Business Intelligence for the Telecommunications Industry

Definition

Data warehousing is the process of integrating enterprise-wide corporate data into a single repository. The resulting data warehouse may then support a variety of decision analysis functions as well as strategic operational functions. This data often originates from a variety of sources, formats, and types and is generally consolidated, transformed, and loaded into one or more instances of a database management system—usually a routing database management system (RDBMS)—to facilitate a broad range of analytical applications. The data warehouse may consist of a single large enterprise-wide database, to which users and administrators connect directly, or it may incorporate several smaller systems, called data marts, each of which addresses a specific subject area within the overall warehouse. As a technology, data warehousing is the foundation of the business intelligence capabilities that enable customer acquisition, customer care, and fraud prevention.

Overview

This tutorial presents the current business landscape and an increasingly popular business model and then explores the fundamental elements of data warehousing—from design methodologies and implementation issues to key technologies. Because the issue of investing immediately in a central, enterprisewide data warehouse or starting small by segmenting data into one or more strategic data marts is often hotly debated, the tutorial will also outline the pros and cons of each approach.

Topics

1. Introduction
2. Shifting Business Landscape
3. The Evolution
4. Business Intelligence Capabilities
5. Data Warehousing Fundamentals
6. Methodologies/Processes

1. Introduction

In competitive telecommunications environments, customers choose their service providers. Today, this is a reality for long-distance, Internet service provider (ISP), wireless, and some local markets in the United States. Internationally, competition exists in countries such as the United Kingdom, Australia, and New Zealand. However, deregulation of the communications market is occurring in the U.S. local telephone market, and privatization/deregulation is occurring across Europe, Latin America, and Asia.

Under competitive conditions, the customer becomes the central focus of the carrier's activities. Customer requirements not only determine service offerings but also shape the network and impact the organizational structure of the carrier to focus on particular types of customers.

Competition (and the threat of competition) has resulted in two distinct trends in the telecommunications industry:

- **industry consolidation**—In an effort to compete, carriers are looking for ways to enter new markets and offer new services. The most logical and expedient way to do this is through mergers and acquisitions.

- **convergence**—The integration of multiple lines of telecommunications services (i.e., video, voice, data, etc.) has become an economic reality, and carriers are beginning to offer multiple services, often in the form of packages or bundles of products.

Telecommunications companies worldwide are exploring business intelligence solutions to achieve competitive advantage. The key solutions for which telecommunications companies are looking involve marketing—such as customer retention, target marketing, and campaign management, customer-relationship management, and network business intelligence to streamline network assets.

2. Shifting Business Landscape

The Strategy

The business landscape of the telecommunications industry is quickly evolving. The previous model, shaped by a handful of competitors in each country, is being replaced by a model shaped by hundreds of competitors vying for a global presence. How do companies survive in this environment? There are two basic strategies that can be pursued.

Product Strategy

Companies can continue marketing their products to the masses. This market-share strategy has been very popular in the telecommunications industry in the past. To compete, companies are driven to increase advertising and marketing costs aggressively while discounting their products. Unfortunately, this strategy has driven customer loyalty to an all-time low. For example, it is not unusual for a consumer to switch from Company A to Company B to Company C and back to Company A in the period of a single year. This may be why companies can report a 40 percent disconnect rate over the period of a year and still show an increase in market-share. Clearly, this model for doing business presents significant challenges and over time threatens to drive profit margins unacceptably low. The ultimate evolution may be similar to what has been seen in the retail industry, where a good year produces profit margins in the two to three percent range.

Customer Strategy

Companies can focus on tailoring products to the individual customer. In this "share of customer" environment, customers are differentiated in addition to products.[1] Corporate resources are efficiently allocated to customer care in relation to the customer's lifetime value. Those customers whose loyalty can be earned and whose lifetime value to the company is high will receive a majority of the attention. In contrast, customers who are not loyal or whose lifetime value is low will receive a lower degree of attention. The result will be an environment that optimizes profits by nurturing valued customer relationships. Essential to this strategy will be the ability to leverage evolving technologies to accomplish the following:

- understand the customers' needs and behaviors

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[1]The One to One Future, Don Peppers and Martha Rogers, Doubleday Publishing.

- leverage this understanding to identify, develop, and deliver relevant products and services

Choosing or integrating these strategies and migrating to this new environment is one of the most profound decisions facing telecommunications companies across the globe.

3. The Evolution

As we review the evolution of the telecommunications industry, it is clear that many companies are aggressively moving (or have already moved) from a business model based on a product strategy to a business model based on a customer strategy. This environment is characterized by customer relationships, product customization, and profitability, and is in response to pressures transforming the business landscape throughout the telecommunications industry.

Growing Consumer Demand

Customers (or consumers) are expecting companies to understand and respect their needs and desires. In this world, the customer drives the relationship. It is the role of the business to hear what the customer has to say and respond by delivering relevant products and services (what they want) on their terms (how they want it). Companies can no longer expect to sell several products and services to the masses (mass marketing) but must tailor many products and services (i.e., mass customization) to the individual. This is generally referred to as mass customization.

Growing Competition

The ability to refocus a product mix in response to evolving competition is a critical success factor for any business. The key is to be able to anticipate the needs of the marketplace before one's competitors. It is this ability to outpace competitors that most companies find difficult or impossible to do, given today's amalgamation of technologies and architectures. Why is this important? Corporations today are facing more and more deregulation; mergers and acquisitions are blurring the relationships to customers; and globalization of the marketplace and consumer is opening up businesses to new avenues for expansion and, as a result, new competitors. Therefore, it is mandatory for a corporation to restructure itself quickly without losing the ability to compete.

Optimization

The ability to measure and predict return on investment (ROI) is something that corporations find difficult to perform rapidly. These measurements indicate the health of the corporation, and the ability to determine them rapidly allows a corporation to change its direction with minimal loss. Other examples of the need for optimization include the ability to determine the most efficient channels for contacting customers, target the appropriate customers for a corporation's product mix, and identify new product opportunities before the competition.
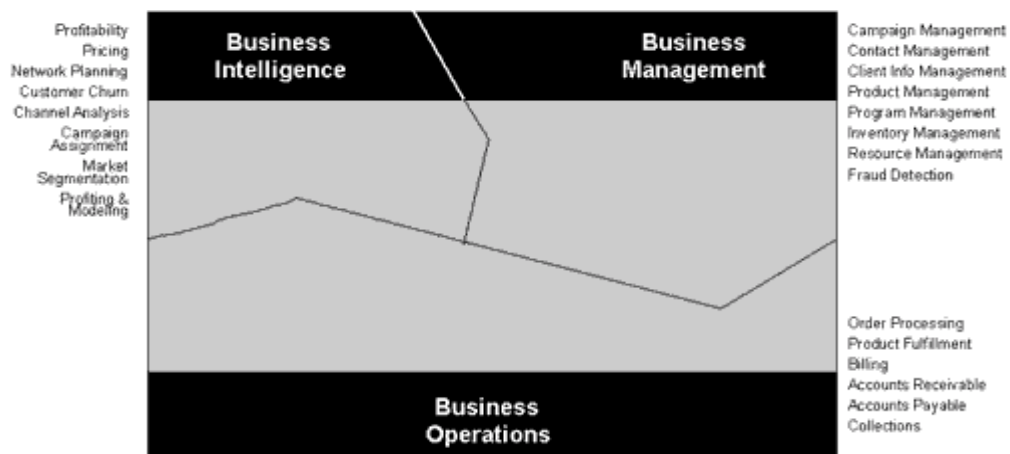
The Challenge

The challenge is that most information systems are built around the product strategy business model. This has resulted in a variety of product-oriented systems that effectively run day-to-day operations. Moving forward, additional systems are needed to augment capabilities produced by these business operation systems with capabilities to deliver best-of-breed business intelligence and business management. These capabilities enable companies to accomplish the following:

- understand the needs of their business (business intelligence)

- manage actions based on those needs (business management)

- effectively run day-to-day operations (business operations)

Figure 1 illustrates how specific capabilities align to each of these areas.
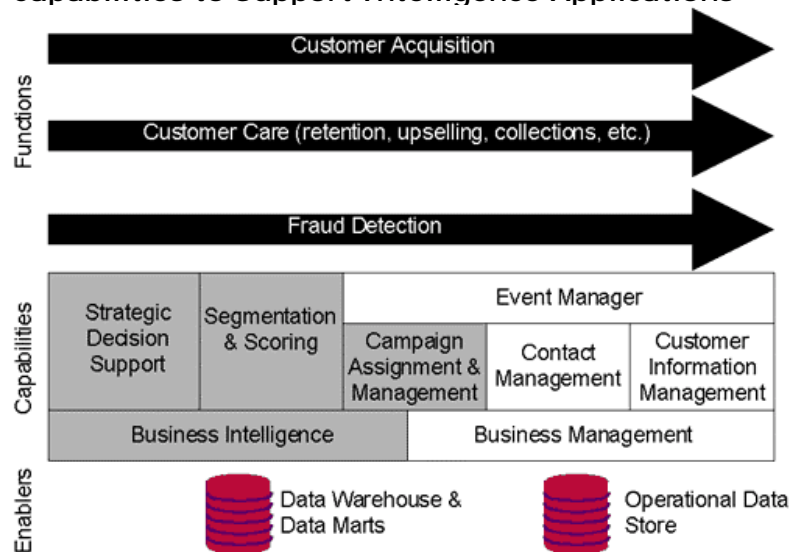
Figure 1. Additional Information Systems Are Needed to Enable New Business Capabilities

These capabilities will enable companies to realize the opportunity of a business landscape characterized by customer relationships, customized product delivery, and opportunity-driven profit. One of the key enabling technologies to this evolution is the data warehouse. *Figure 1* illustrates how the operational data store, as an enabling technology, delivers business management capabilities to complete the information solution.

Figure 2 illustrates how the data warehouse, as an enabling technology, delivers business intelligence capabilities to support business functions in the telecommunications industry.

Figure 2. A Data Warehouse Delivers Business Intelligence Capabilities to Support Intelligence Applications

4. Business Intelligence Capabilities

Strategic Decision Support

This is the cornerstone to business intelligence. In this model, end users are provided with intuitive tools to distill information about corporate assets and their performance. Corporate assets include customers, products and services, network infrastructure, and employees. Typical performance measurements include profitability, availability, usage, sales, and lifetime value. Companies can now track key performance measurements, refine customer segments and scores, and optimize campaign strategies. Some of the typical strategic decision-support capabilities in the telecommunications industry include the following:

- Develop simple reporting capabilities that allow one to measure and trend key performance metrics; these metrics include the following:

- install and disconnect rates

- call-center average sales per hour

- call-center average talk time

- campaign performance

- customer segment lifetime value

- peak network volumes

- uncollected receivables

- customer satisfaction

- Develop complex reporting capabilities that allow one to uncover problems and discover new opportunities; typical areas for analysis include the following:
  - market assessment

  - channel planning

  - competition assessment

  - strategy and pricing

  - customer penetration and profitability

  - customer segmentation

  - program definition

  - recognition of patterns relative to customer behavior and needs

- Develop statistical models that predict customer needs and behaviors; for example, one can build models that predict a customer's likelihood to do the following:
  - buy a new product

  - generate high profitability

  - respond to contacts through specific channels (e.g., direct mail, telemarketing, e-mail, etc.)

  - not pay their bill

In addition, models can be built that predict network growth and fraud based on traffic patterns in the network.

Scoring and Segmentation

These provide the mechanisms for deploying score and segmentation rules developed through strategic decision support. Scoring provides processes that apply statistical models to each customer (or prospect). A score from one to 100 is then assigned to indicate how well the customer fits the model. For example, suppose that a model predicted who was likely to be a high-usage customer. This model would be applied to each customer and a resulting score would be assigned. A score of 100 would indicate a near-perfect match to the model, as opposed to a score of one, which would indicate that the customer did not fit the model at all. Segmentation provides a means for grouping similar customers. For example, one may segment the customer base between residential and commercial markets. In addition, one may decide to provide further granularity by defining segmentation within these subsegments. Defining customer segments is the first key step toward defining a customer management strategy.

Campaign Assignment and Management

These start where strategic decision support and scoring and segmentation leave off. Now that we understand what products to deliver, to whom and how, it is time to set up a campaign to orchestrate the contact activity. Generally, campaigns contain six key elements:

- the list of customers to be contacted as part of the campaign

- the channel to be used in reaching the customer

- the product, program, and service to be offered

- the incentive to be used in selling

- the relationship relative to other campaigns

- the priority relative to other campaigns

Once the campaign has been defined, it is executed via the contact management capability.

Business intelligence—and subsequently the data warehouse—plays a key role in this process by providing capabilities to generate customer lists (element one). Elements two through six are handled as business management activities, as a result of different data, access, and availability requirements. Attempting to perform elements two through six as business intelligence activities (via the data warehouse) is likely to constrain one's information architecture over time.

Putting the Capabilities to Work

Now that the tutorial has discussed business intelligence capabilities that will be crucial to surviving in tomorrow's business landscape, it will examine how these capabilities align to the needs of the business. Customer retention will serve as an example.

1. Strategic decision support would be used to track key performance metrics relative to customer install and disconnect activity. This would provide early warning of increasing disconnect activity.

2. If disconnect activity began to grow outside of acceptable limits, strategic decision support would be used to analyze why customers were disconnecting and extrapolate impact to profitability.

3. If the profitability impacts were not acceptable, strategic decision support would be used to formulate strategies for retention.

4. Once strategies were formulated, strategic decision support would be used to develop predictive models that would align retention strategies to the appropriate customers.

5. Scoring would apply these predictive models to the entire base of customers, assigning a score value between one and 100.

6. Campaign assignment would use these scores and other relevant data to assign customer lists to the appropriate retention campaigns.

7. Business management would initiate these campaigns and manage their execution.

8. As feedback is being returned from business management, input would be used by strategic decision support to refine retention strategies.

As may be deduced, a number of capabilities are needed to support a single business need (e.g., retention), and these capabilities are integrated through the business process. What may not be quite as evident is that these capabilities can be reused to support other business needs, such as customer care or fraud. Capabilities are essential to providing telecommunications companies with the ability to respond to the changing needs of their customers and the marketplace quickly and cost effectively. The data warehouse is a fundamental enabler to delivering business intelligence capabilities.
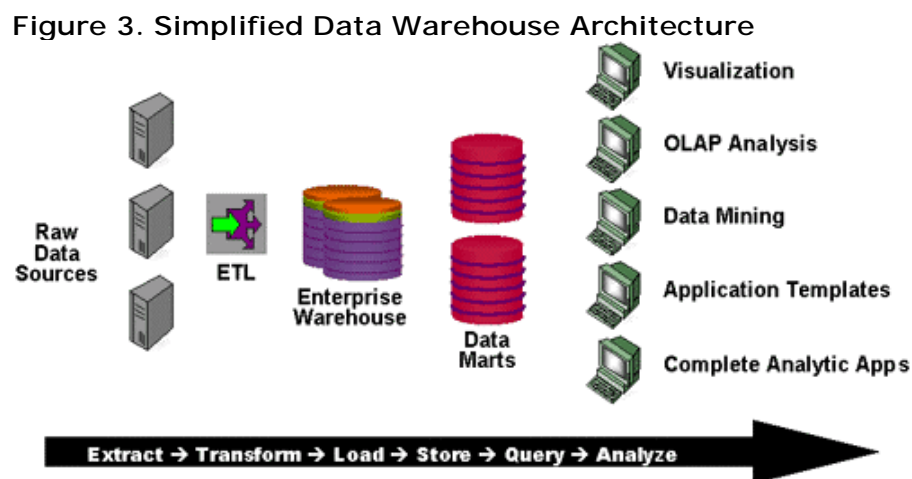
5. Data Warehousing Fundamentals

One of the technology areas that will be critical to supporting the business model discussed in *Topic 4* is data warehousing.

Data may be viewed and analyzed from the warehouse in a number of ways. One very common retrieval paradigm involves the use of an on-line analytical processing (OLAP) engine. OLAP is the term most often used to describe the broad range of analysis for which the data warehouse is used. It is different from on-line transaction processing (OLTP) in a variety of ways, but the key difference is that OLAP focuses on processing queries to the database, whereas OLTP systems process transactions in which information is entered into the database. OLTP applications are rarely, if ever, built on data warehouses.

OLAP products can offer a range of advanced analysis capabilities, such as Top N, data pivoting for multidimensional analysis, statistical functionality, the ability to drill from high-level data to successive levels of detail for iterative analysis, etc. OLAP engines can be leveraged to deliver high performance and extended analytics for ad hoc query and reporting tools, as well as for specialized packaged applications or custom executive information systems (EIS).

Data warehouses can also be used to support sophisticated operational analysis functions such as customer scoring systems (described earlier) and fraud detection applications. All of these facilities may be used in concert with a separate process known as data mining. Data mining is the practice of polling data for interesting elements or anomalies without actually having to pose specific questions or queries. Data mining is very broadly defined in the industry, and consequently, data mining software can vary greatly in terms of functionality and scope. It usually references sampled data and is often customized to an individual organization's needs.

Figure 3. Simplified Data Warehouse Architecture

6. Methodologies and Processes

Architecture: Enterprise versus Data Marts

As previously mentioned, the choice between a single enterprise-wide warehouse architecture and an architecture consisting of many smaller data marts is a point of some contention. The difference is not necessarily one of cost, although a well-planned enterprise solution may require a larger investment initially to account for the more extensive data analysis and modeling up front, as well as to avoid continual hardware upgrades as the warehouse grows. A data mart solution is typically more modular, thus exhibiting a more linear cost curve. Over the long term, however, costs tend to even out, and both systems can allow for expansion and growth. The choice of architecture usually depends more heavily on organizational factors. Depending on the situation, strong arguments can be made for both sides.

Pros and Cons

Decision-support systems existed long before the term *data warehouse* was coined, often starting in the marketing, sales, and finance departments, with each group pulling the data they required down from the legacy systems into small databases on their local servers. These solutions were often implemented independently and without assistance from information services (IS). Consequently, results tended to be inconsistent, particularly as compared to results obtained by sister organizations with similar but separate decision-support systems of their own.

Thus, early wisdom in the data warehousing market favored a single, central enterprise system that would serve all organizations' needs. Although some compromises might be necessary in serving the needs of the many, this type of solution would at least ensure consistency of data and scope across organizations. In addition, the information was typically more reliable, as the process of acquiring and cleansing data was more deliberate and more carefully managed.

However, the enterprise data warehouse approach has a drawback. It takes time, and it takes coordination between many groups across potentially many different organizations within a company. Some pioneers of this approach ran into long delays in their warehouse implementations as well as coordination stumbling blocks that either terminated or significantly set back their deployments. In particular, companies that are very compartmentalized in their structure do not lend themselves easily to an enterprise-wide solution. In these cases, integrated data marts can offer greater customization, less contention for system resources, and greater independence for participating organizations. It is important, however, for the reasons stated earlier, that particular care be taken in planning

the data acquisition, transformation, and consolidation stages for a data mart. Centralized consolidation can often help minimize data inconsistency between data marts.

A sound deployment strategy is to harness the benefits of both approaches by engaging a few key end-user groups as well as the IS organization and designing a skeleton architecture for the broad enterprise data warehouse. However, rather than begin by trying to load, cleanse, deploy, and manage all of the enterprise data, select one or two key applications to focus on first, define the data marts required to support them, and start with a manageable project. Then, as new applications are brought on-line, merge them into the enterprise warehouse architecture and implement them one at a time. This strategy is sometimes referred to as the architected data mart approach.

Critical Success Factors

Know Your Goals

Perhaps the most important success factor in the data warehouse is to keep one's long-term goals in mind. It is easy to let a warehouse project explode beyond the initial boundaries set for it. One user group finds out that it has been excluded from initial rollout and demands to be included. The initial target user group decides it would be even better if it could do churn management and pricing analysis during phase one, rather than wait until phase two to bring the pricing analysis system on-line. The IS director decides it makes sense to define, build, and load the entire warehouse infrastructure before trying to deliver data to end users. Clearly, it is almost impossible to eliminate scope creep completely. Valid issues arise and must be dealt with. However, it is generally a bad sign when objectives change significantly after final sign-off—or, worse, after implementation has begun. Whenever possible, initial goals to which all are agreed should be maintained. Exceptions will always occur, but it is an important rule of thumb.

Performance

The data warehouse will fail if users do not get answers back in a timely fashion. This is why parallel database technology, advanced indexing, data modeling, aggregation, and sampling are so critical to the success of the data warehouse project. This is an area in which investment makes sense—not only in technology, but in experts who know how to maximize the utility of the technology.

Data Volumes: Loads and Management

One of the characteristic challenges of a telecommunications business is managing enormous volumes of data. Not only do telecom systems generate huge numbers of detailed call records (and others), but the records themselves are very large, and it is not always possible to know what, if anything, can be filtered out of the warehouse. Complicating matters is that common telecom applications, like fraud detection, require real-time data feeds for optimal effectiveness. As a result, telecom data warehouses must be able to handle tremendous insertion rates, as well as manage databases that will likely grow into the multiterabyte range. Building a system with technology that will not scale effectively as data volumes grow can be one of the most frustrating (and expensive) experiences a company can endure.

Relationship between IS and Users

In any data warehouse implementation, it is critical that IS and the user community be in agreement about the objectives of the warehouse and be in constant communication throughout the project. A project driven solely by IS runs a significant risk of slow adoption, low return on ROI, or even outright failure. A project solely driven by the user community risks a duplication of effort, a lack of integration with other critical systems across the organization, and an unmanageable enterprise environment.

Executive Sponsorship

Data warehouses are very large, expensive, complex systems. All warehouse projects will encounter tumultuous periods, whether due to technological setbacks, staffing issues, insufficient infrastructure, or poor communication. And this is not an exhaustive list. All problems are resolvable, but if there are no sponsors at the senior management level, these problems can quickly take on monumental proportions. By sponsors, we mean people who understand the business pain being addressed by the project and believe wholeheartedly that building the data warehouse is the best route to resolving that pain. A powerful executive sponsor can help knife through challenges before they impact project momentum. A lack of executive support raises constant doubts about a project and can lead to multiple starts and stops in the implementation, badly demoralizing the project team and the business community.

7. Conclusion

As telecommunications markets become increasingly competitive, the ability to react quickly and decisively to market trends and to tailor products and services to individual customers is more critical than ever. Although data volumes

continue to increase at an astounding rate, the problem is no longer simply one of quantity; at the heart of the issue is how companies are using their information. Increasingly, particularly in the telecommunications industry, it is important to understand customer preferences and behaviors. A data warehouse can be a very effective means of organizing and analyzing the complex barrage of information generated in one's business and helping to generate a more effective business model for keeping one's customer base happy and profitable.

Self-Test

1. Data warehousing is the process of integrating enterprise-wide corporate data into multiple repositories.

    a. true

    b. false

2. The product strategy business model has increased customer loyalty.

    a. true

    b. false

3. A score of _____ indicates a near-perfect match between the customer and the model.

    a. one

    b. 100

4. A score of _____ indicates that the customer does not fit the model at all.

    a. one

    b. 100

5. Capabilities that support a single business need may be reused to support other needs.

    a. true

    b. false

6. The _____ focuses on processing queries to the database.

    a. OLAP

b. OLTP

7. The _____ processes transactions in which information is entered into the database.

   a. OLAP

   b. OLTP

8. Data mining involves posing specific queries or questions to the database.

   a. true

   b. false

9. Costs are about even for enterprise versus data marts.

   a. true

   b. false

10. In any data warehouse implementation, IS and the user community must be in constant communication.

    a. true

    b. false

Correct Answers

1. Data warehousing is the process of integrating enterprise-wide corporate data into multiple repositories.

   a. true

   b. false

   See Definition.

2. The product strategy business model has increased customer loyalty.

   a. true

   b. false

   See Topic 2.

3. A score of _____ indicates a near-perfect match between the customer and the model.

   a. one

   b. 100

   See Topic 4.

4. A score of _____ indicates that the customer does not fit the model at all.

   a. one

   b. 100

   See Topic 4.

5. Capabilities that support a single business need may be reused to support other needs.

   a. true

   b. false

   See Topic 4.

6. The _____ focuses on processing queries to the database.

   a. OLAP

   b. OLTP

   See Topic 5.

7. The _____ processes transactions in which information is entered into the database.

   a. OLAP

   b. OLTP

   See Topic 5.

8. Data mining involves posing specific queries or questions to the database.

   a. true

b. false

See Topic 5.

9. Costs are about even for enterprise versus data marts.

a. true

b. false

See Topic 6.

10. In any data warehouse implementation, IS and the user community must be in constant communication.

a. true

b. false

See Topic 6.

Glossary

EIS
executive information system

IS
information services

ISP
Internet service provider

OLAP
on-line analytical processing

OLTP
on-line transaction processing

RDBMS
routing database management system

ROI
return on investment