer “on the fly,” as the customer reveals certain behaviors. This idea, dubbed preferencing, sounds like a marketer’s dream. The reality is that it is an awful lot more complicated than an initial review might suggest. Imagine a customer who typically logs on to Amazon.com each spring to purchase gardening books, who then also wants to purchase items for his children or shop for a summer vacation. The result would be to quickly end up with multiple profiles that add exponential burdens to storage, database tables and the complexity of the logic to determine what preferencing, if any, should be applied. Complications aside, preferencing in one shape or another is now more than a political slogan, but a mainstream option.

Common Methods of Deployment

Data warehousing can be implemented in three fundamentally different approaches:

- Opportunity
- Control
- Core Business

Each implementation method has its own scope, features, infrastructure, tools, and business benefits. A company that does not understand the project steps, costs, and benefits associated with its specific implementation has little chance of building a data warehouse that provides the expected benefits, on time, and on budget.
Opportunity — Making Your Marketing Smarter: An opportunity implementation is geared towards identifying new marketing prospects and increasing revenue. In most opportunity implementations, the marketing department analyzes existing customer data to identify customer profiles and to apply this new knowledge to outside prospect lists. Opportunity data warehouses are the most traditional form of deployment and are usually relatively self-contained within the enterprise. Common elements of an opportunity warehouse are data access, cleaning, mining, and reporting tools, and the warehouse integrates only with internal customer data.

Data Warehousing: Opportunity Approach

- Lower benefits
- Lower risks
- Lower return
- Slightly lower costs
- Lower professional services costs

CIOview has found that the median company implementing an opportunity data warehouse:

- Achieved a three-year return on investment of 153%.
- Had a median payback period of 1.4 years.
- Received a total three-year benefit equaling only 52% of median total benefits for all deployments, because the opportunity approach does not extend across the entire enterprise.
- Spent 90% of median total costs for all companies. Even when implemented across a small piece of the enterprise, the need for data access, quality, and mining tools, and the coding time to integrate all elements of the warehouse, keep costs high.
- Spent 58% of the initial budget on professional services deployment costs because of the need for significant up-front coding.
- Devoted 56% of the total budget to ongoing support and maintenance costs. An implementation of an opportunity warehouse requires hiring new staff or assigning existing employees to manage the database.
Control — Know Thyself: The control approach involves creating a warehouse that draws information from, and provides information to, multiple touch points in a company’s front-end, back-end, or both. Control data warehouses often serve as a cost-cutting business intelligence function helping to manage suppliers, inventory, internal administration, financial controls, and workflow. The other major type of control database focuses on providing better customer service and new revenue opportunities. It links with the front-end email, call-center, direct sales force, and Web presence (both clickstream data and site personalization features) of a company to gain a more complete view of a customer’s interaction with all parts of that company. Control data warehouses interact with multiple systems that serve different customer or supplier-related functions, so they require far more data management tools, analytical logic, programming time, processing power, and storage space than other approaches. The control approach also requires far more management resources, since business requirements and priorities have to be defined across different departments of the company that often function as “information islands.”

**Data Warehousing: Control Approach**

- Higher returns
- Slightly higher costs
- Significantly more management time
- Medium risk
- Slightly higher professional services costs

CIOview found that the median company implementing a control data warehouse:

- Achieved a three-year ROI of 249%. Extending the data warehouse across the enterprise leads to more cost savings and new revenue opportunities.
- Achieved a payback period of 1.1 years.
- Received total benefits that were 282% of the median benefits for all approaches. The ability to understand one’s business and customers better results in a key aspect of control warehouses. However, total benefits tend to be over-stated since companies rarely account for the true cost of their management time.
- Spent 114% of median total costs for all companies surveyed since so many “touch-points” must be fed into the data warehouse.
- Spent 62% of the initial budget on professional services deployment costs. Similar to the opportunity implementation approach, programmers have to hard-code the communications pathways for different tools and systems to share data.
- Devoted 57% of the total budget to support and maintenance. Control data warehouses require significant effort from database administrators and analysts to manage updates, produce analysis, clean data, and integrate into the warehouse new business functions and systems as the business expands.
Core Business — You are Your Data: Companies such as mailing list managers or demographic information vendors that sell data, and companies such as research labs, technical financial services firms, sales analysis providers, and market research firms that provide services built on large stores of information often follow the core business approach. In this type of implementation, the data warehouse is the company. Instead of using a warehouse to support marketing campaigns or administrative and operational tasks, these types of firms use the information in their data warehouse to create the services they sell to their customers. Commonly, firms whose data warehouse is part of their core business are often relatively small (under 250 employees) and have very high project costs and benefits relative to other approaches for companies of a similar size. This type of data warehouse often combines data access, quality, management, mining, and analysis tools with a large amount of custom logic and a browser-based reporting capability that can support external users.

Data Warehousing: Core Business Approach

- High ROI
- Projects substantially smaller
- Lower benefits
- Low costs
- Magnitude of benefits is enormous

CIOview found that the median company whose core business was based on its data warehouse:

- Achieved an ROI of 224%.
- Achieved a median payback period of 1.5 years.
- Received total benefits that were only 62% of median total benefits for all companies surveyed.
- Spent only 61% of the median total costs for all companies. Both the costs and benefits are lower than the median for all implementations because most companies whose main product is their warehoused information are small.
- Received massively larger benefits than one would expect for an opportunity or control data warehouse of similar size. Companies implementing a core business approach are, on average, 20 to 40 times smaller than the average company implementing a different approach. This indicates that the core business approach provides benefits 24-48 times greater than opportunity implementations of the same size and 4-8 times greater than similarly sized control implementations.
- Spent 78% of the initial budget on professional services, since the data warehouse is such a central part of a company’s existence. Programmers need to develop and implement extremely complex and wide-ranging logical rules and algorithms.
- Devoted 72% of the total budget to support and maintenance. As the data warehouse becomes more central to the operations and business of a company, the number of staff needed to manage and access the warehouse grows.
Regardless of your implementation approach there are a number of steps you can easily take to dramatically improve the likely success of your project.

**Critical Steps to Success**

1. **Project management is king**

2. **Understand the business drivers**

3. **Use it or lose it (evolution or revolution)**

4. **Ensure you transfer knowledge**

5. **Select the correct tools (products based on ease-of-use, scaleability, security, re-usability)**

6. **Relive the old adage “Garbage-In Garbage-Out”**

7. **Involve the primary and secondary users in the design and selection process**

8. **Don’t collect data you do not need (Minimize overhead on existing systems)**

9. **High ongoing costs can kill your ROI**
Critical Steps

**Project management is king:** As more and more companies ramp up to “Web time” there is a tendency to try and rush the deployment of all new technology, not just data warehousing. It is easy to be tempted further to rush things along now that many data warehousing products are much easier to use and implement. It is also true that the time to deploy will have a significant impact on your return on investment and so the pressure is on from day one. Whatever you do, resist the quick fix crowd and stick with a conventional project management approach in which you carefully assess the user requirements and put together a formal needs assessment and business case before moving on to a detailed project schedule. Data warehousing is a classic example of a technology in which the beauty is in the details.

**Understanding the business drivers:** What are the business drivers for your project? Are you trying to wring out costs from the business? Find new revenue streams, increase existing ones? Improve the predictability of your business? There may be more than one business goal. If so, document the priorities and get them signed off by senior management. Make sure that the business goals are on the white board of every meeting regardless of its agenda. Lose sight of the business objectives and your project will be in trouble.

**Use it or lose it:** If you want to fail quickly, implement a data warehouse without a formal project management environment. If you want to fail slowly but painfully, build a data warehouse no one uses. Usage rates will plummet if a data warehouse does not provide the information required, offers data that is outdated, or has significant barriers to data usage such as a cumbersome information request system. As the data warehouse is found to be less useful, financial and human resources will dry up. On the other hand if you make it indispensable and ensure usage rates remain high, the appropriate resources for support and enhancement will follow.

**Knowledge transfer:** Every company should give serious consideration to using an outside party to deploy all or parts of your data warehouse. The reason is simple: the better third parties will generate a better return on investment by speeding your deployment. In the process, the best third parties will transfer their knowledge to your staff and enhance your company’s intellectual capital for future data warehousing projects. Therefore you should ensure that there is a formal knowledge transfer process in place.
Selecting tools: There is a plethora of excellent tools out there that span the entire horizon of data warehouse evolution from data acquisition, through data cleaning, to analysis and presentation. The central focus should be on ascertaining that the different constituents of the user population have the tools they need. Acquire tools with future data warehousing activities in mind, because few of us like to learn to use new tools. That is important because training and support costs for tools are directly related to the rate of usage. In other words when people use tools infrequently they rapidly forget how. Therefore, ease of use is more important than statistical sophistication.

Garbage-in garbage-out: Always budget at least 25% more than you expect to spend both on tools and data-scrubbing. Unreliable data is the quickest way to lose the user’s confidence in the data warehousing system. In general be prepared to spend 80% of your deployment budget on data extraction, transformation and loading (ETL), data quality and the tools to perform these functions.

Involve primary and secondary users: Systems analysts and statistical specialists are key constituencies and their needs are paramount. Secondary users of the system are likely to have quite different requirements and typically need a lot more hand-holding to determine their needs.

Don’t collect data you don’t need: Given a new facility it is easy to begin to think that you need to be able to store and analyze every piece of data. You need to be selective or you will consume system and human resources without obtaining an adequate return. Make sure you stick to the original business objectives, avoid project creep at all costs, gain general recognition and sign off that you have hit the original project targets. Then take the same formalized approach to extending the data warehouse. This will ensure that business requirements, not technological capabilities, are driving the project.

Minimize ongoing costs: Companies frequently are surprised at the size of the initial costs of data warehousing — the costs it takes to get the system up and running. Commonly, everyone is so focused on keeping these under control that they pay less attention to the ongoing costs of maintaining and enhancing the system over time. Don’t forget that you need to pay for staff to manage your data warehouse and pay for expensive storage options such as dedicated fiber channel storage area networks as your warehouse expands in size. Routinely, those companies with the poorest ROI from data warehousing are those with the highest ongoing costs. In fact, there is an exponential relationship between higher ongoing staff support and maintenance costs and a lower ROI. Be careful to separate out the cost of maintenance from the cost of enhancement and ensure that the enhancements are producing a suitable ROI.
Who Benefits from Data Warehousing?

The pressure is on IT executives to develop business cases, not only for new data warehousing projects but increasingly for funds to expand existing ones. As a result, it is essential to have access to good cost and benefit data. Cost data are simply a data collection process, but unfortunately good benefit data are very scarce.

In financial terms there are four broad categories of benefits that can be attained from data warehousing, namely:

- Time Savings
- Personnel Savings
- Operational Savings
- Revenue Gains

**Time Savings:** The time savings accruing from data warehousing vary significantly from one discipline to another. For example:

- 15% of a systems analyst’s time typically is spent simply responding to information requests
- The entire population of a company’s report users commonly spend 1% of their time simply submitting applications and tracking their progress to obtain the ad hoc reports required for them to do their job
- After implementing a data warehouse, financial and budgeting staff typically save as much as 70% of the time they previously had spent searching for data and creating reports
- International Data Corporation found that data operators at a health care provider that deployed a data warehouse could triple their rate of entering patient information, from five patients per day to 16 patients per day.
Other notable improvements in time savings included the time taken by individuals to find the data simply required to do their job. For example:

- Finance personnel tend to be at the lower end of this spectrum, losing only 1% of their work day to this activity. Engineers in a semi-conductor manufacturing facility top out at the high end and often spend 60% of their time trying to find data. Even senior management is not immune to the time savings benefits of data warehousing. Five percent of executives’ time commonly is absorbed by the simple act of consolidating financial data and/or extracting data from standard reports.

The key point is that the time savings benefits of a data warehouse do not simply accrue to the small group of specialists manipulating the data. The time cost of not having a data warehouse extends out to everyone who requests and has to wait for a specialized report, information request, etc., and the cost is to both the provider and the requester of that information.

The time savings you can attain from data warehousing are impressive. However, you must take into account that social psychologists and work specialists the world over agree that you typically should accrue only between 50-60% of the benefit as a productivity saving. This is due to the human penchant to use time saved in the most creative ways. As a result time savings should be calculated as total hours saved * average salary and benefits * 0.5.

**Personnel Savings:** There is a wide assortment of personnel savings that most companies experience after deploying data warehousing. In particular, many companies

- experience a faster growth rate without adding personnel because their existing workforce now can do more with less, a particular boon in the current tight labor market
- move workers from one function to another. Most notably workers typically provide more value by moving up the food chain, since there is normally a reduction in clerical activities such as distributing large numbers of standard reports, completing repetitive data requests, etc.
- commonly can reduce the cost of temporary or seasonal workers, thus adding financial savings as well as reducing administrative overhead associated with temporary workers
- can re-deploy many of the IT resources previously required to run reports. In fact, one financial institution reported that a single query to its data warehouse replaced the need to run 30 standard MIS programs on its mainframe. Most data warehousing customers report 50% savings on resources spent running ad hoc reports, and one national mortgage company experienced a 60% decline in the resources required for ad hoc reports
- a variety of industries, from oil to insurance, can slash consultant costs. Since risk analysis is inherently much easier with a data warehouse, it becomes unnecessary to purchase those service from an outside firm
Operational Savings: Most prospective data warehouse purchasers substantially underestimate the savings they can gain from their business operations. In particular, companies

- that have large field organizations, either for sales or support, generally experience express mail costs of $1,000 per employee/year. These costs can be almost eliminated with data warehousing. In addition, field information is more up-to-date and cheaper to maintain
- can sharply reduce facsimile costs, ranging from $100 per employee/year to almost $1,000 for highly geographically distributed organizations
- can recover up to 80% of their photocopying costs, which commonly exceed $300 per employee/year, particularly in the financial services industry
- can eliminate up to 60% of paper and print supply costs, by fully extending a data warehouse across the enterprise. These costs, associated with generating standard computer reports, commonly average $75 per employee
- can generate substantial savings on mailing costs. Prior to data warehousing, a leading university routinely found that 10% of its mailings were being returned because the addresses were not being reconciled between different operational systems
- can markedly reduce mainframe cycles and storage costs due to fewer report runs. Transcribing those cycle and storage savings will be fairly simple for most companies. As a general heuristic use $100-400/month for each individual receiving a standard report
- experience a sharp decline in report software licensing fees

Revenue Gains: The most obvious benefits of data warehousing are rooted in reducing cost levels. However most companies have sizable revenue opportunities, which also should be fully explored. Many companies have the opportunity to increase existing revenue streams by

- upping the productivity of their sales personnel, field service organization, engineers, consultants and/or technical support personnel
- up-selling and/or cross-selling existing customers
- improving customer retention and more efficiently acquiring customers
- losing less revenue to the competition or to fraud. For example, a data warehouse allowed a major credit card issuer to make a sizable dent in the $800 million per annum it was losing to fraud. Even smaller financial institutions have sizable fraud losses, which commonly are exceed by the cost of default. Data warehousing can provide predictive data to reduce these revenue-related losses.
- reducing overpaid taxes. This is particularly common in the case of complex lease agreements

Other benefits of data warehousing that have revenue implications include improving the time it takes to get new products to market and the ability to shorten business cycles.
What Can Break Your Budget?

The three-year cost of setting up and maintaining a data warehouse can range from less than $100,000 to more than $15 million, including staffing costs. The cost of your warehouse is largely a function of your implementation approach, the amount of people and number of departments affected by your warehouse, and the amount of data you will store. But there are seven other major factors that can grow the cost of your warehouse exponentially.

Your data warehouse will access legacy data: If, like most established companies, your operations and customer data reside on older mainframe applications, you will need to spend IT resources on programming interfaces between systems. You will also need to either buy and install or custom-code ETL (extract-transform-load) tools with data access, cleaning, quality-management, and transformation functions.

Your data warehouse will access data from a variety of sources: In a control implementation approach, your data warehouse will need to pull information from different legacy back-end systems, such as HR, finance, logistics, and operations, and from front-end systems, such as inbound email, management systems, call-centers, field sales transaction monitoring software, clickstream data, information provided by customers, and any third-party data you choose to include. Even larger opportunity implementation approaches will access data from third parties and some front-end systems. To enable your data warehouse to integrate with multiple stand-alone systems, you will have to devote management and programming time to identifying the what, where, and how you plan to put all your data together. You also will have to either purchase and implement or custom-code data access, quality, and management tools.
If you plan to include legacy systems in your warehouse, increase your budget even further to take into account programming effort required for legacy integration. In fact, integration with a very large number of legacy applications can increase your deployment time to as much as 1500 person-days.

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<td>• Will your data warehouse access data from a plethora of sources?</td>
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<td>• Will your data warehouse now, or in the near future, hold vast quantities of data?</td>
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<td>• Will your data warehouse integrate with your existing ERP systems?</td>
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<td>• Will your data warehouse carry out customized, multi-dimensional analyses?</td>
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<td>• Will your data warehouse need to respond to real time queries and status requests?</td>
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<td>• Will your data warehouse power e-business applications?</td>
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Your data warehouse will be very large or you expect it to grow very quickly very soon: If you plan to capture large, fine-grain amounts of customer, Web site visitor, or operations information, your database can easily grow to terabytes in size. If you plan on recording clickstream information from your Web site or have a large number of new unique site visitors who provide you with personal information, your Web site can grow very quickly. To deliver high performance for very large databases, you will probably have to invest in a fiber channel storage area network (SAN) that requires significant implementation and maintenance expenditures.

Often, companies whose major business is to serve online ads or promotions, to carry out content searches, or to collect demographic/personal data need to invest significantly in their storage infrastructure, database processing power, and database management software. One major online advertising company that collects clickstream data from the 1 billion transactions it processes each day has a rapidly growing warehouse that already contains 25 terabytes of information. And a Web-based incentives company’s data warehouse grew from 2.4 to 4 terabytes in six months. At cost of $.07/MB for low end RAID drives to $.15/megabyte for complex SANs, storage costs for a data warehouse that manages e-business functions can stretch into the tens of millions of dollars.

Your data warehouse will integrate with your existing ERP systems: Also known as business intelligence, your warehouse would centralize data from your enterprise report planning systems to perform analysis. This function is often only found in control implementation approaches. IT managers increasingly have found that stand-alone ERP systems provide insufficient reporting capabilities to get a full picture of the enterprise or to allow non-specialized users access to HR, financial, or logistical information. Integrating a data warehouse with an existing ERP system provides an automated way to deliver information on the entire business to any user that needs the information in the format that user desires.
However, most ERP systems were not designed to work well with other applications. You can purchase third-party ERP data extraction, modeling, and reporting tools, but many of these packaged solutions are inflexible and do not allow integration with front-end customer-related systems or outside data. The other alternative, which sometimes can be as complex as integrating with multiple legacy systems, is custom-building your own linkages between your warehouse and your ERP system.

**Your data warehouse will carry out customized, multi-dimensional analyses:** In the last two years, it has become easier and cheaper to purchase pre-packaged analytical applications for analyzing sales and marketing, customer service, and supply chain management; newer pre-packaged tools include online analytical processing elements for some multi-dimensional analysis. However, if you wish to perform very complex queries or search for new patterns in your data, you will have to custom develop and program the extensive logical rules and algorithms needed to guide your analytical applications.

In larger data warehouses, you will have to expend considerable effort even getting managers and employees across different departments (which will have different perspectives on what is important) to determine what business rules should even be included, how they should be included, and how different business rules should interact. A major American direct-marketing and credit-card reporting company spent months developing the customized logic it needed to support its multi-dimensional analyses.

**Your data warehouse will have to respond to real-time queries and requests:** If you choose to integrate front- and back-end functions together, your data warehouse will need to update itself in real-time. This would allow, for example, a customer service representative (front-end) quickly to find the nearest distribution center with the product a customer would like to buy (back-end) and then be able to tell the customer whether the product is in stock and how long it will take to ship it to the customer. Real-time response abilities are also crucial to allowing Web personalization, since your data warehouse must be able to update itself as a site visitor browses through the site. A data warehouse that can respond in real time often needs significantly more processing power than a warehouse that can be updated during off-peak hours.

In addition, if you choose to integrate with an online transaction processing system (OLTP), you will have to purchase or create data replication and migration tools. Data cleansing and transformation tools are also extremely important in a data warehouse that responds to real-time requests since database results must be absolutely error-free; there is no time window to fix mistakes before the customer receives faulty information.
Your data warehouse will power e-business applications: In addition to the storage and real-time issues detailed above, a data warehouse that handles Web applications such as site content, cataloguing and on-line transactions, or that is accessible to many users over the Web, often requires sophisticated metadata management tools, enterprise information portal capabilities, and integration with thin-client and extranet functions. Metadata tools are needed to manage and catalogue which types of visitors get what Web sites, as well as what determines the visitor’s category. Feeding e-commerce transaction information into the data warehouse requires time-intensive integration between the data warehouse and the e-commerce system. And to allow Web-based access to a data warehouse, you must either implement or build a stand-alone enterprise information portal that acts as a user-friendly interface for non-technical users to access information.

Lastly, if you want to allow customers or suppliers to access your data warehouse, you must integrate your warehouse with your extranet and incorporate specialized thin-client data warehousing solutions that provide profile-based security. This ensures that only the customers or suppliers you authorize access only the pieces of your warehouse (i.e., sales information for a particular business partner’s region) you permit.

Conclusions

Data warehousing offers us the possibility of insight into our business, customers and suppliers in a way that even a few years ago was not possible. Preferencing will be the rage for the next two to three years, and no doubt will generate some noise in terms of our privacy laws. Our advice is simple:

- Stay the course—data warehousing will become the linchpin in corporate IT assets
- Continually refine your project management skill set
- Be aware of how expensive SANs are to maintain
- Build good business cases for your data warehousing investments
- And finally, celebrate your involvement in an ever-changing world
Finance at a Glance

Measuring the financial benefits of IT investments is not without controversy. However, the practicalities of limited IT budgets means that it has to be done. There are two basic choices: (1) learn to do it yourself, or (2) hire a consultant. A do-it-yourself approach requires most of us to revisit our financial theory. Fortunately, the concepts are straightforward and any decent spreadsheet already builds in any formulas you may need.

The Basic Concepts

What would you rather have, a dollar now or a dollar next year? Money is normally worth more today than later. So we have a term, “present value,” to explain future cash flows. Imagine you win the lottery and will get $100,000/yr for the next twenty years. To work out what that is worth in today’s terms, you have to take each year’s winnings and appropriately discount each $100,000 payment. Now obviously the payment in Year Five is worth more to you than the payment in year 10. This is because inflation will eat away at the value each year and because you can do something productive with money you have on hand; this is what finance folks euphemistically label “the time value of money.” The question then becomes, “By how much do you discount each of these payments in order to determine what they would be worth if you got all of them today?” This is what financial theorists mean by the “discount rate.” The discount rate is the inverse of an interest rate: instead of telling you how much money will be worth in the future, the discount rate tells you how much future money is worth in the present. This is important because the benefits that you get from an IT investment don’t all happen on day one but tend to be spread over several years. For most financial calculations to work properly it means that both the costs and benefits of multi-year projects have to be discounted back to a single year.

So almost all of the different financial measures have a single common purpose: to determine what the costs and benefits are and discount them all back into today’s terms or value.

The Measures

There are many different ways to measure the financial costs and benefits of a project, but the most commonly accepted ones are:

- Return on Investment (ROI)
- Internal Rate of Return (IRR)
- Net Present Value (NPV)
- Payback Period
Just to Confuse You ...

ROI is commonly used as a collective or generic term to reference a whole range of different financial measurements. However, ROI is actually a specific way of measuring costs and benefits. Confusing? Yes, but if you remember that it can be used as a general term and a specific measurement all will be well.

Finance by Example

Let’s say a small IT project requires $25,000 to implement. You either can accept an instantaneous $50,000 return, or $25,000 at the end of each year for the next three years. So which one is better? The first option’s value can be calculated as ($50,000/$25,000) -1, which equals a 100% Return on Investment. The second option requires you to discount the $25,000 received each year back to what it is worth today (present value).

<table>
<thead>
<tr>
<th>Table A (Return on Investment-ROI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td>Benefits</td>
</tr>
<tr>
<td>Discount Factor</td>
</tr>
<tr>
<td>Present Value of Benefit</td>
</tr>
</tbody>
</table>

At a discount rate of 15%, a present value table will show you that the discount factor that needs to be applied to benefits received at the end of year one is 0.86957. In other words, $25,000 received at the end of one year is worth $21,739 today. Since interest is compounded, the same principle that must be applied to the benefits due at the end of year two also applies to the discount rate. So $25,000 received at the end of year two is only worth $18,904 in real terms. The ROI is simply (a) the sum of the discounted cash flows, $57,081, (b) divided by initial costs, $25,000, (c) minus 1 (since you are consuming your initial investment), which equals (d) an ROI of 128%. This ROI should not be confused with more conventional financial calculations in which you retain the value of your initial investment and accordingly would result in ROI numbers that would all be 100 percentage points higher.
<table>
<thead>
<tr>
<th>Table B (Payback Period)</th>
<th>Initial</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$75,000</td>
</tr>
<tr>
<td>Discounted cash flows</td>
<td>($25,000)</td>
<td>$21,739</td>
<td>$18,904</td>
<td>$16,438</td>
<td>$57,081</td>
</tr>
<tr>
<td>Cumulative cash flows</td>
<td>($3,261)</td>
<td>$15,643</td>
<td>$32,081</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual ROI</td>
<td>-13%</td>
<td>63%</td>
<td>128%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payback (Years)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Year IRR</td>
<td>84%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Year NPV</td>
<td>$32,081</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To calculate the payback period you simply determine when the benefits meet your costs. In this case the costs are $25,000; conveniently, the benefits are $25,000 at the end of year one. So the payback period is exactly one year.

Calculating the IRR is a little more complicated. You need to determine what the discount rate would need to be so that your benefits effectively amount to the same as your initial costs. In other words, your IRR is the discount rate that gives your project a Net Present Value of zero. You can do this by simple arithmetical trial-and-error, or you can locate the formula from your spreadsheet by typing in =IRR (for MS Excel). IRR is a great method to ensure sure you are spending your company’s capital wisely. For a project to be worth undertaking, the IRR must be higher than your company’s cost of capital (which corresponds approximately to what a company would have to pay to borrow).

The Net Present Value (NPV) is just the sum of the discounted cash flows minus the initial costs. In this case the NPV is $57,081 - $25,000 = $32,081

**Conclusion**

Each financial measure has its unique advantages and disadvantages. Ideally, projects should have a large NPV since this ensures they will have a large impact on the business. A project’s IRR should exceed your company’s cost of capital, have a short payback period (ideally less than one year), and give a three-year ROI competitive with other alternative projects. To review the pros and cons of each measure and learn about the implications of taxation and depreciation on your results, visit our website at CIoview.com.
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- A helpful hint that helps you to decide whether or not to accept the default data and where your response should fall on the spectrum of possible answers
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- Offers “what if” analysis so you can change the key variables and see the impact on your financial results, such as rate of deployment, taxation rate, cost of capital, depreciation method, etc.
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